

In this review:

- A. Recent articles – no abstract
- B. Recent articles with abstracts

O/A denotes an open access article or journal

A. Recent articles – no abstract

Weinhold, B. Emergency responder health: What have we learned from past disasters? *Environmental Health Perspectives* 118(8): A346-A350, 2010. O/A

B. Recent articles with abstracts

Makrides, M., Gibson, R.A., McPhee, A.J., Yelland, L., Quinlivan, J., Ryan, P., and DOMInO Investigative Team. Effect of DHA supplementation during pregnancy on maternal depression and neurodevelopment of young children: A randomized controlled trial. *Journal of the American Medical Association* 304(15): 1675-1683, 2010. O/A

Notes: **Context** Uncertainty about the benefits of dietary docosahexaenoic acid (DHA) for pregnant women and their children exists, despite international recommendations that pregnant women increase their DHA intakes. **Objective** To determine whether increasing DHA during the last half of pregnancy will result in fewer women with high levels of depressive symptoms and enhance the neurodevelopmental outcome of their children. **Design, Setting and Participants** A double-blind, multicenter, randomized controlled trial (DHA to Optimize Mother Infant Outcome [DOMInO] trial) in 5 Australian maternity hospitals of 2399 women who were less than 21 weeks' gestation with singleton pregnancies and who were recruited between October 31, 2005, and January 11, 2008. Follow-up of children (n = 726) was completed December 16, 2009. **Intervention** Docosahexaenoic acid-rich fish oil capsules (providing 800 mg/d of DHA) or matched vegetable oil capsules without DHA from study entry to birth. **Main Outcome Measures** High levels of depressive symptoms in mothers as indicated by a score of more than 12 on the Edinburgh Postnatal Depression Scale at 6 weeks or 6 months postpartum. Cognitive and language development in children as assessed by the Bayley Scales of Infant and Toddler Development, Third Edition, at 18 months. **Results** Of 2399 women enrolled, 96.7% completed the trial. The percentage of women with high levels of depressive symptoms during the first 6 months postpartum did not differ between the DHA and control groups (9.67% vs 11.19%; adjusted relative risk, 0.85; 95% confidence interval [CI], 0.70-1.02; P = .09). Mean cognitive composite scores (adjusted mean difference, 0.01; 95% CI, -1.36 to 1.37; P=.99) and mean language composite scores (adjusted mean difference, -1.42; 95% CI, -3.07 to 0.22; P = .09) of children in the DHA group did not differ from children in the control group. **Conclusion** The use of DHA-rich fish oil capsules compared with vegetable oil capsules during pregnancy did not result in lower levels of postpartum depression in mothers or improved cognitive and language development in their offspring during early childhood.

Alagarsamy, S., Thampuran, N., and Joseph, T.C. **Virulence genes, serobiotypes and antibiotic resistance profile of *Escherichia coli* strains isolated from aquaculture and other sources.** *Aquaculture Research* 41(7): 1003-1014, 2010.

Notes: In order to determine the prevalence of pathogenic *Escherichia coli*, a total number of 155 *E. coli* isolates from aquaculture, clinical and veterinary sources were screened for seven pathogenic virulence markers and a house-keeping gene by a polymerase chain reaction. The targeted virulence genes included *eaeA* of enteropathogenic *E. coli*, *elt* and *est* of enterotoxigenic *E. coli* (ETEC), *ipaH* of enteroinvasive *E. coli*, *pCVD432* of enteroaggregative *E. coli*, *stx*, *hlyA* and *eaeA* of shigatoxigenic *E. coli* (STEC) and enterohaemorrhagic *E. coli*. All the isolates were positive for *phoA*, the house-keeping gene for *E. coli*. Among the 155 isolates, seven numbers (4.5%) harboured the virulence markers belonging to the pathogenic group ETEC and STEC. The virulent genes detected in these groups were *elt*, *est*, *hlyA* and *stx*. The sources of these virulence genes were fish (*hlyA*), shrimp (*elt*), feeder canal water (*hlyA* and *elt*) of aquaculture origin and from diarrhoea affected cow (*hlyA*, *est* and *stx*). The isolates with pathogenic traits belonged to the serogroups O6 or O29 and the remaining could not be typed. They showed resistance to two to four antibiotics out of the 12 antibiotics tested. Biotyping revealed that three isolates belonged to a single biotype (7333) and the remaining isolates were of diverse types. In conclusion, a molecular tool such as PCR proves as more effective tool for detection of this pathogen than the conventional methods. Detection of these emerging pathogens in aquaculture samples warrants for strict adherence to hygienic handling at retail outlets and proper cooking by the consumer before consumption.

