

# Literature search for Personal Care Products in the marine environment

*Dominic Andradi-Brown*

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## Search methodology

### Search terms:

The following search string was run on the 13 October 2015:

"Personal care products" OR "Cosmetics" OR "Sunscreen" OR "Soap" OR "shampoo" OR "house-hold products" OR "preservatives" OR "parabens" OR "benzophenones" OR "detergents" OR "fragrances" OR "emulsifiers" OR "surfactants" AND "marine"

### Data Sources:

PubMed

Search was run using the advanced search feature, searching all years and article types. 717 studies were identified, and all were exported for screening.

ScienceDirect

Search was run with their expert search feature, searching all years, books and journals in 'All Science categories'. This resulted in 33,734 search results. The search results were sorted by relevance, and the first 1,000 downloaded for screening. The search results were then sorted by date (with most recent first) and the most recent 1,000 downloaded for screening. This method was used as ScienceDirect only allows blocks of 1,000 references to be downloaded, so it was not possible to download the top 2,000 references when sorted by relevance without manually going through each reference individually on the website.

Scopus:

Scopus advanced search run for all years with the search string. 32,658 references were identified. These were ordered by relevance and the first 2,000 downloaded for screening.

### Screening:

4,717 references were downloaded from data sources in total. These were placed in EndNote X7 where the remove duplicates feature was used. 385 duplicate references that had been picked up by the different data sources were removed, leaving 4,332 references for screening.

References were exported from EndNote into EPPI-Reviewer 4 for screening. References were screened based on title, with obviously not relevant articles rejected at this point. Those potentially relevant articles at title level were viewed at abstract level where they were flagged as relevant or rejected.

## Summary results

In total 153 studies were found relating to PCPs or the effects of chemicals contained within PCPs on the marine environment.

### **Studies of PCPs or PCP chemicals on the marine environment or marine organisms:**

In-situ studies: 4 studies

Lab studies on fish: 7 studies

Lab studies on marine invertebrates: 46 studies

Lab studies on algae, bacteria etc: 27 studies

### **PCP records from the marine environment:**

Fish and marine invertebrates: 18 studies

Marine mammals: 6 studies

Marine sediment and seawater: 37 studies

### **General review papers**

Mention PCPs in the marine environment – 12 studies

## In-situ studies of impacts on marine organisms/ecosystems

**Author:** Alonso, M. B., Feo, M. L., Corcellas, C., Gago-Ferrero, P., Bertozzi, C. P., Marigo, J., Flach, L., Meirelles, A. C., Carvalho, V. L., Azevedo, A. F., Torres, J. P., Lailson-Brito, J., Malm, O., Diaz-Cruz, M. S., Eljarrat, E. and Barcelo, D.

**Year:** 2015

**Title:** Toxic heritage: Maternal transfer of pyrethroid insecticides and sunscreen agents in dolphins from Brazil

**Journal:** Environ Pollut

**Volume:** 207

**Pages:** 391-402

**Date:** 2015

**Short Title:** Toxic heritage: Maternal transfer of pyrethroid insecticides and sunscreen agents in dolphins from Brazil

**ISSN:** 0269-7491

**DOI:** 10.1016/j.envpol.2015.09.039.

**Keywords:** eppi-reviewer4

**Abstract:** Pyrethroids (PYR) and UV filters (UVF) were investigated in tissues of paired mother-fetus dolphins from Brazilian coast in order to investigate the possibility of maternal transfer of these emerging contaminants. Comparison of PYR and UVF concentrations in maternal and fetal blubber revealed Franciscana transferred efficiently both contaminants to fetuses ( $F/M > 1$ ) and Guiana dolphin transferred efficiently PYR to fetuses ( $F/M > 1$ ) different than UVF ( $F/M < 1$ ). PYR and UVF concentrations in fetuses were the highest-ever reported in biota (up to 6640 and 11,530 ng/g lw, respectively). Muscle was the organ with the highest PYR and UVF concentrations ( $p < 0.001$ ), suggesting that these two classes of emerging contaminants may have more affinity for proteins than for lipids. The high PYR and UVF concentrations found in fetuses demonstrate these compounds are efficiently transferred through placenta. This study is the first to report maternal transfer of pyrethroids and UV filters in marine mammals.

**Notes:** 18228309

5140

**URL:** <http://www.ncbi.nlm.nih.gov/pubmed/26453834>

**Author:** Chariton, A. A., Ho, K. T., Proestou, D., Bik, H., Simpson, S. L., Portis, L. M., Cantwell, M. G., Baguley, J. G., Burgess, R. M., Pelletier, M. M., Perron, M., Gunsch, C. and Matthews, R. A.

**Year:** 2014

**Title:** A molecular-based approach for examining responses of eukaryotes in microcosms to contaminant-spiked estuarine sediments

**Journal:** Environmental Toxicology and Chemistry

**Volume:** 33

**Pages:** 359-369

**Date:** 2014

**Short Title:** A molecular-based approach for examining responses of eukaryotes in microcosms to contaminant-spiked estuarine sediments

**Keywords:** eppi-reviewer4

**Abstract:** Ecotoxicological information for most contaminants is limited to a small number of taxa, and these are generally restricted to comparatively hardy organisms that are readily extractable from test media and easily identifiable. Advances in DNA sequencing can now provide a comprehensive view of benthic invertebrate diversity. The authors applied 454 pyrosequencing to examine the responses of benthic communities in microcosms exposed to sediments with elevated concentrations of triclosan, the endpoint being eukaryal communities that have successfully vertically migrated through the manipulated sediments. The biological communities associated with the 3 treatments (control triclosan, low triclosan [14mg/kg], and high triclosan [180mg/kg]) clustered into 3 groups: control/low (n=6 controls and 4 low), moderate (n=2 low), and high (n=5 high). One sample was discarded as an outlier. The most pronounced change as a response to triclosan was the loss of number of metazoan operational taxonomic units (OTUs), indicative of the control/low and moderate groups, with this being most

evident in the range of taxa associated with the classes Chromadorea and Bivalvia and the phylum Kinorhyncha. The authors also describe a range of other taxa that aided discrimination between the groups; compare findings with traditionally obtained meio- and macrofaunal communities obtained from the same experiment; and illustrate some of the advantages and limitations associated with both the molecular and traditional approaches. The described approach illustrates the capacity for amplicon sequencing to provide ecologically relevant information that can be used to strengthen an understanding of how sedimentary communities respond to a range of environmental stressors. © 2014 SETAC.

**Notes:** 18228791

9269

**Cited By :** 8 **Export Date:** 13 October 2015

**URL:** <http://www.scopus.com/inward/record.url?eid=2-s2.0-84892486533&partnerID=40&md5=3564e17c4b7e6ec5ce16e19b9fbc60ca>

**Author:** Danovaro, R., Bongiorno, L., Corinaldesi, C., Giovannelli, D., Damiani, E., Astolfi, P., Greci, L. and Pusceddu, A.

**Year:** 2008

**Title:** Sunscreens cause coral bleaching by promoting viral infections

**Journal:** Environ Health Perspect

**Volume:** 116

**Pages:** 441-7

**Date:** 2008

**Short Title:** Sunscreens cause coral bleaching by promoting viral infections

**ISSN:** 0091-6765 (Print) 0091-6765

**DOI:** 10.1289/ehp.10966.

**Keywords:** eppi-reviewer4

**Abstract:** BACKGROUND: Coral bleaching (i.e., the release of coral symbiotic zooxanthellae) has negative impacts on biodiversity and functioning of reef ecosystems and their production of goods and services. This increasing world-wide phenomenon is associated with temperature anomalies, high irradiance, pollution, and bacterial diseases. Recently, it has been demonstrated that personal care products, including sunscreens, have an impact on aquatic organisms similar to that of other contaminants. OBJECTIVES: Our goal was to evaluate the potential impact of sunscreen ingredients on hard corals and their symbiotic algae. METHODS: In situ and laboratory experiments were conducted in several tropical regions (the Atlantic, Indian, and Pacific Oceans, and the Red Sea) by supplementing coral branches with aliquots of sunscreens and common ultraviolet filters contained in sunscreen formula. Zooxanthellae were checked for viral infection by epifluorescence and transmission electron microscopy analyses. RESULTS: Sunscreens cause the rapid and complete bleaching of hard corals, even at extremely low concentrations. The effect of sunscreens is due to organic ultraviolet filters, which are able to induce the lytic viral cycle in symbiotic zooxanthellae with latent infections. CONCLUSIONS: We conclude that sunscreens, by promoting viral infection, potentially play an important role in coral bleaching in areas prone to high levels of recreational use by humans.

**Notes:** 18229019

5572

**URL:** <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2291018/pdf/ehp0116-000441.pdf>

**'File' Attachments:** internal-pdf://1365633728/Danovaro-2008-Sunscreens cause coral bleaching.pdf

**Author:** Maranhó, L. A., André, C., DelValls, T. A., Gagné, F. and Martín-Díaz, M. L.

**Year:** 2015

**Title:** In situ evaluation of wastewater discharges and the bioavailability of contaminants to marine biota

**Journal:** Science of The Total Environment

**Volume:** 538

**Pages:** 876-887

**Date:** 2015

**Short Title:** In situ evaluation of wastewater discharges and the bioavailability of contaminants to marine biota

**ISSN:** 0048-9697

**Keywords:** eppi-reviewer4

**Abstract:** Marine sediment quality of wastewater discharges areas was determined by using in situ caged clams *Ruditapes philippinarum* taking into account the seasonality. Clams were caged in sediment directly affected by wastewater discharges at four sites (P1, P2, P3, P4) at the Bay of Cádiz (SW, Spain), and one reference site (P6). Exposure to contaminated sediments was confirmed by measurement of metals and As, PAH, pharmaceutical products and surfactants (SAS) in bottom sediments. Biological effects were determined by following biomarkers of exposure (activities of 7-ethoxyresorufin O-deethylase – EROD, dibenzylfluorescein dealkylase – DBF, glutathione S-transferase – GST, glutathione peroxidase – GPX, glutathione reductase – GR and acetylcholinesterase – AChE), effects (lysosomal membrane stability – LMS, DNA damage and lipid peroxidation – LPO), energy status (total lipids – TLP and mitochondrial electron transport – MET), and involved in the mode of action of pharmaceutical products (monoamine oxidase activity – MAO, alkali-labile phosphates – ALP levels and cyclooxygenase activity – COX). In winter, urban effluents were detoxified by phase I biotransformation (CYP3A-like activity), phase II (GST), and the activation of antioxidant defence enzymes (GR). Urban effluents lead to the detoxification metabolism (CYP1A-like), oxidative effects (LPO and DNA damage), neurotoxicity (AChE) and neuroendocrine disruption (COX and ALP levels) involved in inflammation (P1 and P2) and changes in reproduction as spawning delay (P3 and P4) in clams exposed in summer. Adverse effects on biota exposed to sediment directly affected by wastewater discharges depend on the chemical contamination level and also on the reproductive cycle according to seasonality.

**Notes:** 18230562

5987

**URL:** <http://www.sciencedirect.com/science/article/pii/S0048969715306379>

## Lab studies of impacts on fish

**Reference Type:** Journal Article

**Record Number:** 5

**Author:** Hamlin, H. J., Marciano, K. and Downs, C. A.

**Year:** 2015

**Title:** Migration of nonylphenol from food-grade plastic is toxic to the coral reef fish species *Pseudochromis fridmani*

**Journal:** Chemosphere

**Volume:** 139

**Pages:** 223-8

**Date:** 2015

**Short Title:** Migration of nonylphenol from food-grade plastic is toxic to the coral reef fish species *Pseudochromis fridmani*

**ISSN:** 0045-6535

**DOI:** 10.1016/j.chemosphere.2015.06.032. Epub 2015 Jun 29.

**Keywords:** eppi-reviewer4

**Abstract:** Nonylphenol (NP) is a non-ionic surfactant used extensively in industrial applications, personal care products, and many plastics. We exposed marine orchid dottybacks (*Pseudochromis fridmani*) for 48h to either glass, Teflon, or two bags labeled as FDA food-grade polyethylene (PE1 and PE2) from different manufacturers. The PE2 bags leached high levels of NP into the contact water, which were taken up by the fish, and decreased short and long-term survival. Concentrations of NP that leached from the bags were consistent with 96h LC50 values determined in this study, indicating NP is the likely toxic agent. Despite being similarly labeled, the NP concentrations that leached from the bags and the resultant toxicity to the fish varied dramatically between manufacturers. This study highlights that some plastics, labeled as food-safe, can be highly toxic to aquatic animals, and could pose a greater threat to humans than previously realized. This study also highlights risks for aquatic animals exposed to increasing quantities of plastic waste.

**Notes:** 18229630

**URL:** <http://www.sciencedirect.com/science/article/pii/S0045653515006517>

**Reference Type:** Journal Article

**Record Number:** 6

**Author:** Ishibashi, Hiroshi, Matsumura, Naomi, Hirano, Masashi, Matsuoka, Munekazu, Shiratsuchi, Hideki, Ishibashi, Yasuhiro, Takao, Yuji and Arizono, Koji

**Year:** 2004

**Title:** Effects of triclosan on the early life stages and reproduction of medaka *Oryzias latipes* and induction of hepatic vitellogenin

**Journal:** Aquatic Toxicology

**Volume:** 67

**Pages:** 167-179

**Date:** 2004

**Short Title:** Effects of triclosan on the early life stages and reproduction of medaka *Oryzias latipes* and induction of hepatic vitellogenin

**ISSN:** 0166-445X

**Keywords:** eppi-reviewer4

**Abstract:** Triclosan (2,4,4'-trichloro-2'-hydroxydiphenyl ether) is widely used as antibacterial agent in various industrial products, such as textile goods, soap, shampoo, liquid toothpaste and cosmetics, and often detected in wastewater effluent. In this study, the effects of TCS on the early life stages and reproduction of medaka (*Oryzias latipes*) were investigated. The 96-h median lethal concentration value of TCS for 24-h-old larvae was 602 µg/l. The hatchability and time to hatching in fertilized eggs exposed to 313 µg/l TCS for 14 days were significantly decreased and delayed, respectively. An assessment of the effects of a TCS 21-day exposure period on the reproduction of paired medaka showed no significant differences in the number of eggs produced and fertility among the control and 20, 100 and 200 µg/l TCS treatment

groups. However, concentrations of hepatic vitellogenin were increased significantly in males treated with TCS at 20 and 100 µg/l. In the F1 generations, although the hatching of embryos in the 20 µg/l treatment showed adverse effects, there was no dose-response relationship between hatchability and TCS treatment levels. These results suggest that TCS has high toxicity on the early life stages of medaka, and that the metabolite of TCS may be a weak estrogenic compound with the potential to induce vitellogenin in male medaka but with no adverse effect on reproductive success and offspring.

**Notes:** 18229821

7829

**URL:** <http://www.sciencedirect.com/science/article/pii/S0166445X03002522>

**Reference Type:** Journal Article

**Record Number:** 7

**Author:** Nigro, M., Bernardeschi, M., Costagliola, D., Della, Torre, Frenzilli, G., Guidi, P., Lucchesi, P., Mottola, F., Santonastaso, M., Scarcelli, V., Monaci, F., Corsi, I., Stingo, V. and Rocco, L.

**Year:** 2015

**Title:** n-TiO<sub>2</sub> and CdCl<sub>2</sub> co-exposure to titanium dioxide nanoparticles and cadmium: Genomic, DNA and chromosomal damage evaluation in the marine fish European sea bass (*Dicentrarchus labrax*)

**Journal:** Aquatic Toxicology

**Volume:** 168

**Pages:** 72-77

**Date:** 2015

**Short Title:** n-TiO<sub>2</sub> and CdCl<sub>2</sub> co-exposure to titanium dioxide nanoparticles and cadmium: Genomic, DNA and chromosomal damage evaluation in the marine fish European sea bass (*Dicentrarchus labrax*)

**ISSN:** 0166-445X

**Keywords:** eppi-reviewer4

**Abstract:** Due to the large production and growing use of titanium dioxide nanoparticles (n-TiO<sub>2</sub>), their release in the marine environment and their potential interaction with existing toxic contaminants represent a growing concern for biota. Different end-points of genotoxicity were investigated in the European sea bass *Dicentrarchus labrax* exposed to n-TiO<sub>2</sub> (1 mg L<sup>-1</sup>) either alone and combined with CdCl<sub>2</sub> (0.1 mg L<sup>-1</sup>) for 7 days. DNA primary damage (comet assay), apoptotic cells (diffusion assay), occurrence of micronuclei and nuclear abnormalities (cytome assay) were assessed in peripheral erythrocytes and genomic stability (random amplified polymorphism DNA-PCR, RAPD assay) in muscle tissue. Results showed that genome template stability was reduced after CdCl<sub>2</sub> and n-TiO<sub>2</sub> exposure. Exposure to n-TiO<sub>2</sub> alone was responsible for chromosomal alteration but ineffective in terms of DNA damage; while the opposite was observed in CdCl<sub>2</sub> exposed specimens. Co-exposure apparently prevents the chromosomal damage and leads to a partial recovery of the genome template stability.

**Notes:** 18230883

6069

**URL:** <http://www.sciencedirect.com/science/article/pii/S0166445X15300539>

**Reference Type:** Journal Article

**Record Number:** 8

**Author:** Soto, M. and Rodríguez-Fuentes, G.

**Year:** 2014

**Title:** Evaluation of the estrogenic effects of UV filters on the sergeant major damselfish, *Abudefduf saxatilis*

**Journal:** Ciencias Marinas

**Volume:** 40

**Pages:** 187-196

**Date:** 2014



**Short Title:** Evaluation of the estrogenic effects of UV filters on the sergeant major damselfish, *Abudefduf saxatilis*

**Keywords:** eppi-reviewer4

**Abstract:** Oxybenzone, octyl salicylate, and octinoxate are compounds used in a variety of products as a protection against exposure to ultraviolet radiation. Concerns have emerged regarding their environmental safety as previous studies have shown that they tend to bioaccumulate and act as potential xenoestrogens in aquatic organisms. To our knowledge no studies have investigated their impact on tropical reef-associated species. Thus, the aim of the present study was to evaluate the estrogenic effects of these three compounds on the abundant, reef-associated sergeant major damselfish, *Abudefduf saxatilis*. As no genomic information of *A. saxatilis* was available, the first part of the study was to isolate and to sequence the vitellogenin (VTG) and  $\beta$ -actin genes. In the second part, the potential estrogenicity of the three compounds in juvenile fish (<5 cm) was studied using gene expression and protein synthesis analyses to evaluate the induction of VTG. Fish were exposed to doses of 5, 25, and 50  $\mu\text{g g}^{-1}$  of oxybenzone, octyl salicylate, octinoxate, and to a mixture of them in a similar proportion to the one used in commercial personal care products. An increment in alkali-labile phosphate was observed in all treatments, but it was only statistically significant in the positive control (17 $\beta$ -estradiol). Relative gene expression was only statistically augmented in the positive control. © 2014, Ciencias Marinas. All rights reserved.

**Notes:** 18231704

8115

Export Date: 13 October 2015

**URL:** <http://www.scielo.org.mx/pdf/ciemar/v40n3/v40n3a3.pdf>

**Reference Type:** Journal Article

**Record Number:** 9

**Author:** Torre, C. D., Buonocore, F., Frenzilli, G., Corsolini, S., Brunelli, A., Guidi, P., Kocan, A., Mariottini, M., Mottola, F., Nigro, M., Pozo, K., Randelli, E., Vannuccini, M. L., Picchietti, S., Santonastaso, M., Scarcelli, V., Focardi, S., Marcomini, A., Rocco, L., Scapigliati, G. and Corsi, I.

**Year:** 2015

**Title:** Influence of titanium dioxide nanoparticles on 2,3,7,8-tetrachlorodibenzo-p-dioxin bioconcentration and toxicity in the marine fish European sea bass (*Dicentrarchus labrax*)

**Journal:** Environ Pollut

**Volume:** 196

**Pages:** 185-93

**Date:** 2015

**Short Title:** Influence of titanium dioxide nanoparticles on 2,3,7,8-tetrachlorodibenzo-p-dioxin bioconcentration and toxicity in the marine fish European sea bass (*Dicentrarchus labrax*)

**ISSN:** 0269-7491

**Keywords:** eppi-reviewer4

**Abstract:** The present study investigated the influence of nano-TiO<sub>2</sub> (1 mg L<sup>-1</sup>) on 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) (46 pg L<sup>-1</sup>) bioconcentration and toxicity in the European sea bass (*Dicentrarchus labrax*) during 7 days in vivo exposure. A multimarkers approach was applied in different organs: detoxification in liver; innate immunity and pro-inflammatory response and adaptive immunity in gills and spleen; genotoxicity in peripheral erythrocytes and muscle. Bioconcentration of 2,3,7,8-TCDD in presence of nano-TiO<sub>2</sub> was investigated in liver, skin and muscle as well as interaction between nano-TiO<sub>2</sub> and organic pollutants in artificial sea water (ASW). Nano-TiO<sub>2</sub> negatively influenced immune response induced by 2,3,7,8-TCDD in spleen but not in gills and reduced the DNA damage induced by 2,3,7,8-TCDD in erythrocytes. nano-TiO<sub>2</sub> did not interfere with 2,3,7,8-TCDD detoxification and bioconcentration according to the observed no interaction of the nano-TiO<sub>2</sub> with organic pollutants in ASW.

**Notes:** 18231892

**URL:** <http://www.sciencedirect.com/science/article/pii/S0269749114004254>

**Reference Type:** Journal Article

**Record Number:** 10

**Author:** Vidal-Dorsch, D. E., Bay, S. M., Greenstein, D. J., Baker, M. E., Hardiman, G., Reyes, J. A., Kelley, K. M. and Schlenk, D.

**Year:** 2014

**Title:** Biological responses of marine flatfish exposed to municipal wastewater effluent

**Journal:** Environ Toxicol Chem

**Volume:** 33

**Pages:** 583-91

**Date:** 2014

**Short Title:** Biological responses of marine flatfish exposed to municipal wastewater effluent

**ISSN:** 0730-7268

**DOI:** 10.1002/etc.2466. Epub 2014 Jan 24.

**Keywords:** eppi-reviewer4

**Abstract:** There is increasing concern over the presence of pharmaceutical compounds, personal care products, and other chemicals collectively known as contaminants of emerging concern (CECs) in municipal effluents, yet knowledge of potential environmental impacts related to these compounds is still limited. The present study used laboratory exposures to examine estrogenic, androgenic, and thyroid-related endocrine responses in marine hornyhead turbot (*Pleuronichthys verticalis*) exposed to CECs from municipal effluents with 2 degrees of treatment. Fish were exposed for 14 d to environmentally realistic concentrations of effluent (0.5%) and to a higher concentration (5%) to investigate dose responses. Plasma concentrations of estradiol (E2), vitellogenin (VTG), 11-keto testosterone, and thyroxine were measured to assess endocrine responses. Contaminants of emerging concern were analyzed to characterize the effluents. Diverse types of effluent CECs were detected. Statistically significant responses were not observed in fish exposed to environmentally realistic concentrations of effluent. Elevated plasma E2 concentrations were observed in males exposed to ammonia concentrations similar to those found in effluents. However, exposure to ammonia did not induce VTG production in male fish. The results of the present study highlight the importance of conducting research with sentinel organisms in laboratory studies to understand the environmental significance of the presence of CECs in aquatic systems.

**Notes:** 18232008

**URL:** <http://onlinelibrary.wiley.com/doi/10.1002/etc.2466/full>

**Reference Type:** Journal Article

**Record Number:** 11

**Author:** Vignardi, C. P., Hasue, F. M., Sartorio, P. V., Cardoso, C. M., Machado, A. S., Passos, M. J., Santos, T. C., Nucci, J. M., Hewer, T. L., Watanabe, I. S., Gomes, V. and Phan, N. V.

**Year:** 2015

**Title:** Genotoxicity, potential cytotoxicity and cell uptake of titanium dioxide nanoparticles in the marine fish *Trachinotus carolinus* (Linnaeus, 1766)

**Journal:** Aquat Toxicol

**Volume:** 158

**Pages:** 218-29

**Date:** 2015

**Short Title:** Genotoxicity, potential cytotoxicity and cell uptake of titanium dioxide nanoparticles in the marine fish *Trachinotus carolinus* (Linnaeus, 1766)

**ISSN:** 0166-445x

**DOI:** 10.1016/j.aquatox.2014.11.008. Epub 2014 Nov 23.

**Keywords:** eppi-reviewer4

**Abstract:** Nanoparticles have physicochemical characteristics that make them useful in areas such as science, technology, medicine and in products of everyday use. Recently the manufacture and variety of these products has grown rapidly, raising concerns about their impact on human health and the environment. Adverse effects of exposure to

nanoparticles have been reported for both terrestrial and aquatic organisms, but the toxic effects of the substances on marine organisms remain poorly understood. The main aim of this study was to evaluate the genotoxicity of TiO<sub>2</sub>-NP in the marine fish *Trachinotus carolinus*, through cytogenotoxic methods. The fish received two different doses of 1.5 µg and 3.0 µg-TiO<sub>2</sub>-NP g<sup>(-1)</sup> by intraperitoneal injection. Blood samples were collected to analyze erythrocyte viability using the Trypan Blue exclusion test, comet assay (pH>13), micronucleus (MN) and other erythrocyte nuclear abnormalities (ENA) 24, 48 and 72 h after injection. The possible cell uptake of TiO<sub>2</sub>-NP in fish injected with the higher dose was investigated after 72 h using transmission electron microscopy (TEM). The results showed that TiO<sub>2</sub>-NP is genotoxic and potentially cytotoxic for this species, causing DNA damage, inducing the formation of MN and other ENA, and decreasing erythrocyte viability. TEM examination revealed that cell uptake of TiO<sub>2</sub>-NP was mainly in the kidney, liver, gills and to a lesser degree in muscle. To the extent of the authors' knowledge, this is the first in vivo study of genotoxicity and other effects of TiO<sub>2</sub>-NP in a marine fish.

**Notes:** 18232017

**URL:** <http://www.sciencedirect.com/science/article/pii/S0166445X14003440>

## Lab studies of impacts on marine invertebrates

**Reference Type:** Journal Article

**Record Number:** 12

**Author:** Amouroux, I., Pesando, D., Noël, H. and Girard, J. P.

**Year:** 1999

**Title:** Mechanisms of cytotoxicity by cosmetic ingredients in sea urchin eggs

**Journal:** Archives of Environmental Contamination and Toxicology

**Volume:** 36

**Pages:** 28-37

**Date:** 1999

**Short Title:** Mechanisms of cytotoxicity by cosmetic ingredients in sea urchin eggs

**Keywords:** eppi-reviewer4

**Abstract:** The acute cytotoxicities of four cosmetic ingredients: a preservative, imidazolidinylurea (IU) and three mild surfactants, cocamido propyl hydroxy sultaine (CAS), magnesium laurth sulfate (Mg LES), and decyl glucoside (APG) were studied using sea urchin eggs. The cellular targets of these compounds were identified by studying the effects on calcium homeostasis, intracellular pH, sodium and potassium contents, protein and DNA synthesis, and protein phosphorylation. These compounds inhibited the first cleavage of sea urchin eggs in a dose-dependent fashion with half maximal doses (IC50) from 30 µg/ml for Mg LES, 60 µg/ml for IU, 83 µg/ml for CAS, to above 400 µg/ml for APG. The time at which a compound showed the greatest toxicity to the cell cycle was definable for APG (between 20 and 50 min postfertilization) and IU (from fertilization to 50 min later); the other compounds being toxic throughout division. Compounds exhibited toxicity to a wide range of cellular targets. IU, the least toxic, mainly operates through inhibition of protein and DNA syntheses. CAS and Mg LES produced nonspecific cytotoxicity related to alterations of membrane and endomembrane permeabilities resulting in ionic disequilibrium (Na<sup>+</sup>, K<sup>+</sup>, Ca<sup>2+</sup>) and inhibition of intracellular storage of Ca<sup>2+</sup>. The APG effect mainly involved intracellular pH and DNA synthesis a hypothesis suggested by the narrow postfertilization period of maximal toxicity.

**Notes:** 18228334

7927

**Cited By :** 9 **Export Date:** 13 October 2015

**URL:** <http://www.scopus.com/inward/record.url?eid=2-s2.0-0032889307&partnerID=40&md5=880db7921ab923e9e01811decd3a258f>

**Reference Type:** Journal Article

**Record Number:** 13

**Author:** Barmo, C., Ciacci, C., Canonico, B., Fabbri, R., Cortese, K., Balbi, T., Marcomini, A., Pojana, G., Gallo, G. and Canesi, L.

**Year:** 2013

**Title:** In vivo effects of n-TiO<sub>2</sub> on digestive gland and immune function of the marine bivalve *Mytilus galloprovincialis*

**Journal:** Aquat Toxicol

**Volume:** 132-133

**Pages:** 9-18

**Date:** 2013

**Short Title:** In vivo effects of n-TiO<sub>2</sub> on digestive gland and immune function of the marine bivalve *Mytilus galloprovincialis*

**ISSN:** 0166-445x

**DOI:** 10.1016/j.aquatox.2013.01.014. Epub 2013 Feb 7.

**Keywords:** eppi-reviewer4

**Abstract:** Due to the increasing production of nanoparticles (NPs) and their potential release in the aquatic environment, evaluation of their biological impact on aquatic organisms represents a major concern. Suspension feeding invertebrates, in particular bivalve mollusks, may play a role in NP biotransformation and transfer through food webs and may represent a significant target for NP toxicity. In this work, the in vivo effects of titanium dioxide (n-TiO<sub>2</sub>), one of the most widespread NPs in use, were

investigated in the bivalve *Mytilus galloprovincialis*, largely utilised as a sentinel for marine contamination. Mussels were exposed for 96h to different concentrations of n-TiO<sub>2</sub> suspensions (1, 10 and 100µg/L(-1)) and multiple responses were evaluated in the digestive gland and immune cells, the haemocytes. In the digestive gland, n-TiO<sub>2</sub> affected lysosomal and oxidative stress biomarkers and decreased transcription of antioxidant and immune-related genes. In the haemocytes, n-TiO<sub>2</sub> decreased lysosomal membrane stability-LMS and phagocytosis, increased oxyradical production and transcription of antimicrobial peptides; moreover, pre-apoptotic processes were observed. The effects of n-TiO<sub>2</sub> on digestive gland and haemocytes were distinct, also depending on the endpoint and on nominal NP concentrations, with many significant responses elicited by the lowest concentrations tested. The results show that n-TiO<sub>2</sub>, at concentrations close to predicted environmental levels, significantly affected different functional and molecular parameters of mussel digestive gland and immune cells. In particular, the observed changes in immune parameters that represent significant biomarkers of exposure at the organism level suggest that exposure to n-TiO<sub>2</sub> may pose a serious risk to mussel health.

**Notes:** 18228469

**URL:** <http://www.sciencedirect.com/science/article/pii/S0166445X13000246>

**Reference Type:** Journal Article

**Record Number:** 14

**Author:** Breitholtz, M., Wollenberger, L. and Dinan, L.

**Year:** 2003

**Title:** Effects of four synthetic musks on the life cycle of the harpacticoid copepod *Nitocra spinipes*

**Journal:** Aquatic Toxicology

**Volume:** 63

**Pages:** 103-118

**Date:** 2003

**Short Title:** Effects of four synthetic musks on the life cycle of the harpacticoid copepod *Nitocra spinipes*

**Keywords:** eppi-reviewer4

**Abstract:** A full life-cycle ( $\leq 26$  days exposure) toxicity test with the harpacticoid copepod *Nitocra spinipes* was used to study the effects of one nitro musk (musk ketone) as well as three polycyclic musks (Tonalide™, Celestolide™ and Galaxolide™). A subchronic individual life-table endpoint, the larval development rate, was recorded after 7-8 days exposure of juveniles and was significantly decreased in copepods exposed to sublethal concentrations of musk ketone, Celestolide™ and Galaxolide™. However, none of the Tonalide™ concentrations had any effect on larval development. The lowest Galaxolide™ concentration (0.02 mg/l), which affected juvenile development, was about 100 times below the adult 96-h-LC50-value of 1.9 mg/l (95% confidence interval: 1.4-2.7 mg/l). However, none of the four musks had any agonistic or antagonistic activity in the ecdysteroid-sensitive *Drosophila melanogaster* BII-cell line. This indicates that the decrease in larval development rate was due to pharmacological effects rather than steroid receptor-mediated endocrine disruption. A modified Euler-Lotka equation was used to calculate a population-level endpoint, the intrinsic rate of natural increase ( $r_m$ ), from individual life-table endpoints, i.e. mortality rate, time of release of first brood, sex ratio, the fraction of ovigerous females among all females as well as the number of nauplii per ovigerous female. The second highest musk ketone concentration (0.1 mg/l) was the only treatment, which significantly affected  $r_m$  ( $***P < 0.001$ ). At the highest musk ketone (0.3 mg/l) and Celestolide™ (0.3 mg/l) concentrations, all copepods were dead at the end of the exposures. This shows that a sensitive individual life-table endpoint is protective over the population-level endpoint  $r_m$ . Though we think that it is necessary to obtain population-level endpoints from standardised toxicity test, for ecologically successful risk characterisation of synthetic musks as well as other chemicals. The results from the present study show that it is possible to obtain population-level data from the full life-cycle test with *N. spinipes*. However, there seems to be little risk that synthetic musks are harmful to copepods at present environmental concentrations. © 2002 Elsevier Science B.V. All rights reserved.

**Notes:** 18228639

9521

Cited By :55 Export Date: 13 October 2015

URL: <http://www.scopus.com/inward/record.url?eid=2-s2.0-0037430787&partnerID=40&md5=caccd51f195e9c631e379494c4e7d3ee>

**Reference Type:** Journal Article

**Record Number:** 20

**Author:** Burić, Petra, Jakšić, Željko, Štajner, Lara, Dutour, Sikirić, Maja, Jurašin, Darija, Cascio, Claudia, Calzolari, Luigi and Lyons Daniel, Mark

**Title:** Effect of silver nanoparticles on Mediterranean sea urchin embryonal development is species specific and depends on moment of first exposure

**Journal:** Marine Environmental Research

**Short Title:** Effect of silver nanoparticles on Mediterranean sea urchin embryonal development is species specific and depends on moment of first exposure

**ISSN:** 0141-1136

**Keywords:** eppi-reviewer4

**Abstract:** With the ever growing use of nanoparticles in a broad range of industrial and consumer applications there is increasing likelihood that such nanoparticles will enter the aquatic environment and be transported through freshwater systems, eventually reaching estuarine or marine waters. Due to silver's known antimicrobial properties and widespread use of silver nanoparticles (AgNP), their environmental fate and impact is therefore of particular concern. In this context we have investigated the species-specific effects of low concentrations of 60 nm AgNP on embryonal development in Mediterranean sea urchins *Arbacia lixula*, *Paracentrotus lividus* and *Sphaerechinus granularis*. The sensitivity of urchin embryos was tested by exposing embryos to nanoparticle concentrations in the 1-100 µg L<sup>-1</sup> range, with times of exposure varying from 30 min to 24 h (1 h-48 h for *S. granularis*) post-fertilisation which corresponded with fertilized egg, 4 cell, blastula and gastrula development phases. The most sensitive species to AgNP was *A. lixula* with significant modulation of embryonal development at the lowest AgNP concentrations of 1-10 µg L<sup>-1</sup> with high numbers of malformed embryos or arrested development. The greatest impact on development was noted for those embryos first exposed to nanoparticles at 6 and 24 h post fertilisation. For *P. lividus*, similar effects were noted at higher concentrations of 50 µg L<sup>-1</sup> and 100 µg L<sup>-1</sup> for all times of first exposure. The *S. granularis* embryos indicated a moderate AgNP impact, and significant developmental abnormalities were recorded in the concentration range of 10-50 µg L<sup>-1</sup>. As later post-fertilisation exposure times to AgNP caused greater developmental changes in spite of a shorter total exposure time led us to postulate on additional mechanisms of AgNP toxicity. The results herein indicate that toxic effects of AgNP are species-specific. The moment at which embryos first encounter AgNP is also shown to be an important factor in the development of abnormalities, and future applications of the sea urchin embryo development test for nanoparticle toxicity testing should carefully address the specific phase of development of embryos when nanoparticles are first introduced.

**Notes:** 18228673

6798

URL: <http://www.sciencedirect.com/science/article/pii/S0141113615300015>

**Reference Type:** Journal Article

**Record Number:** 15

**Author:** Canesi, L., Ciacci, C., Lorusso, L. C., Betti, M., Gallo, G., Pojana, G. and Marcomini, A.

**Year:** 2007

**Title:** Effects of Triclosan on *Mytilus galloprovincialis* hemocyte function and digestive gland enzyme activities: possible modes of action on non target organisms

**Journal:** Comp Biochem Physiol C Toxicol Pharmacol

**Volume:** 145

**Pages:** 464-72

**Date:** 2007

**Short Title:** Effects of Triclosan on *Mytilus galloprovincialis* hemocyte function and digestive gland enzyme activities: possible modes of action on non target organisms

**ISSN:** 1532-0456 (Print) 1532-0456

**Keywords:** eppi-reviewer4

**Abstract:** Pharmaceuticals and Personal Care Products (PPCPs) are a class of emerging environmental pollutants with the potential of affecting various aquatic organisms through unexpected modes of action. Triclosan (2,4,4'-trichloro-2'-hydroxydiphenyl ether) (TCS), is a common antibacterial agent that is found in significant amounts in the aquatic environment. In this work, the possible effects and modes of action of TCS were investigated in the marine bivalve *Mytilus galloprovincialis* Lam. In mussel immune cells, the hemocytes, in vitro short-term exposure to TCS in the low microM range reduced lysosomal membrane stability (LMS) and induced extracellular release of lysosomal hydrolytic enzymes. The effects on LMS were mediated by activation of ERK MAPKs (Extracellularly Regulated Mitogen Activated Protein Kinases) and PKC (protein kinase C) alpha and betaII isoforms, as demonstrated by both specific kinase inhibitors and Western blotting with specific anti-phospho-antibodies. The effects of TCS were confirmed in vivo, in the hemocytes of mussels injected with different concentrations of TCS (corresponding to 0.29, 2.9 and 29 ng/g dry weight) and sampled at 24 h post-injection. The possible in vivo effects of TCS were also evaluated on the activity of different enzymes in the digestive gland, the tissue mainly involved in accumulation and metabolism of organic contaminants in mussels. Significant increases were observed in the activity of the glycolytic enzymes PFK (phosphofructokinase) and PK (pyruvate kinase), as well as of GST (GSH transferase) and GSR (GSSG reductase), whereas a decrease in catalase activity was observed. The results demonstrate that in mussels TCS can act on kinase-mediated cell signalling, lysosomal membranes and redox balance in different systems/organs. Although further studies are needed in order to evaluate possible consequences of environmental exposure to TCS on mussel health, the results represent the first data on the possible modes of action of this widespread antibacterial in aquatic invertebrates.

**Notes:** 18228717

**URL:** <http://www.sciencedirect.com/science/article/pii/S1532045607000610>

**Reference Type:** Journal Article

**Record Number:** 16

**Author:** Cortez Fernando, Sanzi, Seabra, Pereira, Camilo, Dias, Santos Aldo, Ramos, Cesar, Augusto, Choueri Rodrigo, Brasil, Martini Gisela de, Assis and Bohrer-Morel Maria, Beatriz

**Year:** 2012

**Title:** Biological effects of environmentally relevant concentrations of the pharmaceutical Triclosan in the marine mussel *Perna perna* (Linnaeus, 1758)

**Journal:** Environmental Pollution

**Volume:** 168

**Pages:** 145-150

**Date:** 2012

**Short Title:** Biological effects of environmentally relevant concentrations of the pharmaceutical Triclosan in the marine mussel *Perna perna* (Linnaeus, 1758)

**ISSN:** 0269-7491

**Keywords:** eppi-reviewer4

**Abstract:** Triclosan (5-Chloro-2-(2,4-dichlorophenoxy) phenol) is an antibacterial compound widely employed in pharmaceuticals and personal care products. Although this emerging compound has been detected in aquatic environments, scarce information is found on the effects of Triclosan to marine organisms. The aim of this study was to evaluate the toxicity of a concentration range of Triclosan through fertilization assay (reproductive success), embryo-larval development assay (early life stage) and physiological stress (Neutral Red Retention Time assay - NRRT) (adult stage) in the marine sentinel organism *Perna perna*. The mean inhibition concentrations for fertilization (IC50 = 0.490 mg L<sup>-1</sup>) and embryo-larval development (IC50 = 0.135 mg L<sup>-1</sup>) tests were above environmental relevant concentrations (ng L<sup>-1</sup>) given by previous studies. Differently, significant reduction on NRRT results was found at 12 ng L<sup>-1</sup>, demonstrating the current risk of the continuous introduction of

Triclosan into aquatic environments, and the need of ecotoxicological studies oriented by the mechanism of action of the compound.

**Notes:** 18228955

7417

**URL:** <http://www.sciencedirect.com/science/article/pii/S0269749112002187>

**Reference Type:** Journal Article

**Record Number:** 17

**Author:** Czyżewska, Krystyna

**Year:** 1976

**Title:** The effect of detergents on larval development of a crab

**Journal:** Marine Pollution Bulletin

**Volume:** 7

**Pages:** 108-112

**Date:** 1976

**Short Title:** The effect of detergents on larval development of a crab

**ISSN:** 0025-326X

**Keywords:** eppi-reviewer4

**Abstract:** The effect of a mixture of anionic (ethoxylate) and non-ionic (alkylate) detergents on developmental stages of the crab *Rhithropanopeus* from final embryogenesis to the *Megalopa* larval stage has been studied. Larval resistance increases with age. Larvae still in the eggshells are only slightly sensitive because of the thick and impermeable chorion. Low concentrations of detergents exert a favourable effect, causing a decrease in larval mortality, but during moults there is an increasing mortality and a lengthening of the developmental period of the larvae. The mixture of detergents is more toxic than single detergents.