Skinner, M.K., Manikkam, M., and Guerrero-Bosagna, C. **Epigenetic transgenerational actions of environmental factors in disease etiology.** *Trends in Endocrinology and Metabolism* 21(4): 214-222, 2010.

Notes: The ability of environmental factors to promote a phenotype or disease state not only in the individual exposed but also in subsequent progeny for successive generations is termed transgenerational inheritance. The majority of environmental factors such as nutrition or toxicants such as endocrine disruptors do not promote genetic mutations or alterations in DNA sequence. However, these factors do have the capacity to alter the epigenome. Epimutations in the germline that become permanently programmed can allow transmission of epigenetic transgenerational phenotypes. This review provides an overview of the epigenetics and biology of how environmental factors can promote transgenerational phenotypes and disease.

Guerrero-Bosagna, C. and Skinner, M.K. **Transgenerational epigenetic actions of environmental compounds.** *Animal Reproduction* 7(3): 165-167, 2010.

Notes: Endocrine disrupting chemicals are known for their capacity to alter development and reproduction in mammals. One of the periods most sensitive to endocrine disruptor exposure is embryonic gonadal sex determination, when the germ line is undergoing epigenetic programming and DNA re-methylation. Epigenetic changes derived from exposure to endocrine disruptors have been described in several tissues and organisms. Endocrine disruptor induced epigenetic changes may have a wide range of phenotypic consequences, leading to disease conditions such as cancers, reproductive defects and obesity. Interestingly, the incidence of some diseases resulting from exposure to endocrine disruptors can be transgenerationally transmitted. In particular, exposure to the endocrine disruptor vinclozolin during early development is capable of inducing adult onset disease states that can be perpetuated across multiple generations. Environmental compounds such as endocrine disruptors can produce changes in the genome without altering DNA sequence. These changes are epigenetic in basis and can produce phenotypes that perpetuate transgenerationally. The suggestion that environmental factors can reprogram early development to induce epigenetic transgenerational phenotypes is a new paradigm in biology that will open new avenues for studies in disease etiology, reproduction and evolutionary biology.

Hardell, S., Tilander, H., Welfinger-Smith, G., Burger, J., and Carpenter, D.O. **Levels of polychlorinated biphenyls (PCBs) and three organochlorine pesticides in fish from the Aleutian Islands of Alaska.** *PLoS ONE* 5(8): art. e12396, 2010.
O/A

Notes: Background Persistent organic pollutants (POPs), including polychlorinated biphenyls (PCBs) and chlorinated pesticides, have been shown to have many adverse human health effects. These contaminants therefore may pose a risk to Alaska Natives that follow a traditional diet high in marine mammals and fish, in which POPs bioaccumulate. **Methods and Findings** This study examined the levels of PCBs and three pesticides [*p,p'*-DDE, mirex, and hexachlorobenzene (HCB)] in muscle tissue from nine fish species from several locations around the Aleutian Islands of Alaska. The highest median PCB level was found in rock sole (*Lepidopsetta bilineata*, 285 ppb, wet weight), while the lowest level was found in rock greenling (*Hexagrammos lagocephalus*, 104 ppb, wet weight). Lipid adjusted PCB values were also calculated and significant interspecies differences were found. Again, rock sole had the highest level (68,536 ppb, lipid weight). Concerning the PCB congener patterns, the more highly chlorinated congeners were most common as would be expected due to their greater persistence. Among the pesticides, *p,p'*-DDE generally dominated, and the highest level was found in sockeye salmon (*Oncorhynchus nerka*, 6.9 ppb, wet weight). The methodology developed by U.S. Environmental Protection Agency (USEPA) was used to calculate risk-based consumption limits for the analyzed fish species. For cancer health endpoints for PCBs, all species would trigger strict advisories of between two and six meals per year, depending upon species. For noncancer effects by PCBs, advisories of between seven and twenty-two meals per year were triggered. None of the pesticides triggered consumption limits. **Conclusion** The fish analyzed, mainly from Adak, contain significant concentrations of POPs, in particular PCBs, which raises the question whether these fish are safe to eat, particularly for sensitive populations. However when assessing any risk of the traditional diet, one must also consider the many health and cultural benefits from eating fish.