**Notes:** 18229002

7285

**URL:** <http://www.sciencedirect.com/science/article/pii/0025326X76901855>

**Reference Type:** Journal Article

**Record Number:** 18

**Author:** DeLorenzo, M. E., Keller, J. M., Arthur, C. D., Finnegan, M. C., Harper, H. E., Winder, V. L. and Zdankiewicz, D. L.

**Year:** 2008

**Title:** Toxicity of the antimicrobial compound triclosan and formation of the metabolite methyl-triclosan in estuarine systems

**Journal:** Environmental Toxicology

**Volume:** 23

**Pages:** 224-232

**Date:** 2008

**Short Title:** Toxicity of the antimicrobial compound triclosan and formation of the metabolite methyl-triclosan in estuarine systems

**Keywords:** eppi-reviewer4

**Abstract:** Triclosan, a commonly used antimicrobial compound, has been measured in aquatic systems worldwide. This study exposed marine species to triclosan to examine effects primarily on survival and to investigate the formation of the degradation product, methyl-triclosan, in the estuarine environment. Acute toxicity was assessed using the bacterium *Vibrio fischeri*, the phytoplankton species *Dunaliella tertiolecta*, and three life stages of the grass shrimp *Palaemonetes pugio*. *P. pugio* larvae were more sensitive to triclosan than adult shrimp or embryos. Acute aqueous toxicity values (96 h LC50) were 305 µg/L for adult shrimp, 154 µg/L for larvae, and 651 µg/L for embryos. The presence of sediment decreased triclosan toxicity in adult shrimp (24 h LC50s were 620 µg/L with sediment, and 482 µg/L without sediment). The bacterium was more sensitive to triclosan than the grass shrimp, with a 15 min aqueous IC50 value of 53 µg/L and a 15 min spiked sediment IC50 value of 616 µg/kg. The phytoplankton species was the most sensitive species tested, with a 96 h EC50 value of 3.55 µg/L. Adult grass shrimp were found to accumulate methyl-triclosan after a 14-day exposure to 100 µg/L triclosan, indicating formation of this metabolite in a seawater



environment and its potential to bioaccumulate in higher organisms. Triclosan was detected in limited surface water sampling of Charleston Harbor, SC at a maximum concentration of 0.001 µg/L, substantially lower than the determined toxicity values. These findings suggest triclosan poses low acute toxicity risk to estuarine organisms; however, the potential for chronic, sublethal, and metabolite effects should be investigated. © 2008 Wiley Periodicals, Inc.

**Notes:** 18229081  
8925

Cited By :51 Export Date: 13 October 2015

URL: <http://www.scopus.com/inward/record.url?eid=2-s2.0-41449084230&partnerID=40&md5=b3865138d353ee107502bd51b82b4863>

**Reference Type:** Journal Article

**Record Number:** 19

**Author:** Downs, C. A., Kramarsky-Winter, E., Fauth, J. E., Segal, R., Bronstein, O., Jeger, R., Lichtenfeld, Y., Woodley, C. M., Pennington, P., Kushmaro, A. and Loya, Y.  
**Year:** 2014

**Title:** Toxicological effects of the sunscreen UV filter, benzophenone-2, on planulae and in vitro cells of the coral, *Stylophora pistillata*

**Journal:** Ecotoxicology

**Volume:** 23

**Pages:** 175-191

**Date:** 2014

**Short Title:** Toxicological effects of the sunscreen UV filter, benzophenone-2, on planulae and in vitro cells of the coral, *Stylophora pistillata*

**Keywords:** eppi-reviewer4

**Abstract:** Benzophenone-2 (BP-2) is an additive to personal-care products and commercial solutions that protects against the damaging effects of ultraviolet light. BP-2 is an "emerging contaminant of concern" that is often released as a pollutant through municipal and boat/ship wastewater discharges and landfill leachates, as well as through residential septic fields and unmanaged cesspits. Although BP-2 may be a contaminant on coral reefs, its environmental toxicity to reefs is unknown. This poses a potential management issue, since BP-2 is a known endocrine disruptor as well as a weak genotoxicant. We examined the effects of BP-2 on the larval form (planula) of the coral, *Stylophora pistillata*, as well as its toxicity to in vitro coral cells. BP-2 is a photo-toxicant; adverse effects are exacerbated in the light versus in darkness. Whether in darkness or light, BP-2 induced coral planulae to transform from a motile planktonic state to a deformed, sessile condition. Planulae exhibited an increasing rate of coral bleaching in response to increasing concentrations of BP-2. BP-2 is a genotoxicant to corals, exhibiting a strong positive relationship between DNA-AP lesions and increasing BP-2 concentrations. BP-2 exposure in the light induced extensive necrosis in both the epidermis and gastrodermis. In contrast, BP-2 exposure in darkness induced autophagy and autophagic cell death. The LC50 of BP-2 in the light for an 8 and 24 h exposure was 120 and 165 parts per billion (ppb), respectively. The LC 50s for BP-2 in darkness for the same time points were 144 and 548 ppb. Deformity EC20 levels (24 h) were 246 parts per trillion in the light and 9.6 ppb in darkness. © 2013 Springer Science+Business Media New York.

**Notes:** 18229140

7893

Cited By :2 Export Date: 13 October 2015

URL: <http://www.scopus.com/inward/record.url?eid=2-s2.0-84896712306&partnerID=40&md5=e0a589704eaf05835c11bd6141e6173>

**Reference Type:** Journal Article

**Record Number:** 21

**Author:** Fabrega, J., Tantra, R., Amer, A., Stolpe, B., Tomkins, J., Fry, T., Lead, J. R., Tyler, C. R. and Galloway, T. S.  
**Year:** 2012

**Title:** Sequestration of zinc from zinc oxide nanoparticles and life cycle effects in the sediment dweller amphipod *Corophium volutator*

**Journal:** Environ Sci Technol

**Volume:** 46

**Pages:** 1128–35

**Date:** 2012

**Short Title:** Sequestration of zinc from zinc oxide nanoparticles and life cycle effects in the sediment dweller amphipod *Corophium volutator*

**ISSN:** 0013–936x

**DOI:** 10.1021/es202570g. Epub 2011 Dec 28.

**Keywords:** eppi-reviewer4

**Abstract:** We studied the effects of ZnO nanoparticles [ZnO NPs, primary particle size 35 +/- 10 nm (circular diameter, TEM)], bulk [160 +/- 81 nm (circular diameter, TEM)], and Zn ions (from ZnCl<sub>2</sub>) on mortality, growth, and reproductive endpoints in the sediment dwelling marine amphipod *Corophium volutator* over a complete lifecycle (100 days). ZnO NPs were characterized by size, aggregation, morphology, dissolution, and surface properties. ZnO NPs underwent aggregation and partial dissolution in the seawater exposure medium, resulting in a size distribution that ranged in size from discrete nanoparticles to the largest aggregate of several micrometers. Exposure via water to all forms of zinc in the range of 0.2–1.0 mg L<sup>-1</sup> delayed growth and affected the reproductive outcome of the exposed populations. STEM-EDX analysis was used to characterize insoluble zinc precipitates (sphaerites) of high sulfur content, which accumulated in the hepatopancreas following exposures. The elemental composition of the sphaerites did not differ for ZnO NP, Zn(2+), and bulk ZnO exposed organisms. These results provide an illustration of the comparable toxicity of Zn in bulk, soluble, and nanoscale forms on critical lifecycle parameters in a sediment dwelling organism.

**Notes:** 18229252

5680

**Reference Type:** Journal Article

**Record Number:** 22

**Author:** Flores-Munes, F., Mattos, J. J., Zacchi, F. L., Serrano, M. A., Piazza, C. E., Sasaki, S. T., Taniguchi, S., Bicego, M. C., Melo, C. M. and Bainy, A. C.

**Year:** 2015

**Title:** Effect of linear alkylbenzene mixtures and sanitary sewage in biochemical and molecular responses in pacific oyster *Crassostrea gigas*

**Journal:** Environ Sci Pollut Res Int

**Date:** 2015

**Short Title:** Effect of linear alkylbenzene mixtures and sanitary sewage in biochemical and molecular responses in pacific oyster *Crassostrea gigas*

**ISSN:** 0944–1344

**Keywords:** eppi-reviewer4

**Abstract:** Urban effluents are rich in nutrients, organic matter, pharmaceuticals and personal care products (PPCPs), pesticides, hydrocarbons, surfactants, and others. Previous studies have shown that oysters *Crassostrea gigas* accumulate significant levels of linear alkylbenzenes (LABs) in sanitary sewage contaminated sites, but there is little information about its toxicological effects in marine bivalves. The aim of this study was to analyze the transcription of genes in two tissues of *C. gigas* exposed for 12, 24, and 36 h to LABs or sanitary sewage. Likewise, the activity of antioxidant and biotransformation enzymes was measured in oysters exposed for 36 h in all groups. Oysters exposed to LABs and oysters exposed to sanitary sewage showed different patterns of transcriptional responses. LAB-exposed oysters showed lower level of biological responses than the oysters exposed to sanitary sewage. Despite the ability of the oyster *C. gigas* to accumulate LABs (28-fold), the data indicate that these contaminants are not the cause for the transcriptional responses observed in oysters exposed to sanitary sewage. Possibly, the biological changes observed in the sanitary sewage-exposed oysters are associated with the presence of other contaminants, which might have caused synergistic, additive, or antagonistic effects. The results show that FABP-like and GST-omega-like messenger RNAs (mRNAs) have a rapid

response in tissues of oyster *C. gigas* exposed to sanitary sewage, suggesting a possible protective response and a role in maintaining homeostasis of these organisms.

**Notes:** 18229347

5252

1614-7499 Flores-Nunes, Fabricio Mattos, Jaco J Zacchi, Flavia L Serrano, Miguel A S Piazza, Clei E Sasaki, Silvio T Taniguchi, Satie Bicego, Marcia C Melo, Claudio M R Bainy, Afonso C D Journal article Environ Sci Pollut Res Int. 2015 Apr 14.

**Reference Type:** Journal Article

**Record Number:** 23

**Author:** Galloway, T., Lewis, C., Dolciotti, I., Johnston, B. D., Moger, J. and Regoli, F.

**Year:** 2010

**Title:** Sublethal toxicity of nano-titanium dioxide and carbon nanotubes in a sediment dwelling marine polychaete

**Journal:** Environ Pollut

**Volume:** 158

**Pages:** 1748-55

**Date:** 2010

**Short Title:** Sublethal toxicity of nano-titanium dioxide and carbon nanotubes in a sediment dwelling marine polychaete

**ISSN:** 0269-7491

**DOI:** 10.1016/j.envpol.2009.11.013. Epub 2009 Dec 4.

**Keywords:** eppi-reviewer4

**Abstract:** The ecotoxicology of manufactured nanoparticles (MNPs) in estuarine environments is not well understood. Here we explore the hypothesis that nanoTiO<sub>2</sub> and single walled nanotubes (SWNT) cause sublethal impacts to the infaunal species *Arenicola marina* (lugworm) exposed through natural sediments. Using a 10 day OECD/ASTM 1990 acute toxicity test, no significant effects were seen for SWNT up to 0.03 g/kg and no uptake of SWNTs into tissues was observed. A significant decrease in casting rate ( $P = 0.018$ ), increase in cellular damage ( $P = 0.04$ ) and DNA damage in coelomocytes ( $P = 0.008$ ) was measured for nanoTiO<sub>2</sub>, with a preliminary LOEC of 1 g/kg. Coherent anti-stokes Raman scattering microscopy (CARS) located aggregates of TiO<sub>2</sub> of >200 nm within the lumen of the gut and adhered to the outer epithelium of the worms, although no visible uptake of particles into tissues was detected.

**Notes:** 18229411

5457

**Reference Type:** Journal Article

**Record Number:** 24

**Author:** Gaume, B., Bourgougnon, N., Auzoux-Bordenave, S., Roig, B., Le, Bot and Bedoux, G.

**Year:** 2012

**Title:** In vitro effects of triclosan and methyl-triclosan on the marine gastropod *Haliotis tuberculata*

**Journal:** Comp Biochem Physiol C Toxicol Pharmacol

**Volume:** 156

**Pages:** 87-94

**Date:** 2012

**Short Title:** In vitro effects of triclosan and methyl-triclosan on the marine gastropod *Haliotis tuberculata*

**ISSN:** 1532-0456 (Print) 1532-0456

**DOI:** 10.1016/j.cbpc.2012.04.006. Epub 2012 May 2.

**Keywords:** eppi-reviewer4

**Abstract:** Triclosan (2,4,4'-trichloro-2'-hydroxy-diphenyl ether; TCS) is an antibacterial agent incorporated in a wide variety of household and personal care products. Because of its partial elimination in sewage treatment plants, TCS is commonly detected in natural waters and sediments. Moreover, due to its high hydrophobicity, TCS accumulates in fatty tissues in various aquatic organisms. TCS can

be converted into methyl-triclosan (2,4,4'-trichloro-2'-methoxydiphenyl ether; MTCS) after biological methylation. In this study, the acute cytotoxicity of TCS and MTCS in short-term in vitro experiments was assessed on cell cultures from the European abalone *Haliotis tuberculata*. The results showed that morphology and density of hemocyte are affected from a concentration of 8 µM TCS. Using the XTT reduction assay, TCS has been demonstrated to decrease hemocyte metabolism activity in a dose- and time-dependent exposure. The IC(50) was evaluated at 6 µM for both hemocyte and gill cells after a 24 h-incubation with TCS. A significant cytotoxicity of MTCS was also observed from 4 µM in 24 h-old hemocyte culture. Our results reveal a toxic effect of TCS and MTCS on immune (hemocytes) and/or respiratory cells (gill cells) of the abalone, species living in coastal waters areas and exposed to anthropogenic pollution.

**Notes:** 18229448  
5259

**Reference Type:** Journal Article

**Record Number:** 25

**Author:** Gomez, E., Bachelot, M., Boillot, C., Munaron, D., Chiron, S., Casellas, C. and Fenet, H.

**Year:** 2012

**Title:** Bioconcentration of two pharmaceuticals (benzodiazepines) and two personal care products (UV filters) in marine mussels (*Mytilus galloprovincialis*) under controlled laboratory conditions

**Journal:** Environmental Science and Pollution Research

**Volume:** 19

**Pages:** 2561-2569

**Date:** 2012

**Short Title:** Bioconcentration of two pharmaceuticals (benzodiazepines) and two personal care products (UV filters) in marine mussels (*Mytilus galloprovincialis*) under controlled laboratory conditions

**Keywords:** eppi-reviewer4

**Abstract:** Bioaccumulation is essential for gaining insight into the impact of exposure to organic micropollutants in aquatic fauna. Data are currently available on the bioaccumulation of persistent organic pollutants, but there is very little documentation on the bioaccumulation of pharmaceuticals and personal care products (PPCPs). The bioconcentration of selected PPCPs was studied in marine mussels (*Mytilus galloprovincialis*). The selected PPCPs were two organic UV filters, i. e., 2-ethylhexyl-4-trimethoxycinnamate (EHMC) and octocrylene (OC), and two benzodiazepines (BZP), i. e., diazepam (DZP) and tetrazepam (TZP). Laboratory experiments were performed in which *M. galloprovincialis* was exposed to these compounds either directly from water, for the less lipophilic substances (BZP) or via spiked food for lipophilic UV filters. *M. galloprovincialis* uptook and eliminated BZP following first-order kinetics. The biological half-life ( $t_{1/2}$ ) of TZP was 1.4 days, resulting in a bioconcentration factor of 64 and 99 mL g<sup>-1</sup> dry weight (dw), respectively, for 2.3 and 14.5 µg L<sup>-1</sup> of exposure, while the biological half-life ( $t_{1/2}$ ) of DZP was 0.4 days, resulting in a bioconcentration factor of 51 mL g<sup>-1</sup> dw for 13.2 µg L<sup>-1</sup> of exposure. The uptake of UV filter was rapid in mussels, followed by elimination within 24 h. EHMC increased from 15 to 138 ng g<sup>-1</sup> dw in 1 h and decreased to 25 ng g<sup>-1</sup> after 24 h for 11.9 µg L<sup>-1</sup> exposure. OC reached 839 ng g<sup>-1</sup> dw after 1 h and decreased to 33 ng g<sup>-1</sup> after 24 h for 11.6 µg L<sup>-1</sup> exposure. However, EHMC and OC were slightly accumulated in 48 h, i. e., 38 and 60 ng g<sup>-1</sup> dw, respectively. © 2012 Springer-Verlag.

**Notes:** 18229516

8011

**Cited By :**17 **Export Date:** 13 October 2015

**URL:** <http://www.scopus.com/inward/record.url?eid=2-s2.0-84868195587&partnerID=40&md5=36dac873dfc6ca0c17399575b19b857b>

**Reference Type:** Journal Article

**Record Number:** 26

**Author:** Hanna, S. K., Miller, R. J., Muller, E. B., Nisbet, R. M. and Lenihan, H. S.  
**Year:** 2013  
**Title:** Impact of engineered zinc oxide nanoparticles on the individual performance of *Mytilus galloprovincialis*  
**Journal:** PLoS One  
**Volume:** 8  
**Pages:** e61800  
**Date:** 2013  
**Short Title:** Impact of engineered zinc oxide nanoparticles on the individual performance of *Mytilus galloprovincialis*  
**ISSN:** 1932-6203  
**DOI:** 10.1371/journal.pone.0061800. Print 2013.  
**Keywords:** eppi-reviewer4  
**Abstract:** The increased use of engineered nanoparticles (ENPs) in consumer products raises the concern of environmental release and subsequent impacts in natural communities. We tested for physiological and demographic impacts of ZnO, a prevalent metal oxide ENP, on the mussel *Mytilus galloprovincialis*. We exposed mussels of two size classes, <4.5 and >= 4.5 cm shell length, to 0.1-2 mg l<sup>-1</sup> ZnO ENPs in seawater for 12 wk, and measured the effect on mussel respiration, accumulation of Zn, growth, and survival. After 12 wk of exposure to ZnO ENPs, respiration rates of mussels increased with ZnO concentration. Mussels had up to three fold more Zn in tissues than control groups after 12 wk of exposure, but patterns of Zn accumulation varied with mussel size and Zn concentrations. Small mussels accumulated Zn 10 times faster than large mussels at 0.5 mg l<sup>-1</sup>, while large mussels accumulated Zn four times faster than small mussels at 2 mg l<sup>-1</sup>. Mussels exposed to 2 mg l<sup>-1</sup> ZnO grew 40% less than mussels in our control group for both size classes. Survival significantly decreased only in groups exposed to the highest ZnO concentration (2 mg l<sup>-1</sup>) and was lower for small mussels than large. Our results indicate that ZnO ENPs are toxic to mussels but at levels unlikely to be reached in natural marine waters.  
**Notes:** 18229639  
**URL:** <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0061800>

**Reference Type:** Journal Article  
**Record Number:** 27  
**Author:** Hanna, S. K., Miller, R. J., Zhou, D., Keller, A. A. and Lenihan, H. S.  
**Year:** 2013  
**Title:** Accumulation and toxicity of metal oxide nanoparticles in a soft-sediment estuarine amphipod  
**Journal:** Aquat Toxicol  
**Volume:** 142-143  
**Pages:** 441-6  
**Date:** 2013  
**Short Title:** Accumulation and toxicity of metal oxide nanoparticles in a soft-sediment estuarine amphipod  
**ISSN:** 0166-445x  
**DOI:** 10.1016/j.aquatox.2013.09.019. Epub 2013 Sep 25.  
**Keywords:** eppi-reviewer4  
**Abstract:** Estuarine and marine sediments are a probable end point for many engineered nanoparticles (ENPs) due to enhanced aggregation and sedimentation in marine waters, as well as uptake and deposition by suspension-feeding organisms on the seafloor. Benthic infaunal organisms living in sediments encounter relatively high concentrations of pollutants and may also suffer toxic effects of ENPs. We tested whether three heavily used metal oxide ENPs, zinc oxide (ZnO), copper oxide (CuO), and nickel oxide (NiO) were toxic to an estuarine amphipod, *Leptocheirus plumulosus*. We used results from 10-day laboratory bioassays to estimate potential demographic impacts of ENP exposure. We also evaluated fate and transport pathways of the ENPs in the experiments to elucidate routes of uptake and exposure. Dissolved Zn was found in sediment pore water and overlying water samples at 10 fold the concentrations of Cu or Ni, a pattern indicative of the relatively high dissolution rate of ZnO ENPs compared with CuO and NiO ENPs. Accumulation of metals in amphipod tissues increased with

exposure concentrations for all three ENPs, suggesting possible exposure pathways to higher taxa. Amphipods accumulated  $\leq 600$   $\mu\text{g Zn}$  and  $\text{Cu g}^{-1}$  and  $1000$   $\mu\text{g Ni g}^{-1}$ . Amphipod mortality increased with  $\text{ZnO}$  and  $\text{CuO}$  concentrations, but showed no significant increase with  $\text{NiO}$  to concentrations as high as  $2000$   $\mu\text{g g}^{-1}$ . The median lethal concentration in sediment ( $\text{LC}_{50}$ ) of  $\text{ZnO}$  was  $763$   $\mu\text{g g}^{-1}$  and  $868$   $\mu\text{g g}^{-1}$  for  $\text{CuO}$  ENPs. Our results indicate that  $\text{ZnO}$  and  $\text{CuO}$  ENPs, but not  $\text{NiO}$  ENPs, are toxic to *L. plumulosus* and that  $\text{ZnO}$  toxicity primarily results from  $\text{Zn}$  ion exposure while  $\text{CuO}$  toxicity is due to nanoparticle exposure.

**Notes:** 18229640

**URL:** <http://www.sciencedirect.com/science/article/pii/S0166445X13002464>

**Reference Type:** Journal Article

**Record Number:** 28

**Author:** Hansen, B., Fotel, F. L., Jensen, N. J. and Wittrup, L.

**Year:** 1997

**Title:** Physiological effects of the detergent linear alkylbenzene sulphonate on blue mussel larvae (*Mytilus edulis*) in laboratory and mesocosm experiments

**Journal:** Marine Biology

**Volume:** 128

**Pages:** 627-637

**Date:** 1997

**Short Title:** Physiological effects of the detergent linear alkylbenzene sulphonate on blue mussel larvae (*Mytilus edulis*) in laboratory and mesocosm experiments

**Keywords:** eppi-reviewer4

**Abstract:** A series of laboratory (short-term exposure in small beakers) studies and a 19 d mesocosm (6 m<sup>3</sup> polyethylene bags filled with fjord water) study were conducted on blue mussel, *Mytilus edulis*, larvae and plantigrades exposed to a concentration gradient of the detergent linear alkylbenzene sulphonate (LAS, 0 to 39 mg l<sup>-1</sup>). LAS is increasingly found in nearshore environments receiving wastewater from urban treatment plants. The aims were to observe physiological effects on swimming, grazing and growth in the laboratory and effects on settling and population development at in situ conditions (in field mesocosms) in order to evaluate the damages on ciliated meroplankton caused by LAS. In the laboratory the larvae showed a 50% mortality at 3.8 mg LAS l<sup>-1</sup> after 96 h exposure whether or not food was provided. Additionally the swimming behaviour was affected at 0.8 mg LAS l<sup>-1</sup> (i.e. a more compact swimming track, a smaller diameter of the swimming tracks, and reduced swimming speed). The larval particle grazing was reduced 50% at 1.4 mg LAS l<sup>-1</sup>. The specific growth rate of the larvae was reduced to half at 0.82 mg LAS l<sup>-1</sup> over 9 d. During the mesocosm experiment, the larval population showed a dramatic decrease in abundance within 2 d at concentrations as low as 0.08 mg LAS l<sup>-1</sup>, both due to a significantly increased mortality, but also due to settling. The settling success was reduced at the same LAS concentration as that at which mortality was observed to increase significantly. In addition to reduced settling rate, the larvae showed delayed metamorphosis and reduced shell growth as a response to LAS. Our hypothesis that the larval ciliary apparatus, crucial for normal swimming, orientation, and settling behaviours and for particle uptake, was damaged due to LAS exposure is supported by our results. This is confirmed by the physiological data (grazing, growth) and in the direct video-based observations of larval performance (swimming) and provides a reasonable explanation for what was observed in the bags (abundance, settling, mortality). These physiological effects on blue mussel larvae/plantigrades occurred at LAS concentrations reported to occur in estuarine waters.

**Notes:** 18229642

9226

**Cited By :** 22 **Export Date:** 13 October 2015

**URL:** <http://www.scopus.com/inward/record.url?eid=2-s2.0-0030797180&partnerID=40&md5=061c03f1da91f370160b8a6288ff4c4c>

**Reference Type:** Journal Article

**Record Number:** 29

**Author:** Ho, K. T., Chariton, A. A., Portis, L. M., Proestou, D., Cantwell, M. G., Baguley, J. G., Burgess, R. M., Simpson, S., Pelletier, M. C., Perron, M. M., Gunsch, C. K., Bik, H. M., Katz, D. and Kamikawa, A.

**Year:** 2013

**Title:** Use of a novel sediment exposure to determine the effects of triclosan on estuarine benthic communities

**Journal:** Environ Toxicol Chem

**Volume:** 32

**Pages:** 384-92

**Date:** 2013

**Short Title:** Use of a novel sediment exposure to determine the effects of triclosan on estuarine benthic communities

**ISSN:** 0730-7268

**DOI:** 10.1002/etc.2067. Epub 2012 Dec 10.

**Keywords:** eppi-reviewer4

**Abstract:** Triclosan (5-chloro-2-[2,4-dichlorophenoxy]phenol) is a relatively new, commonly used antimicrobial compound found in many personal care products. Triclosan is toxic to marine organisms at the micrograms per liter level, can photodegrade to a dioxin, can accumulate in humans, and has been found to be stable in marine sediments for over 30 years. To determine the effects of triclosan on marine benthic communities, intact sediment cores were brought into the laboratory and held under flowing seawater conditions. A 2-cm layer of triclosan-spiked sediment was applied to the surface, and after a two-week exposure the meio- and macrofaunal communities were assessed for differences in composition relative to nonspiked cores. A high triclosan treatment (180 mg/kg dry wt) affected both the meio- and the macrobenthic communities. There were no discernible differences with a low-triclosan treatment (14 mg/kg dry wt). This exposure method is effective for testing the benthic community response to sediment contaminants, but improvements should be made with regard to the amount and method of applying the overlying sediment to prevent smothering of fragile benthic organisms.

**Notes:** 18229725

**URL:** <http://onlinelibrary.wiley.com/doi/10.1002/etc.2067/full>

**Reference Type:** Journal Article

**Record Number:** 30

**Author:** Hwang, J., Suh, S. S., Chang, M., Yun, Park, Kwon, Ryu, Lee, S. and Lee, T. K.

**Year:** 2014

**Title:** Effects of triclosan on reproductive parameters and embryonic development of sea urchin, *Strongylocentrotus nudus*

**Journal:** Ecotoxicology and Environmental Safety

**Volume:** 100

**Pages:** 148-152

**Date:** 2014

**Short Title:** Effects of triclosan on reproductive parameters and embryonic development of sea urchin, *Strongylocentrotus nudus*

**Keywords:** eppi-reviewer4

**Abstract:** Triclosan (TCS, 2,4,4'-trichloro-2'-hydroxydiphenyl ether), a broad-spectrum antibacterial agent, is commonly found in the aquatic environment. In this study, we investigated TCS toxicity with pertaining to gamete viability, fertilization, and embryogenesis up to pluteus stage of the sea urchin, (*Strongylocentrotus nudus*). When the sperm and eggs were exposed to TCS (0-3.0 μM), the viability of sperm was significantly decreased at molarities higher than 1 μM of TCS. In addition, for exposure of 2.0 μM TCS the viability of eggs was not influenced and none of the sperm was viable. Fertilization rate was significantly decreased when sperm were exposed to 0.5 and 1 μM of TCS ( $p < 0.001$ ) and no fertilization was observed for the exposure of 1.5 μM of TCS. In embryonic development, embryos are treated with higher than 1.0 μM levels of TCS displayed arrested development. For TCS, the EC50 and LOECs values were 1.8, 1.49 and 0.99 μM and 0.53, 0.62 and 0.39 μM for sperm viability, fertilization rate, and larval development to pluteus, respectively.

In the recovery test regarding normal development of arrested embryos based upon TCS exposure time, it was observed that embryos exposed to 1µM TCS for 15h were normally recovered for normal development, while embryos with more than 30h exposure were not recovered to normal larvae. Overall, the results of this study strongly suggest that the gametes and embryos of *S. nudus* can provide the basis for an effective bioassay, with a fast and sensitive means of evaluating TCS contamination in the marine ecosystem. © 2013 Elsevier Inc.

**Notes:** 18229801

9141

**Cited By :** 3 **Export Date:** 13 October 2015

**URL:** <http://www.scopus.com/inward/record.url?eid=2-s2.0-84892603251&partnerID=40&md5=62724b8f7a7bacde2662889201825cfc>

**Reference Type:** Journal Article

**Record Number:** 31

**Author:** Jarvis, T. A., Miller, R. J., Lenihan, H. S. and Bielmyer, G. K.

**Year:** 2013

**Title:** Toxicity of ZnO nanoparticles to the copepod *Acartia tonsa*, exposed through a phytoplankton diet

**Journal:** Environ Toxicol Chem

**Volume:** 32

**Pages:** 1264-9

**Date:** 2013

**Short Title:** Toxicity of ZnO nanoparticles to the copepod *Acartia tonsa*, exposed through a phytoplankton diet

**ISSN:** 0730-7268

**DOI:** 10.1002/etc.2180. Epub 2013 Apr 15.

**Keywords:** eppi-reviewer4

**Abstract:** Zinc oxide (ZnO) nanoparticles are being increasingly utilized in a variety of products and applications and are therefore commonly discharged into aquatic environments, increasing exposure and potentially impacting aquatic organisms. Zinc oxide nanoparticles can depress growth of some marine phytoplankton, and several examples of nanoparticle trophic transfer have been documented, although not within planktonic communities. The authors test whether feeding on ZnO-exposed phytoplankton could cause toxic effects in a widespread and ecologically important marine grazer, the copepod *Acartia tonsa*. The authors exposed the diatom *Thalassiosira weissflogii* to ZnO nanoparticles for 7 d and measured growth, zinc accumulation, and zinc distribution within the algal cells to elucidate bioavailability to grazing copepods. *Thalassiosira weissflogii* cultured with nano-ZnO were continuously fed to *A. tonsa* for 7 d, and reproduction and survival were quantified. A dose-dependent growth reduction was observed in *T. weissflogii* exposed to nano-ZnO, with a 20% effective concentration (EC20) of 70 µg/L Zn and a lowest observed effect concentration (LOEC) of 99 µg/L Zn. Zinc accumulation in the algae occurred dose-dependently over time, with the majority of the zinc partitioning into the cell wall fraction. Feeding on ZnO-exposed diatoms led to a decrease in copepod survival and reproduction. The EC20s corresponding to the dissolved zinc concentration in the *T. weissflogii* exposure media were 112 µg/L (13 µg/g dry wt) and 143 µg/L (16 µg/g dry wt), and the LOECs were 168 µg/L (17 µg/g dry wt) and 263 µg/L (21 µg/g dry wt) for copepod survival and reproduction, respectively. These results provide evidence of trophic transfer of metal contaminants associated with metal oxide nanomaterials within a marine plankton community, leading to a reduction in individual demographic performance of an important coastal marine grazer.

**Notes:** 18229860

**URL:** <http://onlinelibrary.wiley.com/doi/10.1002/etc.2180/full>

**Reference Type:** Journal Article

**Record Number:** 32

**Author:** Kookana, R. S., Shareef, A., Fernandes, M. B., Hoare, S., Gaylard, S. and Kumar, A.



**Year:** 2013

**Title:** Bioconcentration of triclosan and methyl-triclosan in marine mussels (*Mytilus galloprovincialis*) under laboratory conditions and in metropolitan waters of Gulf St Vincent, South Australia

**Journal:** Mar Pollut Bull

**Volume:** 74

**Pages:** 66-72

**Date:** 2013

**Short Title:** Bioconcentration of triclosan and methyl-triclosan in marine mussels (*Mytilus galloprovincialis*) under laboratory conditions and in metropolitan waters of Gulf St Vincent, South Australia

**ISSN:** 0025-326x

**DOI:** 10.1016/j.marpolbul.2013.07.030. Epub 2013 Aug 6.

**Keywords:** eppi-reviewer4

**Abstract:** The anti-microbial agent triclosan (TCS), and its derivative methyl-triclosan (Me-TCS), are discharged with treated effluents from wastewater treatment plants to receiving environments. We investigated the bioconcentration of TCS and Me-TCS in mussels (*Mytilus galloprovincialis*) exposed to TCS (100 ng L<sup>-1</sup>) for 30 days in seawater aquaria (19±2 degrees C) with fresh phytoplankton as a food source. Bioconcentration increased with time reaching a steady-state around 24-30 days. The bioconcentration factor (log BCF) for TCS were 2.81 L kg<sup>-1</sup> (dry weight) and 4.13 L kg<sup>-1</sup>, when lipid normalised concentrations were used. Mussels were also deployed in cages at four marine locations receiving effluents from WWTPs. The mean (±SD) TCS and Me-TCS concentrations for mussels from these sites were 9.87 (±1.34) and 6.99 (±2.44) mug kg<sup>-1</sup>. The study showed that mussels can be a useful tool for monitoring pollution of TCS and Me-TCS in marine and estuarine environments.

**Notes:** 18230111

**URL:** <http://www.sciencedirect.com/science/article/pii/S0025326X13004177>

**Reference Type:** Journal Article

**Record Number:** 33

**Author:** Kusk, K. O., Avdolli, M. and Wollenberger, L.

**Year:** 2011

**Title:** Effect of 2,4-dihydroxybenzophenone (BP1) on early life-stage development of the marine copepod *Acartia tonsa* at different temperatures and salinities

**Journal:** Environ Toxicol Chem

**Volume:** 30

**Pages:** 959-66

**Date:** 2011

**Short Title:** Effect of 2,4-dihydroxybenzophenone (BP1) on early life-stage development of the marine copepod *Acartia tonsa* at different temperatures and salinities

**ISSN:** 0730-7268

**DOI:** 10.1002/etc.458. Epub 2011 Feb 19.

**Keywords:** eppi-reviewer4

**Abstract:** Benzophenone (BP)-type ultraviolet (UV) filters are widely used in cosmetic and sunscreen products and can enter the aquatic environment. Therefore, we investigated the subchronic toxicity of 2,4-dihydroxybenzophenone (BP1) on the marine calanoid copepod *Acartia tonsa* in an early life-stage development study. Since developmental endpoints depend on environmental conditions, a preceding study of *A. tonsa* development was performed at three temperatures, four salinities, four light:dark regimes, six food densities, and four culture densities. Times elapsed until 50% of the population had reached a copepodite stage (DT((1/2))) at the different conditions were calculated. The DT((1/2)) values decreased from 296 h at 15 degrees C to 89 h at 25 degrees C and were also affected by salinity (126 h at 15 per thousand and 167 h at 30 per thousand), whereas the light:dark regime and culture density influenced development only to a minor extent. BP1 was found acutely toxic at 2.6 mg/L (48-h median lethal concentration [LC50]). The toxicity of BP1 on early life-stage development was studied in combinations of three temperatures (15, 20, 25 degrees C) and three salinities (15, 20, 25 per thousand) using five toxicant

concentrations between 0.051 and 2 mg/L in each scenario. Concentrations causing 10 and 50% inhibition of development (EC10 and EC50) were determined. *Acartia tonsa* was most resistant towards BP1 at 20 degrees C where an EC50 of 1.1 mg/L was found, whereas EC50 values were significantly lower at 15 degrees C (0.49 mg/L) and 25 degrees C (0.77 mg/L), respectively. The EC50 also decreased with increasing salinity. Our results demonstrate that environmental conditions do influence toxicity test results; thus, they need to be considered carefully when developing test protocols as well as for environmental risk assessments of chemicals.

**Notes:** 18230173

**URL:** <http://onlinelibrary.wiley.com/doi/10.1002/etc.458/full>

**Reference Type:** Journal Article

**Record Number:** 34

**Author:** Libralato, G., Minetto, D., Totaro, S., Micetic, I., Pigozzo, A., Sabbioni, E., Marcomini, A. and Volpi, Ghirardini

**Year:** 2013

**Title:** Embryotoxicity of TiO<sub>2</sub> nanoparticles to *Mytilus galloprovincialis* (Lmk)

**Journal:** Mar Environ Res

**Volume:** 92

**Pages:** 71-8

**Date:** 2013

**Short Title:** Embryotoxicity of TiO<sub>2</sub> nanoparticles to *Mytilus galloprovincialis* (Lmk)

**ISSN:** 0141-1136

**DOI:** 10.1016/j.marenvres.2013.08.015. Epub 2013 Sep 10.

**Keywords:** eppi-reviewer4

**Abstract:** Few data exist on the ecotoxicological effects of nanosized titanium dioxide (nTiO<sub>2</sub>) towards marine species with specific reference to bivalve molluscs and their relative life stages. *Mytilus galloprovincialis* Lamarck was selected to assess the potential adverse effects of nTiO<sub>2</sub> (0-64 mg/L) on its early larval development stages (pre-D shell stage, malformed D-shell stage and normal D-shell stage larvae) considering two exposure scenarios characterised by total darkness (ASTM protocol) and natural photoperiod (light/dark). This approach was considered to check the presence of potential effects associated to the photocatalytic properties of nTiO<sub>2</sub>. Parallel experiments were carried on with the bulk reference TiCl<sub>4</sub>. The toxicity of nTiO<sub>2</sub> showed to be mainly related to its "nano" condition and to be influenced by the exposure to light that supported the increase in the number of pre-D shell stage (retarded) larvae compared to the malformed ones especially at the maximum effect concentrations (4 and 8 mg nTiO<sub>2</sub>/L). The non-linear regression toxicity data analysis showed the presence of two EC50 values per exposure scenario: a) EC(50)<sub>1</sub> = 1.23 mg/L (0.00-4.15 mg/L) and EC(50)<sub>2</sub> = 38.56 mg/L (35.64-41.47 mg/L) for the dark exposure conditions; b) EC(50)<sub>1</sub> = 1.65 mg/L (0.00-4.74 mg/L) and EC(50)<sub>2</sub> = 16.39 mg/L (13.31-19.48 mg/L) for the light/dark exposure conditions. The potential implication of agglomeration and sedimentation phenomena on ecotoxicological data was discussed.

**Notes:** 18230366

**URL:** <http://www.sciencedirect.com/science/article/pii/S0141113613001499>

**Reference Type:** Journal Article

**Record Number:** 35

**Author:** Luckenbach, T., Corsi, I. and Epel, D.

**Year:** 2004

**Title:** Fatal attraction: synthetic musk fragrances compromise multitaxenobiotic defense systems in mussels

**Journal:** Mar Environ Res

**Volume:** 58

**Pages:** 215-9

**Date:** 2004

**Short Title:** Fatal attraction: synthetic musk fragrances compromise multitaxenobiotic defense systems in mussels

**ISSN:** 0141-1136 (Print) 0141-1136

**Keywords:** eppi-reviewer4

**Abstract:** We studied interactions of nitromusk compounds musk ketone and musk xylene and polycyclic musks Galaxolide trade mark (HHCB), Celestolide trade mark (ADBI), Tetralide trade mark (AHTN), and Traseolide trade mark (AITI) with multixenobiotic resistance (mxr) transporters in gill tissue of the marine mussel *Mytilus californianus* (Conrad, 1837). A competitive substrate transport test with rhodamine B was used to assay modulation of transport activity by musks. All tested musks inhibited the transport activity in the low microm range as indicated by increased accumulation of rhodamine B in the tissue. Compared to known substrates of mxr transporters, the effective concentration range was similar to quinidine and about 100 times higher than verapamil. Musk ketone and musk xylene also inhibited efflux of rhodamine B from gill tissue which was loaded with the dye and subsequently incubated with these compounds. Synthetic musk compounds are persistent environmental pollutants in aquatic environments with a high potential to bioaccumulate. As potent inhibitors of mxr transporters they may also play a role as chemosensitizers that enable toxic mxr substrates to accumulate in cells of aquatic organisms.

**Notes:** 18230458  
5369

Luckenbach, Till Corsi, Ilaria Epel, David Comparative Study Journal Article Research Support, Non-U.S. Gov't Research Support, U.S. Gov't, Non-P.H.S. England Mar Environ Res. 2004 Aug-Dec;58(2-5):215-9.