Boada, L.D. et al. **Ciguatera fish poisoning on the West Africa Coast: An emerging risk in the Canary Islands (Spain).** *Toxicon* 56(8): 1516-1519, 2010.

Notes: Ciguatera fish poisoning (CFP) is endemic in certain tropical and subtropical regions of the world. CFP had not been described on the West Africa Coast until a 2004 outbreak in the Canary Islands. In 2008-2009, two additional outbreaks of ciguatera occurred. Individuals afflicted had consumed lesser amberjack (*Seriola rivoliana*) captured from nearby waters. Caribbean ciguatoxin-1 (C-CTX-1) was confirmed in fish samples by LC-MS/MS. Ciguatoxic fish in this region may pose a new health risk for the seafood consumer.

Fleisher, J.M. et al. **The BEACHES Study: health effects and exposures from non-point source microbial contaminants in subtropical recreational marine waters.** *International Journal of Epidemiology* 39(5): 1291-1298, 2010.

Notes: Background Microbial water-quality indicators, in high concentrations in sewage, are used to determine whether water is safe for recreational purposes. Recently, the use of these indicators to regulate recreational water bodies, particularly in sub/tropical recreational marine waters without known sources of sewage, has been questioned. The objectives of this study were to evaluate the risk to humans from exposure to subtropical recreational marine waters with no known point source, and the possible relationship between microbe densities and reported symptoms in human subjects with random-exposure assignment and intensive individual microbial monitoring in this environment. **Methods** A total of 1303 adult regular bathers were randomly assigned to bather and non-bather groups, with subsequent follow-up for reported illness, in conjunction with extensive environmental sampling of indicator organisms (enterococci). **Results** Bathing was 1.76 times more likely to report gastrointestinal illness [95% confidence interval (CI) 0.94-3.30; *P* = 0.07]; 4.46 times more likely to report acute febrile respiratory illness (95% CI 0.99-20.90; *P* = 0.051) and 5.91 times more likely to report a skin illness (95% CI 2.76-12.63; *P* < 0.0001) relative to non-bathers. Evidence of a dose-response relationship was found between skin illnesses and increasing enterococci exposure among bathers [1.46 times (95% CI 0.97-2.21; *P* = 0.07) per increasing log₁₀ unit of enterococci exposure], but not for gastrointestinal or respiratory illnesses. **Conclusions** This study indicated that bathers may be at increased risk of several illnesses relative to non-bathers, even in the absence of any known source of domestic sewage impacting the recreational marine waters. There was no dose-response relationship between gastroenteritis and increasing exposure to enterococci, even though many current water-monitoring standards use gastroenteritis as the major outcome illness.

Stauder, M., Vezzulli, L., Pezzati, E., Repetto, B., and Pruzzo, C. **Temperature affects *Vibrio cholerae* O1 El Tor persistence in the aquatic environment via an enhanced expression of GbpA and MSHA adhesins.** *Environmental Microbiology Reports* 2(1): 140-144, 2010. O/A

Notes: *Vibrio cholerae* O1 El Tor attachment to chitin and biofilm formation on polyvinylchloride surfaces via the N-acetylglucosamine-binding protein A (GbpA) and the mannose-sensitive haemagglutinin (MSHA) were investigated under different temperature and salinity conditions simulating those found in the aquatic environment. **In vitro** tests showed that **mshA** and **gfpA** defective *V. cholerae* N16961 strains displayed a significant reduction ($P < 0.05$) in attachment to chitin in comparison with the parent in all the environmental conditions tested. The lack of **mshA**, but not **gfpA**, resulted in a significant decrease ($P < 0.05$) of *V. cholerae* N16961 strain ability to form biofilm. Wild-type attachment to chitin and biofilm formation increased from 15 °C to 25 °C as did **gfpA** and **mshA** expression. **In situ** data obtained analysing zooplankton and water samples collected in coastal waters of NW Mediterranean Sea over an annual cycle showed that the percentage of plankton-associated *V. cholerae* was positive correlated with sea surface temperature, and increased dramatically at temperature values above 22 °C. It is suggested that temperature plays a major role in affecting persistence of *V. cholerae* in the aquatic environment by promoting colonization of environmental surfaces, via an enhanced expression of both **mshA** and **gfpA**.

Carothers, C., Lew, D.K., and Sepez, J. **Fishing rights and small communities: Alaska halibut IFQ transfer patterns.** *Ocean and Coastal Management* 53(9): 518-523, 2010.

Notes: In the Alaska halibut individual fishing quota (IFQ) fishery, small remote fishing communities (SRFCs) have disproportionately lost fishing rights. Our analysis of quota market participation from 1995 to 1999 confirms that SRFC residents are more likely to sell than buy quota. Alaska Native heritage is another important predictor of quota market behavior. Residents of Alaska Native villages have an increased likelihood of selling quota. Loss of fisheries participation in small indigenous communities can be an unintended consequence of quota systems. Mitigation measures should take into account the social factors that can lead to such a redistribution of fishing rights in privatized access fisheries.

Bunce, M., Brown, K., and Rosendo, S. **Policy misfits, climate change and cross-scale vulnerability in coastal Africa: how development projects undermine resilience.** *Environmental Science and Policy* 13(6): 485-497, 2010.

Notes: Coastal social ecological systems in eastern Africa are subject to a range of environmental, social and economic changes. They are already vulnerable to these multiple stressors, and the impacts of climate change are likely to further exacerbate their vulnerabilities. Some of these impacts may be observed and experienced already. The analysis presented in this paper is based on mixed methods empirical research exploring local perceptions of recent changes at four sites in coastal Tanzania and Mozambique. People recognise and rank a number of climate and non-climate stressors which have contributed towards more risky and less diverse livelihoods. Importantly, regional and international policy initiatives – in the form of river basin management in Mozambique and South Africa, and development of a Marine Protected Area in Tanzania – are perceived to further erode resilience and exacerbate vulnerabilities. We suggest this is a form of policy misfit, where policies developed to address a specific issue do not take account of cross-scale dynamics of change, the interactions between multiple stressors, nor longer term climate change. This policy misfit may be remedied by a move towards adaptive forms of governance, and necessitates an explicit focus on building the adaptive capacity of the poor and most vulnerable in society.

Tzanis, C., Theodorakopoulou, K., Theodorakopoulos, P., and Varotsos, C. **Tsunamis among the natural disasters.** *Fresenius Environmental Bulletin* 19(8): 1385-1403, 2010.

Notes: The 26 December 2004, Sumatra-Andaman earthquake of magnitude 9.0 on the Richter scale triggered a massive tsunami in the Indian Ocean, which led to a widespread catastrophe. A comparison of tsunamis with the diverse kinds of natural and man-made disasters that are of utmost importance is herewith explored to show the necessity for the development and implementation of a special satellite monitoring of disasters, and especially tsunamis, under the general program of environmental monitoring. The adverse impacts of tsunamis to the public health are also examined.

Luna, G.M., Vignaroli, C., Rinaldi, C., Pusceddu, A., Nicoletti, L., Gabellini, M., Danovaro, R., and Biavasco, F. **Extraintestinal *Escherichia coli* carrying virulence genes in coastal marine sediments.** *Applied and Environmental Microbiology* 76(17): 5659-5668, 2010.

Notes: Despite the recognized potential of long-term survival or even growth of fecal indicator bacteria (FIB) in marine sediments, this compartment is largely ignored by health protection authorities. We conducted a large-scale study over approximately 50 km of the Marche coasts (Adriatic Sea) at depths ranging from 2 to 5 m. Total and fecal coliforms (FC) were counted by culture-based methods. *Escherichia coli* was also quantified using fluorescence *in situ* hybridization targeting specific 16S rRNA sequences, which yielded significantly higher abundances than culture-based methods, suggesting the potential importance of viable but nonculturable *E. coli* cells. Fecal coliforms displayed high abundances at most sites and showed a prevalence of *E. coli*. FC isolates (n = 113) were identified by API 20E, additional biochemical tests, and internal transcribed spacer-PCR. *E. coli* strains, representing 96% of isolates, were then characterized for genomic relatedness and phylogenetic group (A, B1, B2, and D) of origin by randomly amplified polymorphic DNA and multiplex-PCR. The results indicated that *E. coli* displayed a wide genotypic diversity, also among isolates from the same station, and that 44 of the 109 *E. coli* isolates belonged to groups B2 and D. Further characterization of B2 and D isolates for the presence of 11 virulence factor genes (*pap*, *sfa/foc*, *afa*, *eaeA*, *ibeA*, *traT*, *hlyA*, *stx*₁, *stx*₂, *aer*, and *fyuA*) showed that 90% of B2 and 65% of D isolates were positive for at least one of these. Most of the variance of both *E. coli* abundance and assemblage composition (>62%) was explained by a combination of physical-chemical and trophic variables. These findings indicate that coastal sediments could represent a potential reservoir for commensal and pathogenic *E. coli* and that *E. coli* distribution in marine coastal sediments largely depends upon the physical and trophic status of the sediment. We conclude that future sampling designs aimed at monitoring the microbiological quality of marine coastal areas should not further neglect the analysis of the sediment and that monitoring of these environments can be improved by including molecular methods as a complement of culture-based techniques.