**Reference Type:** Journal Article

**Record Number:** 36

**Author:** Luckenbach, T. and Epel, D.

**Year:** 2005

**Title:** Nitromusk and polycyclic musk compounds as long-term inhibitors of cellular xenobiotic defense systems mediated by multidrug transporters

**Journal:** Environ Health Perspect

**Volume:** 113

**Pages:** 17-24

**Date:** 2005

**Short Title:** Nitromusk and polycyclic musk compounds as long-term inhibitors of cellular xenobiotic defense systems mediated by multidrug transporters

**ISSN:** 0091-6765 (Print) 0091-6765

**Keywords:** eppi-reviewer4

**Abstract:** Synthetic musk compounds, widely used as fragrances in consumer products, have been detected in human tissue and, surprisingly, in aquatic organisms such as fish and mollusks. Although their persistence and potential to bioaccumulate are of concern, the toxicity and environmental risks of these chemicals are generally regarded as low. Here, however, we show that nitromusks and polycyclic musks inhibit the activity of multidrug efflux transporters responsible for multixenobiotic resistance (MXR) in gills of the marine mussel *Mytilus californianus*. The  $IC_{10}$  (concentration that inhibits 10%) values for the different classes of musks were in the range of 0.09–0.39  $\mu$ M, and  $IC_{50}$  values were 0.74–2.56  $\mu$ M. The immediate consequence of inhibition of efflux transporters is that normally excluded xenobiotics will now be able to enter the cell. Remarkably, the inhibitory effects of a brief 2-hr exposure to musks were only partially reversed after a 24- to 48-hr recovery period in clean seawater. This unexpected consequence of synthetic musks—a long-term loss of efflux transport activity—will result in continued accumulation of normally excluded toxicants even after direct exposure to the musk has ended. These findings also point to the need to determine whether other environmental chemicals have similar long-term effects on these transporters. The results are relevant to human health because they raise the possibility that exposure to common xenobiotics and pharmaceuticals could cause similar long-term inhibition of these transporters and lead to increased exposure to normally excluded toxicants.

**Notes:** 18230459

**URL:** <http://www.jstor.org/stable/3435741>

**Reference Type:** Journal Article

**Record Number:** 37

**Author:** Magesky, Adriano and Pelletier, Émilien

**Year:** 2015

**Title:** Toxicity mechanisms of ionic silver and polymer-coated silver nanoparticles with interactions of functionalized carbon nanotubes on early development stages of sea urchin

**Journal:** Aquatic Toxicology

**Volume:** 167

**Pages:** 106-123

**Date:** 2015

**Short Title:** Toxicity mechanisms of ionic silver and polymer-coated silver nanoparticles with interactions of functionalized carbon nanotubes on early development stages of sea urchin

**ISSN:** 0166-445X

**Keywords:** eppi-reviewer4

**Abstract:** Exposures of aquatic organisms to multiple contaminants are likely to take place in estuarine and coastal areas and combined effects on early life stages have to be examined. Among emerging contaminants, ionic silver (Ag<sup>+</sup>) and silver nanoparticles (AgNps) have demonstrated contrasting effects on marine invertebrates, but their interactions with functionalized carbon nanotubes (f-SWCNTs) have not yet been investigated in details. In order to observe the impacts and understand the toxicity mechanism of Ag<sup>+</sup> and polymer-coated AgNps, and their combined effects with f-SWCNTs, successive development stages of embryos of sea urchin, *Strongylocentrotus droebachiensis*, were exposed to Ag<sup>+</sup>, AgNps and f-SWCNTs, separately and in mixtures using moderate environmental concentrations. We also assessed long-term effects of treatments under recovery conditions. Morphological endpoints such as archenteron elongation, primary and secondary mesenchyme cells fate, pigment cells migration, spiculogenic cells and gut development indicated different effects of silver and nanosilver forms during successive development stages. Whereas Ag<sup>+</sup> induced vegetalization and extrusion of mesenchyme cells on early embryos; f-SWCNTs + Ag<sup>+</sup> strongly interfered with gut regionalization in late larvae. Sensitive blastocoelar cells got vacuolized and shapeless with AgNps, but not with mixtures with f-SWCNTs. Increased concentrations of Ag<sup>+</sup> and f-SWCNTs + Ag<sup>+</sup> led to the most disruptive effects during development, but f-SWCNTs + Ag<sup>+</sup> caused the highest mortality rate during the recovery period, which indicated far-reaching effects driven by f-SWCNTs and their ability to keep silver more available during exposure period.

**Notes:** 18230517

6230

**URL:** <http://www.sciencedirect.com/science/article/pii/S0166445X15300163>

**Reference Type:** Journal Article

**Record Number:** 38

**Author:** Majone, F., Beltrame, C. and Brunetti, R.

**Year:** 1988

**Title:** Frequencies of micronuclei detected on *Mytilus galloprovincialis* by different staining techniques after treatment with zinc chloride

**Journal:** Mutat Res

**Volume:** 209

**Pages:** 131-4

**Date:** 1988

**Short Title:** Frequencies of micronuclei detected on *Mytilus galloprovincialis* by different staining techniques after treatment with zinc chloride

**ISSN:** 0027-5107 (Print) 0027-5107

**Keywords:** eppi-reviewer4

**Abstract:** The frequencies of micronuclei induced by ZnCl<sub>2</sub> and detected on the gill tissue of the marine mussel *Mytilus galloprovincialis* with different staining techniques (acridine orange, galloycyanin chromallum, Feulgen, Giemsa) were compared. At least in the used system, the Feulgen and galloycyanin chromallum methods gave a frequency of micronuclei significantly lower than that obtained with the acridine

orange and Giemsa techniques. No significant difference between the frequencies obtained with acridine orange and Giemsa was shown. So, though the acridine orange is surely the method which provides the more reliable data, in environmental screening works the Giemsa technique may be more suitable for its simplicity.

**Notes:** 18230533

**URL:** <http://www.sciencedirect.com/science/article/pii/0165799288900292>

**Reference Type:** Journal Article

**Record Number:** 39

**Author:** Maranhó, L. A., André, C., DelValls, T. A., Gagné, F. and Martín-Díaz, M. L.

**Year:** 2015

**Title:** Adverse effects of wastewater discharges in reproduction, energy budget, neuroendocrine and inflammation processes observed in marine clams *Ruditapes philippinarum*

**Journal:** Estuarine, Coastal and Shelf Science

**Volume:** 164

**Pages:** 324-334

**Date:** 2015

**Short Title:** Adverse effects of wastewater discharges in reproduction, energy budget, neuroendocrine and inflammation processes observed in marine clams *Ruditapes philippinarum*

**ISSN:** 0272-7714

**Keywords:** eppi-reviewer4

**Abstract:** The present study investigated possible adverse outcomes in the marine clams *Ruditapes philippinarum* exposed to sediment affected by wastewater discharges at the Bay of Cádiz (SW, Spain). Six locations representing five cities were chosen for the sediment sampling during winter and summer seasons: P1 – Chiclana de la Frontera, P2 – Puerto Real, P3 – Cádiz, P4 and P5 – El Puerto de Santa María, P6 – Rota (reference site). Biochemical biomarkers were explored in clams after 14-days of exposure under controlled conditions, that included changes in cellular energy status (total lipids content – TLP and mitochondrial electron transport activity – MET), gametogenic activity (dopamine and ALP levels), metabolism of monoamines (monoamine oxidase activity – MAO), inflammation and spawning properties (cyclooxygenase activity – COX). Wastewater discharges induced energy budget alterations, as suggested by MET decrease (P4 and P5) and accumulation of TLP (P1, P2 and P3) in gonads. ALP levels (P1, P2 and P3), dopamine (P2) and COX activity (P1, P2, P3, P4 and P5) decreased in clams after the exposure to summer sediments. MAO increased in clams exposed to winter (P1 and P2) and summer (P3 and P4) sediments. Wastewater discharges composition changed between different seasons, mainly leading to oxidative stress, inflammation (COX activity and ALP levels) and spawning delay in summer. This study highlights the importance of considering reproduction of marine biota when assessing adverse effects of wastewater discharges. Continuous release of wastewater adequately treated or not, in aquatic ecosystems may culminate in adverse effects to the local benthic biota.

**Notes:** 18230563

6214

**URL:** <http://www.sciencedirect.com/science/article/pii/S0272771415300512>

**Reference Type:** Journal Article

**Record Number:** 40

**Author:** Montes, M. O., Hanna, S. K., Lenihan, H. S. and Keller, A. A.

**Year:** 2012

**Title:** Uptake, accumulation, and biotransformation of metal oxide nanoparticles by a marine suspension-feeder

**Journal:** J Hazard Mater

**Volume:** 225-226

**Pages:** 139-45

**Date:** 2012

**Short Title:** Uptake, accumulation, and biotransformation of metal oxide nanoparticles by a marine suspension-feeder

**ISSN:** 0304-3894

**DOI:** 10.1016/j.jhazmat.2012.05.009. Epub 2012 May 9.

**Keywords:** eppi-reviewer4

**Abstract:** A growing body of evidence indicates that some engineered nanoparticles (ENPs) are toxic to organisms that perform important ecosystem services in terrestrial and aquatic ecosystems. However, toxicity can be influenced by the biotransformation of contaminants, including ENPs, as it may alter the fate and transport of these substances. In turn, fate and transport can influence their bioavailability. To understand how biotransformation influences the fate and transport of ENPs in marine ecosystems, we exposed suspension-feeding mussels, *Mytilus galloprovincialis*, to two common nano-metal oxides, CeO<sub>2</sub> and ZnO, over a range of concentrations from 1mg L<sup>-1</sup> to 10mg L<sup>-1</sup>, in a laboratory experiment. Mussels exposed to 10mg L<sup>-1</sup> accumulated 62μg g<sup>-1</sup> of Ce and 880μg g<sup>-1</sup> of Zn on a dry tissue basis but rejected 21,000μg g<sup>-1</sup> for Ce and 63,000μg g<sup>-1</sup> for Zn in pseudofeces. Scanning electron microscope evidence indicates CeO<sub>2</sub> remained as ENPs but ZnO did not after being rejected by the mussels. Mussels filtered most of the CeO<sub>2</sub> from the aqueous media, while a significant fraction of Zn remained in solution. Differences in ENP solubility affect ENP uptake, excretion, and accumulation in mussels. Our study highlights the potential role of marine suspension feeders in biotransformation of ENPs.

**Notes:** 18230718

**URL:** <http://www.sciencedirect.com/science/article/pii/S0304389412004918>

**Reference Type:** Journal Article

**Record Number:** 41

**Author:** Ostroumov, S. A.

**Year:** 2003

**Title:** Studying effects of some surfactants and detergents on filter-feeding bivalves

**Journal:** Hydrobiologia

**Volume:** 500

**Pages:** 341-344

**Date:** 2003

**Short Title:** Studying effects of some surfactants and detergents on filter-feeding bivalves

**Keywords:** eppi-reviewer4

**Abstract:** Effects of several surfactants and chemical mixtures on marine bivalves were studied. An anionic surfactant, sodium dodecylsulphate (SDS), and a cationic surfactant, tetradecyltrimethylammonium bromide (TDTMA), inhibited the filtering activity of oysters (*Crassostrea gigas*). Similar effects were exhibited by some chemical mixtures that included surfactants. Those mixtures inhibited the filtering activity of *Crassostrea gigas* and *Mytilus galloprovincialis*. The new results are in agreement with the author's previous experiments, where a number of xenobiotics and/or pollutants inhibited the filtering activity of several species of marine and freshwater bivalves, e.g., it had been shown that SDS inhibited filtering activity of *Mytilus edulis* (e.g., Ostroumov, 2000c, 2001a). This experimental approach is helpful in assessment of environmental hazards from man-made chemicals that can contaminate marine systems.

**Notes:** 18230978

8563

**Cited By :** 11 **Export Date:** 13 October 2015

**URL:** <http://www.scopus.com/inward/record.url?eid=2-s2.0-0345330923&partnerID=40&md5=df92b5b7c4998f4e5ad2d53dbacd1bfe>

**Reference Type:** Journal Article

**Record Number:** 42

**Author:** Ostroumov, S. A. and Widdows, J.

**Year:** 2006

**Title:** Inhibition of mussel suspension feeding by surfactants of three classes

**Journal:** Hydrobiologia

**Volume:** 556

**Pages:** 381-386

**Date:** 2006

**Short Title:** Inhibition of mussel suspension feeding by surfactants of three classes

**Keywords:** eppi-reviewer4

**Abstract:** Effects of three surfactants on the filtration rates by marine mussels were studied. The xenobiotics tested represented anionic, cationic and non-ionic surfactants (tetradecyltrimethylammonium bromide, a representative of a class of cationic surfactants; sodium dodecyl sulphate, a representative of anionic alkyl sulfates; and Triton X-100, a representative of non-ionic hydroxyethylated alkyl phenols). All three surfactants inhibited the clearance rates. The significance of the results for the ecology of marine ecosystems is discussed. © Springer 2006.

**Notes:** 18230981

9014

**Cited By :** 8 **Export Date:** 13 October 2015

**URL:** <http://www.scopus.com/inward/record.url?eid=2-s2.0-29344466675&partnerID=40&md5=b5f1751a3379408d2514a89f7550599f>

**Reference Type:** Journal Article

**Record Number:** 43

**Author:** Paredes, E., Perez, S., Rodil, R., Quintana, J. B. and Beiras, R.

**Year:** 2014

**Title:** Ecotoxicological evaluation of four UV filters using marine organisms from different trophic levels *Isochrysis galbana*, *Mytilus galloprovincialis*, *Paracentrotus lividus*, and *Siriella armata*

**Journal:** Chemosphere

**Volume:** 104

**Pages:** 44-50

**Date:** 2014

**Short Title:** Ecotoxicological evaluation of four UV filters using marine organisms from different trophic levels *Isochrysis galbana*, *Mytilus galloprovincialis*, *Paracentrotus lividus*, and *Siriella armata*

**ISSN:** 0045-6535

**DOI:** 10.1016/j.chemosphere.2013.10.053. Epub 2013 Dec 19.

**Keywords:** eppi-reviewer4

**Abstract:** Due to the concern about the negative effects of exposure to sunlight, combinations of UV filters like 4-Methylbenzylidene-camphor (4-MBC), Benzophenone-3 (BP-3), Benzophenone-4 (BP-4) and 2-Ethylhexyl-4-methoxycinnamate (EHMC) are being introduced in all kind of cosmetic formulas. These chemicals are acquiring a concerning status due to their increasingly common use and the potential risk for the environment. The aim of this study is to assess the behaviour of these compounds in seawater, the toxicity to marine organisms from three trophic levels including autotrophs (*Isochrysis galbana*), herbivores (*Mytilus galloprovincialis* and *Paracentrotus lividus*) and carnivores (*Siriella armata*), and set a preliminary assessment of potential ecological risk of UV filters in coastal ecosystems. In general, EC50 results show that both EHMC and 4-MBC are the most toxic for our test species, followed by BP-3 and finally BP-4. The most affected species by the presence of these UV filters are the microalgae *I. galbana*, which showed toxicity thresholds in the range of  $\mu\text{g L}^{-1}$  units, followed by *S. armata* > *P. lividus* > *M. galloprovincialis*. The UV filter concentrations measured in the sampled beach water were in the range of tens or even hundreds of  $\text{ng L}^{-1}$ . The resulting risk quotients showed appreciable environmental risk in coastal environments for BP-3 and 4-MBC.

**Notes:** 18231038

**URL:** <http://www.sciencedirect.com/science/article/pii/S0045653513014872>

**Reference Type:** Journal Article

**Record Number:** 44

**Author:** Perron, M. M., Ho, K. T., Cantwell, M. G., Burgess, R. M. and Pelletier, M. C.

**Year:** 2012  
**Title:** Effects of triclosan on marine benthic and epibenthic organisms  
**Journal:** Environ Toxicol Chem  
**Volume:** 31  
**Pages:** 1861-6  
**Date:** 2012  
**Short Title:** Effects of triclosan on marine benthic and epibenthic organisms  
**ISSN:** 0730-7268  
**DOI:** 10.1002/etc.1884. Epub 2012 Jun 14.  
**Keywords:** eppi-reviewer4  
**Abstract:** Triclosan is an antimicrobial compound that has been widely used in consumer products such as toothpaste, deodorant, and shampoo. Because of its widespread use, triclosan has been detected in various environmental media, including wastewater, sewage sludge, surface waters, and sediments. Triclosan is acutely toxic to numerous aquatic organisms, but very few studies have been performed on estuarine and marine benthic organisms. For whole sediment toxicity tests, the sediment-dwelling estuarine amphipod, *Ampelisca abdita*, and the epibenthic mysid shrimp, *Americamysis bahia*, are commonly used organisms. In the present study, median lethal concentration values (LC50) were obtained for both of these organisms using water-only and whole sediment exposures. Acute 96-h water-only toxicity tests resulted in LC50 values of 73.4 and 74.3 microg/L for the amphipod and mysid, respectively. For the 7-d whole sediment toxicity test, LC50 values were 303 and 257 mg/kg (dry wt) for the amphipod and mysid, respectively. Using equilibrium partitioning theory, these whole sediment values are equivalent to interstitial water LC50 values of 230 and 190 microg/L for the amphipod and mysid, respectively, which are within a threefold difference of the observed 96-h LC50 water-only values. Triclosan was found to accumulate in polychaete tissue in a 28-d bioaccumulation study with a biota-sediment accumulation factor of 0.23 kg organic carbon/kg lipid. These data provide some of the first toxicity data for triclosan with marine benthic and epibenthic species while also indicating a need to better understand the effects of other forms of sediment carbon, triclosan ionization, and organism metabolism of triclosan on the chemical's behavior and toxicity in the aquatic environment.  
**Notes:** 18231111  
**URL:** <http://onlinelibrary.wiley.com/doi/10.1002/etc.1884/full>

**Reference Type:** Journal Article  
**Record Number:** 45  
**Author:** Ramskov, Tina, Forbes Valery, E., Gilliland, Douglas and Selck, Henriette  
**Year:** 2015  
**Title:** Accumulation and effects of sediment-associated silver nanoparticles to sediment-dwelling invertebrates  
**Journal:** Aquatic Toxicology  
**Volume:** 166  
**Pages:** 96-105  
**Date:** 2015  
**Short Title:** Accumulation and effects of sediment-associated silver nanoparticles to sediment-dwelling invertebrates  
**ISSN:** 0166-445X  
**Keywords:** eppi-reviewer4  
**Abstract:** Sediment is increasingly recognized as the major sink for contaminants including nanoparticles (NPs). Thus, sediment-living organisms are especially susceptible to NP exposure. Studies of the fate and effects of NPs in the sediment matrix are still in their infancy, and data from such studies are in high demand. Here, we examine the effects of exposure to sediment mixed with either aqueous Ag (administered as AgNO3) or Ag NPs (13 nm, citrate-capped) at a nominal exposure concentration of 100 µg Ag/g dry weight sediment on four benthic invertebrates: two clones of the gastropod *Potamopyrgus antipodarum* (clones A and B) and two polychaete species (*Capitella teleta*, *Capitella* sp. S). Our results show that both species sensitivity and Ag form (aqueous Ag, Ag NPs) play a role in bioaccumulation and effects. Following two weeks of exposure, both clones of *P. antipodarum* were found to



be insensitive towards both Ag forms (generally low Ag accumulation, no toxicity). In contrast, the two *Capitella* species varied widely with respect to Ag uptake and observed toxicity. *Capitella* sp. S was adversely affected by both aqueous Ag (mortality) and Ag NPs (growth), whereas *C. teleta* was not affected by either Ag form. For neither polychaete species was the observed toxicity directly related to bioaccumulation. Therefore, future nano-ecotoxicological research should focus on understanding differences in uptake and handling mechanisms among species and the relationship between bioaccumulation and toxicity.

**Notes:** 18231256

6432

**URL:** <http://www.sciencedirect.com/science/article/pii/S0166445X15300072>

**Reference Type:** Journal Article

**Record Number:** 46

**Author:** Renaud, F., Warnau, M., Oberhänkli, F., Teyssié, J. L., Temara, A., Rouleau, C. and Metian, M.

**Year:** 2014

**Title:** Bioconcentration of the anionic surfactant linear alkylbenzene sulfonate (LAS) in the marine shrimp *Palaemonetes varians*: A radiotracer study

**Journal:** Marine Pollution Bulletin

**Volume:** 85

**Pages:** 244–247

**Date:** 2014

**Short Title:** Bioconcentration of the anionic surfactant linear alkylbenzene sulfonate (LAS) in the marine shrimp *Palaemonetes varians*: A radiotracer study

**Keywords:** eppi-reviewer4

**Abstract:** Uptake and depuration kinetics of dissolved [<sup>14</sup>C]C<sub>12</sub>-6-linear alkylbenzene sulfonate (LAS) were determined in the shrimp *Palaemonetes varians* using environmentally relevant exposure concentration. The shrimp concentrated LAS from seawater with a mean BCF value of 120Lkg<sup>-1</sup> after a 7-day exposure. Uptake biokinetics were best described by a saturation model, with an estimated BCF<sub>ss</sub> of 159±34Lkg<sup>-1</sup>, reached after 11.5days. Shrimp weight influenced significantly BCF value with smaller individuals presenting higher affinity to LAS. To the light of a whole body autoradiography, major accumulation of LAS occurred in the cephalothorax circulatory system (gills, heart, hepatopancreas) and ocular peduncle, but not in the flesh, limiting potential transfer to human consumers. LAS depuration rate constant value of the shrimp was 1.18±0.08d<sup>-1</sup> leading to less than 1% of remaining LAS in its tissues after 8days of depuration. © 2014 Elsevier Ltd.

**Notes:** 18231307

9629

**Export Date:** 13 October 2015

**URL:** <http://www.scopus.com/inward/record.url?eid=2-s2.0-84905719845&partnerID=40&md5=c50f84f8937f3645d95d2b3ecd410da8>

**Reference Type:** Journal Article

**Record Number:** 47

**Author:** Sánchez-Quiles, D. and Tovar-Sánchez, A.

**Year:** 2014

**Title:** Sunscreens as a source of hydrogen peroxide production in coastal waters

**Journal:** Environmental Science and Technology

**Volume:** 48

**Pages:** 9037–9042

**Date:** 2014

**Short Title:** Sunscreens as a source of hydrogen peroxide production in coastal waters

**Keywords:** eppi-reviewer4

**Abstract:** Sunscreens have been shown to give the most effective protection for human skin from ultraviolet (UV) radiation. Chemicals from sunscreens (i.e., UV filters) accumulate in the sea and have toxic effects on marine organisms. In this report, we

demonstrate that photoexcitation of inorganic UV filters (i.e., TiO<sub>2</sub> and ZnO nanoparticles) under solar radiation produces significant amounts of hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>), a strong oxidizing agent that generates high levels of stress on marine phytoplankton. Our results indicate that the inorganic oxide nanoparticle content in 1 g of commercial sunscreen produces rates of H<sub>2</sub>O<sub>2</sub> in seawater of up to 463 nM/h, directly affecting the growth of phytoplankton. Conservative estimates for a Mediterranean beach reveal that tourism activities during a summer day may release on the order of 4 kg of TiO<sub>2</sub> nanoparticles to the water and produce an increment in the concentration of H<sub>2</sub>O<sub>2</sub> of 270 nM/day. Our results, together with the data provided by tourism records in the Mediterranean, point to TiO<sub>2</sub> nanoparticles as the major oxidizing agent entering coastal waters, with direct ecological consequences on the ecosystem. © 2014 American Chemical Society.

**Notes:** 18231462  
9006

**Export Date:** 13 October 2015

**URL:** <http://www.scopus.com/inward/record.url?eid=2-s2.0-84906234277&partnerID=40&md5=5d366f701b839395c856956e2b504b86>

**Reference Type:** Journal Article

**Record Number:** 48

**Author:** Shafir, S., Halperin, I. and Rinkevich, B.

**Year:** 2014

**Title:** Toxicology of household detergents to reef corals

**Journal:** Water, Air, and Soil Pollution

**Volume:** 225

**Date:** 2014

**Short Title:** Toxicology of household detergents to reef corals

**Keywords:** eppi-reviewer4

**Abstract:** Ecotoxicological impacts (survivorship, growth) of two detergents, the linear alkylbenzene sulfonates (LAS) and the nonionic surfactants, nonylphenol ethoxylate (NPE), were examined on two branching coral species ( *Stylophora pistillata* and *Pocillopora damicornis*). Nubbins assays (n=1,890, 24-h exposures, 203-day monitoring) revealed high mortality in 1 and 5 mg/l detergents concentrations (for both species combined, LAS LC<sub>50</sub>=1.99 mg/l; NPE LC<sub>50</sub>=2.16 mg/l). Assays further showed detergent as species-specific mortalities (*Stylophora* LAS LC<sub>50</sub>=1.00 mg/l; NPE=3.03 mg/l; *Pocillopora* LAS LC<sub>50</sub>=2.21 mg/l; NPE=2.26 mg/l), also influenced by genotype-specific mortalities, phenomena which could downgrade genetic diversity of corals in the field, leaving frequently or chronically affected areas with detergent-resistant genotypes. Results revealed that LAS detergents were significantly more detrimental to coral nubbins than NPE detergents, resulting in high mortality and reduced tissue growth on substrates. Surprisingly, nubbins exposed to second and third LAS treatments exhibited significant higher survivorship levels than after the first exposure, whereas in all NPE treatments, nubbins' survivorship did not significantly differ in the repeated exposures as compared to the first set of assays. This outcome, while adding to our knowledge for the toxicity of various detergents, highlights the need to reduce repeated sewage spills. Furthermore, it is recommended that reef managers should emphasize disparate detergents' ecotoxicity on corals when establishing environmental policies. © Springer International Publishing 2014.

**Notes:** 18231581

8315

**Export Date:** 13 October 2015

**URL:** <http://www.scopus.com/inward/record.url?eid=2-s2.0-84893650127&partnerID=40&md5=544b3eed653e80cfedbb23c1765ae096>

**Reference Type:** Journal Article

**Record Number:** 49

**Author:** Tian, S., Zhang, Y., Song, C., Zhu, X. and Xing, B.

**Year:** 2014

**Title:** Titanium dioxide nanoparticles as carrier facilitate bioaccumulation of phenanthrene in marine bivalve, ark shell (*Scapharca subcrenata*)  
**Journal:** Environ Pollut  
**Volume:** 192  
**Pages:** 59–64  
**Date:** 2014  
**Short Title:** Titanium dioxide nanoparticles as carrier facilitate bioaccumulation of phenanthrene in marine bivalve, ark shell (*Scapharca subcrenata*)  
**ISSN:** 0269–7491  
**DOI:** 10.1016/j.envpol.2014.05.010. Epub 2014 Jun 2.  
**Keywords:** eppi-reviewer4  
**Abstract:** To evaluate the impact of titanium dioxide nanoparticles (nTiO<sub>2</sub>) on the uptake of hydrophobic organic chemicals by marine bivalves, we conducted a comparative bioaccumulation study by exposing clam, *Scapharca subcrenata*, to phenanthrene (Phe) in the presence and absence of nTiO<sub>2</sub>. The large surface area of nTiO<sub>2</sub> resulted in adsorption of co-existing Phe in aqueous solution to form nTiO<sub>2</sub>-Phe complexes. Accumulation of nTiO<sub>2</sub> was not observed in clams at exposed concentration (500 µg/L) in this study. However, enhanced uptake of Phe by clams was observed in the presence of nTiO<sub>2</sub>, with *K<sub>d</sub>* and BAFs values being 2 and 1.7 times higher than that of Phe alone, respectively. The enhanced uptake can be explained by ingestion of nTiO<sub>2</sub>-Phe complexes into the gut and subsequent desorption of Phe there. Therefore, nTiO<sub>2</sub> as a carrier facilitated the uptake of Phe by marine bivalves.  
**Notes:** 18231873  
**URL:** <http://www.sciencedirect.com/science/article/pii/S0269749114001985>

**Reference Type:** Journal Article

**Record Number:** 50

**Author:** Tian, S., Zhang, Y., Song, C., Zhu, X. and Xing, B.

**Year:** 2015

**Title:** Bioaccumulation and biotransformation of polybrominated diphenyl ethers in the marine bivalve (*Scapharca subcrenata*): influence of titanium dioxide nanoparticles

**Journal:** Mar Pollut Bull

**Volume:** 90

**Pages:** 48–53

**Date:** 2015

**Short Title:** Bioaccumulation and biotransformation of polybrominated diphenyl ethers in the marine bivalve (*Scapharca subcrenata*): influence of titanium dioxide nanoparticles

**ISSN:** 0025–326x

**DOI:** 10.1016/j.marpolbul.2014.11.031. Epub 2014 Dec 7.

**Keywords:** eppi-reviewer4

**Abstract:** Titanium dioxide nanoparticles (nTiO<sub>2</sub>) have the potential to adsorb co-existing contaminants in aqueous environment to form nanoparticle-contaminant complexes. Adsorption by nTiO<sub>2</sub> might impact the fate of contaminants in water. Bioaccumulation experiments were conducted to compare the accumulation of polybrominated diphenyl ethers (PBDEs) in marine bivalve (*Scapharca subcrenata*) exposed to PBDEs in the presence and absence of nTiO<sub>2</sub>. PBDEs can be taken up by *S. subcrenata* through aqueous exposure. nTiO<sub>2</sub> acts as a carrier and can enhance the ingestion of PBDEs, but the bioaccumulation of PBDEs was not facilitated significantly in the presence of nTiO<sub>2</sub>. Similar accumulation kinetics pattern was found after exposing to PBDEs in the presence and absence of nTiO<sub>2</sub>. Further analysis showed that no significant difference between the congener profiles of PBDEs in the presence and absence of nTiO<sub>2</sub>, suggesting that nTiO<sub>2</sub> would not influence the biotransformation of PBDEs in clams.

**Notes:** 18231874

**URL:** <http://www.sciencedirect.com/science/article/pii/S0025326X1400784X>

**Reference Type:** Journal Article

**Record Number:** 51

**Author:** Tsarpali, Vasiliki, Belavgeni, Alexia and Dailianis, Stefanos  
**Year:** 2015  
**Title:** Investigation of toxic effects of imidazolium ionic liquids, [bmim][BF4] and [omim][BF4], on marine mussel *Mytilus galloprovincialis* with or without the presence of conventional solvents, such as acetone  
**Journal:** Aquatic Toxicology  
**Volume:** 164  
**Pages:** 72-80  
**Date:** 2015  
**Short Title:** Investigation of toxic effects of imidazolium ionic liquids, [bmim][BF4] and [omim][BF4], on marine mussel *Mytilus galloprovincialis* with or without the presence of conventional solvents, such as acetone  
**ISSN:** 0166-445X  
**Keywords:** eppi-reviewer4  
**Abstract:** This study investigated the cytotoxic, oxidative and genotoxic effects of two commonly used imidazolium ionic liquids (ILs), [bmim][BF4] (1-butyl-3-methylimidazolium) and [omim][BF4] (1-methyl-3-octylimidazolium tetrafluoroborate), on the marine mussel *Mytilus galloprovincialis*, as well as whether acetone could mediate their toxic profile. In this context, mussels were firstly exposed to different concentrations of [bmim][BF4] or [omim][BF4], with or without the presence of acetone (at a final concentration of 0.06% v/v), for a period of 96 h, in order to determine the concentration that causes 50% mussel mortality (LC50 values) in each case. Thereafter, mussels were exposed to sub- and non-lethal concentrations of ILs for investigating their ability to cause lysosomal membrane impairment (with the use of neutral red retention assay/NRRT), superoxide anion and lipid peroxidation byproduct (malondialdehyde/MDA) formation, as well as DNA damage and formation of nuclear abnormalities in hemocytes. The results showed that [omim][BF4] was more toxic than [bmim][BF4] in all cases, while the presence of acetone resulted in a slight attenuation of its toxicity. The different toxic behavior of ILs was further revealed by the significantly lower levels of NRRT values observed in [omim][BF4]-treated mussels, compared to those occurring in [bmim][BF4] in all cases. Similarly, [bmim][BF4]-mediated oxidative and genotoxic effects were observed only in the highest concentration tested (10 mg L<sup>-1</sup>), while [omim][BF4]-mediated effects were enhanced at lower concentrations (0.01-0.05 mg L<sup>-1</sup>). Overall, the present study showed that [bmim][BF4] and [omim][BF4] could induce not only lethal but also nonlethal effects on mussel *M. galloprovincialis*. The extent of [bmim][BF4] and/or [omim][BF4]-mediated effects could be ascribed to the length of each IL alkyl chain, as well as to their lipophilicity. Moreover, the role of acetone on the obtained toxic effects of the specific ILs was reported for the first time, giving evidence for its interaction with the ILs and the modulation of their toxicity.  
**Notes:** 18231926  
6809  
**URL:** <http://www.sciencedirect.com/science/article/pii/S0166445X15001344>

**Reference Type:** Journal Article  
**Record Number:** 52  
**Author:** Tsarpali, Vasiliki and Dailianis, Stefanos  
**Year:** 2015  
**Title:** Toxicity of two imidazolium ionic liquids, [bmim][BF4] and [omim][BF4], to standard aquatic test organisms: Role of acetone in the induced toxicity  
**Journal:** Ecotoxicology and Environmental Safety  
**Volume:** 117  
**Pages:** 62-71  
**Date:** 2015  
**Short Title:** Toxicity of two imidazolium ionic liquids, [bmim][BF4] and [omim][BF4], to standard aquatic test organisms: Role of acetone in the induced toxicity  
**ISSN:** 0147-6513  
**Keywords:** eppi-reviewer4  
**Abstract:** The main goal of this study was to investigate the toxicity of the imidazolium-based ionic liquids (ILs), [bmim][BF4] (1-butyl-3-methylimidazolium

tetrafluoroborate) and [omim][BF<sub>4</sub>] (1-octyl-3-methylimidazolium tetrafluoroborate), in battery of standard aquatic toxicity test organisms. Specifically, exposure of the algae *Scenedesmus rubescens*, crustaceans *Thamnocephalus platyurus* and *Artemia franciscana*, rotifers *Brachionus calyciflorus* and *Brachionus plicatilis* and bivalve *Mytilus galloprovincialis* to different concentrations of [bmim][BF<sub>4</sub>], [omim][BF<sub>4</sub>] and/or a binary mixture of [bmim][BF<sub>4</sub>]-[omim][BF<sub>4</sub>] (1:1) with or without acetone (carrier solvent), revealed that solvent can differentially mediate ILs' toxic profile. Acetone's ability to differentially affect ILs' cation's alkyl chain length, as well as the hydrolysis of [BF<sub>4</sub>-] anions was evident. Given that the toxic potency of the tested ILs seemed to be equal or even higher (in some cases) than those of conventional organic solvents, the present study revealed that the characterization of imidazolium-based ILs as "green solvents" should not be generalized, at least in case of their natural occurrence in mixtures with organic solvents, such as acetone.

**Notes:** 18231927

6827

**URL:** <http://www.sciencedirect.com/science/article/pii/S0147651315001256>

**Reference Type:** Journal Article

**Record Number:** 53

**Author:** Uc-Peraza, R. G. and Delgado-Blas, V. H.

**Year:** 2012

**Title:** Determination of lethal concentration (LC<sub>50</sub>) four domestic biodegradable detergents in *Laonereis culveri* (Webster 1879) (Polychaeta: Annelida)

**Journal:** Revista Internacional de Contaminacion Ambiental

**Volume:** 28

**Pages:** 137-144

**Date:** 2012

**Short Title:** Determination of lethal concentration (LC<sub>50</sub>) four domestic biodegradable detergents in *Laonereis culveri* (Webster 1879) (Polychaeta: Annelida)

**Keywords:** eppi-reviewer4

**Abstract:** The toxicity of four formulations of biodegradable household detergents was experimentally tested (Roma®, Foca®, Puro-Sol® and Blanca Nieves®), using *Laonereis culveri* (Webster 1879) as test organism. The Probit method was used to determine the LC<sub>50</sub> of the formula and the active ingredient from Linear Alkylbenzene Sulfonate (LAS), with a confidence level of 95%. The results obtained showed that *Laonereis culveri* when exposed to the detergents, had the following order of sensitivity according to the test LC<sub>50</sub>-48 h: FOCA® (formula: 59.56; LAS: 12.88 ppm) > Blanca Nieves® (formula: 70.79; LAS: 13.03 ppm) > Roma® (formula: 89.12; LAS: 13.48 ppm) > Puro-Sol® (formula: 91.83; LAS: 14.12 ppm). Significant differences were found (p < 0.05) in relation to the toxicity of the four detergent formulations and also according to the different concentrations. The risk quotient (RQ) in all cases was higher than 1, suggesting that biodegradable detergents can cause damage to living organisms in the sediment and consequently to the entire ecosystem. This species is proposed as a tool for environmental risk assessment for household detergents.

**Notes:** 18231948

8932

**Export Date:** 13 October 2015

**URL:** <http://www.scopus.com/inward/record.url?eid=2-s2.0-84861424465&partnerID=40&md5=f848d434e51344605612446e1bed2312>

**Reference Type:** Journal Article

**Record Number:** 54

**Author:** Wollenberger, L., Breitholtz, M., Kusk, K. O. and Bengtsson, B. E.

**Year:** 2003

**Title:** Inhibition of larval development of the marine copepod *Acartia tonsa* by four synthetic musk substances

**Journal:** Science of the Total Environment

**Volume:** 305

**Pages:** 53-64

**Date:** 2003

**Short Title:** Inhibition of larval development of the marine copepod *Acartia tonsa* by four synthetic musk substances

**Keywords:** eppi-reviewer4

**Abstract:** A nitro musk (musk ketone) and three polycyclic musks (Tonalide™, Galaxolide™ and Celestolide™) were tested for acute and subchronic effects on a marine crustacean, the calanoid copepod *Acartia tonsa*. Sublethal effects on *A. tonsa* larvae were investigated with a rapid and cost effective bioassay, which is based on the easily detectable morphological change from the last nauplius to the first copepodite stage during copepod larval development. The inhibition of larval development after 5 days exposure was a very sensitive endpoint, with 5-d-EC50-values as low as 0.026 mg/l (Tonalide™), 0.059 mg/l (Galaxolide™), 0.066 mg/l (musk ketone) and 0.160 mg/l (Celestolide™), respectively. These values were generally more than one order of magnitude below the 48-h-LC50-values found for adults, which were 0.47 mg/l (Galaxolide™), 0.71 mg/l (Celestolide™), 1.32 mg/l (musk ketone) and 2.5 mg/l (Tonalide™). Since the synthetic musks strongly inhibited larval development in *A. tonsa* at low nominal concentrations, they should be considered as very toxic. The larval development test with *A. tonsa* is able to provide important aquatic toxicity data for the evaluation of synthetic musks, for which there is little published ecotoxicological information available regarding Crustacea. It is suggested that subchronic and chronic copepod toxicity tests should be used more frequently for risk assessment of environmental pollutants. © 2002 Elsevier Science B.V. All rights reserved.

**Notes:** 18232165

8488

**Cited By :**48 **Export Date:** 13 October 2015

**URL:** <http://www.scopus.com/inward/record.url?eid=2-s2.0-0242669234&partnerID=40&md5=388ed3ece8a7e73d638f477ae56099d1>

**Reference Type:** Journal Article

**Record Number:** 56

**Author:** Wong, S. W. and Leung, K. M.

**Year:** 2014

**Title:** Temperature-dependent toxicities of nano zinc oxide to marine diatom, amphipod and fish in relation to its aggregation size and ion dissolution

**Journal:** Nanotoxicology

**Volume:** 8 Suppl 1

**Pages:** 24-35

**Date:** 2014

**Short Title:** Temperature-dependent toxicities of nano zinc oxide to marine diatom, amphipod and fish in relation to its aggregation size and ion dissolution

**ISSN:** 1743-5390

**DOI:** 10.3109/17435390.2013.848949. Epub 2013 Nov 13.

**Keywords:** eppi-reviewer4

**Abstract:** This study, for the first time, concurrently investigated the influence of seawater temperature, exposure concentration and time on the aggregation size and ion dissolution of nano zinc oxides (nZnO) in seawater, and the interacting effect of temperature and waterborne exposure of nZnO to the marine diatom *Skeletonema costatum*, amphipod *Melita longidactyla* and fish *Oryzias melastigma*, respectively. Our results showed that aggregate size was jointly affected by seawater temperature, nZnO concentration and exposure time. Among the three factors, the concentration of nZnO was the most important and followed by exposure time, whereas temperature was less important as reflected by their F values in the three-way analysis of variance (concentration: F3, 300 = 247.305; time: F2, 300 = 20.923 and temperature: F4, 300 = 4.107; All p values < 0.001). The aggregate size generally increased with increasing nZnO concentration and exposure time. The release of Zn ions from nZnO was significantly influenced by seawater temperature and exposure time; the ion dissolution rate generally increased with decreasing temperature and increasing exposure time. Growth inhibition of diatoms increased with increasing temperature, while temperature and nZnO had an interactional effect on their photosynthesis. For

the amphipod, mortality was positively correlated with temperature. Fish larvae growth rate was only affected by temperature but not nZnO, while the two factors interactively modulated the expression of heat shock and metallothionein proteins. Evidently, temperature can influence aggregate size and ion dissolution and thus toxicity of nZnO to the marine organisms in a species-specific manner.

**Notes:** 18232169

**URL:** <http://www.tandfonline.com/doi/abs/10.3109/17435390.2013.848949>

**Reference Type:** Journal Article

**Record Number:** 55

**Author:** Wong, S. W., Leung, P. T., Djurisic, A. B. and Leung, K. M.

**Year:** 2010

**Title:** Toxicities of nano zinc oxide to five marine organisms: influences of aggregate size and ion solubility

**Journal:** Anal Bioanal Chem

**Volume:** 396

**Pages:** 609-18

**Date:** 2010

**Short Title:** Toxicities of nano zinc oxide to five marine organisms: influences of aggregate size and ion solubility

**DOI:** 10.1007/s00216-009-3249-z. Epub 2009 Nov 10.

**Keywords:** eppi-reviewer4

**Abstract:** Nano zinc oxide (nZnO) is increasingly used in sunscreen products, with high potential of being released directly into marine environments. This study primarily aimed to characterize the aggregate size and solubility of nZnO and bulk ZnO, and to assess their toxicities towards five selected marine organisms. Chemical characterization showed that nZnO formed larger aggregates in seawater than ZnO, while nZnO had a higher solubility in seawater (3.7 mg L<sup>-1</sup>) than that of ZnO (1.6 mg L<sup>-1</sup>). Acute tests were conducted using the marine diatoms *Skeletonema costatum* and *Thalassiosira pseudonana*, the crustaceans *Tigriopus japonicus* and *Elasmopus rapax*, and the medaka fish *Oryzias melastigma*. In general, nZnO was more toxic towards algae than ZnO, but relatively less toxic towards crustaceans and fish. The toxicity of nZnO could be mainly attributed to dissolved Zn(2+) ions. Furthermore, molecular biomarkers including superoxide dismutase (SOD), metallothionein (MT) and heat shock protein 70 (HSP70) were employed to assess the sublethal toxicities of the test chemicals to *O. melastigma*. Although SOD and MT expressions were not significantly increased in nZnO-treated medaka compared to the controls, exposure to ZnO caused a significant up-regulation of SOD and MT. HSP70 was increased two to fourfold in all treatments indicating that there were probably other forms of stress in addition to oxidative stress such as cellular injury.

**Notes:** 18232170

**URL:** <http://link.springer.com/article/10.1007/s00216-009-3249-z>

**Reference Type:** Journal Article

**Record Number:** 57

**Author:** Zhu, X., Zhou, J. and Cai, Z.

**Year:** 2011

**Title:** TiO<sub>2</sub> nanoparticles in the marine environment: impact on the toxicity of tributyltin to abalone (*Haliotis diversicolor supertexta*) embryos

**Journal:** Environ Sci Technol

**Volume:** 45

**Pages:** 3753-8

**Date:** 2011

**Short Title:** TiO<sub>2</sub> nanoparticles in the marine environment: impact on the toxicity of tributyltin to abalone (*Haliotis diversicolor supertexta*) embryos

**ISSN:** 0013-936x

**DOI:** 10.1021/es103779h. Epub 2011 Mar 17.

**Keywords:** eppi-reviewer4

**Abstract:** Little information is available on the potential ecotoxicity of manufactured nanomaterials (MNMs) in the marine environment. To carefully address this issue, the toxicity of nanosized titanium dioxide (nTiO<sub>2</sub>) aggregates in the marine environment was evaluated using abalone (*Haliotis diversicolor supertexta*) embryonic development as a model. The effect of nTiO<sub>2</sub> aggregates on the toxicity of the highly toxic marine antifouling compound tributyltin (TBT) to abalone embryos was also investigated. No developmental effects of nTiO<sub>2</sub> were observed at 2 mg/L but concentrations  $\geq 10$  mg/L caused hatching inhibition and malformations. The presence of 2 mg/L nTiO<sub>2</sub> increased the toxicity of TBT up to 20-fold compared with TBT alone. This enhancement of TBT may be due to the combined effects of TBT adsorption onto nTiO<sub>2</sub> aggregates and the internalization of nTiO<sub>2</sub> aggregates by abalone embryos. These observations indicate that MNMs may have important indirect impacts on aquatic organisms by varying the toxicity of coexisting pollutants. Thus, risk assessments for MNMs should consider both their direct effects and possible indirect effects of interactions with other environmental contaminants.

**Notes:** 18232415

**URL:** <http://pubs.acs.org/doi/abs/10.1021/es103779h>



## Lab studies of impacts on bacteria, algae, diatoms etc

**Reference Type:** Journal Article

**Record Number:** 58

**Author:** Aidar, Elizabeth, Sigaud-Kutner Teresa, C. S., Nishihara, Linda, Schinke Katya, P., Braga Maria Cristina, C., Farah Roberto, E. and Kutner Miryam, B. B.

**Year:** 1997

**Title:** Marine phytoplankton assays: Effects of detergents

**Journal:** Marine Environmental Research

**Volume:** 43

**Pages:** 55-68

**Date:** 1997

**Short Title:** Marine phytoplankton assays: Effects of detergents

**ISSN:** 0141-1136

**Keywords:** eppi-reviewer4

**Abstract:** Environmental impacts of an anionic detergent – sodium dodecylbenzene sulfonate (LAS) – a polyphosphate, and a largely employed commercial detergent powder containing methylene blue active substances (MBAS) were evaluated with cultures of the diatom *Phaeodactylum tricornutum*. Bioassays with natural phytoplankton from an estuarine region (Cananéia – SP) were also performed using the same commercial detergent powder. For *P. tricornutum*, LC50 values of LAS were 1.94 and 1.90 mg/l after 48 and 96 h, respectively, and NOEC values were always below 0.50 mg/l. LC50 values for the commercial detergent were 2.14 mg/l and 1.65 mg/l of its MBAS content after 48 and 96 h, respectively. NOEC values were 1.2 mg MBAS/l after 48 h, and less than 0.1 mg MBAS/l 96 h after the beginning of the experiment. The polyphosphate can be an effective source of phosphorus for cell growth. MBAS concentrations in Cananéia estuarine waters showed values ranging from 0.10 mg/l in surface waters, to 8.75 mg/l in a laundry effluent. The commercial detergent solution added to samples of natural phytoplankton (with or without nutrient enrichment) showed a significant change on chlorophyll-a content, primary production potential, and a drastic reduction in *P. tricornutum* cell density, at concentrations of 2.0 and 5.0 mg MBAS/l. Microphytoplankton diversity was not affected. The agreement found between field and laboratory experiments emphasized the need for toxicological tests in the monitoring of aquatic environments.

**Notes:** 18228273

7738

**URL:** <http://www.sciencedirect.com/science/article/pii/0141113696000025>

**Reference Type:** Journal Article

**Record Number:** 60

**Author:** Aizdaicher, N. A.

**Year:** 2000

**Title:** [Response of the algae *Gymnodinium kovalevskii* (Dinophyta) to exposure to synthetic detergents and distillation]

**Journal:** Izv Akad Nauk Ser Biol

**Pages:** 575-80

**Date:** 2000

**Short Title:** [Response of the algae *Gymnodinium kovalevskii* (Dinophyta) to exposure to synthetic detergents and distillation]

**ISSN:** 1026-3470 (Print) 1026-3470

**Keywords:** eppi-reviewer4

**Abstract:** The effects of synthetic detergents and combined effects of synthetic detergents and water freshening on growth characteristics of the alga *Gymnodinium kovalevskii* (Dinophyta) were studied. Low concentrations of synthetic detergents (0.1 and 1.0 mg/l) stimulated the algal growth. Elevated concentrations inhibited cell

division, affected their motility and induced morphological changes. Contamination with synthetic detergents adversely affected the adaptation plasticity of algae with respect to salinity.

**Notes:** 18228275

**URL:** <http://europepmc.org/abstract/med/11042963>

**Reference Type:** Journal Article

**Record Number:** 59

**Author:** Aizdaicher, N. A., Malynova, S. I. and Khristoforova, N. K.

**Year:** 1999

**Title:** The effect of detergents on the growth of microalgae

**Journal:** Russian Journal of Marine Biology

**Volume:** 25

**Pages:** 267-271

**Date:** 1999

**Short Title:** The effect of detergents on the growth of microalgae

**Keywords:** eppi-reviewer4

**Abstract:** A study was made of the effect of two synthetic detergents in concentrations 0.1, 1.0, 10, and 100 mg/l on the growth of marine unicellular algae *Gymnodinium kovalevskii*, *Chaetoceros muelleri*, *Platymonas* sp., and *Dunaliella tertiolecta*. Low concentrations of detergents (0.1 and 1.0 mg/l) stimulated the growth of all microalgae. At 10 mg/l, growth was inhibited in *G. kovalevskii* and *Ch. muelleri*; in *D. tertiolecta* and *Platymonas* sp. the stimulatory effect was reduced. Exposure to 100 mg/l of detergent produced a lethal effect on *Ch. muelleri* and *D. tertiolecta*. At this concentration, the greater part of *G. kovalevskii* cells underwent lysis, and cell division in *Platymonas* sp. was inhibited. Threshold detergent concentrations were determined for the algae. *Platymonas* sp. showed high tolerance, while *Ch. muelleri* was most sensitive to detergents. © 1999 MAEe cyrillic signK "Hayka/Interperiodica".

**Notes:** 18228276

9684

**Cited By :** 1 Export Date: 13 October 2015

**URL:** <http://www.scopus.com/inward/record.url?eid=2-s2.0-27644498678&partnerID=40&md5=6a4d753cf81d8046dcb77f50a293b7c3>

**Reference Type:** Journal Article

**Record Number:** 61

**Author:** Aizdaicher, N. A. and Reunova Yu, A.

**Year:** 2002

**Title:** Effects of detergents on in vitro growth of diatom alga *Thalassiosira pseudonana*

**Journal:** Russian Journal of Marine Biology

**Volume:** 28

**Pages:** 324-328

**Date:** 2002

**Short Title:** Effects of detergents on in vitro growth of diatom alga *Thalassiosira pseudonana*

**Keywords:** eppi-reviewer4

**Abstract:** The growth of the diatom alga *Thalassiosira pseudonana* was studied when exposed to an environment polluted by a detergent. We determined concentrations that inhibit cell division (10 mg/l) instead of algae growth (0.1 and 1 mg/l). It was shown that *T. pseudonana* can adapt to high detergent concentrations. The stimulation of the growth of *Thalassiosira* within a range of 0.03-0.08 mg/l concentration has been registered. © MAIK "Nauka/Interperiodica" 2002.

**Notes:** 18228277

9278

**Export Date:** 13 October 2015

**URL:** <http://www.scopus.com/inward/record.url?eid=2-s2.0-33846796370&partnerID=40&md5=1894edad4320695a3271995acee1e860>

**Reference Type:** Journal Article

**Record Number:** 66

**Author:** Antizar-Ladislao, B., Bhattacharya, B. D., Ray, Chaudhuri and Sarkar, S. K.

**Title:** Impact of silver nanoparticles on benthic prokaryotes in heavy metal-contaminated estuarine sediments in a tropical environment

**Journal:** Marine Pollution Bulletin

**Short Title:** Impact of silver nanoparticles on benthic prokaryotes in heavy metal-contaminated estuarine sediments in a tropical environment

**ISSN:** 0025-326X

**Keywords:** eppi-reviewer4

**Abstract:** Little knowledge is available about the potential impact of commercial silver nanoparticles (Ag-NPs) on estuarine microbial communities. The Hugli river estuary, India, is susceptible to heavy metals pollution through boat traffic, and there is the potential for Ag-NP exposure via effluent discharged from ongoing municipal and industrial activities located in close proximity. This study investigated the effects of commercial Ag-NPs on native microbial communities in estuarine sediments collected from five stations, using terminal restriction fragment length polymorphism (T-RFLP) technique. An increase in the number of bacteria in consortium in sediments was observed following exposure to Ag-NPs. In general microbial communities may be resistant in estuarine systems to the antimicrobial effects of commercial Ag-NPs, but key microorganisms, such as *Pelobacter propionicus*, disappeared following exposure to Ag-NPs. In conclusion, the T-RFLP analysis indicated that Ag-NPs have the potential to shape estuarine sediment bacterial community structure.

**Notes:** 18228357

6712

**URL:** <http://www.sciencedirect.com/science/article/pii/S0025326X15004713>

**Reference Type:** Journal Article

**Record Number:** 62

**Author:** Backhaus, T., Porsbring, T., Arrhenius, A., Brosche, S., Johansson, P. and Blanck, H.

**Year:** 2011

**Title:** Single-substance and mixture toxicity of five pharmaceuticals and personal care products to marine periphyton communities

**Journal:** Environ Toxicol Chem

**Volume:** 30

**Pages:** 2030-40

**Date:** 2011

**Short Title:** Single-substance and mixture toxicity of five pharmaceuticals and personal care products to marine periphyton communities

**ISSN:** 0730-7268

**DOI:** 10.1002/etc.586. Epub 2011 Jul 11.

**Keywords:** eppi-reviewer4

**Abstract:** The single-substance and mixture toxicity of five pharmaceuticals and personal care products (fluoxetine, propranolol, triclosan, zinc-pyrithione, and clotrimazole) to marine microalgal communities (periphyton) was investigated. All compounds proved to be toxic, with median effective concentration values (EC50s) between 1,800 nmol/L (triclosan) and 7.2 nmol/L (Zn-pyrithione). With an EC50 of 356 nmol/L, the toxicity of the mixture falls into this span, indicating the absence of strong synergisms or antagonisms. In fact, a comparison with mixture toxicity predictions by the classical mixture concepts of concentration addition and independent action showed a good predictability in the upper effect range. However, the mixture provoked stimulating effects (hormesis) in the lower effect range, hampering the application of either concept. An independent repetition of the mixture experiment resulted in a principally similar concentration-response curve, again with clear hormesis effects in the lower range of test concentrations. However, the curve was shifted toward higher effect concentrations (EC50 1,070 nmol/L), which likely is

due to changes in the initial species composition. Clear mixture effects were observed even when all five components were present only at their individual no-observed-effect concentrations (NOECs). These results show that, even with respect to mixtures of chemically and functionally dissimilar compounds, such as the five pharmaceuticals and personal care products investigated, environmental quality standards must take possible mixture effects from low-effect concentrations of individual compounds into consideration.

**Notes:** 18228416

**URL:** <http://onlinelibrary.wiley.com/doi/10.1002/etc.586/full>

**Reference Type:** Journal Article

**Record Number:** 63

**Author:** Danovaro, R. and Corinaldesi, C.

**Year:** 2003

**Title:** Sunscreen products increase virus production through prophage induction in marine bacterioplankton

**Journal:** Microb Ecol

**Volume:** 45

**Pages:** 109-18

**Date:** 2003

**Short Title:** Sunscreen products increase virus production through prophage induction in marine bacterioplankton

**ISSN:** 0095-3628 (Print) 0095-3628

**Keywords:** eppi-reviewer4

**Abstract:** Classical pollutants (e.g., hydrocarbon, pesticides) have been recently recognized to induce lytic cycle in lysogenic bacteria, but information on micro-pollutants is almost completely lacking. We investigated the effects of cosmetic sun products (sunscreen and solar oil) on viral abundance and bacterial activity. We found that both sunscreen and solar oil acted as pollutants, inducing viral development and controlling bacterial abundance and production, thus leading to an increase of the virus to bacterium ratio. Short-term experiments revealed that sunscreen supplementation induced the lytic cycle in a large fraction of total bacterial abundance (13-24% of bacteria, at low and high concentrations, respectively), whereas solar oil had a lower impact (6-9%). A synchronized development of the phage-host system was observed only after sunscreen addition. The addition of sunscreen, even at low concentrations, had a significant impact on all enzymatic activities (aminopeptidase, glucosidase, and phosphatase), which increased significantly. However, when enzymatic activities were normalized per cell, a selective enhancement was observed for certain enzymes (e.g., aminopeptidase) and inhibition for others (e.g., glucosidase). These results indicate that sunscreen products can modify C, N, and P biogeochemical cycling in seawater and increase virus abundance through prophage induction in marine bacterioplankton.

**Notes:** 18229020

5251

Danovaro, R Corinaldesi, C Journal Article Research Support, Non-U.S. Gov't United States Microb Ecol. 2003 Feb;45(2):109-18. Epub 2003 Jan 28.

**URL:** <http://link.springer.com/article/10.1007/s00248-002-1033-0>

**Reference Type:** Journal Article

**Record Number:** 64

**Author:** DeLorenzo, M. E. and Fleming, J.

**Year:** 2008

**Title:** Individual and mixture effects of selected pharmaceuticals and personal care products on the marine phytoplankton species *Dunaliella tertiolecta*

**Journal:** Arch Environ Contam Toxicol

**Volume:** 54

**Pages:** 203-10

**Date:** 2008

**Short Title:** Individual and mixture effects of selected pharmaceuticals and personal care products on the marine phytoplankton species *Dunaliella tertiolecta*

**ISSN:** 0090-4341 (Print) 0090-4341

**Keywords:** eppi-reviewer4

**Abstract:** Pharmaceuticals and personal care products (PPCPs) entering the environment may have detrimental effects on aquatic organisms. Simvastatin, clofibrac acid, diclofenac, carbamazepine, fluoxetine, and triclosan represent some of the most commonly used and/or detected PPCPs in aquatic environments. This study analyzed the individual and mixture toxicity of these six PPCPs to the marine phytoplankton species *Dunaliella tertiolecta* using a standard 96-hour static algal bioassay protocol. All PPCPs tested had a significant effect on *D. tertiolecta* population cell density. However, of the six PPCPs tested, only triclosan yielded toxicity at typical environmental concentrations. The 96-hour EC(50) values for triclosan, fluoxetine, simvastatin, diclofenac, and clofibrac acid were 3.55 microg/L, 169.81 microg/L, 22,800 microg/L, 185,690 microg/L, and 224,180 microg/L, respectively. An EC(50) value could not be determined for carbamazepine; however, the highest concentration tested (80,000 microg/L) reduced cell density by 42%. Both mixtures tested-simvastatin-clofibrac acid and fluoxetine-triclosan-demonstrated additive toxicity. The presence of PPCP mixtures may decrease the toxicity threshold for phytoplankton populations. Detrimental effects on phytoplankton populations could ultimately impact nutrient cycling and food availability to higher trophic levels. The results of this study are a first step toward identifying the risk of PPCPs to estuarine organisms and may benefit environmental resource managers.

**Notes:** 18229080

5286

DeLorenzo, Marie E Fleming, Jessica Journal Article Research Support, U.S. Gov't, Non-P.H.S. United States Arch Environ Contam Toxicol. 2008 Feb;54(2):203-10.

**URL:** <http://link.springer.com/article/10.1007/s00244-007-9032-2>

**Reference Type:** Journal Article

**Record Number:** 65

**Author:** Eriksson, K. M., Johansson, C. H., Fihlman, V., Grehn, A., Sanli, K., Andersson, M. X., Blanck, H., Arrhenius, A., Sircar, T. and Backhaus, T.

**Year:** 2015

**Title:** Long-term effects of the antibacterial agent triclosan on marine periphyton communities

**Journal:** Environ Toxicol Chem

**Volume:** 34

**Pages:** 2067-77

**Date:** 2015

**Short Title:** Long-term effects of the antibacterial agent triclosan on marine periphyton communities

**ISSN:** 0730-7268

**DOI:** 10.1002/etc.3030. Epub 2015 Jun 24.

**Keywords:** eppi-reviewer4

**Abstract:** Triclosan is a widely used antibacterial agent that has become a ubiquitous contaminant in freshwater, estuary, and marine environments. Concerns about potential adverse effects of triclosan have been described in several recent risk assessments. Its effects on freshwater microbial communities have been well studied, but studies addressing effects on marine microbial communities are scarce. In the present study, the authors describe short- and long-term effects of triclosan on marine periphyton (microbial biofilm) communities. Short-term effects on photosynthesis were estimated after 60 min to 210 min of exposure. Long-term effects on photosynthesis, chlorophyll a fluorescence, pigment content, community tolerance, and bacterial carbon utilization were studied after exposing periphyton for 17 d in flow-through microcosms to 0.316 nM to 10 000 nM triclosan. Results from the short-term studies show that triclosan is toxic to periphyton photosynthesis. Half maximal effective concentration (EC50) values of 1080 nM and 3000 nM were estimated using (14) CO<sub>2</sub> -incorporation and pulse amplitude modulation (PAM) fluorescence measurements, respectively. After long-term triclosan exposure in flow-through microcosms, photosynthesis estimated using PAM fluorometry was not inhibited by triclosan concentrations up to 1000 nM but instead

increased with increasing triclosan concentration. Similarly, at exposure concentrations of 31.6 nM and higher, triclosan caused an increase in photosynthetic pigments. At 316 nM triclosan, the pigment amounts were increased by a factor of 1.4 to 1.9 compared with the control level. Pollution-induced community tolerance was observed for algae and cyanobacteria at 100 nM triclosan and higher. Despite the widespread use of triclosan as an antibacterial agent, the compound did not have any effects on bacterial carbon utilization after long-term exposure. *Environ Toxicol Chem* 2015;34:2067-2077. (c) 2015 SETAC.

**Notes:** 18229229

**URL:** <http://onlinelibrary.wiley.com/doi/10.1002/etc.3030/abstract>

**Reference Type:** Journal Article

**Record Number:** 67

**Author:** Johansson, C. H., Janmar, L. and Backhaus, T.

**Year:** 2014

**Title:** Triclosan causes toxic effects to algae in marine biofilms, but does not inhibit the metabolic activity of marine biofilm bacteria

**Journal:** *Marine Pollution Bulletin*

**Volume:** 84

**Pages:** 208-212

**Date:** 2014

**Short Title:** Triclosan causes toxic effects to algae in marine biofilms, but does not inhibit the metabolic activity of marine biofilm bacteria

**Keywords:** eppi-reviewer4

**Abstract:** Effects of the antimicrobial agent triclosan to natural periphyton communities (biofilms, comprising primarily microalgae and bacteria) were assessed in two independent experiments during spring and summer. For that purpose a semi-static test system was used in which periphyton was exposed to a concentration range of 5-9054. nmol/L triclosan. Effects on algae were analyzed as content and composition of photosynthetic pigments. The corresponding EC50 values were 39.25 and 302.45. nmol/L for the spring and summer experiment, respectively. Effects on periphytic bacteria were assessed as effects on carbon utilization patterns, using Biolog Ecoplates. No inhibition of either total carbon utilization or functional diversity was observed, indicating a pronounced triclosan tolerance of the marine bacteria. In contrast, a small stimulation of the total carbon utilization was observed at triclosan concentrations exceeding 100. nmol/L. © 2014 Elsevier Ltd.

**Notes:** 18229903

8537

**Cited By :** 1 Export Date: 13 October 2015

**URL:** <http://www.sciencedirect.com/science/article/pii/S0025326X14002884>

**Reference Type:** Journal Article

**Record Number:** 68

**Author:** Manzo, S., Miglietta, M. L., Rametta, G., Buono, S. and Di, Francia

**Year:** 2013

**Title:** Toxic effects of Zn0 nanoparticles towards marine algae *Dunaliella tertiolecta*

**Journal:** *Sci Total Environ*

**Volume:** 445-446

**Pages:** 371-6

**Date:** 2013

**Short Title:** Toxic effects of Zn0 nanoparticles towards marine algae *Dunaliella tertiolecta*

**ISSN:** 0048-9697

**DOI:** 10.1016/j.scitotenv.2012.12.051. Epub 2013 Jan 23.

**Keywords:** eppi-reviewer4

**Abstract:** Dose response curve and population growth rate alterations of marine Chlorophyte *Dunaliella tertiolecta* derived from the exposure to Zn0 nanoparticles were evaluated. Bulk Zn0 and ionic zinc were also investigated for comparison. At the same time, the aggregation state and particle size distribution were monitored. The evaluated 50% effect concentration (EC50 1.94 [0.78-2.31] mg Zn L(-1)) indicates that

nano ZnO is more toxic than its bulk counterpart (EC50 3.57 [2.77–4.80] mg Zn L<sup>-1</sup>). Cross-referencing the toxicity parameters calculated for ZnCl<sub>2</sub> (EC50 0.65 [0.36–0.70] mg Zn L<sup>-1</sup>) and the dissolution properties of the ZnO, it can be gathered that the higher toxicity of nano ZnO is most likely related to the peculiar physicochemical properties of the nanostate with respect to the bulk material. Furthermore growth rate of *D. tertiolecta* was significantly affected by nano ZnO exposure. Our findings suggest that the primary particle size of the dispersed particles affect the overall toxicity.

**Notes:** 18230557

5305

**URL:** <http://www.sciencedirect.com/science/article/pii/S0048969712016087>

**Reference Type:** Journal Article

**Record Number:** 69

**Author:** Markina Zh, V. and Aizdaicher, N. A.

**Year:** 2007

**Title:** Influence of laundry detergents on the abundance dynamics and physiological state of the benthic microalga *Attheya ussurensis* (Bacillariophyta) in laboratory culture

**Journal:** Russian Journal of Marine Biology

**Volume:** 33

**Pages:** 391–398

**Date:** 2007

**Short Title:** Influence of laundry detergents on the abundance dynamics and physiological state of the benthic microalga *Attheya ussurensis* (Bacillariophyta) in laboratory culture

**Keywords:** eppi-reviewer4

**Abstract:** This study examines the influence of the detergents "Obychnyi poroshok" and "Ariel" (at 0.1, 1, and 10 mg/l) on the growth and physiological state of the benthic marine microalga *Attheya ussurensis*. Cell number, growth rate, and oxygen productivity turned out to be the most sensitive characteristics for evaluation of toxic effects, while the pH of the culture medium and the contents of chlorophyll a and carotenoids were more tolerant to detergent. Toxicants in concentrations of 0.1 and 1 mg/l had a weak inhibitory effect on the microalga *A. ussurensis*; at 10 mg/l, the detergent Ariel exerted a greater inhibitory effect on the microalga than Obychnyi poroshok did. © Pleiades Publishing, Ltd. 2007.

**Notes:** 18230583

8237

**Cited By :** 6 **Export Date:** 13 October 2015

**URL:** <http://www.scopus.com/inward/record.url?eid=2-s2.0-38749141754&partnerID=40&md5=8910ccc2c892f264f80532c213493bf8>

**Reference Type:** Journal Article

**Record Number:** 70

**Author:** Masakorala, K., Turner, A. and Brown, M. T.

**Year:** 2011

**Title:** Toxicity of synthetic surfactants to the marine macroalga, *Ulva lactuca*

**Journal:** Water, Air, and Soil Pollution

**Volume:** 218

**Pages:** 283–291

**Date:** 2011

**Short Title:** Toxicity of synthetic surfactants to the marine macroalga, *Ulva lactuca*

**Keywords:** eppi-reviewer4

**Abstract:** The toxicities of three synthetic surfactants to the marine macroalga, *Ulva lactuca*, have been examined by monitoring chlorophyll a fluorescence quenching. The anionic surfactant, sodium dodecyl sulphate (SDS), exerted no measurable toxicity over the concentration range 0–10 mg L<sup>-1</sup>, while presence of the non-ionic surfactant, Triton X-100 (TX), elicited a small reduction in photochemical efficiency that was independent of concentration. The cationic surfactant, hexadecyltrimethylammonium bromide (HDTMA), incurred a dose-dependent response to ~3 mg L<sup>-1</sup> (EC 50=2.4 mg L<sup>-1</sup>),

but a reduction in toxicity thereafter. Presence of TX had little effect on the toxicity of HDTMA but an equimolar concentration of SDS directly offset the impact of HDTMA on photochemical efficiency. Relative toxicities of the surfactants are attributed to differences in affinity for the algal surface and tendencies to disrupt cell membranes and interact with intracellular macromolecules. Non-linear dose responses and antagonistic effects are attributed to non-specific interactions between molecules of the same surfactant and electrostatic interactions between molecules of different amphiphilic character. © Springer Science+Business Media B.V. 2010.

**Notes:** 18230605

8550

**Cited By :** 9 **Export Date:** 13 October 2015

**URL:** <http://www.scopus.com/inward/record.url?eid=2-s2.0-80053568828&partnerID=40&md5=9f796a5d6f1762e845fe3f87a0264ad4>

**Reference Type:** Journal Article

**Record Number:** 71

**Author:** Miao, A. J., Zhang, X. Y., Luo, Z., Chen, C. S., Chin, W. C., Santschi, P. H. and Quigg, A.

**Year:** 2010

**Title:** Zinc oxide-engineered nanoparticles: dissolution and toxicity to marine phytoplankton

**Journal:** Environ Toxicol Chem

**Volume:** 29

**Pages:** 2814-22

**Date:** 2010

**Short Title:** Zinc oxide-engineered nanoparticles: dissolution and toxicity to marine phytoplankton

**ISSN:** 0730-7268

**DOI:** 10.1002/etc.340. Epub 2010 Oct 7.

**Keywords:** eppi-reviewer4

**Abstract:** It is now widely recognized that dissolution plays an important role in metallic nanoparticle toxicity, but to what extent remains unclear. In the present study, it was found that ZnO-engineered nanoparticle (ZnO-EN) toxicity to the marine diatom *Thalassiosira pseudonana* could be solely explained by zinc ion (Zn(2+)) release. This is based on comparable inhibitive effects from ZnO-EN addition media, with or without the ultrafiltration through a 3-kD membrane, and from the media in which only Zn(2+) was added. Considering the importance of dissolution in ZnO-EN toxicity, Zn(2+) release kinetics was systematically examined under different conditions for the first time. It was found to be mainly influenced by pH as well as the specific surface area of the nanoparticles. In contrast, natural organic compounds either enhance or reduce Zn(2+) release, depending on their chemical composition and concentration. Compared with deionized water, ZnO-EN dissolution rates were accelerated in seawater, whereas ZnO-EN concentration itself only had a very small effect on Zn(2+) release. Therefore, dissolution as affected by several physicochemical factors should not be neglected in the effects, behavior, and fate of ENs in the environment.

**Notes:** 18230670

**URL:** <http://onlinelibrary.wiley.com/doi/10.1002/etc.340/full>

**Reference Type:** Journal Article

**Record Number:** 73

**Author:** Miller, R. J., Bennett, S., Keller, A. A., Pease, S. and Lenihan, H. S.

**Year:** 2012

**Title:** TiO<sub>2</sub> nanoparticles are phototoxic to marine phytoplankton

**Journal:** PLoS One

**Volume:** 7

**Pages:** e30321

**Date:** 2012

**Short Title:** TiO<sub>2</sub> nanoparticles are phototoxic to marine phytoplankton



**ISSN:** 1932-6203

**DOI:** 10.1371/journal.pone.0030321. Epub 2012 Jan 20.

**Keywords:** eppi-reviewer4

**Abstract:** Nanoparticulate titanium dioxide (TiO<sub>2</sub>) is highly photoactive, and its function as a photocatalyst drives much of the application demand for TiO<sub>2</sub>. Because TiO<sub>2</sub> generates reactive oxygen species (ROS) when exposed to ultraviolet radiation (UVR), nanoparticulate TiO<sub>2</sub> has been used in antibacterial coatings and wastewater disinfection, and has been investigated as an anti-cancer agent. Oxidative stress mediated by photoactive TiO<sub>2</sub> is the likely mechanism of its toxicity, and experiments demonstrating cytotoxicity of TiO<sub>2</sub> have used exposure to strong artificial sources of ultraviolet radiation (UVR). In vivo tests of TiO<sub>2</sub> toxicity with aquatic organisms have typically shown low toxicity, and results across studies have been variable. No work has demonstrated that photoactivity causes environmental toxicity of TiO<sub>2</sub> under natural levels of UVR. Here we show that relatively low levels of ultraviolet light, consistent with those found in nature, can induce toxicity of TiO<sub>2</sub> nanoparticles to marine phytoplankton, the most important primary producers on Earth. No effect of TiO<sub>2</sub> on phytoplankton was found in treatments where UV light was blocked. Under low intensity UVR, ROS in seawater increased with increasing nano-TiO<sub>2</sub> concentration. These increases may lead to increased overall oxidative stress in seawater contaminated by TiO<sub>2</sub>, and cause decreased resiliency of marine ecosystems. Phototoxicity must be considered when evaluating environmental impacts of nanomaterials, many of which are photoactive.

**Notes:** 18230685

**URL:** <http://dx.plos.org/10.1371/journal.pone.0030321>

**Reference Type:** Journal Article

**Record Number:** 72

**Author:** Miller, R. J., Lenihan, H. S., Muller, E. B., Tseng, N., Hanna, S. K. and Keller, A. A.

**Year:** 2010

**Title:** Impacts of metal oxide nanoparticles on marine phytoplankton

**Journal:** Environ Sci Technol

**Volume:** 44

**Pages:** 7329-34

**Date:** 2010

**Short Title:** Impacts of metal oxide nanoparticles on marine phytoplankton

**ISSN:** 0013-936x

**DOI:** 10.1021/es100247x.

**Keywords:** eppi-reviewer4

**Abstract:** Information on the toxicity of environmentally relevant concentrations of nanoparticles in marine ecosystems is needed for informed regulation of these emerging materials. We tested the effects of two types of metal oxide nanoparticles, TiO<sub>2</sub> and ZnO, on population growth rates of four species of marine phytoplankton representing three major coastal groups (diatoms, chlorophytes, and prymnesiophytes). These metal oxide nanoparticles (NPs) are becoming common components in many industrial, household, and cosmetic products that are released into coastal ecosystems. Titania NPs showed no measurable effect on growth rates of any species, while ZnO NPs significantly depressed growth rate of all four species. ZnO NPs aggregated rapidly in seawater, forming particles >400 nm hydrodynamic diameter within 30 min, and dissolved quickly, reaching equilibrium concentrations within 12 h. Toxicity of ZnO NPs to phytoplankton was likely due to dissolution, release, and uptake of free zinc ions, but specific nanoparticulate effects may be difficult to disentangle from effects due to free zinc ions. A modeling approach based on a Dynamic Energy Budget (DEB) framework was used to estimate sublethal effects of the two NPs on phytoplankton populations. Concentrations that were estimated to have no effect on population growth (NEC) were (one standard error in parentheses) 428 (58) µg L<sup>-1</sup> ZnO for the diatom *Skeletonema marinoi* and 223 (56) µg L<sup>-1</sup> for *Thalassiosira pseudonana*. NEC could not be estimated for the other taxa but were within the range of 500-1000 µg L<sup>-1</sup>. Our results suggest that effects of metal oxide NPs on marine organisms is likely to vary with particle type and organism taxonomy.

**Notes:** 18230686  
5357  
**URL:** <http://pubs.acs.org/doi/pdfplus/10.1021/es100247x>

**Reference Type:** Journal Article  
**Record Number:** 74  
**Author:** Mistic, C., Covazzi, Harriague and Trielli, F.  
**Year:** 2011  
**Title:** Organic matter recycling in a beach environment influenced by sunscreen products and increased inorganic nutrient supply (Sturla, Ligurian Sea, NW Mediterranean)  
**Journal:** Sci Total Environ  
**Volume:** 409  
**Pages:** 1689–96  
**Date:** 2011  
**Short Title:** Organic matter recycling in a beach environment influenced by sunscreen products and increased inorganic nutrient supply (Sturla, Ligurian Sea, NW Mediterranean)  
**ISSN:** 0048–9697  
**DOI:** 10.1016/j.scitotenv.2010.12.015. Epub 2011 Feb 12.  
**Keywords:** eppi-reviewer4

**Abstract:** The beaches are sites where the human influence may be strong and the beach ecosystems have often shown a high sensibility to environmental alterations. These zones may be affected by a large series of anthropogenic-derived pressures, such as unbalanced inorganic nutrient input, that may cause anomalous development of primary production, altering the structure of the trophic webs. Furthermore, the utilisation of cosmetic sunscreen products is reaching unexpected levels, thus assuming a potentially important as well as unknown role in the contamination of marine environments. The present study was planned to test the response of the beach ecosystem to increases in inorganic nutrients (nitrate and phosphate) and to the input of a widely used cosmetic sunscreen product. A short-term laboratory experiment was carried out on microsystems consisting of sediments and seawater from the swash zone of a Ligurian city beach (Sturla). The processes related to organic matter (OM) recycling and some microbial food web components (bacteria and micro-autotrophic organisms) were analysed. The multivariate statistical analysis of the results showed that the increase in inorganic nutrients and sunscreen caused only a transient alteration in the OM recycling processes in the seawater. The sedimentary processes, instead, were different in the different systems, although starting from the same condition. In the sediment, surprisingly, an increase in inorganic nutrients did not lead to an increase in the primary biomass nor to significantly higher bacterial abundance, while the sunscreen caused increased OM recycling, especially devoted to protein and lipid mobilisation, supporting a growing bacterial and autotrophic community by reducing the bottom-up pressure. Additional toxicity tests performed on protozoa highlighted that, while the inorganic nutrients seemed to show no effects, sunscreen decreased the protozoan viability, thus likely favouring microautotrophic and bacterial increases by reducing the top-down pressure.

**Notes:** 18230698  
5192  
**URL:** <http://www.sciencedirect.com/science/article/pii/S0048969710013185>

**Reference Type:** Journal Article  
**Record Number:** 75  
**Author:** Peng, X., Palma, S., Fisher, N. S. and Wong, S. S.  
**Year:** 2011  
**Title:** Effect of morphology of ZnO nanostructures on their toxicity to marine algae  
**Journal:** Aquat Toxicol  
**Volume:** 102  
**Pages:** 186–96  
**Date:** 2011

**Short Title:** Effect of morphology of ZnO nanostructures on their toxicity to marine algae

**ISSN:** 0166-445x

**DOI:** 10.1016/j.aquatox.2011.01.014. Epub 2011 Feb 2.

**Keywords:** eppi-reviewer4

**Abstract:** The influence of ZnO nanoparticle morphology on its toxicity for marine diatoms was evaluated. Four ZnO nanoparticle motifs, possessing distinctive sizes and shapes, were synthesized without adding surfactants. Diameters of ZnO spheres ranged from 6.3 nm to 15.7 nm, and lengths of rod-shaped particles were 242 nm to 862 nm. Their effects on the growth of the marine diatoms, *Thalassiosira pseudonana*, *Chaetoceros gracilis*, and *Phaeodactylum tricornutum*, were determined in laboratory cultures. Between 4.1 and 4.9% of the Zn from all types of nanoparticles dissolved within 72 h and was neither concentration dependent nor morphology dependent. Addition of all nanoparticles at all concentrations tested stopped growth of *T. pseudonana* and *C. gracilis*, whereas *P. tricornutum* was the least sensitive, with its growth rate inversely proportional to nanoparticle concentration. Bioaccumulation of Zn released from nanoparticles in *T. pseudonana* was sufficient to kill this diatom. The toxicity of rod-shaped particles to *P. tricornutum* was noted to be greater than that of the spheres. The overall results suggest that toxicity studies assessing the effects of nanoparticles on aquatic organisms need to consider both the dissolution of these particles and the cellular interaction of nanoparticle aggregates.

**Notes:** 18231089

**URL:** <http://www.sciencedirect.com/science/article/pii/S0166445X1100021X>

**Reference Type:** Journal Article

**Record Number:** 76

**Author:** Petersen, K., Heiaas, H. H. and Tollefsen, K. E.

**Year:** 2014

**Title:** Combined effects of pharmaceuticals, personal care products, biocides and organic contaminants on the growth of *Skeletonema pseudocostatum*

**Journal:** *Aquat Toxicol*

**Volume:** 150

**Pages:** 45-54

**Date:** 2014

**Short Title:** Combined effects of pharmaceuticals, personal care products, biocides and organic contaminants on the growth of *Skeletonema pseudocostatum*

**ISSN:** 0166-445x

**DOI:** 10.1016/j.aquatox.2014.02.013. Epub 2014 Feb 28.

**Keywords:** eppi-reviewer4

**Abstract:** Organisms in the environment are exposed to a number of pollutants from different compound groups. In addition to the classic pollutants like the polychlorinated biphenyls, polyaromatic hydrocarbons (PAHs), alkylphenols, biocides, etc. other compound groups of concern are constantly emerging. Pharmaceuticals and personal care products (PPCPs) can be expected to co-occur with other organic contaminants like biocides, PAHs and alkylphenols in areas affected by wastewater, industrial effluents and intensive recreational activity. In this study, representatives from these four different compound groups were tested individually and in mixtures in a growth inhibition assay with the marine algae *Skeletonema pseudocostatum* (formerly *Skeletonema costatum*) to determine whether the combined effects could be predicted by models for additive effects; the concentration addition (CA) and independent action (IA) prediction model. The eleven tested compounds reduced the growth of *S. pseudocostatum* in the microplate test in a concentration-dependent manner. The order of toxicity of these chemicals were irgarol>fluoxetine>diuron>benzo(a)pyrene>thioguanine>triclosan>propranolol>benzophenone 3>cetrimonium bromide>4-tert-octylphenol>endosulfan. Several binary mixtures and a mixture of eight compounds from the four different compound groups were tested. All tested mixtures were additive as model deviation ratios, the deviation between experimental and predicted effect concentrations, were within a factor of 2 from one or both prediction models (e.g. CA and IA). Interestingly, a concentration dependent shift from IA to CA, potentially due to activation of similar toxicity pathways at

higher concentrations, was observed for the mixture of eight compounds. The combined effects of the multi-compound mixture were clearly additive and it should therefore be expected that PPCPs, biocides, PAHs and alkylphenols will collectively contribute to the risk in areas contaminated by such complex mixtures.

**Notes:** 18231115

**URL:** <http://www.sciencedirect.com/science/article/pii/S0166445X14000630>

**Reference Type:** Journal Article

**Record Number:** 77

**Author:** Popova, A. and Kemp, R.

**Year:** 2007

**Title:** Effects of surfactants on the ultrastructural organization of the phytoplankton, *Chlamydomonas reinhardtii* and *Anabaena cylindrica*

**Journal:** Fundamental and Applied Limnology

**Volume:** 169

**Pages:** 131-136

**Date:** 2007

**Short Title:** Effects of surfactants on the ultrastructural organization of the phytoplankton, *Chlamydomonas reinhardtii* and *Anabaena cylindrica*

**Keywords:** eppi-reviewer4

**Abstract:** *Chlamydomonas reinhardtii* and *Anabaena cylindrica* were used as model phytoplankton to show the ultrastructural changes in cell membranes and organelles exposed to the most common, commercial surfactants, the anionic sodium dodecyl sulphate and the cationic catamine, in a range of concentrations from 0.1 to 10.0 mg/l and an exposure range from 5 h to 7 days. It was found that cell structure was not affected significantly by short-time exposure (to 5 h) to low concentrations of the surfactants, but they caused an intensification of cell vacuolization compared to the control. The degree of change caused by the surfactants to the ultrastructure of cell organelles increased with the greater concentration of them. At higher surfactant concentrations (3.0 to 5.0 mg/l), marked cell vacuolization was observed and there were changes to membrane structure, especially to the plasma membrane but also to the chloroplast thylakoids. In addition, there were increases in the number and size of the mitochondria as well as morphological alterations to them. There was also a reduction in the nuclear chromatin condensation. At the highest surfactant concentrations (to 10 mg/ml), the cells had numerous degenerative changes, and death occurred to the majority of them. Thus, the results of the model system revealed the precise dependence of the degree of structural reorganisation of the cell organelles on the concentration of surfactant in the culture medium. The data on the state of the phytoplankton should be used for remotely monitoring the state of the microplanktonic organisms in water ecosystems. © 2007 E. Schweizerbartsche Verlagsbuchhandlung.