Schriewer, A., Miller, W.A., Byrne, B.A., Miller, M.A., Oates, S., Conrad, P.A., Hardin, D., Yang, H.-H., Chouicha, N., Melli, A., Jessup, D., Dominik, C., and Wuertz, S. **Presence of *Bacteroidales* as a predictor of pathogens in surface waters of the central California coast.** *Applied and Environmental Microbiology* 76(17): 5802-5814, 2010.

Notes: The value of *Bacteroidales* genetic markers and fecal indicator bacteria (FIB) to predict the occurrence of waterborne pathogens was evaluated in ambient waters along the central California coast. *Bacteroidales* host-specific quantitative PCR (qPCR) was used to quantify fecal bacteria in water and provide insights into contributing host fecal sources. Over 140 surface water samples from 10 major rivers and estuaries within the Monterey Bay region were tested over 14 months with four *Bacteroidales*-specific assays (universal, human, dog, and cow), three FIB (total coliforms, fecal coliforms, and enterococci), two protozoal pathogens (*Cryptosporidium* and *Giardia* spp.), and four bacterial pathogens (*Campylobacter* spp., *Escherichia coli* O157:H7, *Salmonella* spp., and *Vibrio* spp.). Indicator and pathogen distribution was widespread, and detection was not highly seasonal. *Vibrio cholerae* was detected most frequently, followed by *Giardia*, *Cryptosporidium*, *Salmonella*, and *Campylobacter* spp. Bayesian conditional probability analysis was used to characterize the *Bacteroidales* performance assays, and the ratios of concentrations determined using host-specific and universal assays were used to show that fecal contamination from human sources was more common than livestock or dog sources in coastal study sites. Correlations were seen between some, but not all, indicator-pathogen combinations. The ability to predict pathogen occurrence in relation to indicator threshold cutoff levels was evaluated using a weighted measure that showed the universal *Bacteroidales* genetic marker to have a comparable or higher mean predictive potential than standard FIB. This predictive ability, in addition to the *Bacteroidales* assays providing information on contributing host fecal sources, supports using *Bacteroidales* assays in water quality monitoring programs.

Grandjean, P., Satoh, H., Murata, K., and Eto, K. **Adverse effects of methyl-mercury: Environmental health research implications.** *Environmental Health Perspectives* 118(8): 1137-1145, 2010. O/A

Notes: BACKGROUND: The scientific discoveries of health risks resulting from methyl-mercury exposure began in 1865 describing ataxia, dysarthria, constriction of visual fields, impaired hearing, and sensory disturbance as symptoms of fatal methyl-mercury poisoning. OBJECTIVE: Our aim was to examine how knowledge and consensus on methyl-mercury toxicity have developed in order to identify problems of wider concern in research. DATA SOURCES AND EXTRACTION: We tracked key publications that reflected new insights into human methyl-mercury toxicity. From this evidence, we identified

possible caveats of potential significance for environmental health research in general. SYNTHESIS: At first, methylmercury research was impaired by inappropriate attention to narrow case definitions and uncertain chemical speciation. It also ignored the link between eco-toxicity and human toxicity. As a result, serious delays affected the recognition of methyl-mercury as a cause of serious human poisonings in Minamata, Japan. Developmental neurotoxicity was first reported in 1952, but despite accumulating evidence, the vulnerability of the developing nervous system was not taken into account in risk assessment internationally until approximately 50 years later. Imprecision in exposure assessment and other forms of uncertainty tended to cause an under-estimation of methylmercury toxicity and repeatedly led to calls for more research rather than prevention. CONCLUSIONS: Coupled with legal and political rigidity that demanded convincing documentation before considering prevention and compensation, types of uncertainty that are common in environmental research delayed the scientific consensus and were used as an excuse for deferring corrective action. Symptoms of methyl-mercury toxicity, such as tunnel vision, forgetfulness, and lack of coordination, also seemed to affect environmental health research and its interpretation.