**Notes:** 18231167

9503

**Cited By :** 2 **Export Date:** 13 October 2015

**URL:** <http://www.scopus.com/inward/record.url?eid=2-s2.0-34848856992&partnerID=40&md5=aa7a2289196f565c44e6f3e307fe7fcd>

**Reference Type:** Journal Article

**Record Number:** 78

**Author:** Pybus, C.

**Year:** 1973

**Title:** Effects of anionic detergent on the growth of *Laminaria*

**Journal:** Marine Pollution Bulletin

**Volume:** 4

**Pages:** 73-77

**Date:** 1973

**Short Title:** Effects of anionic detergent on the growth of *Laminaria*

**ISSN:** 0025-326X

**Keywords:** eppi-reviewer4

**Abstract:** Anionic detergents affect the growth of sporophytes of the alga *Laminaria saccharina*. The effect of these detergents on all phases of the life history of the alga has now been examined. The motility and settling of the zoospores and growth of sporophytes are affected by the detergent. The development of individuals of the gametophyte generation is least affected.

**Notes:** 18231195

7584

**URL:** <http://www.sciencedirect.com/science/article/pii/0025326X73902427>

**Reference Type:** Journal Article

**Record Number:** 79

**Author:** Suman, T. Y., Radhika, Rajasree, S, R. and Kirubakaran, R.

**Year:** 2015

**Title:** Evaluation of zinc oxide nanoparticles toxicity on marine algae *Chlorella vulgaris* through flow cytometric, cytotoxicity and oxidative stress analysis

**Journal:** *Ecotoxicol Environ Saf*

**Volume:** 113

**Pages:** 23-30

**Date:** 2015

**Short Title:** Evaluation of zinc oxide nanoparticles toxicity on marine algae *Chlorella vulgaris* through flow cytometric, cytotoxicity and oxidative stress analysis

**ISSN:** 0147-6513

**DOI:** 10.1016/j.ecoenv.2014.11.015. Epub 2014 Dec 5.

**Keywords:** eppi-reviewer4

**Abstract:** The increasing industrial use of nanomaterials during the last decades poses a potential threat to the environment and in particular to organisms living in the aquatic environment. In the present study, the toxicity of zinc oxide nanoparticles (ZnO NPs) was investigated in Marine algae *Chlorella vulgaris* (*C. vulgaris*). High zinc dissociation from ZnONPs, releasing ionic zinc in seawater, is a potential route for zinc assimilation and ZnONPs toxicity. To examine the mechanism of toxicity, *C. vulgaris* were treated with 50mg/L, 100mg/L, 200mg/L and 300 mg/L ZnO NPs for 24h and 72h. The detailed cytotoxicity assay showed a substantial reduction in the viability dependent on dose and exposure. Further, flow cytometry revealed the significant reduction in *C. vulgaris* viable cells to higher ZnO NPs. Significant reductions in LDH level were noted for ZnO NPs at 300 mg/L concentration. The activity of antioxidant enzyme superoxide dismutase (SOD) significantly increased in the *C. vulgaris* exposed to 200mg/L and 300 mg/L ZnO NPs. The content of non-enzymatic antioxidant glutathione (GSH) significantly decreased in the groups with a ZnO NPs concentration of higher than 100mg/L. The level of lipid peroxidation (LPO) was found to increase as the ZnO NPs dose increased. The FT-IR analyses suggested surface chemical interaction between nanoparticles and algal cells. The substantial morphological changes and cell wall damage were confirmed through microscopic analyses (FESEM and CM).

**Notes:** 18231764

**URL:** <http://www.sciencedirect.com/science/article/pii/S0147651314005272>

**Reference Type:** Journal Article

**Record Number:** 80

**Author:** Tovar-Sanchez, A., Sanchez-Quiles, D., Basterretxea, G., Benede, J. L., Chisvert, A., Salvador, A., Moreno-Garrido, I. and Blasco, J.

**Year:** 2013

**Title:** Sunscreen products as emerging pollutants to coastal waters

**Journal:** *PLoS One*

**Volume:** 8

**Pages:** e65451

**Date:** 2013

**Short Title:** Sunscreen products as emerging pollutants to coastal waters

**ISSN:** 1932-6203

**DOI:** 10.1371/journal.pone.0065451. Print 2013.

**Keywords:** eppi-reviewer4

**Abstract:** A growing awareness of the risks associated with skin exposure to ultraviolet (UV) radiation over the past decades has led to increased use of sunscreen cosmetic products leading the introduction of new chemical compounds in the marine environment. Although coastal tourism and recreation are the largest and most rapidly growing activities in the world, the evaluation of sunscreen as source of chemicals to the coastal marine system has not been addressed. Concentrations of chemical UV filters included in the formulation of sunscreens, such as benzophenone 3 (BZ-3), 4-methylbenzylidene camphor (4-MBC), TiO<sub>2</sub> and ZnO, are detected in nearshore waters with variable concentrations along the day and mainly concentrated in the surface microlayer (i.e. 53.6–577.5 ng L<sup>-1</sup>(1) BZ-3; 51.4–113.4 ng L<sup>-1</sup>(1) 4-MBC; 6.9–37.6 microg L<sup>-1</sup>(1) Ti; 1.0–3.3 microg L<sup>-1</sup>(1) Zn). The presence of these compounds in seawater suggests relevant effects on phytoplankton. Indeed, we provide evidences of the negative effect of sunblocks on the growth of the commonly found marine diatom *Chaetoceros gracilis* (mean EC<sub>50</sub> = 125+/-71 mg L<sup>-1</sup>(1)). Dissolution of sunscreens in seawater also releases inorganic nutrients (N, P and Si forms) that can fuel algal growth. In particular, PO<sub>4</sub>(<sup>3-</sup>) is released by these products in notable amounts (up to 17 micromol PO<sub>4</sub>(<sup>3-</sup>)g<sup>-1</sup>(1)). We conservatively estimate an increase of up to 100% background PO<sub>4</sub>(<sup>3-</sup>) concentrations (0.12 micromol L<sup>-1</sup>(1) over a background level of 0.06 micromol L<sup>-1</sup>(1)) in nearshore waters during low water renewal conditions in a populated beach in Majorca island. Our results show that sunscreen products are a significant source of organic and inorganic chemicals that reach the sea with potential ecological consequences on the coastal marine ecosystem.

**Notes:** 18231899

**URL:** <http://dx.plos.org/10.1371/journal.pone.0065451>

**Reference Type:** Journal Article

**Record Number:** 82

**Author:** Wong, S. W. and Leung, K. M.

**Year:** 2014

**Title:** Temperature-dependent toxicities of nano zinc oxide to marine diatom, amphipod and fish in relation to its aggregation size and ion dissolution

**Journal:** Nanotoxicology

**Volume:** 8 Suppl 1

**Pages:** 24–35

**Date:** 2014

**Short Title:** Temperature-dependent toxicities of nano zinc oxide to marine diatom, amphipod and fish in relation to its aggregation size and ion dissolution

**ISSN:** 1743–5390

**DOI:** 10.3109/17435390.2013.848949. Epub 2013 Nov 13.

**Keywords:** eppi-reviewer4

**Abstract:** This study, for the first time, concurrently investigated the influence of seawater temperature, exposure concentration and time on the aggregation size and ion dissolution of nano zinc oxides (nZnO) in seawater, and the interacting effect of temperature and waterborne exposure of nZnO to the marine diatom *Skeletonema costatum*, amphipod *Melita longidactyla* and fish *Oryzias melastigma*, respectively. Our results showed that aggregate size was jointly affected by seawater temperature, nZnO concentration and exposure time. Among the three factors, the concentration of nZnO was the most important and followed by exposure time, whereas temperature was less important as reflected by their F values in the three-way analysis of variance (concentration: F<sub>3</sub>, 300 = 247.305; time: F<sub>2</sub>, 300 = 20.923 and temperature: F<sub>4</sub>, 300 = 4.107; All p values < 0.001). The aggregate size generally increased with increasing nZnO concentration and exposure time. The release of Zn ions from nZnO was significantly influenced by seawater temperature and exposure time; the ion dissolution rate generally increased with decreasing temperature and increasing exposure time. Growth inhibition of diatoms increased with increasing temperature, while temperature and nZnO had an interactional effect on their photosynthesis. For the amphipod, mortality was positively correlated with temperature. Fish larvae growth rate was only affected by temperature but not nZnO, while the two factors interactively modulated the expression of heat shock and metallothionein proteins.

Evidently, temperature can influence aggregate size and ion dissolution and thus toxicity of nZnO to the marine organisms in a species-specific manner.

**Notes:** 18232169

**URL:** <http://www.tandfonline.com/doi/abs/10.3109/17435390.2013.848949>

**Reference Type:** Journal Article

**Record Number:** 81

**Author:** Wong, S. W., Leung, P. T., Djurisic, A. B. and Leung, K. M.

**Year:** 2010

**Title:** Toxicities of nano zinc oxide to five marine organisms: influences of aggregate size and ion solubility

**Journal:** Anal Bioanal Chem

**Volume:** 396

**Pages:** 609-18

**Date:** 2010

**Short Title:** Toxicities of nano zinc oxide to five marine organisms: influences of aggregate size and ion solubility

**DOI:** 10.1007/s00216-009-3249-z. Epub 2009 Nov 10.

**Keywords:** eppi-reviewer4

**Abstract:** Nano zinc oxide (nZnO) is increasingly used in sunscreen products, with high potential of being released directly into marine environments. This study primarily aimed to characterize the aggregate size and solubility of nZnO and bulk ZnO, and to assess their toxicities towards five selected marine organisms. Chemical characterization showed that nZnO formed larger aggregates in seawater than ZnO, while nZnO had a higher solubility in seawater (3.7 mg L<sup>-1</sup>) than that of ZnO (1.6 mg L<sup>-1</sup>). Acute tests were conducted using the marine diatoms *Skeletonema costatum* and *Thalassiosira pseudonana*, the crustaceans *Tigriopus japonicus* and *Elasmopus rapax*, and the medaka fish *Oryzias melastigma*. In general, nZnO was more toxic towards algae than ZnO, but relatively less toxic towards crustaceans and fish. The toxicity of nZnO could be mainly attributed to dissolved Zn(2+) ions. Furthermore, molecular biomarkers including superoxide dismutase (SOD), metallothionein (MT) and heat shock protein 70 (HSP70) were employed to assess the sublethal toxicities of the test chemicals to *O. melastigma*. Although SOD and MT expressions were not significantly increased in nZnO-treated medaka compared to the controls, exposure to ZnO caused a significant up-regulation of SOD and MT. HSP70 was increased two to fourfold in all treatments indicating that there were probably other forms of stress in addition to oxidative stress such as cellular injury.

**Notes:** 18232170

**URL:** <http://link.springer.com/article/10.1007/s00216-009-3249-z>

**Reference Type:** Journal Article

**Record Number:** 83

**Author:** Xia, B., Chen, B., Sun, X., Qu, K., Ma, F. and Du, M.

**Year:** 2015

**Title:** Interaction of TiO<sub>2</sub> nanoparticles with the marine microalga *Nitzschia closterium*: growth inhibition, oxidative stress and internalization

**Journal:** Sci Total Environ

**Volume:** 508

**Pages:** 525-33

**Date:** 2015

**Short Title:** Interaction of TiO<sub>2</sub> nanoparticles with the marine microalga *Nitzschia closterium*: growth inhibition, oxidative stress and internalization

**ISSN:** 0048-9697

**DOI:** 10.1016/j.scitotenv.2014.11.066. Epub 2014 Dec 5.

**Keywords:** eppi-reviewer4

**Abstract:** The toxicity of TiO<sub>2</sub> engineered nanoparticles (NPs) to the marine microalga *Nitzschia closterium* was investigated by examining growth inhibition, oxidative stress and uptake. The results indicated that the toxicity of TiO<sub>2</sub> particles to algal cells significantly increased with decreasing nominal particle size, which was evidenced by

the 96 EC50 values of 88.78, 118.80 and 179.05 mg/L for 21 nm, 60 nm and 400 nm TiO<sub>2</sub> particles, respectively. The growth rate was significantly inhibited when the alga was exposed to 5mg/L TiO<sub>2</sub> NPs (21 nm). Measurements of antioxidant enzyme activities showed that superoxide dismutase (SOD), catalase (CAT) and peroxidase (POD) activities were first induced and subsequently inhibited following exposure to 5mg/L TiO<sub>2</sub> NPs. The depletion of antioxidant enzymes with a concomitant increase in malondialdehyde (MDA) levels and reactive oxygen species (ROS) posed a hazard to membrane integrity. A combination of flow cytometry analysis, transmission electron microscopy and Ti content measurement indicated that TiO<sub>2</sub> NPs were internalized in *N. closterium* cells. The level of extracellular ROS, which was induced by TiO<sub>2</sub> NPs under visible light, was negligible when compared with the intracellular ROS level (accounting for less than 6.0% of the total ROS level). These findings suggest that elevated TiO<sub>2</sub> nanotoxicity in marine environments is related to increased ROS levels caused by internalization of TiO<sub>2</sub> NPs.

**Notes:** 18232212

**URL:** <http://www.sciencedirect.com/science/article/pii/S004896971401660X>

**Reference Type:** Journal Article

**Record Number:** 84

**Author:** Yung Mana, M. N., Wong Stella, W. Y., Kwok Kevin, W. H., Liu, F. Z., Leung, Y. H., Chan, W. T., Li, X. Y., Djurišić, A. B. and Leung Kenneth, M. Y.

**Year:** 2015

**Title:** Salinity-dependent toxicities of zinc oxide nanoparticles to the marine diatom *Thalassiosira pseudonana*

**Journal:** Aquatic Toxicology

**Volume:** 165

**Pages:** 31-40

**Date:** 2015

**Short Title:** Salinity-dependent toxicities of zinc oxide nanoparticles to the marine diatom *Thalassiosira pseudonana*

**ISSN:** 0166-445X

**Keywords:** eppi-reviewer4

**Abstract:** This study comprehensively investigated the influences of salinity, exposure concentration and time on the aggregate size, surface charge and dissolution of zinc oxide nanoparticles (ZnO-NPs; 20 nm) in seawater, and examined the interacting effect of salinity and waterborne exposure of ZnO-NPs on the marine diatom *Thalassiosira pseudonana* for 96 h. We found that aggregate sizes of ZnO-NPs significantly increased with increasing salinity, but generally decreased with increasing exposure concentration. Ion release decreased with increasing salinity, whereas the surface charge of the particles was not affected by salinity. The increased aggregate size and decreased ion release with increasing salinity, and consequently lower concentration of bioavailable zinc ions, resulted in decreased toxicity of ZnO-NPs at higher salinity in general in terms of growth inhibition (IC<sub>50</sub>) and chlorophyll fluorescence (EC<sub>50</sub> -  $\Phi$ Po and EC<sub>50</sub> -  $\Phi$ 2). However, IC<sub>50</sub>s and EC<sub>50</sub>s of ZnO-NPs were smaller than those of Zn<sup>2+</sup> (from ZnO-NPs ultrafiltrate and ZnCl<sub>2</sub>), indicating that dissolved Zn<sup>2+</sup> can only partially explain the toxicity of ZnO-NPs. SEM images showed that ZnO-NPs attached on the diatom frustule surface, suggesting that the interaction between the nanoparticles and the cell surface may exacerbate the toxicity of ZnO-NPs. Our results linked the physicochemical characteristics of ZnO-NPs in seawater with their toxicities to the marine diatom and highlighted the importance of salinity as an influential environmental factor governing the aggregation, dissolution and the toxicity of ZnO-NPs.

**Notes:** 18232310

6617

**URL:** <http://www.sciencedirect.com/science/article/pii/S0166445X15001538>



## PCP records in marine fish and invertebrates

**Reference Type:** Journal Article

**Record Number:** 85

**Author:** Bachelot, M., Li, Z., Munaron, D., Le, Gall, Casellas, C., Fenet, H. and Gomez, E.

**Year:** 2012

**Title:** Organic UV filter concentrations in marine mussels from French coastal regions

**Journal:** Science of the Total Environment

**Volume:** 420

**Pages:** 273-279

**Date:** 2012

**Short Title:** Organic UV filter concentrations in marine mussels from French coastal regions

**Keywords:** eppi-reviewer4

**Abstract:** The accumulation of EHMC, OCT and OD-PABA, three common UV filter compounds, was investigated in marine mussels. Wild *Mytilus edulis* and *Mytilus galloprovincialis* were sampled in ten sites along the French Atlantic and Mediterranean coasts from June to November. In mussel tissues, 100% of the samples had quantifiable EHMC concentrations ranging from 3 to 256ngg-1 dry weight, while 55% of the samples had detectable OCT concentrations ranging from under 2 to 7 112ngg-1 dry weight. These concentrations significantly increased with the rising air temperature in summer, the recreational pressure and the geomorphological structure of the sampling sites (its lack of openness to the wide). This is the first study to report bioaccumulation of UV filters in marine mussels, thus highlighting the need for further monitoring and assessment. © 2012 Elsevier B.V.

**Notes:** 18228413

9037

**Cited By :**26 **Export Date:** 13 October 2015

**URL:** <http://www.scopus.com/inward/record.url?eid=2-s2.0-84862805866&partnerID=40&md5=713f912460d4a8498411cc4af6eda741>

**Reference Type:** Journal Article

**Record Number:** 86

**Author:** Casatta, Nadia, Mascolo, Giuseppe, Roscioli, Claudio and Viganò, Luigi

**Year:** 2015

**Title:** Tracing endocrine disrupting chemicals in a coastal lagoon (Sacca di Goro, Italy): Sediment contamination and bioaccumulation in Manila clams

**Journal:** Science of The Total Environment

**Volume:** 511

**Pages:** 214-222

**Date:** 2015

**Short Title:** Tracing endocrine disrupting chemicals in a coastal lagoon (Sacca di Goro, Italy): Sediment contamination and bioaccumulation in Manila clams

**ISSN:** 0048-9697

**Keywords:** eppi-reviewer4

**Abstract:** The Water Framework Directive, recently amended with new priority substances (2013/39/EU), is meant to regulate the health status of European aquatic environments, including transitional waters. Despite the ecological and economic importance of transitional water bodies and, in particular, of coastal lagoons, a relevant example of this type of environments, little is known about their contamination by priority substances, particularly by endocrine disrupting chemicals (EDCs). In this study, a wide array of priority substances, all with recognised disrupting properties, was investigated in the Sacca di Goro Lagoon (Adriatic Sea, Italy), which receives freshwater from the Po River after draining the most urbanised and industrialised Italian regions. Flame retardants, alkylphenols, bisphenol A, natural and synthetic steroids, personal care products and legacy pollutants were investigated both in sediments and in the clam *Ruditapes philippinarum* collected from

three sites in the lagoon. Sediments showed that most of the chemicals analysed could reach the lagoon ecosystem but their concentrations were below existing quality guidelines. Clams essentially reflected this condition although some concern was raised by polybrominated diphenyl ethers (PBDEs): the limit for the sum of six congeners set for biota in the European Directive (2013/39/EU) to protect human health was exceeded 4–5 times. No significant biota–sediment accumulation factors (BSAFs) were calculated. Nonylphenol, tonalide, PBDE, polychlorinated biphenyls and bisphenol A were the most abundant chemicals in clam tissues.

**Notes:** 18228754

7348

**URL:** <http://www.sciencedirect.com/science/article/pii/S0048969714017537>

**Reference Type:** Journal Article

**Record Number:** 87

**Author:** Cunha, S. C., Fernandes, J. O., Vallecillos, L., Cano-Sancho, G., Domingo, J. L., Pocurull, E., Borrull, F., Maulvault, A. L., Ferrari, F., Fernandez-Tejedor, M., Van den, Heuvel and Kotterman, M.

**Title:** Co-occurrence of musk fragrances and UV-filters in seafood and macroalgae collected in European hotspots

**Journal:** Environmental Research

**Short Title:** Co-occurrence of musk fragrances and UV-filters in seafood and macroalgae collected in European hotspots

**ISSN:** 0013-9351

**Keywords:** eppi-reviewer4

**Abstract:** In the last decades, awareness regarding personal care products (PCP), i.e. synthetic organic chemicals frequently used in cosmetic and hygienic products, has become a forward-looking issue, due to their persistency in the environment and their potential multi-organ toxicity in both human and wildlife. Seafood is one of the most significant food commodities in the world and, certainly, one of the most prone to bioaccumulation of PCP, what can consequently lead to human exposure, especially for coastal population, where its consumption is more marked. The aim of this work was to evaluate the co-occurrence of musk fragrances and UV-filters in both seafood and macroalgae collected in different European hotspots (areas with high levels of pollution, highly populated and near wastewater treatment plants). Despite the fact that UV-filters were detected in three different kind of samples (mussel, mullet, and clam), in all cases they were below the limit of quantification. Galaxolide (HHCB) and tonalide (AHTN) were the musk fragrances most frequently detected and quantified in samples from the European hotspots. Cashmeran (DPMI) was also detected in most samples but only quantified in two of them (flounder/herring and mullet). The highest levels of HHCB and AHTN were found in mussels from Po estuary.

**Notes:** 18228993

6843

**URL:** <http://www.sciencedirect.com/science/article/pii/S0013935115001498>

**Reference Type:** Journal Article

**Record Number:** 88

**Author:** Dodder, N. G., Maruya, K. A., Lee, Ferguson, Grace, R., Klosterhaus, S., La, Guardia, M, J., Lauenstein, G. G. and Ramirez, J.

**Year:** 2014

**Title:** Occurrence of contaminants of emerging concern in mussels (*Mytilus* spp.) along the California coast and the influence of land use, storm water discharge, and treated wastewater effluent

**Journal:** Mar Pollut Bull

**Volume:** 81

**Pages:** 340–6

**Date:** 2014

**Short Title:** Occurrence of contaminants of emerging concern in mussels (*Mytilus* spp.) along the California coast and the influence of land use, storm water discharge, and treated wastewater effluent

**ISSN:** 0025-326x

**DOI:** 10.1016/j.marpolbul.2013.06.041. Epub 2013 Jul 10.

**Keywords:** eppi-reviewer4

**Abstract:** Contaminants of emerging concern were measured in mussels collected along the California coast in 2009–2010. The seven classes were alkylphenols, pharmaceuticals and personal care products, polybrominated diphenyl ethers (PBDE), other flame retardants, current use pesticides, perfluorinated compounds (PFC), and single walled carbon nanotubes. At least one contaminant was detected at 67 of the 68 stations (98%), and 67 of the 167 analytes had at least one detect (40%). Alkylphenol, PBDE, and PFC concentrations increased with urbanization and proximity to storm water discharge; pesticides had higher concentrations at agricultural stations. These results suggest that certain compounds; for example, alkylphenols, lomefloxacin and PBDE, are appropriate for inclusion in future coastal bivalve monitoring efforts based on maximum concentrations >50 ng/g dry weight and detection frequencies >50%. Other compounds, for example PFC and hexabromocyclododecane (HBCD), may also be suggested for inclusion due to their >25% detection frequency and potential for biomagnification.

**Notes:** 18229125

5341

**Reference Type:** Journal Article

**Record Number:** 89

**Author:** Foltz, James, Abdul, Mottaleb, Meziani Mohammed, J. and Rafiq, Islam

**Year:** 2014

**Title:** Simultaneous detection and quantification of select nitromusks, antimicrobial agent, and antihistamine in fish of grocery stores by gas chromatography–mass spectrometry

**Journal:** Chemosphere

**Volume:** 107

**Pages:** 187–193

**Date:** 2014

**Short Title:** Simultaneous detection and quantification of select nitromusks, antimicrobial agent, and antihistamine in fish of grocery stores by gas chromatography–mass spectrometry

**ISSN:** 0045-6535

**Keywords:** eppi-reviewer4

**Abstract:** Continually detected biologically persistent nitromusks; galaxolide (HHCB), tonalide (AHTN) and musk ketone (MK), antimicrobial triclosan (TCS), and antihistamine diphenhydramine (DPH) were examined for the first time in edible fillets originating from eight fish species grown in salt- and fresh-water. The sampled fish collected from local grocery stores were homogenized, extracted, pre-concentrated and analyzed by gas chromatography–mass spectrometry (GC–MS) using selected ion monitoring (SIM). The presence of the target compounds in fish extracts was confirmed based on similar mass spectral features and retention behavior with standards. Internal standard based calibration plots were used for quantification. The HHCB, AHTN, TCS and DPH were consistently observed with concentration of 0.163–0.892, 0.068–0.904, 0.189–1.182, and 0.942–7.472 ng g<sup>-1</sup>, respectively. These values are at least 1–3 orders of magnitude lower than those obtained in environmental fish specimens. The MK was not detected in any fish.

**Notes:** 18229352

7411

**URL:** <http://www.sciencedirect.com/science/article/pii/S0045653513016974>

**Reference Type:** Journal Article

**Record Number:** 90

**Author:** Fromme, Hermann, Otto, Thomas, Pilz, Konstanze and Neugebauer, Frank

**Year:** 1999

**Title:** Levels of synthetic musks; Bromocyclene and PCBs in eel (*anguilla anguilla*) and PCBs in sediment samples from some waters of Berlin / Germany

**Journal:** Chemosphere

**Volume:** 39

**Pages:** 1723-1735

**Date:** 1999

**Short Title:** Levels of synthetic musks; Bromocyclene and PCBs in eel (*anguilla anguilla*) and PCBs in sediment samples from some waters of Berlin / Germany

**ISSN:** 0045-6535

**Keywords:** eppi-reviewer4

**Abstract:** The purpose of this study was to identify firstly the extent of contamination both of the aquatic biota and of sediments and secondly any regional differences in the concentrations of these compounds. In 1996, polychlorinated biphenyls (PCBs, including their coplanar congeners) were measured in 58 eel and 50 sediment samples. Furthermore, the veterinary pharmaceutical bromocyclene and the nitro musks were determined in 84 (1995) and 122 (1996) eel samples. Polycyclic musk fragrances were additionally determined in analyses carried out in 1996. The mean values obtained during the two measurement periods (1995 and 1996) were 24 and 12 µg/kg fw. for musk xylene, 41 and 39 pg/kg fw. for musk ketone, 14 and 7 µg/kg fw. for bromocyclene and, in 1996, 592 µg/kg fw. for HHCb (maximum: 4131 µg/kg fw.). Decreasing contamination levels are seen for musk xylene and bromocyclene but not for musk ketone. This tendency, and the high amounts of polycyclic musk fragrances in the edible parts of eel show that these musks are widely being used in place of nitro musks and that they reach the aquatic system via waste waters, especially those of sewage treatment plants. The mean levels of PCBs in the biota samples of a highly polluted area were 1227 µg/kg fw. or 119 pgTEQ/g (sediment: 203 µg/kg dw.) and of a slightly polluted area 340 µg/kg fw. or 49 TEQ/g (sediment: 47 µg/kg dw.).

**Notes:** 18229377

7516

**URL:** <http://www.sciencedirect.com/science/article/pii/S0045653599000661>

**Reference Type:** Journal Article

**Record Number:** 91

**Author:** Gatermann, Robert, Hellou, Jocelyne, Hühnerfuss, Heinrich, Rimkus, Gerhard and Zitko, Vladimir

**Year:** 1999

**Title:** Polycyclic and nitro musks in the environment: A comparison between Canadian and European aquatic biota

**Journal:** Chemosphere

**Volume:** 38

**Pages:** 3431-3441

**Date:** 1999

**Short Title:** Polycyclic and nitro musks in the environment: A comparison between Canadian and European aquatic biota

**ISSN:** 0045-6535

**Keywords:** eppi-reviewer4

**Abstract:** Nitro and polycyclic musks were determined for the first time in Canadian aquatic fauna such as lobster, winter flounder, American eel, lake trout, clams and mussels. Samples from densely populated areas, Halifax and the industrialized Miramichi estuary, showed relatively high concentrations of musk ketone (4-acetyl-1-tert-butyl-3,5-dimethyl-2,6-dinitrobenzene, MK; maximum levels: mussels 2,200 ng/g lipid; winter flounder muscle 2,700 ng/g lipid; clams 17,700 ng/g lipid) and HHCb (1,3,4,6,7,8-hexahydro-4,6,6,7,8,8-hexamethyl-cyclopenta[g]-2-benzopyrane, 'galaxolide'; mussels 1,700 ng/g lipid; winter flounder 40 ng/g lipid; clams 3,000 ng/g lipid), while the samples from sparsely populated areas like Cap-Pelé exhibited lower levels (MK maximum levels 130 ng/g lipid; HHCb maximum levels 16 ng/g lipid). Most samples contained relatively low concentrations of musk xylene (1-tert-butyl-3,5-dimethyl-2,4,6-trinitrobenzene, MX) and AHTN (7-acetyl-1,1,3,4,4,6-hexamethyl-tetrahydro-naphthalene, 'tonalide'). In contrast, in Western Europe, concentrations of the polycyclic musks HHCb and AHTN in fish presently exceed those of the nitro musks by about one to three orders of magnitude. These data seem to reflect the different application modes in Western Europe and North America with regard to the prevailing

musk components in fragrances. Synthetic musks were not detectable in most commercial fish oils used in the preparation of aquaculture feed and fish lipids extracted in the 1980's in the laboratory, with the exception of a pollock (*Pollachius virens*) lipid from the Halifax area, which contained MX and MK at 350 and 64 ng/g lipid, respectively.

**Notes:** 18229446  
7828

**URL:** <http://www.sciencedirect.com/science/article/pii/S0045653598005645>

**Reference Type:** Journal Article

**Record Number:** 92

**Author:** Kallenborn, R., Gatermann, R., Nygård, T., Knutzen, J. and Schlabach, M.

**Year:** 2001

**Title:** Synthetic musks in Norwegian marine fish samples collected in the vicinity of densely populated areas

**Journal:** Fresenius Environmental Bulletin

**Volume:** 10

**Pages:** 832-842

**Date:** 2001

**Short Title:** Synthetic musks in Norwegian marine fish samples collected in the vicinity of densely populated areas

**Keywords:** eppi-reviewer4

**Abstract:** Within the past decade, a large number of ecotoxicological and trace analytical investigations identified synthetic musk compounds as important environmental contaminants in densely populated regions. Today, synthetic musks are still widely used as artificial fragrances added to perfume-, household-, hygienic- and cosmetic products. The presence and distribution of the 6 synthetic musk derivatives 1,3,4,6,7,8-hexahydro-4,6,6, 7,8,8-hexamethyl-cyclo[g]-2-benzopyrane (HHCB, Galaxolide®), 1-[2,3-dihydro-1,1,2,6-tetramethyl-3-(1-methyl-ethyl)-1H-inden-5-yl]- ethanone, (AHTN, Tonalide®), 1-(5,6,7,8-tetrahydro-3,5,5,6,8,8-hexamethyl-2-naphthalenyl)-ethanone (AHTN, Tonalide®), 1,3,4,6,7,8-hexahydro-4, 6,6,7,8,8-hexamethyl-cyclopenta[g]-2-benzopyran-1-one (HHCB-lactone), 4-acetyl-1-tert-butyl-3,5-dimethyl-2,6-dinitrobenzene (Musk-ketone, MK) and 1-tert-butyl-3,5-dimethyl-2,4,6-trinitrobenzene (Musk-xylene, MX) in 25 fish samples from 4 different fish species from five selected Norwegian marine sampling sites related to densely populated areas at Oslo, inner Oslo fjord, Grenland fjords, Larvik, Trondheim and Tromsø have been investigated. Filet and liver samples from Atlantic cod, thornback ray, saithe and haddock were collected for analysis. The highest sum concentration was found for Atlantic cod liver samples from the densely populated Oslo area. Samples from industrial locations like Grenland fjords were not as highly contaminated. This result confirms the hypothesis that mainly household and municipal sewage is responsible for the major environmental release in Norway and not industrial sources. HHCB-lactone, the major transformation product of HHCB, was determined in the Norwegian environment for the first time. Compared with conventional organo-chlorine contaminants, synthetic musks were found in about the same concentration ranges as polychlorinated biphenyls and pesticides. The relatively high concentrations found demonstrate impressively the still underestimated environmental potential of this contaminant class. The risk of laboratory contamination through personnel is known for synthetic musk analysis in environmental samples. Extensive quality control measures were taken to control and monitor laboratory contamination. However, relatively elevated blank values for the complete preparation and quantification method calculated from laboratory and instrument blanks were determined, demonstrating the limits of the used analytical method. In order to improve the performance of the analytical method and reduce average blank levels into the pg-range, drastic measures like use of closed laboratory environments (e.g. clean air laboratory) and special treatment of solvents is needed and recommended. However, the analytical method used here was sufficient for the purpose of the study, namely to confirm the presence and concentration levels of synthetic musks in high and medium contaminated Norwegian marine environments.

**Notes:** 18229947  
9160

Cited By :18 Export Date: 13 October 2015  
URL: <http://www.scopus.com/inward/record.url?eid=2-s2.0-0035724167&partnerID=40&md5=48799d13c84eaf73043b122199cb6edd>

**Reference Type:** Journal Article

**Record Number:** 93

**Author:** Kannan, K., Reiner, J. L., Se, H. Y., Perrotta, E. E., Tao, L., Johnson-Restrepo, B. and Rodan, B. D.

**Year:** 2005

**Title:** Polycyclic musk compounds in higher trophic level aquatic organisms and humans from the United States

**Journal:** Chemosphere

**Volume:** 61

**Pages:** 693-700

**Date:** 2005

**Short Title:** Polycyclic musk compounds in higher trophic level aquatic organisms and humans from the United States

**Keywords:** eppi-reviewer4

**Abstract:** Polycyclic musks, 1,3,4,6,7,8-hexahydro-4,6,6,7,8,8-hexamethylcyclopenta[g]-2-benzopyran (HHCB) and 7-acetyl-1,1,3,4,4,6-hexamethyl-1,2,3,4-tetrahydronaphthalene (AHTN), are used as fragrance ingredients in numerous consumer products such as cleaning agents and personal care products. Studies have reported the widespread occurrence of these musks in surface waters and fish from western European countries. Nevertheless, little is known about their accumulation in humans and wildlife in the United States. In this study, we measured concentrations of HHCB and AHTN in human adipose fat collected from New York City. Furthermore, tissues from marine mammals, water birds, and fish collected from US waters were analyzed to determine the concentrations of HHCB and AHTN. Concentrations of HHCB and AHTN in human adipose fat samples ranged from 12 to 798 and from <5 to 134 ng/g, on a lipid weight basis, respectively. A significant correlation existed between the concentrations of HHCB and AHTN in human adipose fat. Concentrations of HHCB and AHTN were not positively correlated with age or gender of the donors. HHCB was found in tissues of several wildlife species, but not in the livers of polar bear from the Alaskan Arctic. Among wildlife species analyzed, spinner and bottlenose dolphins collected from Florida coastal waters contained measurable concentrations of HHCB. © 2005 Elsevier Ltd. All rights reserved.

**Notes:** 18229964

8180

Cited By :118 Export Date: 13 October 2015

URL: <http://www.scopus.com/inward/record.url?eid=2-s2.0-26444526620&partnerID=40&md5=3f2e71557a56156ca490b71771404861>

**Reference Type:** Journal Article

**Record Number:** 94

**Author:** Kim, Joon-Woo, Ramaswamy Babu, Rajendran, Chang, Kwang-Hyeon, Isobe, Tomohiko and Tanabe, Shinsuke

**Year:** 2011

**Title:** Multiresidue analytical method for the determination of antimicrobials, preservatives, benzotriazole UV stabilizers, flame retardants and plasticizers in fish using ultra high performance liquid chromatography coupled with tandem mass spectrometry

**Journal:** Journal of Chromatography A

**Volume:** 1218

**Pages:** 3511-3520

**Date:** 2011

**Short Title:** Multiresidue analytical method for the determination of antimicrobials, preservatives, benzotriazole UV stabilizers, flame retardants and plasticizers in fish using ultra high performance liquid chromatography coupled with tandem mass spectrometry

**ISSN:** 0021-9673

**Keywords:** eppi-reviewer4

**Abstract:** A multiresidue analytical method for the determination of emerging pollutants belonging to personal care products (PCPs) (antimicrobials, preservatives), benzotriazole UV stabilizers (BUVSs) and organophosphorus compounds (OPCs) in fish has been developed using high speed solvent extraction (HSSE) followed by silica gel clean up and ultra fast liquid chromatography coupled with tandem mass spectrometry (UFLC-MS/MS) analysis. Developed extraction and clean up method yielded good recovery (>70%) for all the four groups of emerging pollutants, i.e. antimicrobials (78.5–85.6%), preservatives (85.0–89.4%), BUVSs (70.9–112%) and OPCs (81.6–114%; except for TEP – 68.9% and TPp – 58.1%) with RSDs ranging from 0.7 to 15.4%. Intra- and inter-day repeatabilities were less than 19.8% and 19.0%, respectively at three spiked levels. The concentrations were given in lipid weight (lw) basis, and the method detection limits were achieved in the lowest range of 0.001–0.006 ng g<sup>-1</sup> for two antimicrobials, 0.001–0.015 ng g<sup>-1</sup> for four preservatives, 0.0002–0.009 ng g<sup>-1</sup> for eight BUVSs and 0.001–0.014 ng g<sup>-1</sup> for nine OPCs. Finally, the method was successfully validated as a simple and fast extraction method for the determination of 23 compounds belonging to PCPs, BUVSs and OPCs and applied to the analysis of three species of fish from Manila Bay, the Philippines. Concentrations ranged from 27 to 278 ng g<sup>-1</sup> for antimicrobials, 6.61 to 1580 ng g<sup>-1</sup> for paraben preservatives, <MDL (method detection limit) to 179 ng g<sup>-1</sup> for BUVSs and ND (not detected) to 266 ng g<sup>-1</sup> for OPCs suggesting the ubiquitous contamination by these emerging pollutants in Manila Bay. This is the first method developed for the determination of triclocarban, four paraben preservatives and four BUVSs, in fish.

**Notes:** 18230045

6881

**URL:** <http://www.sciencedirect.com/science/article/pii/S0021967311004742>

**Reference Type:** Journal Article

**Record Number:** 95

**Author:** Klosterhaus Susan, L., Grace, Richard, Hamilton, M. Coreen and Yee, Donald

**Year:** 2013

**Title:** Method validation and reconnaissance of pharmaceuticals, personal care products, and alkylphenols in surface waters, sediments, and mussels in an urban estuary

**Journal:** Environment International

**Volume:** 54

**Pages:** 92–99

**Date:** 2013

**Short Title:** Method validation and reconnaissance of pharmaceuticals, personal care products, and alkylphenols in surface waters, sediments, and mussels in an urban estuary

**ISSN:** 0160-4120

**Keywords:** eppi-reviewer4

**Abstract:** Novel methods utilizing liquid chromatography–tandem mass spectrometry and gas chromatography–mass spectrometry were validated for low-level detection of 104 pharmaceuticals and personal care products ingredients (PPCPs) and four alkylphenols (APs) in environmental samples. The methods were applied to surface water, sediment, and mussel tissue samples collected from San Francisco Bay, CA, USA, an urban estuary that receives direct discharge from over forty municipal and industrial wastewater outfalls. Among the target PPCPs, 35% were detected in at least one sample, with 31, 10, and 17 compounds detected in water, sediment, and mussels, respectively. Maximum concentrations were 92 ng/L in water (valsartan), 33 ng/g dry weight (dw) in sediments (triclocarban), and 14 ng/g wet weight (ww) in mussels (N,N-diethyl-m-toluamide). Nonylphenol was detected in water (< 2–73 ng/L), sediments (22–86 ng/g dw), and mussels (< 0.04–95 ng/g ww), and nonylphenol mono- and diethoxylates were detected in sediments (< 1–40 ng/g dw) and mussels (< 5–192 ng/g ww). The concentrations of PPCPs and APs detected in the San Francisco Bay samples were generally at least an order of magnitude below concentrations expected to elicit toxic effects in aquatic organisms. This study represents the first reconnaissance of PPCPs in mussels living

in an urban estuary and provides the first field-derived bioaccumulation factors (BAFs) for select compounds in aquatic organisms.

**Notes:** 18230083

7499

**URL:** <http://www.sciencedirect.com/science/article/pii/S0160412013000226>

**Reference Type:** Journal Article

**Record Number:** 96

**Author:** Langford Katherine, H., Reid Malcolm, J., Fjeld, Eirik, Øxnevad, Sigurd and Thomas Kevin, V.

**Year:** 2015

**Title:** Environmental occurrence and risk of organic UV filters and stabilizers in multiple matrices in Norway

**Journal:** Environment International

**Volume:** 80

**Pages:** 1-7

**Date:** 2015

**Short Title:** Environmental occurrence and risk of organic UV filters and stabilizers in multiple matrices in Norway

**ISSN:** 0160-4120

**Keywords:** eppi-reviewer4

**Abstract:** Eight organic UV filters and stabilizers were quantitatively determined in wastewater sludge and effluent, landfill leachate, sediments, and marine and freshwater biota. Crab, prawn and cod from Oslofjord, and perch, whitefish and burbot from Lake Mjøsa were selected in order to evaluate the potential for trophic accumulation. All of the cod livers analysed were contaminated with at least 1 UV filter, and a maximum concentration of almost 12 µg/g wet weight for octocrylene (OC) was measured in one individual. 80% of the cod livers contained OC, and approximately 50% of cod liver and prawn samples contained benzophenone (BP3). Lower concentrations and detection frequencies were observed in freshwater species and the data of most interest is the 4 individual whitefish that contained both BP3 and ethylhexylmethoxycinnamate (EHMC) with maximum concentrations of almost 200 ng/g wet weight. The data shows a difference in the loads of UV filters entering receiving water dependent on the extent of wastewater treatment. Primary screening alone is insufficient for the removal of selected UV filters (BP3, Padimate, EHMC, OC, UV-234, UV-327, UV-328, UV-329). Likely due in part to the hydrophobic nature of the majority of the UV filters studied, particulate loading and organic carbon content appear to be related to concentrations of UV filters in landfill leachate and an order of magnitude difference in these parameters correlates with an order of magnitude difference in the effluent concentrations of selected UV filters (Fig. 2). From the data, it is possible that under certain low flow conditions selected organic UV filters may pose a risk to surface waters but under the present conditions the risk is low, but some UV filters will potentially accumulate through the trophic food chain.

**Notes:** 18230206

6829

**URL:** <http://www.sciencedirect.com/science/article/pii/S016041201500063X>

**Reference Type:** Journal Article

**Record Number:** 97

**Author:** Lee, I. S., Kim, U. J., Oh, J. E., Choi, M. and Hwang, D. W.

**Year:** 2014

**Title:** Comprehensive monitoring of synthetic musk compounds from freshwater to coastal environments in Korea: With consideration of ecological concerns and bioaccumulation

**Journal:** Science of the Total Environment

**Volume:** 470-471

**Pages:** 1502-1508

**Date:** 2014



**Short Title:** Comprehensive monitoring of synthetic musk compounds from freshwater to coastal environments in Korea: With consideration of ecological concerns and bioaccumulation

**Keywords:** eppi-reviewer4

**Abstract:** This study investigated the concentration levels of synthetic musk compounds (SMCs), including HHCB (1,3,4,6,7,8-hexahydro-4,6,6,7,8,8-hexamethylcyclopenta-(g)-2-benzopyran), AHTN (7-acetyl-1,1,3,4,4,6-hexamethyl-1,2,3,4-tetrahydronaphthalene), MK (Musk ketone), and MX (Musk xylene), in freshwater, freshwater and coastal sediments, and coastal bivalves from freshwater to coastal environments. The levels in freshwater close to sewage treatment plants (STPs) showed higher contamination and suggested a medium to high ecological risk, especially posed by MK making more than 65% contribution to the combined risk by the total SMCs. STP effluent discharge points showed higher SMC concentrations in freshwater and coastal sediments. Predominant HHCB contributions regardless of sample types such as abiota and biota were consistent with the greater usage of HHCB than AHTN and MK in Korea. However, the higher contributions of AHTN than those predicted from AHTN consumption in Korea indicate the need for further research on the characteristic properties of individual SMCs, including partitioning, biomagnification, degradation, and metabolism for a realistic risk characterization. With respect to the highest HHCB levels in coastal bivalves reported, we determined the biota-sediment accumulation factor (BSAF) to understand the bioaccumulation of SMCs between coastal sediment and bivalves. The calculated BSAF values suggested that SMCs in bivalves were not biomagnified via the food chain but mostly partitioned from sediment. To our knowledge, this is the first study to measure BSAF values of SMCs, especially HHCB, AHTN, and MK, in coastal bivalve samples. © 2013 Elsevier B.V.

**Notes:** 18230263

9445

Cited By :2 Export Date: 13 October 2015

**URL:** <http://www.scopus.com/inward/record.url?eid=2-s2.0-84891737461&partnerID=40&md5=4cd820354fb7b71ccc79639b45443bae>

**Reference Type:** Journal Article

**Record Number:** 98

**Author:** Nakata, H., Sasaki, H., Takemura, A., Yoshioka, M., Tanabe, S. and Kannan, K.  
**Year:** 2007

**Title:** Bioaccumulation, temporal trend, and geographical distribution of synthetic musks in the marine environment

**Journal:** Environ Sci Technol

**Volume:** 41

**Pages:** 2216-22

**Date:** 2007

**Short Title:** Bioaccumulation, temporal trend, and geographical distribution of synthetic musks in the marine environment

**ISSN:** 0013-936X (Print) 0013-936x

**Keywords:** eppi-reviewer4

**Abstract:** Bioaccumulation of synthetic musks in a marine food chain was investigated by analyzing marine organisms at various trophic levels, including lugworm, clam, crustacean, fish, marine mammal, and bird samples collected from tidal flat and shallow water areas of the Ariake Sea, Japan. Two of the polycyclic musks, HHCB and AHTN, were the dominant compounds found in most of the samples analyzed, whereas nitro musks were not detected in any of the organisms, suggesting greater usage of polycyclic musks relative to the nitro musks in Japan. The highest concentrations of HHCB were detected in clams (258-2730 ng/g lipid wt.), whereas HHCB concentrations in mallard and black-headed gull were low, and comparable with concentrations in fish and crab. These results are in contrast to the bioaccumulation pattern of polychlorinated biphenyls; for which a positive correlation between the concentration and the trophic status of organisms was found. Such a difference in the bioaccumulation is probably due to the metabolism and elimination of HHCB in higher trophic organisms. Temporal trends in concentrations of synthetic musks were examined by analyzing tissues of marine mammals from Japanese coastal waters collected during 1977-2005. HHCB

concentrations in marine mammals have shown significant increase since the early 1990s, suggesting a continuous input of this compound into the marine environment. Comparison of the time trend for HHCB with those for PCBs and PBDEs suggested that the rates of increase in HHCB concentrations were higher than the other classes of pollutants. To examine the geographical distribution of HHCB, we have analyzed tissues of fish, marine mammals, and birds collected from several locations. Synthetic musks were not detected in a sperm whale (pelagic species) from Japanese coastal water and in eggs of south polar skua from Antarctica. While the number of samples analyzed is limited, these results imply a lack of long-range transportation potential of synthetic musks in the environment.

**Notes:** 18230825

5468

Nakata, Haruhiko Sasaki, Hiroshi Takemura, Akira Yoshioka, Motoi Tanabe, Shinsuke Kannan, Kurunthachalam Journal Article Research Support, Non-U.S. Gov't United States Environ Sci Technol. 2007 Apr 1;41(7):2216-22.

**Reference Type:** Journal Article

**Record Number:** 99

**Author:** Picot, Groz, Martinez, Bueno, M, J., Rosain, D., Fenet, H., Casellas, C., Pereira, C., Maria, V., Bebianno, M. J. and Gomez, E.

**Year:** 2014

**Title:** Detection of emerging contaminants (UV filters, UV stabilizers and musks) in marine mussels from Portuguese coast by QuEChERS extraction and GC-MS/MS

**Journal:** Science of The Total Environment

**Volume:** 493

**Pages:** 162-169

**Date:** 2014

**Short Title:** Detection of emerging contaminants (UV filters, UV stabilizers and musks) in marine mussels from Portuguese coast by QuEChERS extraction and GC-MS/MS

**ISSN:** 0048-9697

**Keywords:** eppi-reviewer4

**Abstract:** The UV filters and musk fragrances have come into focus because these compounds are contained and increasingly used not only in sunscreen products but also in many products of daily use, such as cosmetics, skin creams, plastics or varnish. In view of this, the main objective of the present work was to develop and validate a method for the determination of three UV filters, two UV stabilizers and four musks in mussel samples (*Mytilus galloprovincialis*). The procedure combined a QuEChERS (Quick, Easy, Cheap, Effective, Rugged, and Safe) extraction method with an analysis by gas chromatography-tandem mass spectrometry (GC-MS/MS). The methodology allowed the determination of target analytes at trace concentration levels (ng/g), with mean recoveries ranging from 91 to 112%. A monitoring study was conducted in four beaches in the Portuguese coast which are impacted by recreational activities and outflow of treated waste water effluents in rivers. The results are used to assess the occurrence of UV filters in comparison with UV stabilizers and musk fragrances which indicate other activities than bathing.

**Notes:** 18231132

6858

**URL:** <http://www.sciencedirect.com/science/article/pii/S0048969714007426>

**Reference Type:** Journal Article

**Record Number:** 100

**Author:** Rimkus Gerhard, G. and Wolf, Manfred

**Year:** 1995

**Title:** Nitro musk fragrances in biota from freshwater and marine environment

**Journal:** Chemosphere

**Volume:** 30

**Pages:** 641-651

**Date:** 1995

**Short Title:** Nitro musk fragrances in biota from freshwater and marine environment

**ISSN:** 0045-6535

**Keywords:** eppi-reviewer4

**Abstract:** The nitro musks – musk xylene, musk ketone, musk ambrette, musk moskene, and musk tibetene – are intensively used as fragrances in cosmetics and detergents. The residue analysis (clean-up and GC/ECD analysis) of nitro musks in biota from freshwater and marine environment is described. In particular musk xylene and musk ketone were determined in a total of 145 samples of fish, mussels and shrimps originating from domestic and foreign aquacultures, some rivers in northern Germany, from Baltic Sea and North Sea coast. The residue levels ranged from  $<0.01$  to 1.06 mg musk xylene/kg lipid and from  $<0.01$  to 0.38 mg musk ketone/kg lipid, respectively. Our results seem to indicate the high bioconcentration potential and the ubiquitous distribution of this new group of contaminants in biota from freshwater and marine ecosystems.

**Notes:** 18231343  
6950

**URL:** <http://www.sciencedirect.com/science/article/pii/0045653594004303>

**Reference Type:** Journal Article

**Record Number:** 101

**Author:** Sapozhnikova, Y., Liebert, D., Wirth, E. and Fulton, M.

**Year:** 2010

**Title:** Polycyclic musk fragrances in sediments and shrimp tissues

**Journal:** Polycyclic Aromatic Compounds

**Volume:** 30

**Pages:** 298-308

**Date:** 2010

**Short Title:** Polycyclic musk fragrances in sediments and shrimp tissues

**Keywords:** eppi-reviewer4

**Abstract:** Polycyclic musk fragrances are widely used as ingredients in personal care products, shampoos, lotions, and household cleaning agents. These chemicals have relatively high octanol-water partition coefficients, and therefore tend to accumulate in sediments, sludge, and biological tissues. We analyzed shrimp and sediment samples for the presence of synthetic musks. Samples were extracted using accelerated solvent extraction. Gel permeation chromatography and solid phase extraction with silica were used to clean the extracts. The extracts were analyzed with Gas Chromatography Mass Spectrometry with Electron Impact ionization (GC-MS-EI) in selected ion monitoring (SIM) mode. Sediment samples were collected from three tidal tributaries of the Chesapeake Bay. HHCB was detected in concentrations up to 9.2 (average  $1.1 \pm 2.2$ ) ng/g dry weight. Shrimp samples were collected as part of a seafood market survey of wild and farmed shrimp from the USA and other countries (Mexico, India, Equador, Thailand, China and others). Detected HHCB concentrations ranged from 48 to 683 (average  $198 \pm 156$ ) ng/g lipid in farmed shrimp, and from 66 to 762 (average  $334 \pm 236$ ) ng/g lipid in wild shrimp. Estimated concentrations of AHTN were up to 185 ng/g lipid in farmed shrimp, and up to 384 ng/g lipid weight in wild shrimp. HHCB was detected in all tissue samples analyzed, thus indicating the widespread distribution of this synthetic fragrance in shrimp. © Taylor & Francis Group, LLC.

**Notes:** 18231491

7900

**Cited By :** 5 **Export Date:** 13 October 2015

**URL:** <http://www.scopus.com/inward/record.url?eid=2-s2.0-78649339076&partnerID=40&md5=8e01e0edb8cb9b44851f5f9ce1ccf3b9>

**Reference Type:** Journal Article

**Record Number:** 102

**Author:** Subedi, B., Du, B., Chambliss, C. K., Koschorreck, J., Rüdél, H., Quack, M., Brooks, B. W. and Usenko, S.

**Year:** 2012

**Title:** Occurrence of pharmaceuticals and personal care products in German fish tissue: A national study

**Journal:** Environmental Science and Technology

**Volume:** 46

**Pages:** 9047-9054

**Date:** 2012

**Short Title:** Occurrence of pharmaceuticals and personal care products in German fish tissue: A national study

**Keywords:** eppi-reviewer4

**Abstract:** German Environment Specimen Bank (GESB) fish tissue samples, collected from 14 different GESB locations, were analyzed for 15 pharmaceuticals, 2 pharmaceutical metabolites, and 12 personal care products. Only 2 pharmaceuticals, diphenhydramine and desmethylsertraline, were measured above MDL. Diphenhydramine (0.04-0.07 ng g<sup>-1</sup> ww) and desmethylsertraline (1.65-3.28 ng g<sup>-1</sup> ww) were measured at 4 and 2 locations, respectively. The maximum concentrations of galaxolide (HHCb) (447 ng g<sup>-1</sup> ww) and tonalide (AHTN) (15 ng g<sup>-1</sup> ww) were measured at the Rehlingen sampling site in the Saar River. A significant decrease in HHCb and AHTN fish tissue concentrations was observed from 1995 to 2008 at select GESB sampling sites ( $r^2 = 0.69-0.89$  for galaxolide and  $0.89-0.97$  for tonalide with  $p < 0.003$ ). Galaxolide and tonalide fish tissue concentrations in Germany were ~19× and ~28× lower, respectively, as compared to fish tissue concentrations measured in a United States nationwide PPCP study conducted in 2006. Proximity of the sampling locations to the upstream wastewater treatment plant discharging point and mean annual flow at the sampling location were found to significantly predict galaxolide and tonalide fish tissue concentrations (HHCb:  $r^2 = 0.79$ ,  $p = 0.021$  and AHTN:  $r^2 = 0.81$ ,  $p = 0.037$ ) in Germany. © 2012 American Chemical Society.

**Notes:** 18231754

8078

**Cited By :**26 **Export Date:** 13 October 2015

**URL:** <http://www.scopus.com/inward/record.url?eid=2-s2.0-84865527146&partnerID=40&md5=5e0f9b5681658d504a4f91f958160883>

## PCP records in marine mammals

**Reference Type:** Journal Article

**Record Number:** 103

**Author:** Gago-Ferrero, P., Alonso, M. B., Bertozzi, C. P., Marigo, J., Barbosa, L., Cremer, M., Secchi, E. R., Azevedo, A., Lailson, Brito, Jr., Torres, J. P. M., Malm, O., Eljarrat, E., Díaz-Cruz, M. S. and Barceló, D.

**Year:** 2013

**Title:** First determination of UV filters in marine mammals. octocrylene levels in Franciscana dolphins

**Journal:** Environmental Science and Technology

**Volume:** 47

**Pages:** 5619-5625

**Date:** 2013

**Short Title:** First determination of UV filters in marine mammals. octocrylene levels in Franciscana dolphins

**Keywords:** eppi-reviewer4

**Abstract:** Most current bioexposure assessments for UV filters focus on contaminants concentrations in fish from river and lake. To date there is not information available on the occurrence of UV filters in marine mammals. This is the first study to investigate the presence of sunscreen agents in tissue liver of Franciscana dolphin (*Pontoporia blainvillei*), a species under special measures for conservation. Fifty six liver tissue samples were taken from dead individuals accidentally caught or found stranded along the Brazilian coastal area (six states). The extensively used octocrylene (2-ethylhexyl-2-cyano-3,3-diphenyl-2-propenoate, OCT) was frequently found in the samples investigated (21 out of 56) at concentrations in the range 89-782 ng·g<sup>-1</sup> lipid weight. São Paulo was found to be the most polluted area (70% frequency of detection). Nevertheless, the highest concentration was observed in the dolphins from Rio Grande do Sul (42% frequency of detection within that area). These findings constitute the first data reported on the occurrence of UV filters in marine mammals worldwide. © 2013 American Chemical Society.

**Notes:** 18229397

7898

**Cited By :**14 **Export Date:** 13 October 2015

**URL:** <http://www.scopus.com/inward/record.url?eid=2-s2.0-84878637874&partnerID=40&md5=ba4e4d670a4320712fb9aa6868eb0e80>

**Reference Type:** Journal Article

**Record Number:** 105

**Author:** Moon, H. B., An, Y. R., Choi, S. G., Choi, M. and Choi, H. G.

**Year:** 2012

**Title:** Accumulation of PAHs and synthetic musk compound in minke whales (*Balaenoptera acutorostrata*) and long-beaked common dolphins (*Delphinus capensis*) from Korean coastal waters

**Journal:** Environmental Toxicology and Chemistry

**Volume:** 31

**Pages:** 477-485

**Date:** 2012

**Short Title:** Accumulation of PAHs and synthetic musk compound in minke whales (*Balaenoptera acutorostrata*) and long-beaked common dolphins (*Delphinus capensis*) from Korean coastal waters

**Keywords:** eppi-reviewer4

**Abstract:** Information on the occurrence and accumulation profiles of polycyclic aromatic hydrocarbons (PAHs) and synthetic musk compounds (SMCs) in marine mammals is scarce. In the present study, we recorded the concentrations and profiles of PAHs and SMCs in liver tissue and blubber from minke whales and common dolphins from Korean coastal waters. The overall concentrations of PAHs and SMCs in blubber from both cetacean species were approximately three to five times higher than those in liver

tissues. Residue levels of PAHs were lower, whereas levels of SMCs were relatively higher than those reported in other studies. Lack of species- and sex-dependent differences in the concentrations of PAHs and SMCs were found. Naphthalene and 1,3,4,6,7,8-hexahydro-4,6,6,7,8,8-hexamethylcyclopenta-r-2-benzopyran (HHCb) were predominant compounds in all the samples for PAHs and SMCs, respectively. The concentrations of PAHs and SMCs were significantly correlated with each other, but were not correlated with body size of cetaceans. The present data provide valuable information on the exposure of Korean cetaceans to PAHs and SMCs. © 2011 SETAC.

**Notes:** 18230728

8897

**Cited By :**13 **Export Date:** 13 October 2015

**URL:** <http://www.scopus.com/inward/record.url?eid=2-s2.0-84857506169&partnerID=40&md5=dd934908df1076a282f590d1c4d3745d>

**Reference Type:** Journal Article

**Record Number:** 104

**Author:** Moon, H. B., An, Y. R., Park, K. J., Choi, S. G., Moon, D. Y., Choi, M. and Choi, H. G.

**Year:** 2011

**Title:** Occurrence and accumulation features of polycyclic aromatic hydrocarbons and synthetic musk compounds in finless porpoises (*Neophocaena phocaenoides*) from Korean coastal waters

**Journal:** Marine Pollution Bulletin

**Volume:** 62

**Pages:** 1963-1968

**Date:** 2011

**Short Title:** Occurrence and accumulation features of polycyclic aromatic hydrocarbons and synthetic musk compounds in finless porpoises (*Neophocaena phocaenoides*) from Korean coastal waters

**Keywords:** eppi-reviewer4

**Abstract:** Reports of the occurrence and accumulation patterns of polycyclic aromatic hydrocarbons (PAHs) and synthetic musk compounds (SMCs) in marine mammals are scarce. In this study, the concentrations and accumulation profiles of PAHs and SMCs were determined in blubber from finless porpoises in Korean coastal waters. Total concentrations of PAHs and SMCs ranged from 6.0 to 432 (mean: 160) ng/g lipid weight and from 17 to 144 (mean: 52) ng/g lipid weight, respectively. Residue levels of PAHs were lower than those reported from other studies, while residue levels of SMCs were relatively higher than those reported in other studies. Naphthalene was the most abundant PAH and HHCb was the dominant SMC observed in finless porpoises. The concentrations of PAHs and SMCs were not correlated with each other, but were significantly correlated within the same chemical groups. No correlations were found between body size and residue levels of PAHs and SMCs. © 2011 Elsevier Ltd.

**Notes:** 18230729

9089

**Cited By :**9 **Export Date:** 13 October 2015

**URL:** <http://www.scopus.com/inward/record.url?eid=2-s2.0-80051820518&partnerID=40&md5=317510d5f4f37c3f697b84ac2e6c0855>

**Reference Type:** Journal Article

**Record Number:** 106

**Author:** Nakata, H.

**Year:** 2005

**Title:** Occurrence of synthetic musk fragrances in marine mammals and sharks from Japanese coastal waters

**Journal:** Environ Sci Technol

**Volume:** 39

**Pages:** 3430-4

**Date:** 2005

**Short Title:** Occurrence of synthetic musk fragrances in marine mammals and sharks from Japanese coastal waters

**ISSN:** 0013-936X (Print) 0013-936x

**Keywords:** eppi-reviewer4

**Abstract:** In this study, the occurrence of the polycyclic musk fragrances HHCB (1,3,4,6,7,8-hexahydro-4,6,6,7,8,8-hexamethylcyclopenta[g]-2-benzopyran) and AHTN (7-acetyl-1,1,3,4,4,6-hexamethyltetrahydronaphthalene) in marine mammals and sharks collected from Japanese coastal waters is reported. HHCB was present in the blubbers of all finless porpoises (*Neophocaena phocaenoides*) analyzed (n = 8), at levels ranging from 13 to 149 ng/g on a wet weight basis. A fetus sample of finless porpoise contained a notable concentration of HHCB (26 ng/g wet wt), suggesting transplacental transfer of this compound. Among 12 tissues and organs of a finless porpoise analyzed, the highest HHCB concentration was found in blubber, followed by kidney. This indicates that HHCB accumulates in lipid-rich tissues in marine mammals, which is similar to the accumulation profiles of persistent organochlorines, such as PCBs and DDTs. In general, the residue levels of AHTN and nitro musks were low or below the detection limits in finless porpoises, implying either less usage in Japan or high metabolic capacity of these compounds in this animal. HHCB was also found in the livers of five hammerhead sharks (*Sphrna lewini*) from Japanese coastal waters, at concentrations ranging from 16 to 48 ng/g wet wt. Occurrence of HHCB in higher trophic organisms strongly suggests that it is less degradable in the environment and accumulates in the top predators of marine food chains. This is the first report on the accumulation of synthetic musk fragrances in marine mammals and sharks.

**Notes:** 18230823

5255

Nakata, Haruhiko Journal Article United States Environ Sci Technol. 2005 May 15;39(10):3430-4.

**Reference Type:** Journal Article

**Record Number:** 107

**Author:** Nakata, H., Sasaki, H., Takemura, A., Yoshioka, M., Tanabe, S. and Kannan, K.

**Year:** 2007

**Title:** Bioaccumulation, temporal trend, and geographical distribution of synthetic musks in the marine environment

**Journal:** Environ Sci Technol

**Volume:** 41

**Pages:** 2216-22

**Date:** 2007

**Short Title:** Bioaccumulation, temporal trend, and geographical distribution of synthetic musks in the marine environment

**ISSN:** 0013-936X (Print) 0013-936x

**Keywords:** eppi-reviewer4

**Abstract:** Bioaccumulation of synthetic musks in a marine food chain was investigated by analyzing marine organisms at various trophic levels, including lugworm, clam, crustacean, fish, marine mammal, and bird samples collected from tidal flat and shallow water areas of the Ariake Sea, Japan. Two of the polycyclic musks, HHCB and AHTN, were the dominant compounds found in most of the samples analyzed, whereas nitro musks were not detected in any of the organisms, suggesting greater usage of polycyclic musks relative to the nitro musks in Japan. The highest concentrations of HHCB were detected in clams (258-2730 ng/g lipid wt.), whereas HHCB concentrations in mallard and black-headed gull were low, and comparable with concentrations in fish and crab. These results are in contrast to the bioaccumulation pattern of polychlorinated biphenyls; for which a positive correlation between the concentration and the trophic status of organisms was found. Such a difference in the bioaccumulation is probably due to the metabolism and elimination of HHCB in higher trophic organisms. Temporal trends in concentrations of synthetic musks were examined by analyzing tissues of marine mammals from Japanese coastal waters collected during 1977-2005. HHCB concentrations in marine mammals have shown significant increase since the early 1990s, suggesting a continuous input of this compound into the marine environment. Comparison of the time trend for HHCB with those for PCBs and PBDEs suggested that the

rates of increase in HHCB concentrations were higher than the other classes of pollutants. To examine the geographical distribution of HHCB, we have analyzed tissues of fish, marine mammals, and birds collected from several locations. Synthetic musks were not detected in a sperm whale (pelagic species) from Japanese coastal water and in eggs of south polar skua from Antarctica. While the number of samples analyzed is limited, these results imply a lack of long-range transportation potential of synthetic musks in the environment.

**Notes:** 18230825  
5468

Nakata, Haruhiko Sasaki, Hiroshi Takemura, Akira Yoshioka, Motoi Tanabe, Shinsuke Kannan, Kurunthachalam Journal Article Research Support, Non-U.S. Gov't United States Environ Sci Technol. 2007 Apr 1;41(7):2216-22.

**Reference Type:** Journal Article

**Record Number:** 108

**Author:** Xue, J., Sasaki, N., Elangovan, M., Diamond, G. and Kannan, K.

**Year:** 2015

**Title:** Elevated Accumulation of Parabens and their Metabolites in Marine Mammals from the United States Coastal Waters

**Journal:** Environ Sci Technol

**Date:** 2015

**Short Title:** Elevated Accumulation of Parabens and their Metabolites in Marine Mammals from the United States Coastal Waters

**ISSN:** 0013-936x

**Keywords:** eppi-reviewer4

**Abstract:** The widespread exposure of humans to parabens present in personal care products is well-known. Nevertheless, little is known about the accumulation of parabens in marine organisms. In this study, six parabens and four common metabolites of parabens were measured in 121 tissue samples from eight species of marine mammals collected along the coastal waters of Florida, California, Washington, and Alaska. Methyl paraben (MeP) was the predominant compound found in the majority of the marine mammal tissues analyzed, and the highest concentration found was 865 ng/g (wet weight [wet wt]) in the livers of bottlenose dolphins from Sarasota Bay, FL. 4-Hydroxybenzoic acid (4-HB) was the predominant paraben metabolite found in all tissue samples. The measured concentrations of 4-HB were on the order of hundreds to thousands of ng/g tissue, and these values are some of the highest ever reported in the literature. MeP and 4-HB concentrations showed a significant positive correlation ( $p < 0.05$ ), which suggested a common source of exposure to these compounds in marine mammals. Trace concentrations of MeP and 4-HB were found in the livers of polar bears from the Chuckchi Sea and Beaufort Sea, which suggested widespread distribution of MeP and 4-HB in the oceanic environment.

**Notes:** 18232237

5118

1520-5851 Xue, Jingchuan Sasaki, Nozomi Elangovan, Madhavan Diamond, Guthrie Kannan, Kurunthachalam Journal article Environ Sci Technol. 2015 Oct 2.



## PCP records in marine sediment and seawater

**Reference Type:** Journal Article

**Record Number:** 115

**Year:** 2007

**Title:** Chemicals from personal care products pollute SF Bay

**Journal:** Focus on Surfactants

**Volume:** 2007

**Pages:** 5

**Date:** 2007

**Short Title:** Chemicals from personal care products pollute SF Bay

**ISSN:** 1351-4210

**Keywords:** eppi-reviewer4

**Abstract:** Hormone-disrupting chemicals utilized in personal care products are contaminating the San Francisco Bay, creating potential harm to marine life and consumers and local utility districts, according to a report from the Environmental Working Group. At least one of three unregulated hormone-disrupting chemicals – phthalates, bisphenol A or triclosan – are found in 18 out of 19 wastewater samples sourced from residential, commercial and industrial sites. The chemicals are used in cosmetics, antibacterial soaps and perfumes. However, a bisphenol A panel at the American Chemistry Council claims the levels of the chemicals in wastewater are still safe for the environment since they are not persistent and do not bioaccumulate.

**Notes:** 18228151

6855

**URL:** <http://www.sciencedirect.com/science/article/pii/S1351421007703396>

**Reference Type:** Journal Article

**Record Number:** 109

**Author:** Aboul-Kassim, T. A.

**Year:** 1992

**Title:** Impact of sewage disposal on the distribution and flux of detergents in Alexandria coastal waters, Egypt

**Journal:** Water Science and Technology

**Volume:** 25

**Pages:** 93-100

**Date:** 1992

**Short Title:** Impact of sewage disposal on the distribution and flux of detergents in Alexandria coastal waters, Egypt

**Keywords:** eppi-reviewer4

**Abstract:** Detergents from 26 stations, representing four different zones from pollution view points, were sampled biweekly during 1985-1986 from the coastal waters of Alexandria, Egypt. Samples were analyzed for anionic surfactants, total suspended matter and salinity. The main objective of this work is to study retrospectively the relation between the state of pollution of Alexandria waters by anionic detergents and sewage and waste water disposal. A comparison with background level was performed to evaluate the deviations in anionic detergent concentrations. The absolute detergent values varied between a minimum of 0.02 mg LAS/l and a maximum of 12.55 mg LAS/l. The estimated detergent loadings reaching the study area are about 86, 109 and 7000 Kg/day through zones I, II and III, respectively. Based on the daily discharge of detergents to the waters of Alexandria, the population equivalent will vary from 0.40-0.73. The expected total loading of detergents to the area is projected to be approximately double between now and year 2000. Detergents from 26 stations, representing four different zones from pollution view points, were sampled biweekly during 1985-1986 from the coastal waters of Alexandria, Egypt. Samples were analyzed for anionic surfactants, total suspended matter and salinity. The main objective of this work is to study retrospectively the relation between the state of pollution of Alexandria

waters by anionic detergents and sewage and waste water disposal. A comparison with background level was performed to evaluate the deviations in anionic detergent concentrations. The absolute detergent values varied between a minimum of 0.02 mg LAS/l and a maximum of 12.55 mg LAS/l. The estimated detergent loadings reaching the study area are about 86, 109 & 7000 Kg/day through zones I, II & III, respectively. Based on the daily discharge of detergents to the waters of Alexandria, the population equivalent will vary from 0.40-0.73. The expected total loading of detergents to the area is projected to be approximately double between now and year 2000.

**Notes:** 18228227

8422

**Cited By :** 2 **Export Date:** 13 October 2015

**URL:** <http://www.scopus.com/inward/record.url?eid=2-s2.0-0026614725&partnerID=40&md5=31db3e79c07ffd55499c91e370c828c8>

**Reference Type:** Journal Article

**Record Number:** 110

**Author:** Amine, H., Gomez, E., Halwani, J., Casellas, C. and Fenet, H.

**Year:** 2012

**Title:** UV filters, ethylhexyl methoxycinnamate, octocrylene and ethylhexyl dimethyl PABA from untreated wastewater in sediment from eastern Mediterranean river transition and coastal zones

**Journal:** Marine Pollution Bulletin

**Volume:** 64

**Pages:** 2435-2442

**Date:** 2012

**Short Title:** UV filters, ethylhexyl methoxycinnamate, octocrylene and ethylhexyl dimethyl PABA from untreated wastewater in sediment from eastern Mediterranean river transition and coastal zones

**Keywords:** eppi-reviewer4

**Abstract:** UVF may occur in the aquatic environment through two principal sources: direct inputs from recreational activities and indirect wastewater- and river-borne inputs. The aim of this study was to obtain a first overview of levels of three UVF (EHMC, OC and OD-PABA) in coastal areas subjected to river inputs, untreated wastewater discharges and dumpsite leachates. We selected three eastern Mediterranean rivers that have been impacted for decades by untreated wastewater release and collected sediment in the coastal zone during the hot and humid seasons. Western Mediterranean sites receiving treated wastewaters were analyzed for comparison. The results gave an overview of sediment contamination under these two contrasted situations representative of Mediterranean coastal areas without bathing activities. The analysis of the three UVF revealed the ubiquity and high point source contamination by EHMC and OC in transition and coastal zones, with levels as high as 128ngg-1d.w. OD-PABA was also frequently detected, but at lower concentrations (<LTD-17ngg-1d.w.). A temporal trend was observed, with a higher sediment concentration in the dry period (August and October). Based on these results, we conclude that there is background contamination from river input that could be exacerbated by the direct contribution in coastal bathing zones. © 2012.

**Notes:** 18228331

9093

**Cited By :** 9 **Export Date:** 13 October 2015

**URL:** <http://www.scopus.com/inward/record.url?eid=2-s2.0-84868203431&partnerID=40&md5=76b325c48b01837b89b41cfae63f608b>

**Reference Type:** Journal Article

**Record Number:** 111

**Author:** Beretta, M., Britto, V., Tavares, T. M., da, Silva, S. M. T. and Pletsch, A. L.

**Year:** 2014

**Title:** Occurrence of pharmaceutical and personal care products (PPCPs) in marine sediments in the Todos os Santos Bay and the north coast of Salvador, Bahia, Brazil

**Journal:** Journal of Soils and Sediments

**Volume:** 14

**Pages:** 1278-1286

**Date:** 2014

**Short Title:** Occurrence of pharmaceutical and personal care products (PPCPs) in marine sediments in the Todos os Santos Bay and the north coast of Salvador, Bahia, Brazil

**Keywords:** eppi-reviewer4

**Abstract:** Purpose: The Todos os Santos Bay is the largest bay in Brazil and receives drainage from various watersheds. For more than 450 years, it was the main destination for the domestic and hospital sewage from the city of Salvador, Bahia. With the growing concern regarding the presence of pharmaceutical and personal care products (PPCPs) in the environment, an investigation was undertaken to determine the presence and levels of some commonly used drugs (i.e., atenolol, caffeine, carbamazepine, diazepam, diclofenac, erythromycin, ibuprofen) and personal care products (i.e., galaxolide, tonalide), using sediments as an indicator of their presence in the water column. Material and methods: Surficial sediment samples from 17 stations located in the intertidal zone of the Todos os Santos Bay and infralittoral zone along the north coast of Salvador were tested for the presence of some PPCPs using LC-MS/MS (for drugs) and GC-MS/MS (for fragrances). Results and discussion: The PPCPs examined were present in all sediment samples at levels of parts per billion of dry sediment. The highest concentrations were found for the fragrances galaxolide (52.5 ng g<sup>-1</sup>) and tonalide (27.9 ng g<sup>-1</sup>), followed by caffeine (23.4 ng g<sup>-1</sup>) and pharmaceuticals ibuprofen (14.3 ng g<sup>-1</sup>), atenolol (9.84 ng g<sup>-1</sup>), carbamazepine (4.81 ng g<sup>-1</sup>), erythromycin (2.29 ng g<sup>-1</sup>), diclofenac (1.06 ng g<sup>-1</sup>), and diazepam (0.71 ng g<sup>-1</sup>). Conclusions: Pharmaceuticals were found to be ubiquitous in the sediments of the study areas. The texture of the sediment was an important factor in PPCPs fixation and deposition. The concentrations of all PPCPs had statistically significant positive correlations with the percentage of clay in the sediments. © 2014 Springer-Verlag Berlin Heidelberg.

**Notes:** 18228525

7977

Cited By :3 Export Date: 13 October 2015

URL: <http://www.scopus.com/inward/record.url?eid=2-s2.0-84901823459&partnerID=40&md5=723be2080ceb3196e26592fc2dffcc54>

**Reference Type:** Journal Article

**Record Number:** 112

**Author:** Birch, G. F., Drage, D. S., Thompson, K., Eaglesham, G. and Mueller, J. F.

**Year:** 2015

**Title:** Emerging contaminants (pharmaceuticals, personal care products, a food additive and pesticides) in waters of Sydney estuary, Australia

**Journal:** Mar Pollut Bull

**Volume:** 97

**Pages:** 56-66

**Date:** 2015

**Short Title:** Emerging contaminants (pharmaceuticals, personal care products, a food additive and pesticides) in waters of Sydney estuary, Australia

**ISSN:** 0025-326x

**DOI:** 10.1016/j.marpolbul.2015.06.038. Epub 2015 Jun 27.

**Keywords:** eppi-reviewer4

**Abstract:** The current investigation of marine water from 30 sites adjacent to stormwater outlets across the entire Sydney estuary is the first such research in Australia. The number of analytes detected were: 8/59 pharmaceutical compounds (codeine, paracetamol, tramadol, venlafaxine, propranolol, fluoxetine, iopromide and carbamazepine), 7/38 of the pesticides (2,4-dichlorophenoxyacetic acid (2,4-D), 3,4-dichloroaniline, carbaryl, diuron, 2-methyl-4-chlorophenoxyacetic acid (MCPA), mecoprop and simazine) and 0/3 of the personal care products (PCPs) analysed. An artificial sweetener (acesulfame) was detected, however none of the nine antibiotics analysed were identified. Sewage water is not discharged to this estuary, except

infrequently as overflow during high-precipitation events. The presence of acesulfame (a recognised marker of domestic wastewater) and pharmaceuticals in water from all parts of the estuary after a dry period, suggests sewage water is leaking into the stormwater system in this catchment. The pesticides are applied to the environment and were discharged via stormwater to the estuary.

**Notes:** 18228571  
5132

**Reference Type:** Journal Article

**Record Number:** 113

**Author:** Bratkovics, S. and Sapozhnikova, Y.

**Year:** 2011

**Title:** Determination of seven commonly used organic UV filters in fresh and saline waters by liquid chromatography-tandem mass spectrometry

**Journal:** Analytical Methods

**Volume:** 3

**Pages:** 2943-2950

**Date:** 2011

**Short Title:** Determination of seven commonly used organic UV filters in fresh and saline waters by liquid chromatography-tandem mass spectrometry

**Keywords:** eppi-reviewer4

**Abstract:** An analytical method for the simultaneous determination of seven of the most widely used organic UV filter compounds in tap and saline waters was developed and validated. Target compounds included oxybenzone, dioxybenzone, sulisobenzene, avobenzone, octocrylene, octinoxate, and padimate-0. Water samples were adjusted to pH 2 prior to solid-phase extraction (SPE) using Oasis HLB 500 mg cartridges. The detection and quantification were performed using liquid chromatography-tandem mass spectrometry (LC-MS/MS) with positive electrospray ionization (ESI) using Multiple Reaction Monitoring mode (MRM). Calculated recoveries from fortified samples ranged from 74 to 109% with relative standard deviations of 6-25% for fortified tap water samples and from 71 to 111% with relative standard deviations 2-12% for fortified seawater samples, indicating acceptable method accuracy and precision (n = 5). Method reporting limits ranged from 0.5 to 25 ng L<sup>-1</sup> for the seven compounds. Oxybenzone, avobenzone, octocrylene, octinoxate, and padimate-0 were detected in seawater samples collected from Folly Beach, South Carolina in the summer of 2010, at concentrations ranging from 10 to 2013 ng L<sup>-1</sup>, demonstrating the ability of the developed method to measure target compounds in environmental samples. Oxybenzone and octocrylene were found in the highest concentrations, up to 2013 ng L<sup>-1</sup> and 1409 ng L<sup>-1</sup>, respectively. Concentrations for avobenzone, octinoxate, and padimate-0 ranged from 62-321 ng L<sup>-1</sup>, 30-264 ng L<sup>-1</sup> and <1-111 ng L<sup>-1</sup>, respectively, in surface seawater samples (n= 4). Dioxybenzone and sulisobenzene were not detected in any samples from the four sites (method reporting limits 1 ng L<sup>-1</sup>). To our knowledge, this is the first study reporting sunscreen compounds in the coastal waters of the U.S.A. © 2011 The Royal Society of Chemistry.

**Notes:** 18228634

8425

**Cited By :** 5 **Export Date:** 13 October 2015

**URL:** <http://www.scopus.com/inward/record.url?eid=2-s2.0-82555169354&partnerID=40&md5=f7dd314df46ff6a90640db827db211c8>

**Reference Type:** Journal Article

**Record Number:** 114

**Author:** Cantwell Mark, G., Wilson Brittan, A., Zhu, Jun, Wallace Gordon, T., King John, W., Olsen Curtis, R., Burgess Robert, M. and Smith Joseph, P.

**Year:** 2010

**Title:** Temporal trends of triclosan contamination in dated sediment cores from four urbanized estuaries: Evidence of preservation and accumulation

**Journal:** Chemosphere

**Volume:** 78

**Pages:** 347–352

**Date:** 2010

**Short Title:** Temporal trends of triclosan contamination in dated sediment cores from four urbanized estuaries: Evidence of preservation and accumulation

**ISSN:** 0045-6535

**Keywords:** eppi-reviewer4

**Abstract:** Triclosan is an antimicrobial agent added to a wide array of consumer goods and personal care products. Through its use, it is introduced into municipal sewer systems where it is only partially removed during wastewater treatment. In this study, triclosan was measured in dated sediment cores from four urbanized estuaries in order to reconstruct temporal and spatial trends of accumulation. Measurable concentrations of triclosan first appeared in each of the sediment cores near 1964, which corresponds with the US patent issuance date of triclosan. The presence of triclosan at each of the study sites at or near the patent date indicates that long-term preservation is occurring in estuarine sediments. Temporal trends of triclosan at each location are unique, reflecting between site variability. Concentrations at one site climbed to as high as 400 ng g<sup>-1</sup>, due in part, to local commercial production of triclosan. At two locations, levels of triclosan rise towards the surface of each core, suggesting increasing usage in recent years. One location adjacent to a major combined sewer overflow had high sediment concentrations of triclosan, confirming their potential as a source of triclosan to estuaries.