Feingold, B.J., Vegosen, L., Davis, M., Leibler, J., Peterson, A., and Silbergeld, E.K. **A niche for infectious disease in environmental health: Rethinking the toxicological paradigm.** *Environmental Health Perspectives* 118(8): 1165-1172, 2010. O/A

Notes: OBJECTIVE: In this review we highlight the need to expand the scope of environmental health research, which now focuses largely on the study of toxicants, to incorporate infectious agents. We provide evidence that environmental health research would be strengthened through finding common ground with the tools and approaches of infectious disease research. DATA SOURCES AND EXTRACTION: We conducted a literature review for examples of interactions between toxic agents and infectious diseases, as well as the role of these interactions as risk factors in classic "environmental" diseases. We investigated existing funding sources and research mandates in the United States from the National Science Foundation and the National Institutes of Health, particularly the National Institute of Environmental Health Sciences. DATA SYNTHESIS: We adapted the toxicological paradigm to guide reintegration of infectious disease into environmental health research and to identify common ground between these two fields as well as opportunities for improving public health through interdisciplinary research. CONCLUSIONS: Environmental health encompasses complex disease processes, many of which involve interactions among multiple risk factors, including toxicant exposures, pathogens, and susceptibility. Funding and program mandates for environmental health studies should be expanded to include pathogens in order to capture the true scope of these overlapping risks, thus creating more effective research investments with greater relevance to the complexity of real-world exposures and multifactorial health outcomes. We propose a new model that integrates the toxicology and infectious disease paradigms to facilitate improved collaboration and communication by providing a framework for interdisciplinary research. Pathogens should be part of environmental health research planning and funding allocation, as well as applications such as surveillance and policy development.

Bhatnagar, I. and Kim, S.-K. **Immense essence of excellence: Marine microbial bioactive compounds.** *Marine Drug* 8(10): 2673-2701, 2010. O/A

Notes: Oceans have borne most of the biological activities on our planet. A number of biologically active compounds with varying degrees of action, such as anti-tumor, anti-cancer, anti-microtubule, anti-proliferative, cytotoxic, photo protective, as well as antibiotic and antifouling properties, have been isolated to date from marine sources. The marine environment also represents a largely unexplored source for isolation of new microbes (bacteria, fungi, actinomycetes, microalgae-cyanobacteria and diatoms) that are potent producers of bioactive secondary metabolites. Extensive research has been done to unveil the bioactive potential of marine microbes (free living and symbiotic) and the results are amazingly diverse and productive. Some of these bioactive secondary metabolites of microbial origin with strong antibacterial and antifungal activities are being intensely used as antibiotics and may be effective against infectious diseases such as HIV, conditions of multiple bacterial infections (penicillin, cephalosporines, streptomycin, and vancomycin) or neuropsychiatric sequelae. Research is also being conducted on the general aspects of biophysical and biochemical properties, chemical structures and biotechnological applications of the bioactive substances derived from marine microorganisms, and their potential use as cosmeceuticals and nutraceuticals. This review is an attempt to consolidate the latest studies and critical research in this field, and to showcase the immense competence of marine microbial flora as bioactive metabolite producers. In addition, the present review addresses some effective and novel approaches of procuring marine microbial compounds utilizing the latest screening strategies of drug discovery.

Bhatnagar, I. and Kim, S.-K. **Marine antitumor drugs: Status, shortfalls and strategies.** *Marine Drugs* 8(10): 2702-2720, 2010. O/A

Notes: Cancer is considered as one of the deadliest diseases in the medical field. Apart from the preventive therapies, it is important to find a curative measure which holds no loopholes and acts accurately and precisely to curb cancer. Over the past few decades, there have been advances in this field and there are many antitumor compounds available on the market, which are of natural as well as synthetic origin. Marine chemotherapy is well recognized nowadays and profound development has been achieved by researchers to deal with different molecular pathways of tumors. However, the marine environment has been less explored for the production of safe and novel antitumor compounds. The reason is a number of shortfalls in this field. Though ample reviews cover the importance and applications of various anticancerous compounds from marine natural products, in the present review, we have tried to bring the current status of antitumor research based on marine inhibitors of cancer signaling pathways. In addition, focus has been placed on the shortfalls and probable strategies in the arena of marine antitumor drug discovery.