**Notes:** 18228729

7617

**URL:** <http://www.sciencedirect.com/science/article/pii/S0045653509013782>

**Reference Type:** Journal Article

**Record Number:** 116

**Author:** Choi, M., Furlong, E. T., Werner, S. L., Pait, A. S., Lee, I. S. and Choi, H. G.

**Year:** 2014

**Title:** Cimetidine, acetaminophen, and 1,7-dimethylxanthine, as indicators of wastewater pollution in marine sediments from masan bay, korea

**Journal:** Ocean Science Journal

**Volume:** 49

**Pages:** 231–240

**Date:** 2014

**Short Title:** Cimetidine, acetaminophen, and 1,7-dimethylxanthine, as indicators of wastewater pollution in marine sediments from masan bay, korea

**Keywords:** eppi-reviewer4

**Abstract:** Concerns have emerged regarding the presence of human-use pharmaceuticals in aquatic environments. We investigated the status of contamination by 29 human-use pharmaceuticals as well as wastewater indicator compounds, fecal sterols and the synthetic endocrine disruptor nonylphenol, in marine sediments from Masan Bay, one of the most contaminated bays in Korea as a result of untreated and/or treated sewage. Among the 29 pharmaceuticals determined, 10 including antacid, analgesic, antibiotic, and antipruritic compounds, and metabolites of caffeine and nicotine were detected in all sediment samples. Cimetidine, acetaminophen, and 1,7-dimethylxanthine were the most frequently detected pharmaceuticals (frequency > 50%), and at high concentrations. The highest concentrations and detection frequencies were at stations located close to wastewater treatment plant (WWTP) outfalls and at the river mouth. The spatial distributions of pharmaceutical were significantly correlated with those of wastewater compounds. These results indicate that occurrence of the pharmaceuticals in marine environments is likely associated with direct sewage inputs, such as WWTP effluents and with other sewage-influenced sources, such as river discharge. © KSO, KIOST and Springer 2014.

**Notes:** 18228872

8551

**Cited By :** 1 Export Date: 13 October 2015

**URL:** [http://www.scopus.com/inward/record.url?eid=2-s2.0-](http://www.scopus.com/inward/record.url?eid=2-s2.0-84927778190&partnerID=40&md5=f36f156883d1e1d1be0bada6dbe187f8)

[84927778190&partnerID=40&md5=f36f156883d1e1d1be0bada6dbe187f8](http://www.scopus.com/inward/record.url?eid=2-s2.0-84927778190&partnerID=40&md5=f36f156883d1e1d1be0bada6dbe187f8)

**Reference Type:** Journal Article

**Record Number:** 117

**Author:** Corada-Fernández, Carmen, Lara-Martín Pablo, A., Candela, Lucila and González-Mazo, Eduardo

**Year:** 2013

**Title:** Vertical distribution profiles and diagenetic fate of synthetic surfactants in marine and freshwater sediments

**Journal:** Science of The Total Environment

**Volume:** 461-462

**Pages:** 568-575

**Date:** 2013

**Short Title:** Vertical distribution profiles and diagenetic fate of synthetic surfactants in marine and freshwater sediments

**ISSN:** 0048-9697

**Keywords:** eppi-reviewer4

**Abstract:** This manuscript deals with the presence and degradation of the most commonly-used surfactants, including anionic (linear alkylbenzene sulfonates, LAS, and alkyl ethoxysulfates, AES) and non-ionic (alcohol polyethoxylates, AEOs, and nonylphenol polyethoxylates, NPEOs) compounds, in sediments and pore water from several aquatic environments (Southwest, Spain). Different vertical distributions were observed according to the respective sources, uses, production volumes and physicochemical properties of each surfactant. Levels of nonionics (up to 10 mg kg<sup>-1</sup>) were twice as high as anionics in industrial areas and harbors, whereas the opposite was found near urban wastewater discharge outlets. Sulfophenyl carboxylic acids (SPCs), LAS degradation products, were identified at anoxic depths at some sampling stations. Their presence was related to in situ anaerobic degradation of LAS in marine sediments, whereas the occurrence of these metabolites in freshwater sediments was attributed to the existence of wastewater sources nearby. No significant changes in the average length of AEO and NPEO ethoxylated chains were observed along the sediment cores, suggesting that their biodegradation was very limited in the sampling area. This may be directly related to their lower bioavailability, as their calculated sediment-pore water distribution coefficients (log K<sub>sw</sub>), which showed that non-ionic surfactants examined in this study had greater sorption affinity than the anionic surfactants (e.g., 2.3 ± 0.3 for NPEOs).

**Notes:** 18228946

7005

**URL:** <http://www.sciencedirect.com/science/article/pii/S004896971300541X>

**Reference Type:** Journal Article

**Record Number:** 119

**Author:** Fernández-Ramos, C., Ballesteros, O., Zafra-Gómez, A., Camino-Sánchez, F. J., Blanc, R., Navalón, A., Pérez-Trujillo, J. P. and Vílchez, J. L.

**Year:** 2014

**Title:** Evaluation of the levels of alcohol sulfates and ethoxysulfates in marine sediments near wastewater discharge points along the coast of Tenerife Island

**Journal:** Marine Pollution Bulletin

**Volume:** 79

**Pages:** 107-113

**Date:** 2014

**Short Title:** Evaluation of the levels of alcohol sulfates and ethoxysulfates in marine sediments near wastewater discharge points along the coast of Tenerife Island

**ISSN:** 0025-326X

**Keywords:** eppi-reviewer4

**Abstract:** Alcohol sulfates (AS) and alcohol ethoxysulfates (AES) are all High Production Volume and 'down-the-drain' chemicals used globally in detergent and personal care products, resulting in low levels ultimately released to the environment via wastewater treatment plant effluents. They have a strong affinity for sorption to sediments. Almost 50% of Tenerife Island surface area is environmentally protected.

Therefore, determination of concentration levels of AS/AES in marine sediments near wastewater discharge points along the coast of the Island is of interest. These data were obtained after pressurized liquid extraction and liquid chromatography–tandem mass spectrometry analysis. Short chains of AES and especially of AS dominated the homologue distribution for AES. The Principal Components Analysis was used. The results showed that the sources of AS and AES were the same and that both compounds exhibit similar behavior. Three different patterns in the distribution for homologues and ethoxymers were found.

**Notes:** 18229324

7017

**URL:** <http://www.sciencedirect.com/science/article/pii/S0025326X13007649>

**Reference Type:** Journal Article

**Record Number:** 118

**Author:** Fernandez-Ramos, C., Ballesteros, O., Zafra-Gomez, A., Camino-Sanchez, F. J., Blanc, R., Navalon, A. and Vilchez, J. L.

**Year:** 2014

**Title:** Environmental monitoring of alcohol sulfates and alcohol ethoxysulfates in marine sediments

**Journal:** Environ Sci Pollut Res Int

**Volume:** 21

**Pages:** 4286–96

**Date:** 2014

**Short Title:** Environmental monitoring of alcohol sulfates and alcohol ethoxysulfates in marine sediments

**ISSN:** 0944-1344

**DOI:** 10.1007/s11356-013-2146-3. Epub 2013 Dec 5.

**Keywords:** eppi-reviewer4

**Abstract:** The study describes the environmental monitoring of anionic surfactants–alcohol sulfates (AS) and alcohol ethoxysulfates (AES)–in marine sediments. Concentration values were obtained after pressurised liquid extraction (PLE) and liquid chromatography–tandem mass spectrometry analysis (LC-MS/MS). Samples were collected from a range of wastewater discharge points along the coast of the provinces of Huelva, Malaga, Granada and Almeria. Urban, agricultural and industrial wastewaters are discharged at the selected 38 sampling sites. Principal component analysis was carried out in order to evaluate the distribution and behaviour of these compounds in these coastal environments. Evaluation of the data revealed that the behaviour and sources of AS and AES in marine sediments are different, and that the distribution of AES depends on the length of the alkyl chain, while the number of ethoxylated units is not relevant. Additionally, the 38 sampling sites can be grouped into only two types of outfalls according to their AS distribution. The concentration of compounds in sediment samples ranged from 7.52 to 13.50 mg kg<sup>(-1)</sup> for AS, from 3.04 to 10.68 mg kg<sup>(-1)</sup> for AES-C12Ex and from 3.83 to 11.56 mg kg<sup>(-1)</sup> for AES-C14Ex.

**Notes:** 18229325

5211

**Reference Type:** Journal Article

**Record Number:** 120

**Author:** Folke, J., Cassani, G., Ferrer, J., Lopez, I., Karlsson, M. O. and Willumsen, B.

**Year:** 2003

**Title:** Linear alkylbenzene sulphonates, branched dodecylbenzene sulphonates and soap analysed in marine sediments from the Baltic Proper and Little Belt

**Journal:** Tenside, Surfactants, Detergents

**Volume:** 40

**Pages:** 17–24

**Date:** 2003

**Short Title:** Linear alkylbenzene sulphonates, branched dodecylbenzene sulphonates and soap analysed in marine sediments from the Baltic Proper and Little Belt

**Keywords:** eppi-reviewer4

**Abstract:** Sediment samples from the Baltic Proper and Little Belt were analysed through biological and chemical analysis of Linear Alkylbenzene Sulphonates (LAS), Branched Dodecylbenzene Sulphonates (BDS), soap and volatile solids of the dried sediment. Sediments from inner shipping ports consist of anaerobic sludge. The fact that BDS used in the 60ies were found in the sludge from Haderslev shipping port demonstrates that this is not a recent pollution problem. The sediments became healthier with increasing distance to all the shipping ports, having oxidised layers of a few centimetres in thickness. The chemical analysis results indicated that Danish marine sediments are not generally contaminated with LAS ( $\leq 0.1$  mg/kg d. m.). Although the study cannot pinpoint the detergent-origin of all detected soap, the concentration in relatively uncontaminated sediment is 15,000 - 40,000 times higher than the LAS concentration, which disappears rapidly with increasing distance from the shipping port. LAS concentrations at low levels can only be determined reliably using HPLC/MS. HPLC/FE detection gives results of one or two orders of magnitude higher.

**Notes:** 18229351

8089

**Cited By :**9 **Export Date:** 13 October 2015

**URL:** <http://www.scopus.com/inward/record.url?eid=2-s2.0-0037265518&partnerID=40&md5=d29264864bcc4ae9ab74a90ea0af41ad>

**Reference Type:** Journal Article

**Record Number:** 121

**Author:** French, V. A., Codi, King, Kumar, A., Northcott, G., McGuinness, K. and Parry, D.

**Year:** 2015

**Title:** Characterisation of microcontaminants in Darwin Harbour, a tropical estuary of northern Australia undergoing rapid development

**Journal:** Sci Total Environ

**Volume:** 536

**Pages:** 639-47

**Date:** 2015

**Short Title:** Characterisation of microcontaminants in Darwin Harbour, a tropical estuary of northern Australia undergoing rapid development

**ISSN:** 0048-9697

**DOI:** 10.1016/j.scitotenv.2015.07.114. Epub 2015 Aug 4.

**Keywords:** eppi-reviewer4

**Abstract:** The detection of microcontaminants in aquatic environments raises concerns about their potential to exert ecotoxicological effects and impact human health. In contrast to freshwater habitats, little information is available on environmental concentrations in urban estuarine and marine environments. This study investigated an extensive range of organic and inorganic microcontaminants in the Darwin Harbour catchment, a tropical estuary in northern Australia undergoing rapid urbanisation and industrial development. We sampled wastewater effluent and surface water from seven sites in Darwin Harbour for pharmaceuticals and personal care products, alkylphenols, hormones, pesticides, herbicides and metals. In vitro bioassays were used to estimate the (anti)estrogenic and (anti)androgenic activities of samples. Seventy-nine of 229 organic microcontaminants analysed were detected at concentrations ranging from 0.01 to 20µg/L, with acesulfame, paracetamol, cholesterol, caffeine, DEET and iopromide detected at the highest concentrations in wastewater effluent (20µg/L, 17µg/L, 11µg/L, 11µg/L, 10µg/L and 7.6µg/L, respectively). Levels of estrogenic activity ranged from estradiol equivalency quotients (EEQs) of  $<0.10$  to  $6.29 \pm 0.16$  ng/L while levels of androgenic activity ranged from dihydrotestosterone equivalency quotients (DHTEQs) of  $<3.50$  to  $138.23 \pm 3.71$  ng/L. Environmental concentrations of organic microcontaminants were comparable to ranges reported from aquatic environments worldwide with sewage effluent discharges representing the dominant source of entry into Darwin Harbour. The measured concentration range of DEET was higher than ranges reported in previous studies.

**Notes:** 18229372

5314



**Reference Type:** Journal Article

**Record Number:** 122

**Author:** Gatermann, Robert, Hühnerfuss, Heinrich, Rimkus, Gerhard, Wolf, Manfred and Franke, Stephan

**Year:** 1995

**Title:** The distribution of nitrobenzene and other nitroaromatic compounds in the North Sea

**Journal:** Marine Pollution Bulletin

**Volume:** 30

**Pages:** 221-227

**Date:** 1995

**Short Title:** The distribution of nitrobenzene and other nitroaromatic compounds in the North Sea

**ISSN:** 0025-326X

**Keywords:** eppi-reviewer4

**Abstract:** An analytical approach is presented that allows quantification of nitroaromatics below ng l<sup>-1</sup> (ppt) levels by fluid-fluid extraction and subsequent GC-AFID detection. Nitrobenzene, 1-chloro-2-nitrobenzene and other nitroaromatic compounds such as musk xylene and musk ketone, synthetic fragrances used on a large scale, were analysed in 33 North Sea water samples in concentrations between 0.05 and 2.5 ng l<sup>-1</sup>. This is the first report about the contamination of seawater with nitro musks and the distribution of nitroaromatics in the German Bight and the eastern part of the North Sea.

**Notes:** 18229447

7586

**URL:** <http://www.sciencedirect.com/science/article/pii/0025326X94001612>

**Reference Type:** Journal Article

**Record Number:** 123

**Author:** Hampel, M., Mauffret, A., Pazdro, K. and Blasco, J.

**Year:** 2012

**Title:** Anionic surfactant linear alkylbenzene sulfonates (LAS) in sediments from the Gulf of Gdansk (southern Baltic Sea, Poland) and its environmental implications

**Journal:** Environ Monit Assess

**Volume:** 184

**Pages:** 6013-23

**Date:** 2012

**Short Title:** Anionic surfactant linear alkylbenzene sulfonates (LAS) in sediments from the Gulf of Gdansk (southern Baltic Sea, Poland) and its environmental implications

**ISSN:** 0167-6369

**DOI:** 10.1007/s10661-011-2399-6. Epub 2011 Oct 18.

**Keywords:** eppi-reviewer4

**Abstract:** Linear alkylbenzene sulfonate (LAS) is a group of anionic surfactants employed in the formulation of laundry and cleaning products, with a global production rate of 4 million metric tons. Sediments from the Polish coast of the southern Baltic Sea were collected at ten stations. Total LAS concentrations, measured by high-performance liquid chromatography, were between 0.04 and 0.72 mg LAS.kg<sup>(-1)</sup> dry weight. Highest LAS concentrations were found in suspended matter collected from the Vistula River, sediment collected close to the Vistula River mouth and from the Gdansk Deep, known as the depositional area. With the obtained environmental LAS concentrations, a risk assessment for this surfactant has been carried out, based on publicly available acute and chronic toxicity data in target organisms. The results indicated that LAS could pose a low risk for the existing benthic community applying worst case scenario assessment. This is the first time that levels of LAS have been measured in environmental samples of the southern Baltic Sea.

**Notes:** 18229633

5617

**Reference Type:** Journal Article

**Record Number:** 124

**Author:** Hedgespeth Melanie, Lea, Sapozhnikova, Yelena, Pennington, Paul, Clum, Allan, Fairey, Andy and Wirth, Edward

**Year:** 2012

**Title:** Pharmaceuticals and personal care products (PPCPs) in treated wastewater discharges into Charleston Harbor, South Carolina

**Journal:** Science of The Total Environment

**Volume:** 437

**Pages:** 1-9

**Date:** 2012

**Short Title:** Pharmaceuticals and personal care products (PPCPs) in treated wastewater discharges into Charleston Harbor, South Carolina

**ISSN:** 0048-9697

**Keywords:** eppi-reviewer4

**Abstract:** This study assessed seasonal and regional trends of pharmaceuticals and personal care products (PPCPs) detected in monthly samples from two local wastewater treatment plants (WWTPs) in Charleston, South Carolina, USA, over the period of one year. Surface water of Charleston Harbor was also analyzed to examine environmental distribution in an estuarine ecosystem. Of the 19 compounds examined, 11 were quantified in wastewater influent, 9 in effluent, and 7 in surface water. Aqueous concentrations of many PPCPs were reduced by > 86% in wastewater effluent compared with influent, though some compounds showed low removal and greater effluent concentrations compared with influent (e.g. estrone and fluoxetine). Differences in effluent concentrations and estimated removal between facilities were likely related to variations in the facilities' operating procedures. Surface water concentrations were generally reduced by > 90% for those chemicals found in effluent. Additionally, there were seasonal trends that indicate reduced degradation in colder months in wastewater and surface water. To our knowledge, this is the first study examining PPCPs in the South Atlantic Bight.

**Notes:** 18229688

7626

**URL:** <http://www.sciencedirect.com/science/article/pii/S0048969712010212>

**Reference Type:** Journal Article

**Record Number:** 125

**Author:** Jonkers, N., Sousa, A., Galante-Oliveira, S., Barroso, C. M., Kohler, H. P. and Giger, W.

**Year:** 2010

**Title:** Occurrence and sources of selected phenolic endocrine disruptors in Ria de Aveiro, Portugal

**Journal:** Environ Sci Pollut Res Int

**Volume:** 17

**Pages:** 834-43

**Date:** 2010

**Short Title:** Occurrence and sources of selected phenolic endocrine disruptors in Ria de Aveiro, Portugal

**ISSN:** 0944-1344

**DOI:** 10.1007/s11356-009-0275-5. Epub 2009 Dec 17.

**Keywords:** eppi-reviewer4

**Abstract:** BACKGROUND, AIM AND SCOPE: Ria de Aveiro (Portugal) is a shallow coastal lagoon of high economic and ecological importance. Hardly any data on its chemical pollution by polar organic pollutants are available in literature. This study focused on the presence and sources of a series of phenolic endocrine-disrupting compounds (EDCs) in this area, including parabens, alkylphenolic compounds and bisphenol-A (BPA). A number of possible sources of pollution are present in the area, including the large harbours present in the lagoon, the city of Aveiro and the rivers discharging into the area. A recently constructed submarine wastewater outfall,

located a few kilometres from the lagoon inlet has also been suggested as a possible source of pollution to Ria de Aveiro in several publications. The aim of the current field study was to investigate the occurrence and main sources of phenolic endocrine disruptors in Ria de Aveiro. **MATERIALS AND METHODS:** An extensive sampling campaign was performed, with surface water and wastewater grab samples taken at over 50 locations, in duplicate on different days. Samples were treated using solid phase extraction and analysed by liquid chromatography tandem mass spectrometry. **RESULTS AND DISCUSSION:** Concentrations in lagoon water were generally low: not exceeding 20 ng/L for most analytes. Levels in river water exceeded those in the lagoon by a factor 3 to 500 (o-phenylphenol (PhP) and nonylphenoxy ethoxy acetic acids (A9PEC), respectively), with concentrations up to 700 ng/L for BPA and 7,300 ng/L for A9PEC. Samples from the harbours showed EDC levels similar to those in the rest of the lagoon, but in the city of Aveiro, elevated concentrations were observed for alkylphenol ethoxylates (A9PEO), A9PEC, PhP and BPA. Wastewater effluents showed low levels for parabens, whilst alkylphenolic compounds reached several micrograms per litre. The effluents are discharged into the ocean via a submarine outfall, but as marine water near the outfall showed slightly elevated concentrations only for A9PEO, it does not seem to be a significant source of these EDCs for the area. **CONCLUSIONS:** All the studied phenolic EDCs were detected in the study area, with high levels found in some of the rivers discharging into the lagoon, and generally low concentrations in the lagoon itself. The main sources for all investigated EDCs were the rivers Caster and Antua which discharge into the lagoon. The city of Aveiro was identified as a secondary source. As the tidal water exchange volume is much larger than the freshwater input from the rivers, concentrations of phenolic EDCs remained low in the lagoon.

**Notes:** 18229916  
5340

**Reference Type:** Journal Article

**Record Number:** 126

**Author:** Langford, K. H. and Thomas, K. V.

**Year:** 2008

**Title:** Inputs of chemicals from recreational activities into the Norwegian coastal zone

**Journal:** Journal of Environmental Monitoring

**Volume:** 10

**Pages:** 894-898

**Date:** 2008

**Short Title:** Inputs of chemicals from recreational activities into the Norwegian coastal zone

**Keywords:** eppi-reviewer4

**Abstract:** Wastewater treatment works effluent is often considered to be one of the most important point sources of a wide range of anthropogenic contaminants to aquatic systems, however, this paper discusses other potential sources. With the aim of establishing the important sources of UV filters, insect repellent and biocides to the aquatic environment, samples were collected from sites with direct (bathing areas and marinas) and indirect (sites receiving wastewater effluent) human influences.

Sunscreens containing UV filters are used in large volumes during the summer months and often applied shortly before a person enters the water for swimming activities. The results presented here demonstrate that washing directly from the skin is an important point source of 4 UV filters to the Oslofjord. The insect repellent, diethyl toluamide, was also measured and it was concluded that washing from the skin was not such an important point source into the fjord. Concentrations of the biocide Irgarol 1051 were also measured and were elevated in the small boat marina and surrounding enclosed area. This work demonstrates that mans recreational water-based activities are a diffuse source of some contaminants into coastal and fjord environments and this study provides an initial assessment of the levels being released. © The Royal Society of Chemistry.

**Notes:** 18230207  
8337

**Cited By :** 27 **Export Date:** 13 October 2015

**URL:** <http://www.scopus.com/inward/record.url?eid=2-s2.0-46449129910&partnerID=40&md5=a87ff7103bf034c5c0065d9dcb079ce4>

**Reference Type:** Journal Article

**Record Number:** 127

**Author:** Lara-Martin, P. A., Li, X., Bopp, R. F. and Brownawell, B. J.

**Year:** 2010

**Title:** Occurrence of alkyltrimethylammonium compounds in urban estuarine sediments: behentrimonium as a new emerging contaminant

**Journal:** Environ Sci Technol

**Volume:** 44

**Pages:** 7569-75

**Date:** 2010

**Short Title:** Occurrence of alkyltrimethylammonium compounds in urban estuarine sediments: behentrimonium as a new emerging contaminant

**ISSN:** 0013-936x

**DOI:** 10.1021/es101169a.

**Keywords:** eppi-reviewer4

**Abstract:** The distribution of alkyltrimethylammonium compounds (ATMAC), cationic surfactants used in a wide variety of applications, has been determined in sediments from Jamaica Bay (NY). Total concentrations in surficial sediments collected between 1998 and 2008 ranged from 361 to 6750 ng/g. The highest values were found in samples from a deeper basin directly affected by treated wastewater discharges.

Behentrimonium, a mixture dominated by a homologue having 22 carbon atoms in its alkyl chain (ATMAC 22), was identified for the first time using time-of-flight mass spectrometry and accounted for approximately 80% of the total ATMAC in recent sediment samples. Analyses of a dated sediment core and subsequent surface grab samples revealed an exponential increase in concentration over the last three decades with a doubling time of 3.9 years. Similar temporal trends were seen in surface samples from other sites in Jamaica Bay and Newton Creek (NY), another site greatly influenced by wastewater discharges. This dramatic increase in ATMAC 22 reflects greater use of behentrimonium and likely replacement of other products containing other ATMAC homologues in personal care products. Further monitoring is recommended to assess the environmental risk and fate of this persistent emerging contaminant.

**Notes:** 18230219

5491

**Reference Type:** Journal Article

**Record Number:** 128

**Author:** Long, E. R., Dutch, M., Weakland, S., Chandramouli, B. and Benskin, J. P.

**Year:** 2013

**Title:** Quantification of pharmaceuticals, personal care products, and perfluoroalkyl substances in the marine sediments of Puget Sound, Washington, USA

**Journal:** Environ Toxicol Chem

**Volume:** 32

**Pages:** 1701-10

**Date:** 2013

**Short Title:** Quantification of pharmaceuticals, personal care products, and perfluoroalkyl substances in the marine sediments of Puget Sound, Washington, USA

**ISSN:** 0730-7268

**DOI:** 10.1002/etc.2281.

**Keywords:** eppi-reviewer4

**Abstract:** Concentrations of 119 pharmaceuticals and personal care products (PPCPs) and 13 perfluoroalkyl substances (PFASs) in marine sediments measured throughout Puget Sound (n = 10) and Bellingham Bay (n = 30), Washington, USA, are reported. These data are among the first measurements of PPCPs and PFASs in marine sediments from the Pacific Northwest and provide a comparison to previous measurements of these chemicals in influent, effluent, and biosolids from municipal wastewater treatment plants throughout the region. The concentrations of both PPCPs and PFASs in sediments from

Puget Sound and Bellingham Bay ranged from very low to non-detectable for most compounds. Only 14 of the 119 PPCPs and 3 of 13 PFASs were quantifiable in sediments. Diphenhydramine (an antihistamine) was most frequently detected (87.5% of samples), with a maximum concentration of 4.81 ng/g dry weight and an estimated mean detected concentration of 1.68 ng/g. Triclocarban (an antibacterial) was detected in 35.0% of the samples, with a maximum concentration of 16.6 ng/g dry weight. Perfluoroalkyl substances were detected in 2.5% of analyses. Perfluorobutanoate, perfluorooctane sulfonate, and perfluorooctane sulfonamide were detected in 7, 5, and 1 sample(s) each, respectively, with the highest concentrations observed for perfluorooctane sulfonate (1.5 ng/g). Detected concentrations were often highest within the industrial harbor in Bellingham Bay and near the cities of Seattle and Bremerton. Environ Toxicol Chem 2013;32:1701-1710. (c) 2013 SETAC.

**Notes:** 18230433  
5121

**Reference Type:** Journal Article

**Record Number:** 129

**Author:** Okbah, M. A., Ibrahim, A. M. A. and Gamal, M. N. M.

**Year:** 2013

**Title:** Environmental monitoring of linear alkylbenzene sulfonates and physicochemical characteristics of seawater in El-Mex Bay (Alexandria, Egypt)

**Journal:** Environmental Monitoring and Assessment

**Volume:** 185

**Pages:** 3103-3115

**Date:** 2013

**Short Title:** Environmental monitoring of linear alkylbenzene sulfonates and physicochemical characteristics of seawater in El-Mex Bay (Alexandria, Egypt)

**Keywords:** eppi-reviewer4

**Abstract:** In the present work, the influence of different physicochemical characteristics on the distribution of anionic detergents, linear alkylbenzene sulfonates (LAS), was studied. Surface and bottom water samples were collected from eight different sites from a small bay near the main sewage discharge of Alexandria City (El-Max Bay). The results showed great variations in the concentrations, as a function of the regional and seasonal variations. The study revealed that the pH values lie in the normal side, with a range of 8.0-8.5 inside the bay and 7.5-7.7 at El-Umum Drain effluent. Wide variations, observed between the surface and the bottom water of the bay, salinity, dissolved oxygen, oxidizable organic matter, total hardness, and total alkalinity, were scattered in the ranges (3.33-42.73 practical salinity unit), (0.42-8.27 mg O<sub>2</sub>/l), (0.12-10.49 mg/l), (1.39-8.99 mg/l), and (0.23-0.48 mg/l), respectively. The regional variations of LAS concentrations in the bay waters showed that the concentration decreased as the distance from the source of drainage water (El-Umum Drain). The seasonal average variations of LAS cleared out that summer and spring periods had the highest concentrations at surface (0.13 ± 0.04 mg LAS/l) and bottom (0.12 ± 0.10 mg LAS/l) layer, which is attributed to increase in population density and human activities. The inverse relationships between total LAS concentration and salinity, dissolved oxygen, and calcium ions concentration are  $r = -0.78$ ,  $0.50$ , and  $0.67$ , respectively. This is related to the occurrence of the untreated wastewater containing detergents, the biodegradation rate of surfactants, and strong precipitation of LAS as Ca. © 2012 The Author(s).

**Notes:** 18230938  
8987

**Cited By :** 4 **Export Date:** 13 October 2015

**URL:** <http://www.scopus.com/inward/record.url?eid=2-s2.0-84876330334&partnerID=40&md5=88579b5ad69676396e26f40023c37e7a>

**Reference Type:** Journal Article

**Record Number:** 130

**Author:** Petrovic, M., Fernández-Alba, A. R., Borrull, F., Marce, R. M., Mazo, E. G. and Barceló, D.

**Year:** 2002

**Title:** Occurrence and distribution of nonionic surfactants, their degradation products, and linear alkylbenzene sulfonates in coastal waters and sediments in Spain

**Journal:** Environmental Toxicology and Chemistry

**Volume:** 21

**Pages:** 37-46

**Date:** 2002

**Short Title:** Occurrence and distribution of nonionic surfactants, their degradation products, and linear alkylbenzene sulfonates in coastal waters and sediments in Spain

**Keywords:** eppi-reviewer4

**Abstract:** Spain is one of the European countries that still discharges untreated wastewaters and sewage sludge to the sea. A total of 35 samples of coastal waters and 39 samples of harbor sediments was analyzed. Samples were collected from several hot spots on the Spanish coast, such as the harbors of Tarragona, Almería, and Barcelona, the mouths of the Besos and Llobregat rivers, the Bay of Cadiz, and various yacht harbors at the Mediterranean coast. A generic analytical procedure based on solid-phase extraction-liquid chromatography-atmospheric pressure chemical ionization/electrospray ionization mass spectrometry (SPE-LC-APCI/ESIMS) was employed for determining the concentrations of alcohol ethoxylates (AEO), nonylphenol ethoxylates (NPEO), coconut diethanol amides (CDEA), nonylphenoxy-monocarboxylates (NPEC), nonylphenol (NP), octylphenol (OP), and linear alkylbenzene sulfonates (LAS) in sediment and water samples. The analysis revealed the presence of considerably high concentrations of NPEOs and NP near the points of discharge of industrial and urban wastewaters. Nonylphenol was found in 47% of water samples and in 77% of all sediment samples analyzed. Values for NP ranged from  $<0.15$  to  $4.1 \mu\text{g/L}$  in seawater and from  $<8$  to  $1,050 \mu\text{g/kg}$  in sediments. Levels of AEOs and CDEAs in seawater and marine sediments are reported for the first time. Concentrations of CDEAs in sediment, which were predominated by C11 through C15 homologues, ranged from 30 to  $2,700 \mu\text{g/kg}$ , while in seawater, concentrations found were up to  $24 \mu\text{g/L}$ . The AEOs were found to accumulate in a bottom sediment and they were detected in all analyzed sediment samples in concentrations from 37 to  $1,300 \mu\text{g/kg}$ .

**Notes:** 18231123

9682

**Cited By :**98 **Export Date:** 13 October 2015

**URL:** <http://www.scopus.com/inward/record.url?eid=2-s2.0-0036137114&partnerID=40&md5=99f39bf4484d9ed7db798436c4acefb4>

**Reference Type:** Journal Article

**Record Number:** 131

**Author:** Raymundo, C. C. and Preston, M. R.

**Year:** 1992

**Title:** The distribution of linear alkylbenzenes in coastal and estuarine sediments of the western North Sea

**Journal:** Marine Pollution Bulletin

**Volume:** 24

**Pages:** 138-146

**Date:** 1992

**Short Title:** The distribution of linear alkylbenzenes in coastal and estuarine sediments of the western North Sea

**ISSN:** 0025-326X

**Keywords:** eppi-reviewer4

**Abstract:** Linear alkylbenzenes (LAB) are synthetic compounds used as precursors for the manufacture of linear alkylbenzene sulfonates (LABS) and which have been previously used as molecular tracers of sewage contamination. LABS are anionic surfactants commonly used in commercial detergents and both LAB and LABS are introduced to the aquatic environment through wastewater discharges. The present paper reports the concentrations of linear alkylbenzenes (LABs) in sediment samples from The Wash and the Thames and Humber Estuaries. The concentrations found in sediment samples from the Humber and Wash areas ranged between  $2.5$ - $84.8 \text{ ng g}^{-1}$  dry wt and their distributions follow the path of the plumes. LAB concentrations in samples from the

Thames estuary ranged from 0.10–2.3 µg g<sup>-1</sup> dry wt with the highest concentration occurring at the sludge dumping site.

**Notes:** 18231280

7613

**URL:** <http://www.sciencedirect.com/science/article/pii/0025326X9290241W>

**Reference Type:** Journal Article

**Record Number:** 132

**Author:** Sánchez, Rodríguez, Rodrigo, Sanz, Betancort, Rodríguez and J, R.

**Year:** 2015

**Title:** Occurrence of eight UV filters in beaches of Gran Canaria (Canary Islands). An approach to environmental risk assessment

**Journal:** Chemosphere

**Volume:** 131

**Pages:** 85–90

**Date:** 2015

**Short Title:** Occurrence of eight UV filters in beaches of Gran Canaria (Canary Islands). An approach to environmental risk assessment

**ISSN:** 0045–6535

**Keywords:** eppi-reviewer4

**Abstract:** Due to the growing concern about human health effects of ultraviolet (UV) radiation, the use of UV filters has increased in recent decades. Unfortunately, some common UV filters are bioaccumulated in aquatic organisms and show a potential for estrogenic activity. The aim of the present study is to determine the presence of some UV filters in the coastal waters of six beaches around Gran Canaria Island as consequence of recreational seaside activities. Eight commonly used UV filters: benzophenone–3 (BP–3), octocrylene (OC), octyl–dimethyl–PABA (OD–PABA), ethylhexyl methoxy cinnamate (EHMC), homosalate (HMS), butyl methoxydibenzoyl methane (BMDBM), 4–methylbenzylidene camphor (4–MBC) and diethylamino hydroxybenzoyl hexyl benzoate (DHHB), were monitored and, with the exception of OD–PABA, all were detected in the samples collected. 99% of the samples showed some UV filters and concentration levels reached up to 3316.7 ng/L for BP–3. Environmental risk assessment (ERA) approach showed risk quotients (RQ) higher than 10, which means that there is a significant potential for adverse effects, for 4–MBC and EHMC for those samples with highest levels of UV filters.

**Notes:** 18231452

6819

**URL:** <http://www.sciencedirect.com/science/article/pii/S004565351500168X>

**Reference Type:** Journal Article

**Record Number:** 133

**Author:** Sankoda, K., Murata, K., Tanihata, M., Suzuki, K., Nomiyama, K. and Shinohara, R.

**Year:** 2015

**Title:** Seasonal and Diurnal Variation of Organic Ultraviolet Filters from Personal Care Products Used Along the Japanese Coast

**Journal:** Archives of Environmental Contamination and Toxicology

**Volume:** 68

**Pages:** 217–224

**Date:** 2015

**Short Title:** Seasonal and Diurnal Variation of Organic Ultraviolet Filters from Personal Care Products Used Along the Japanese Coast

**Keywords:** eppi-reviewer4

**Abstract:** This study aimed to investigate the behavior of organic ultraviolet (UV) filters released by recreational activities along the Japanese coastline. Seasonal variations of organic UV filters in seawater were investigated at four different recreational beaches (Mogushi, Wakamiya, Tsurugahama, and Otachimisaki beaches) in both summer (July through August) and winter (December). Moreover, short time scale diurnal changes were monitored at Otachimisaki beach in summer. Of the four sunscreen

agents tested in this study, two agents - 2-ethylhexyl-4-methoxycinnamate (EHMC) and 2-ethylhexyl salicylate (EHS) - were detected in all samples, whereas octyl-dimethyl-p-aminobenzoic acid and 3-(4-methylbenzylidene)-camphor were lower than detection limits. In particular, EHMC, one of the most popular organic UV filters, was dominant. The highest concentration of EHMC was observed at 1,080 ng L<sup>-1</sup>, a level that exceeds those of previous studies. Both EHMC and EHS concentrations showed significant ( $p < 0.05$ ) seasonal variations with advancing summer suggesting direct input from recreational activities. The subsequent examination showed short time scale diurnal changes of organic UV filters on the beach. The results showed that diurnal changes in EHMC concentrations were correlated to the number of bathers. EHMC concentrations increased during the afternoon and decreased during the night, although complete attenuation during the night did not occur. EHMC persists along the coast due to low mobility and may persist the next day. This is the first study to show the natural attenuation behavior of organic UV filters along recreational beaches. © 2014 Springer Science+Business Media New York.©2015.

**Notes:** 18231477  
7974

**Export Date:** 13 October 2015

**URL:** <http://www.scopus.com/inward/record.url?eid=2-s2.0-84927170267&partnerID=40&md5=9847c9b2a67a2caf1e16125e84eaa505>

**Reference Type:** Journal Article

**Record Number:** 134

**Author:** Singh, S. P., Azua, A., Chaudhary, A., Khan, S., Willett, K. L. and Gardinali, P. R.

**Year:** 2010

**Title:** Occurrence and distribution of steroids, hormones and selected pharmaceuticals in South Florida coastal environments

**Journal:** Ecotoxicology

**Volume:** 19

**Pages:** 338-350

**Date:** 2010

**Short Title:** Occurrence and distribution of steroids, hormones and selected pharmaceuticals in South Florida coastal environments

**Keywords:** eppi-reviewer4

**Abstract:** The common occurrence of human derived contaminants like pharmaceuticals, steroids and hormones in surface waters has raised the awareness of the role played by the release of treated or untreated sewage in the water quality along sensitive coastal ecosystems. South Florida is home of many important protected environments ranging from wetlands to coral reefs which are in close proximity to large metropolitan cities. Because, large portions of South Florida and most of the Florida Keys population are not served by modern sewage treatment plants and rely heavily on the use of septic systems, a comprehensive survey of selected human waste contamination markers was conducted in three areas to assess water quality with respect to non-traditional micro-constituents. This study documents the occurrence and distribution of fifteen hormones and steroids and five commonly detected pharmaceuticals in surface water samples collected from different near shore environments along South Florida between 2004 and 2006. The compounds most frequently detected were: cholesterol, caffeine, estrone, DEET, coprostanol, biphenol-A,  $\beta$ -estradiol, and triclosan. The concentration detected for estrone and  $\beta$ -estradiol were up to 5.2 and 1.8 ng/L, respectively. Concentrations of caffeine (5.5-68 ng/L) and DEET (4.8-49 ng/L) were generally higher and more prevalent than were the steroids. Distribution of microconstituents was site specific likely reflecting a diversity of sources. In addition to chemical analysis, the yeast estrogen screen assay was used to screen the samples for estrogen equivalency. Overall, the results show that water collected from inland canals and restricted circulation water bodies adjacent to heavily populated areas had high concentrations of multiple steroids, pharmaceuticals, and personal care products while open bay waters were largely devoid of the target analytes. © 2009 Springer Science+Business Media, LLC.

**Notes:** 18231656



8628

Cited By :27 Export Date: 13 October 2015

URL: <http://www.scopus.com/inward/record.url?eid=2-s2.0-76849115960&partnerID=40&md5=17089efa32eb0302227e3b8a86bcbb74>

**Reference Type:** Journal Article

**Record Number:** 135

**Author:** Stalmans, M., Matthijs, E., de, Oude and N, T.

**Year:** 1991

**Title:** Fate and effect of detergent chemicals in the marine and estuarine environment

**Journal:** Water Science and Technology

**Volume:** 24

**Pages:** 115-126

**Date:** 1991

**Short Title:** Fate and effect of detergent chemicals in the marine and estuarine environment

**Keywords:** eppi-reviewer4

**Abstract:** Detergents are high-volume consumer products which are discharged directly into domestic sewage after their use. They are removed in the treatment of domestic sewage and via instream removal mechanisms in surface waters. Important removal mechanisms are biological degradation, adsorption to sediments, etc. The degree of removal mainly depends on the physico-chemical and environmental properties of the chemical and on the type of sewage treatment. The continuous removal processes, combined with the continuous discharge to surface waters via treated or untreated sewage effluents, results in the presence of detergent chemicals in surface waters, where they can further biodegrade. Detergent chemicals can thus, ultimately, enter the marine environment. Data are presented on the discharged amounts of detergent ingredients, such as surfactants and phosphates, to surface waters and to the North Sea. Furthermore, the fate and effects of a typical surfactant in the marine and estuarine environment are described. Monitoring data for one of the major anionic surfactants, Linear Alkylbenzene Sulphonate (LAS), are presented. A comparison of the measured concentrations of LAS with the concentrations, predicted on the basis of a measured dilution of the river water with sea water, shows that this surfactant continues to biodegrade under marine conditions.

**Notes:** 18231713

8470

Cited By :17 Export Date: 13 October 2015

URL: <http://www.scopus.com/inward/record.url?eid=2-s2.0-0026332726&partnerID=40&md5=4454c9f15ce646543b7899fc23830e4e>

**Reference Type:** Journal Article

**Record Number:** 136

**Author:** Sumner Nicola, R., Guitart, Carlos, Fuentes, Gustavo and Readman James, W.

**Year:** 2010

**Title:** Inputs and distributions of synthetic musk fragrances in an estuarine and coastal environment; a case study

**Journal:** Environmental Pollution

**Volume:** 158

**Pages:** 215-222

**Date:** 2010

**Short Title:** Inputs and distributions of synthetic musk fragrances in an estuarine and coastal environment; a case study

**ISSN:** 0269-7491

**Keywords:** eppi-reviewer4

**Abstract:** Synthetic musks are ubiquitous contaminants in the environment. Compartmental distributions (dissolved, suspended particle associated and sedimentary) of the compounds throughout an axial estuarine transect and in coastal waters are reported. High concentrations of Galaxolide® (HHCB) and Tonalide® (AHTN) (987-2098 ng/L and 55-159 ng/L, respectively) were encountered in final effluent samples

from sewage treatment plants (STPs) discharging into the Tamar and Plym Estuaries (UK), with lower concentrations of Celestolide® (ADBI) (4–13 ng/L), Phantolide® (AHMI) (6–9 ng/L), musk xylene (MX) (4–7 ng/L) and musk ketone (MK) (18–30 ng/L). Rapid dilution from the outfalls is demonstrated with resulting concentrations of HHCB spanning from 5 to 30 ng/L and those for AHTN from 3 to 15 ng/L. The other musks were generally not detected in the estuarine and coastal waters. The suspended particulate matter (SPM) and sedimentary profiles and compositions (HHCB:AHTN ratios) generally reflect the distribution in the water column with highest concentrations adjacent to sewage outfalls.

**Notes:** 18231765

7186

**URL:** <http://www.sciencedirect.com/science/article/pii/S026974910900356X>

**Reference Type:** Journal Article

**Record Number:** 137

**Author:** Tashiro, Yutaka and Kameda, Yutaka

**Year:** 2013

**Title:** Concentration of organic sun-blocking agents in seawater of beaches and coral reefs of Okinawa Island, Japan

**Journal:** Marine Pollution Bulletin

**Volume:** 77

**Pages:** 333–340

**Date:** 2013

**Short Title:** Concentration of organic sun-blocking agents in seawater of beaches and coral reefs of Okinawa Island, Japan

**ISSN:** 0025–326X

**Keywords:** eppi-reviewer4

**Abstract:** The concentration of UV filters (UVFs) and UV light stabilizers (UVLSs) were measured in seawater and river water collected from sites at four beaches, two reefs, and one river on Okinawa Island, Japan. UVFs and/or UVLSs of 8–10 types were detected in beaches samples and 6–9 types were detected in reef samples. The total UVF concentrations at the beach sites were highest either in July or August with a maximum of 1.4 µg L<sup>-1</sup>. The concentrations at the reef sites did not show peaks in summer and the maximum values were close to 10 ng L<sup>-1</sup>. The detected UVF profiles reflected the ingredients of sunscreens used in each region. The highest UVLS concentrations at the reefs were observed not only in summer but also in June and September. The UVLS concentrations at the reefs were similar to or even higher than that at the beaches or in the river.

**Notes:** 18231830

7204

**URL:** <http://www.sciencedirect.com/science/article/pii/S0025326X13005493>

**Reference Type:** Journal Article

**Record Number:** 138

**Author:** Tovar-Sanchez, A., Sanchez-Quiles, D., Basterretxea, G., Benede, J. L., Chisvert, A., Salvador, A., Moreno-Garrido, I. and Blasco, J.

**Year:** 2013

**Title:** Sunscreen products as emerging pollutants to coastal waters

**Journal:** PLoS One

**Volume:** 8

**Pages:** e65451

**Date:** 2013

**Short Title:** Sunscreen products as emerging pollutants to coastal waters

**ISSN:** 1932–6203

**DOI:** 10.1371/journal.pone.0065451. Print 2013.

**Keywords:** eppi-reviewer4

**Abstract:** A growing awareness of the risks associated with skin exposure to ultraviolet (UV) radiation over the past decades has led to increased use of sunscreen cosmetic products leading the introduction of new chemical compounds in the marine

environment. Although coastal tourism and recreation are the largest and most rapidly growing activities in the world, the evaluation of sunscreen as source of chemicals to the coastal marine system has not been addressed. Concentrations of chemical UV filters included in the formulation of sunscreens, such as benzophenone 3 (BZ-3), 4-methylbenzylidene camphor (4-MBC), TiO<sub>2</sub> and ZnO, are detected in nearshore waters with variable concentrations along the day and mainly concentrated in the surface microlayer (i.e. 53.6–577.5 ng L<sup>-1</sup>(1) BZ-3; 51.4–113.4 ng L<sup>-1</sup>(1) 4-MBC; 6.9–37.6 microg L<sup>-1</sup>(1) Ti; 1.0–3.3 microg L<sup>-1</sup>(1) Zn). The presence of these compounds in seawater suggests relevant effects on phytoplankton. Indeed, we provide evidences of the negative effect of sunblocks on the growth of the commonly found marine diatom *Chaetoceros gracilis* (mean EC<sub>50</sub> = 125+/-71 mg L<sup>-1</sup>(1)). Dissolution of sunscreens in seawater also releases inorganic nutrients (N, P and Si forms) that can fuel algal growth. In particular, PO<sub>4</sub>(<sup>3-</sup>) is released by these products in notable amounts (up to 17 micromol PO<sub>4</sub>(<sup>3-</sup>)g<sup>-1</sup>(1)). We conservatively estimate an increase of up to 100% background PO<sub>4</sub>(<sup>3-</sup>) concentrations (0.12 micromol L<sup>-1</sup>(1) over a background level of 0.06 micromol L<sup>-1</sup>(1) in nearshore waters during low water renewal conditions in a populated beach in Majorca island. Our results show that sunscreen products are a significant source of organic and inorganic chemicals that reach the sea with potential ecological consequences on the coastal marine ecosystem.

**Notes:** 18231899  
5124

**Reference Type:** Journal Article

**Record Number:** 139

**Author:** Traverso-Soto Juan, M., Lara-Martín Pablo, A., González-Mazo, Eduardo and León Víctor, M.

**Year:** 2015

**Title:** Distribution of anionic and nonionic surfactants in a sewage-impacted Mediterranean coastal lagoon: Inputs and seasonal variations

**Journal:** Science of The Total Environment

**Volume:** 503–504

**Pages:** 87–96

**Date:** 2015

**Short Title:** Distribution of anionic and nonionic surfactants in a sewage-impacted Mediterranean coastal lagoon: Inputs and seasonal variations

**ISSN:** 0048-9697

**Keywords:** eppi-reviewer4

**Abstract:** In this work we have monitored the seasonal inputs, occurrence and distribution of the world's most widely used surfactants (linear alkylbenzene sulfonates, LAS, nonylphenol polyethoxylates, NPEOs, and alcohol polyethoxylates, AEOs) in Mar Menor lagoon (SE Spain) and its main tributary (El Albuñón) for the first time. Concentration of target compounds was determined in both surface waters and sediments after solid phase extraction and pressurized liquid extraction, respectively, followed by liquid chromatography-mass spectrometry (LC-MS). There were significant differences in surfactant fluxes from El Albuñón towards Mar Menor depending on the season and the day of the week, with maximum estimated annual inputs being detected for LAS (406 kg) and their metabolites, sulfophenyl carboxylic acids (482 kg). Average concentrations of surfactants in the lagoon were between 44 and 1665 µg/kg in sediment, and between 0.3 and 63 µg/L in water. These levels were significantly higher for samples collected near the shore than for those measured inside the lagoon itself. Overall, the occurrence and distribution of surfactants in the system could be explained due to a combination of different sources (surface and groundwater inputs, treated and untreated wastewater effluents, towns, ports, etc.) and simultaneous in-situ physicochemical and biological processes, with an special emphasis on degradation during warmer months.

**Notes:** 18231915

7032

**URL:** <http://www.sciencedirect.com/science/article/pii/S0048969714009802>

**Reference Type:** Journal Article

**Record Number:** 141

**Author:** Tsui Mirabelle, M. P., Leung, H. W., Kwan Billy, K. Y., Ng, Ka-Yan, Yamashita, Nobuyoshi, Taniyasu, Sachi, Lam Paul, K. S. and Murphy Margaret, B.

**Year:** 2015

**Title:** Occurrence, distribution and ecological risk assessment of multiple classes of UV filters in marine sediments in Hong Kong and Japan

**Journal:** Journal of Hazardous Materials

**Volume:** 292

**Pages:** 180-187

**Date:** 2015

**Short Title:** Occurrence, distribution and ecological risk assessment of multiple classes of UV filters in marine sediments in Hong Kong and Japan

**ISSN:** 0304-3894

**Keywords:** eppi-reviewer4

**Abstract:** Organic ultraviolet (UV) filters are used widely in various personal care products and their ubiquitous occurrence in the aquatic environment has been reported in recent years. However, data on their fate and potential impacts in marine sediments is limited. This study reports the occurrence and risk assessment of eleven widely used organic UV filters in marine sediment collected in Hong Kong and Tokyo Bay. Seven of the 11 target UV filters were detected in all sediment samples (median concentrations: <math>\lt;MLOD-21\text{ ng/g dry weight}</math>) with detection frequencies higher in the wet season than in the dry season. Composition profiles showed that BMDM, EHMC and ODPABA were the predominant compounds, accounting for more than 60% of the total UV filter occurrence; this was likely due to their relatively higher octanol-water partition coefficients. Probabilistic ecological risk assessment showed that the likelihood of EHMC causing toxic effects on reproduction in snails was over 84% and 32% based on toxicity data for two species, respectively, suggesting potential risks of UV filters to benthic organisms and possible wider effects on the marine food web. However, more toxicity data for sediment organisms is necessary for better risk assessment of these compounds in benthic communities.

**Notes:** 18231936

6762

**URL:** <http://www.sciencedirect.com/science/article/pii/S0304389415002137>

**Reference Type:** Journal Article

**Record Number:** 140

**Author:** Tsui, M. M. P., Leung, H. W., Wai, T. C., Yamashita, N., Taniyasu, S., Liu, W., Lam, P. K. S. and Murphy, M. B.

**Year:** 2014

**Title:** Occurrence, distribution and ecological risk assessment of multiple classes of UV filters in surface waters from different countries

**Journal:** Water Research

**Volume:** 67

**Pages:** 55-65

**Date:** 2014

**Short Title:** Occurrence, distribution and ecological risk assessment of multiple classes of UV filters in surface waters from different countries

**Keywords:** eppi-reviewer4

**Abstract:** Organic UV filters are common ingredients of personal care products (PCPs), but little is known about their distribution in and potential impacts to the marine environment. This study reports the occurrence and risk assessment of twelve widely used organic UV filters in surface water collected in eight cities in four countries (China, the United States, Japan, and Thailand) and the North American Arctic. The number of compounds detected, Hong Kong (12), Tokyo (9), Bangkok (9), New York (8), Los Angeles (8), Arctic (6), Shantou (5) and Chaozhou (5), generally increased with population density. Median concentrations of all detectable UV filters were <math><250\text{ng/L}</math>. The presence of these compounds in the Arctic is likely due to a combination of inadequate wastewater treatment and long-range oceanic transport. Principal component analysis (PCA) and two-way analysis of variance (ANOVA) were conducted to explore

spatiotemporal patterns and difference in organic UV filter levels in Hong Kong. In general, spatial patterns varied with sampling month and all compounds showed higher concentrations in the wet season except benzophenone-4 (BP-4). Probabilistic risk assessment showed that 4-methylbenzylidene camphor (4-MBC) posed greater risk to algae, while benzophenone-3 (BP-3) and ethylhexyl methoxycinnamate (EHMC) were more likely to pose a risk to fishes and also posed high risk of bleaching in hard corals in aquatic recreational areas in Hong Kong. This study is the first to report the occurrence of organic UV filters in the Arctic and provides a wider assessment of their potential negative impacts in the marine environment. © 2014 Elsevier Ltd.

**Notes:** 18231938

7907

Cited By :5 Export Date: 13 October 2015

URL: <http://www.scopus.com/inward/record.url?eid=2-s2.0-84907568077&partnerID=40&md5=fd8ede7695cfd518bb96ad6364c88646>

**Reference Type:** Journal Article

**Record Number:** 142

**Author:** Weigel, S., Berger, U., Jensen, E., Kallenborn, R., Thoresen, H. and Hühnerfuss, H.

**Year:** 2004

**Title:** Determination of selected pharmaceuticals and caffeine in sewage and seawater from Tromsø/Norway with emphasis on ibuprofen and its metabolites

**Journal:** Chemosphere

**Volume:** 56

**Pages:** 583-592

**Date:** 2004

**Short Title:** Determination of selected pharmaceuticals and caffeine in sewage and seawater from Tromsø/Norway with emphasis on ibuprofen and its metabolites

**Keywords:** eppi-reviewer4

**Abstract:** Selected pharmaceuticals, among them analgesics,  $\beta$ -blockers and anti-depressants as well as caffeine, the anti-bacterial triclosan and the insect repellent N,N-diethyl-3-toluamide (DEET) were determined in different sewage samples (sewage treatment plants, hospital effluents) from Tromsø/Norway and in seawater from Tromsø-Sound, into which the sewage is discharged. While caffeine, triclosan, ibuprofen and its major metabolites hydroxy- and carboxy-ibuprofen were present in all sewage samples, additional pharmaceuticals were observed in sewage containing hospital effluents. Concentrations were in the range of 20-293  $\mu\text{g/l}$  (caffeine), 0.2-2.4  $\mu\text{g/l}$  (triclosan) and 0.1-20  $\mu\text{g/l}$  ( $\Sigma$ ibuprofen+metabolites). In seawater, only caffeine (7-87 ng/l), DEET (0.4-13 ng/l) and ibuprofen+metabolites (sum concentration < LOQ-7.7 ng/l) were detected. Ibuprofen and its metabolites hydroxy- and carboxy-ibuprofen were quantified individually by use of the respective reference compounds. Relative amounts of the three compounds were determined in different types of water showing characteristic patterns, with hydroxy-ibuprofen being the major component in sewage whereas carboxy-ibuprofen was dominant in seawater samples. The patterns which were compared to those observed in similar samples from Germany indicated different transformation behaviour under limnic and marine conditions. © 2004 Elsevier Ltd. All rights reserved.

**Notes:** 18232118

9244

Cited By :209 Export Date: 13 October 2015

URL: <http://www.scopus.com/inward/record.url?eid=2-s2.0-2942718830&partnerID=40&md5=3ce935e2706481c8f2459a88f6857358>

**Reference Type:** Journal Article

**Record Number:** 143

**Author:** Zoller, U.

**Year:** 1992

**Title:** Distribution and survival of nonionic surfactants in the surface, sea and groundwater of Israel

**Journal:** Journal of Environmental Science and Health – Part A Environmental Science and Engineering

**Volume:** 27

**Pages:** 1521–1533

**Date:** 1992

**Short Title:** Distribution and survival of nonionic surfactants in the surface, sea and groundwater of Israel

**Keywords:** eppi-reviewer4

**Abstract:** The transport, distribution, and survival of organic detergent pollutants from point and nonpoint sources in rivers, sea, and groundwater is an issue of major concern worldwide. Preliminary studies conducted in Israel have indicated that, thus far, in spite of what has been done, both surface and groundwaters are contaminated by surfactants, especially the nonbiodegradable ('hard'), nonionic detergents. These findings suggest that laundry detergent formulations are a causal factor. The transport, distribution, and survival of organic detergent pollutants from point and nonpoint sources in rivers, sea, and groundwater is an issue of major concern worldwide. Preliminary studies conducted in Israel have indicated that, thus far, in spite of what has been done, both surface and groundwaters are contaminated by surfactants, especially the nonbiodegradable ('hard'), nonionic detergents. These findings suggest that laundry detergent formulations are a causal factor.

**Notes:** 18232430

9003

**Cited By :**10 **Export Date:** 13 October 2015

**URL:** <http://www.scopus.com/inward/record.url?eid=2-s2.0-0026908695&partnerID=40&md5=a8b91a553754f4e0756d88b7e0798dd3>

**Reference Type:** Journal Article

**Record Number:** 144

**Author:** Zoller, U. and Hushan, M.

**Year:** 2000

**Title:** The nonionic surfactant pollution profile of Israel's Mediterranean Sea coastal water

**Journal:** Water Science and Technology

**Volume:** 42

**Pages:** 429–435

**Date:** 2000

**Short Title:** The nonionic surfactant pollution profile of Israel's Mediterranean Sea coastal water

**Keywords:** eppi-reviewer4

**Abstract:** Anionic and nonionic surfactants, as core components of detergent formulations, contribute significantly to the pollution profile of sewage and wastewaters of all kinds. In Israel about 15% of the total amount of ca.  $4 \times 10^8$  m<sup>3</sup>/year of sewage is discharged, directly, or via receiving streams/rivers, into the Mediterranean Sea. Based on our previous findings that about 85% of the nonionic surfactants in the country sewage are nonbiodegradable alkylphenol-based ethoxylates, we have undertaken this study, aimed at mapping the receiving eastern Mediterranean seawater with respect to its nonionic surfactant pollution profile. The total concentrations of nonionic surfactants were found – via reverse phase HPLC determinations – to be within the range of 4.2–25.0 ppb in seawater samples taken 2–3 m off the coastline at those locations where sewage-containing streams flow into the sea. Thus, neither the existing sewage treatment facilities nor natural biodegradation processes in receiving surface water systems are capable of avoiding this coastal water pollution. The potential estrogenic health risk of such concentrations of the anthropogenic EPEOs is dependent, among other factors, on their specific homological distribution, biodegradation rate (slower for those having  $> 10$  E0 units) and survival. Anionic and nonionic surfactants, as core components of detergent formulations, contribute significantly to the pollution profile of sewage and wastewaters of all kinds. In Israel about 15% of the total amount of ca.  $4 \times 10^8$  m<sup>3</sup>/year of sewage is discharged, directly, or via receiving streams/rivers, into the Mediterranean Sea. Based on our previous findings that about 85% of the nonionic

surfactants in the country sewage are nonbiodegradable alkyphenol-based ethoxylates, we have undertaken this study, aimed at mapping the receiving eastern Mediterranean seawater with respect to its nonionic surfactant pollution profile. The total concentration of nonionic surfactants were found - via reverse phase HPLC determinations - to be within the range of 4.2-25.0 ppb in seawater samples taken 2-3 m off the coastline at those locations where sewage-containing streams flow into the sea. Thus, neither the existing sewage treatment facilities nor natural biodegradation processes in receiving surface water systems are capable of avoiding this coastal water pollution. The potential estrogenic health risk of such concentrations of the anthropogenic EPEOs is dependent, among other factors, on their specific homological distribution, biodegradation rate (slower for those having > 10 E0 units) and survival. Seawater samples were collected along the Mediterranean coast of Israel, and the total concentration of nonionic surfactants was determined using reverse-phase high-performance liquid chromatography. The total concentration of nonionic surfactants ranged 4.2-25.0 ppb within 2-3 m of the coastline. Highest concentrations were noted at locations impacted by sewage-containing stream flows. (from Int Assoc on Water Qual/et al 7th Int Conf on Israel Society for Ecology and Environ Quality Sciences, Jerusalem (Jun 13-18, 99)).

**Notes:** 18232432

9045

Cited By :10 Export Date: 13 October 2015

URL: <http://www.scopus.com/inward/record.url?eid=2-s2.0-0033833652&partnerID=40&md5=248c12b1c8318fbdefbfc40d11e2a9c8>

**Reference Type:** Journal Article

**Record Number:** 145

**Author:** Zoller, U. and Hushan, M.

**Year:** 2001

**Title:** The nonionic surfactant pollution profile of Israel Mediterranean Sea coastal water

**Journal:** Water Science and Technology

**Volume:** 43

**Pages:** 245-250

**Date:** 2001

**Short Title:** The nonionic surfactant pollution profile of Israel Mediterranean Sea coastal water

**Keywords:** eppi-reviewer4

**Abstract:** Anionic and nonionic surfactants, as core components of detergent formulations, contribute significantly to the pollution profile of sewage and wastewaters of all kinds. In Israel about 15% of the total amount of ca.  $4 \times 10^8$  m<sup>3</sup>/year of sewage is discharged, directly, or via receiving streams/rivers, into the Mediterranean Sea. Based on our previous findings that about 85% of the nonionic surfactants in the country's sewage are nonbiodegradable alkylphenol-based ethoxylates, we have undertaken this study, aiming at mapping the receiving eastern Mediterranean seawater with respect to its nonionic surfactant pollution profile. The total concentrations of nonionic surfactants were found - via reverse phase HPLC determinations - to be within the range of 4.2-25.0 ppb in seawater samples taken 2-3 m off the coastline at those locations where sewage-containing streams flow into the sea. Thus, neither the existing sewage treatment facilities nor natural biodegradation processes in receiving surface water systems are capable of avoiding this coastal water pollution. The potential estrogenic health risk of such concentrations of the anthropogenic EPEOs is dependent, among other things, on their specific homological distribution, biodegradation rate (slower for those having > 10 E0 units) and survival.

**Notes:** 18232433

8796

Cited By :10 Export Date: 13 October 2015

URL: <http://www.scopus.com/inward/record.url?eid=2-s2.0-0035032460&partnerID=40&md5=469b2a9adee69010827291c8fe6344f3>





## Review articles on PCPs that mention marine systems

**Reference Type:** Journal Article

**Record Number:** 157

**Year:** 2014

**Title:** UV absorber used in cosmetics and detergents is highly toxic to corals

**Journal:** Focus on Surfactants

**Volume:** 2014

**Pages:** 5

**Date:** 2014

**Short Title:** UV absorber used in cosmetics and detergents is highly toxic to corals

**ISSN:** 1351-4210

**Keywords:** eppi-reviewer4

**Abstract:** A team of marine scientists from the USA and Israel published a study demonstrating that a common UV absorber found in more than 380 different product lines of soaps, laundry detergents, cosmetics and body fragrances is highly toxic to corals. This chemical, benzophenone-2, commonly known as BP-2, is released into the environment through discharges from municipal, residential and boat/ship waste-water and sewage. BP-2 is similar to oxybenzone, the active ingredient found in many sunscreen lotions. It is not removed from most municipal wastewater treatment facilities, and for many islands in the Caribbean, as well as in the IndoPacific, this discharge is often released within 500 yards of near-shore coral reefs. Residential septic systems and cesspits can also be major contributors to releasing BP-2 onto near-shore coral reefs. Growing human population and activity in the Caribbean and IndoPacific (eg Hawaii, Maldives) also means increased waste water pollution in the coral reef environment, suggesting that BP-2 levels have increased over time.

**Notes:** 18228174

6839

**URL:** <http://www.sciencedirect.com/science/article/pii/S1351421014700964>

**Reference Type:** Journal Article

**Record Number:** 146

**Author:** Ai, J., Jianying, Hu, Jianxian, S. and Jiachen, S.

**Year:** 2009

**Title:** Pharmaceuticals and personal care products (PPCPs) in environment

**Journal:** Progress in Chemistry

**Volume:** 21

**Pages:** 389-399

**Date:** 2009

**Short Title:** Pharmaceuticals and personal care products (PPCPs) in environment

**Keywords:** eppi-reviewer4

**Abstract:** There is increasing concern about pharmaceuticals and personal care products (PPCPs) during the last decade due to their environmental occurrence and potential physiological effects. These compounds can be continually discharged into the environment primarily via untreated and treated sewage since current wastewater treatment plant can not completely remove them. This results in chronic low concentration exposure of aquatic organisms by PPCPs, which potentially hazard the ecological system and human health. This paper reviews current studies on the environmental analytical methods, occurrence, fates in the wastewater treatment process, potential ecological impacts, and preliminary risk assessment of PPCPs.

**Notes:** 18228272

8158

**Cited By :** 2 **Export Date:** 13 October 2015

**URL:** <http://www.scopus.com/inward/record.url?eid=2-s2.0-67650692468&partnerID=40&md5=5230a3cee9cfa34da17e524ca17086a7>

**Reference Type:** Journal Article

**Record Number:** 147

**Author:** Arpin-Pont, L., Bueno, M. J. M., Gomez, E. and Fenet, H.

**Year:** 2014

**Title:** Occurrence of PPCPs in the marine environment: a review

**Journal:** Environmental Science and Pollution Research

**Date:** 2014

**Short Title:** Occurrence of PPCPs in the marine environment: a review

**Keywords:** eppi-reviewer4

**Abstract:** Little research has been conducted on the occurrence of pharmaceuticals and personal care products (PPCPs) in the marine environment despite being increasingly impacted by these contaminants. This article reviews data on the occurrence of PPCPs in seawater, sediment, and organisms in the marine environment. Data pertaining to 196 pharmaceuticals and 37 personal care products reported from more than 50 marine sites are analyzed while taking sampling strategies and analytical methods into account. Particular attention is focused on the most frequently detected substances at highest concentrations. A snapshot of the most impacted marine sites is provided by comparing the highest concentrations reported for quantified substances. The present review reveals that: (i) PPCPs are widespread in seawater, particularly at sites impacted by anthropogenic activities, and (ii) the most frequently investigated and detected molecules in seawater and sediments are antibiotics, such as erythromycin. Moreover, this review points out other PPCPs of concern, such as ultraviolet filters, and underlines the scarcity of data on those substances despite recent evidence on their occurrence in marine organisms. The exposure of marine organisms in regard to these insufficient data is discussed. © 2014 Springer-Verlag Berlin Heidelberg

**Notes:** 18228377

8124

**Export Date:** 13 October 2015 Article in Press

**URL:** <http://www.scopus.com/inward/record.url?eid=2-s2.0-84908528655&partnerID=40&md5=3db393664724d047dd39466a01653878>

**Reference Type:** Journal Article

**Record Number:** 148

**Author:** Błędzka, D., Gromadzińska, J. and Wasowicz, W.

**Year:** 2014

**Title:** Parabens. From environmental studies to human health

**Journal:** Environment International

**Volume:** 67

**Pages:** 27-42

**Date:** 2014

**Short Title:** Parabens. From environmental studies to human health

**Keywords:** eppi-reviewer4

**Abstract:** Parabens are a group of substances commonly employed as preservatives, mainly in personal care products, pharmaceuticals and food. Scientific reports concerning their endocrine disrupting potential and the possible link with breast cancer raised wide discussion about parabens' impact and safety. This paper provides holistic overview of paraben usage, occurrence in the environment, methods of their degradation and removal from aqueous solution, as well as hazards related to their endocrine disrupting potential and possible involvement in carcinogenesis. © 2014 Elsevier Ltd.

**Notes:** 18228585

7837

**Cited By :**16 **Export Date:** 13 October 2015

**URL:** <http://www.scopus.com/inward/record.url?eid=2-s2.0-84896312766&partnerID=40&md5=6070c663dc6837237b9c29be095c3a54>

**Reference Type:** Journal Article

**Record Number:** 149

**Author:** Blitz Jason, B. and Norton Scott, A.

**Year:** 2008

**Title:** Possible environmental effects of sunscreen run-off  
**Journal:** Journal of the American Academy of Dermatology  
**Volume:** 59  
**Pages:** 898  
**Date:** 2008  
**Short Title:** Possible environmental effects of sunscreen run-off  
**ISSN:** 0190-9622  
**Keywords:** eppi-reviewer4

**Abstract:** Letter to the Editor: We would like to add another perspective to Forestier's article on sunscreen development published in the Journal's May 2008 supplement. 1 He identified the need for further development of ultraviolet light (UV) filters that provide balanced protection against both UVA and UVB solar radiation. We believe that these efforts should also consider the potential environmental effects of sunscreens. Run-off of pharmaceutical products, especially antibiotics and hormonal agents used in both human and veterinary medicine, have had significant unanticipated environmental effects. Recent investigations suggest that run-off of personal care products (PCPs), including sunscreens, may have similar consequences. 2, 3 and 4 The US Environmental Protection Agency regards UV filters as environmental contaminants because they are measurable in many aquatic ecosystems.5 and 6 Environmental risk assessments show that current levels of filtering agents can have deleterious effects at microscopic and macroscopic levels.4, 5, 6, 7 and 8 Sunscreen agents that are dispersed in bodies of water decrease the penetration of UV light, which in turn affects aquatic organisms that depend on light for metabolic and reproductive functions.5, 6, 7 and 8 A recent study showed certain cosmetic sunscreen agents (3-benzylidene camphor and 4-methylbenzylidene camphor) disrupt the androgen and estrogen balance in laboratory rats and their progeny.8 The experiment's exposure levels of 4-methylbenzylidene were consistent with amounts detected in freshwater fish in Swiss lakes.5 and 8 In addition, an in situ study of oceanic coral showed that sunscreen agents can deplete symbiotic zooxanthellae, the microscopic algae that provide the photosynthesis essential for coral's growth. Without these symbionts, the coral becomes bleached, which further disrupts marine ecosystems.4 To date, relatively little attention has been directed at the potential long-term direct and indirect effects that PCPs have on the health of the environment and human populations. As the controversies regarding the health benefits and risks associated with sun exposure continue,9 we recommend including the inadvertent effects of PCPs on the environment and on human populations in these discussions.

**Notes:** 18228588  
7079

**URL:** <http://www.sciencedirect.com/science/article/pii/S019096220800738X>

**Reference Type:** Journal Article

**Record Number:** 150

**Author:** Brausch John, M. and Rand Gary, M.

**Year:** 2011

**Title:** A review of personal care products in the aquatic environment: Environmental concentrations and toxicity

**Journal:** Chemosphere

**Volume:** 82

**Pages:** 1518-1532

**Date:** 2011

**Short Title:** A review of personal care products in the aquatic environment: Environmental concentrations and toxicity

**ISSN:** 0045-6535

**Keywords:** eppi-reviewer4

**Abstract:** Considerable research has been conducted examining occurrence and effects of human use pharmaceuticals in the aquatic environment; however, relatively little research has been conducted examining personal care products although they are found more often and in higher concentrations than pharmaceuticals. Personal care products are continually released into the aquatic environment and are biologically active and persistent. This article examines the acute and chronic toxicity data available for

personal care products and highlights areas of concern. Toxicity and environmental data were synergized to develop a preliminary hazard assessment in which only triclosan and triclocarban presented any hazard. However, numerous PCPs including triclosan, paraben preservatives, and UV filters have evidence suggesting endocrine effects in aquatic organisms and thus need to be investigated and incorporated in definitive risk assessments. Additional data pertaining to environmental concentrations of UV filters and parabens, in vivo toxicity data for parabens, and potential for bioaccumulation of PCPs needs to be obtained to develop definitive aquatic risk assessments.

**Notes:** 18228637

6838

**URL:** <http://www.sciencedirect.com/science/article/pii/S0045653510013007>

**Reference Type:** Journal Article

**Record Number:** 151

**Author:** Careghini, A., Mastorgio, A. F., Saponaro, S. and Sezenna, E.

**Year:** 2015

**Title:** Bisphenol A, nonylphenols, benzophenones, and benzotriazoles in soils, groundwater, surface water, sediments, and food: a review

**Journal:** Environmental Science and Pollution Research

**Volume:** 22

**Pages:** 5711-5741

**Date:** 2015

**Short Title:** Bisphenol A, nonylphenols, benzophenones, and benzotriazoles in soils, groundwater, surface water, sediments, and food: a review

**Keywords:** eppi-reviewer4

**Abstract:** Contaminants of emerging concern (CECs) are not commonly monitored in the environment, but they can enter the environment from a variety of sources. The most worrying consequence of their wide use and environmental diffusion is the increase in the possible exposure pathways for humans. Moreover, knowledge of their behavior in the environment, toxicity, and biological effects is limited or not available for most CECs. The aim of this work is to edit the state of the art on few selected CECs having the potential to enter the soil and aquatic systems and cause adverse effects in humans, wildlife, and the environment: bisphenol A (BPA), nonylphenol (NP), benzophenones (BPs), and benzotriazole (BT). Some reviews are already available on BPA and NP, reporting about their behavior in surface water and sediments, but scarce and scattered information is available about their presence in soil and groundwater. Only a few studies are available about BPs and BT in the environment, in particular in soil and groundwater. This work summarizes the information available in the literature about the incidence and behavior of these compounds in the different environmental matrices and food. In particular, the review focuses on the physical-chemical properties, the environmental fate, the major degradation byproducts, and the environmental evidence of the selected CECs. © 2014, The Author(s).

**Notes:** 18228738

8130

**Cited By :** 6 **Export Date:** 13 October 2015

**URL:** <http://www.scopus.com/inward/record.url?eid=2-s2.0-84934917903&partnerID=40&md5=98056b709fafdc7d268706c3f92bddd4>

**Reference Type:** Journal Article

**Record Number:** 152

**Author:** Gago-Ferrero, P., Díaz-Cruz, M. S. and Barceló, D.

**Year:** 2012

**Title:** An overview of UV-absorbing compounds (organic UV filters) in aquatic biota

**Journal:** Analytical and Bioanalytical Chemistry

**Volume:** 404

**Pages:** 2597-2610

**Date:** 2012

**Short Title:** An overview of UV-absorbing compounds (organic UV filters) in aquatic biota

**Keywords:** eppi-reviewer4

**Abstract:** The purpose of this article is to summarize biological monitoring information on UV-absorbing compounds, commonly referred as organic UV filters or sunscreen agents, in aquatic ecosystems. To date a limited range of species (macroinvertebrates, fish, and birds), habitats (lakes, rivers, and sea), and compounds (benzophenones and camphors) have been investigated. As a consequence there is not enough data enabling reliable understanding of the global distribution and effect of UV filters on ecosystems. Both liquid chromatography and gas chromatography coupled with mass spectrometry-based methods have been developed and applied to the trace analysis of these pollutants in biota, enabling the required selectivity and sensitivity. As expected, the most lipophilic compounds occur most frequently with concentrations up to 7112 ng g<sup>-1</sup> lipids in mussels and 3100 ng g<sup>-1</sup> lipids (homosalate) in fish. High concentrations have also been reported for 4-methylbenzilidenecamphor (up to 1800 ng g<sup>-1</sup> lipids) and octocrylene (2400 ng g<sup>-1</sup> lipids). Many fewer studies have evaluated the potential bioaccumulation and biomagnification of these compounds in both fresh and marine water and terrestrial food webs. Estimated biomagnification factors suggest biomagnification in predator-prey pairs, for example bird-fish and fish-invertebrates. Ecotoxicological data and preliminary environmental assessment of the risk of UV filters are also included and discussed. © Springer-Verlag 2012.

**Notes:** 18229402

7971

Cited By :26 Export Date: 13 October 2015

**URL:** <http://www.scopus.com/inward/record.url?eid=2-s2.0-84870899965&partnerID=40&md5=ee6676b9aad95cde26792607391a80e3>

**Reference Type:** Journal Article

**Record Number:** 153

**Author:** Hontela, A. and Habibi, H. R.

**Year:** 2013

**Title:** Personal Care Products in the Aquatic Environment: A Case Study on the Effects of Triclosan in Fish

**Journal:** Fish Physiology

**Volume:** 33

**Pages:** 411-437

**Date:** 2013

**Short Title:** Personal Care Products in the Aquatic Environment: A Case Study on the Effects of Triclosan in Fish

**Keywords:** eppi-reviewer4

**Abstract:** Pharmaceuticals and personal care products (PPCPs) are widely used by individuals for health or cosmetic reasons, or by industries such as agrifood and business to promote growth or protect the health of production animals. These chemicals include a huge variety of therapeutic drugs for humans, veterinary drugs, fragrances, and cosmetics. Among these and the focus of this chapter are chemicals used for preventing the growth of bacteria and other pathogens. Here, as a case study, we consider triclosan (TCS), a chlorinated phenoxy phenol that is a potent antibacterial and antifungal chemical. TCS is used in many personal care products, including shampoos, toothpaste, deodorants, and liquid soaps, in textiles used for sport clothing, as well as in plastic and polymers for medical uses. It is considered relatively safe to humans, although there are emerging concerns about the development of bacterial resistance and heightened sensitivity to allergens. In this chapter we consider its no-target effects on fishes. Similar to other personal care products, TCS enters municipal waste and, although the majority of the TCS is removed from the wastewater treatment plant (WWTP) effluents, some TCS enters surface waters. TCS has the potential to bioaccumulate in aquatic organisms and exert adverse physiological effects. Algae are extremely sensitive to TCS, with growth inhibition occurring at concentrations measured in surface waters. Fish are similarly negatively affected by TCS, with notable reproductive and developmental effects, including lower hatchability of eggs, delayed time to hatching, and reduction in swim performance being reported.

Some of the TCS effects occur through disruption of the thyroid axis. Even though the effects in fish generally occur at TCS concentrations higher than those measured in the environment, the concern is that the potential for increasing environmental concentrations of TCS is significant because it is still used in many products worldwide. Indeed, the use of TCS is being reevaluated in several OECD countries because of growing evidence concerning its potential to exert adverse effects on fish and other aquatic organisms. © 2014 Elsevier Inc.

**Notes:** 18229742  
7856

**Cited By :**1 Export Date: 13 October 2015

**URL:** <http://www.scopus.com/inward/record.url?eid=2-s2.0-84890146635&partnerID=40&md5=a60ede028ff2727f9f6c4a68775a5458>

**Reference Type:** Journal Article

**Record Number:** 154

**Author:** Liu, J. L. and Wong, M. H.

**Year:** 2013

**Title:** Pharmaceuticals and personal care products (PPCPs): A review on environmental contamination in China

**Journal:** Environment International

**Volume:** 59

**Pages:** 208-224

**Date:** 2013

**Short Title:** Pharmaceuticals and personal care products (PPCPs): A review on environmental contamination in China

**Keywords:** eppi-reviewer4

**Abstract:** Pharmaceuticals and personal care products (PPCPs) which contain diverse organic groups, such as antibiotics, hormones, antimicrobial agents, synthetic musks, etc., have raised significant concerns in recently years for their persistent input and potential threat to ecological environment and human health. China is a large country with high production and consumption of PPCPs for its economic development and population growth in recent years. This may result in PPCP contamination in different environmental media of China. This review summarizes the current contamination status of different environment media, including sewage, surface water, sludge, sediments, soil, and wild animals, in China by PPCPs. The human body burden and adverse effects derived from PPCPs are also evaluated. Based on this review, it has been concluded that more contamination information of aquatic environment and wildlife as well as human body burden of PPCPs in different areas of China is urgent. Studies about their environmental behavior and control technologies need to be conducted, and acute and chronic toxicities of different PPCP groups should be investigated for assessing their potential ecological and health risks. © 2013.

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**Reference Type:** Journal Article

**Record Number:** 155

**Author:** Overturf, M. D., Anderson, J. C., Pandelides, Z., Beyger, L. and Holdway, D. A.

**Year:** 2015

**Title:** Pharmaceuticals and personal care products: A critical review of the impacts on fish reproduction

**Journal:** Critical Reviews in Toxicology

**Volume:** 45

**Pages:** 492-530

**Date:** 2015

**Short Title:** Pharmaceuticals and personal care products: A critical review of the impacts on fish reproduction

**Keywords:** eppi-reviewer4

**Abstract:** Research in environmental toxicology involving pharmaceuticals and personal care products (PPCPs) has increased greatly over the last 10–15 years. Much research has been focused on the endocrine-disrupting potential of PPCPs, as they relate to negative population impacts of aquatic organisms. This review assesses the current data on the reported effects of PPCPs on fish reproduction with an emphasis on fecundity, a predictor of population effects. Studies of both individual PPCPs and PPCP mixtures are presented. As the majority of individual PPCP studies reviewed demonstrate negative effects on fish fecundity, we relate these findings to detected surface water concentrations of these compounds. Very few studies involving PPCP mixtures have been conducted; however, the need for these types of studies is warranted as fish are most likely exposed to mixtures of PPCPs in the wild. In addition, laboratory and field assessments of wastewater treatment plant (WWTP) effluents, a major source of PPCPs, are reviewed. Much of the data provided from these assessments are variable and do not generally demonstrate negative impacts on reproduction, or the studies are unable to directly associate observed effects with WWTP effluents. Finally, future research considerations are outlined to provide an avenue into understanding how wild populations of fish are affected by PPCPs. These considerations are aimed at determining the adaptation potential of fish exposed to mixtures of PPCPs over multiple generations. As global use of PPCPs continually rises, the need to discern the effects of chronic exposure to PPCPs is greatly increased. © 2015 Informa Healthcare USA, Inc.

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**Reference Type:** Journal Article

**Record Number:** 156

**Author:** Sánchez-Quiles, David and Tovar-Sánchez, Antonio

**Year:** 2015

**Title:** Are sunscreens a new environmental risk associated with coastal tourism?

**Journal:** Environment International

**Volume:** 83

**Pages:** 158–170

**Date:** 2015

**Short Title:** Are sunscreens a new environmental risk associated with coastal tourism?

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**Keywords:** eppi-reviewer4

**Abstract:** The world coastal-zone population and coastal tourism are expected to grow during this century. Associated with that, there will be an increase in the use of sunscreens and cosmetics with UV-filters in their formulation, which will make coastal regions worldwide susceptible to the impact of these cosmetics. Recent investigations indicate that organic and inorganic UV-filters, as well as many other components that are constituents of the sunscreens, reach the marine environment – directly as a consequence of water recreational activities and/or indirectly from wastewater treatment plants (WWTP) effluents. Toxicity of organic and inorganic UV filters has been demonstrated in aquatic organism. UV-filters inhibit growth in marine phytoplankton and tend to bioaccumulate in the food webs. These findings together with coastal tourism data records highlight the potential risk that the increasing use of these cosmetics would have in coastal marine areas. Nevertheless, future investigations into distribution, residence time, aging, partitioning and speciation of their main components and by-products in the water column, persistence, accumulation and toxicity in the trophic chain, are needed to understand the magnitude and real impact of these emerging pollutants in the marine system.

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**URL:** <http://www.sciencedirect.com/science/article/pii/S0160412015001476>