James, M., Proudman, S., and Cleland, L. **Fish oil and rheumatoid arthritis: past, present and future.** *Proceedings of the Nutrition Society* 69(3): 316-323, 2010.

Notes: Meta- and mega-analysis of randomised controlled trials indicate reduction in tender joint counts and decreased use of non-steroidal anti-inflammatory drugs with fish-oil supplementation in long-standing rheumatoid arthritis (RA). Since non-steroidal anti-inflammatory drugs confer cardiovascular risk and there is increased cardiovascular mortality in RA, an additional benefit of fish oil in RA may be reduced cardiovascular risk via direct mechanisms and decreased non-steroidal anti-inflammatory drug use. Potential mechanisms for anti-inflammatory effects of fish oil include inhibition of inflammatory mediators (eicosanoids and cytokines), and provision of substrates for synthesis of lipid suppressors of inflammation (resolvins). Future studies need progress in clinical trial design and need to shift from long-standing disease to examination of recent-onset RA. We are addressing these issues in a current randomised controlled trial of fish oil in recent-onset RA, where the aim is to intervene before joint damage has occurred. Unlike previous studies, the trial occurs on a background of drug regimens determined by an algorithm that is responsive to disease activity and drug intolerance. This allows drug use to be an outcome measure whereas in previous trial designs, clinical need to alter drug use was a 'problem'. Despite evidence for efficacy and plausible biological mechanisms, the limited clinical use of fish oil indicates there are barriers to its use. These probably include the pharmaceutical dominance of RA therapies and the perception that fish oil has relatively modest effects. However, when collateral benefits of fish oil are included within efficacy, the argument for its adjunctive use in RA is strong.

Calder, P.C., Kremmyda, L.S., Vlachava, M., Noakes, P.S., and Miles, E.A. **Is there a role for fatty acids in early life programming of the immune system?** *Proceedings of the Nutrition Society* 69(3): 373-380, 2010.

Notes: There may be a causal relationship between n-6 PUFA intake and allergic disease and there are biologically plausible mechanisms, involving eicosanoid mediators of the n-6 PUFA arachidonic acid, that could explain this. There is some evidence that high linoleic acid intake is linked with increased risk of atopic sensitisation and allergic manifestations. Fish and fish oils are sources of long-chain n-3 PUFA and these fatty acids act to oppose the actions of n-6 PUFA. It is considered that n-3 PUFA will protect against atopic sensitisation and against the clinical manifestations of atopy. All five epidemiological studies investigating the effect of maternal fish intake during pregnancy on atopic or allergic outcomes in infants/children of those pregnancies concluded protective associations. Epidemiological studies investigating the effects of fish intake during infancy and childhood on atopic outcomes in those infants or children are inconsistent, although the majority of the studies (9/14) showed a protective effect of fish. Fish oil provision to pregnant women is associated with immunologic changes in cord blood. Provision of fish oil during pregnancy may reduce sensitisation to common food allergens and reduce the prevalence and severity of atopic dermatitis in the first year of life. This effect may persist until adolescence with a reduction in prevalence and/or severity of eczema, hayfever and asthma. Fish oil supplementation in infancy may decrease the risk of developing some manifestations of allergic disease, but whether this benefit persists as other factors come into play remains to be determined.

Saoudi, M., Abdelmouleh, A., and El Feki, A. **Tetrodotoxin: a potent marine toxin.** *Toxin Reviews* 29(2): 60-70, 2010.

Notes: Tetrodotoxin (TTX) is a neurotoxin found in puffer fish and other marine animals. This toxin is predominantly isolated from the skin, viscera, ovaries, and liver of the puffer fish. The toxin is produced by various species of bacteria, and TTX-bearing animals may have absorbed and accumulated it through the food chain. TTX is widely used in many laboratories as an important pharmacological reagent because of its ability to selectively block the sodium channels on the nerve membrane. No antidote is available for clinical use. The mainstay of treatment is careful observation and serial neurological assessment to monitor the progression of the clinical effects so that respiratory failure or cardiac effects are appropriately treated.

Bownik, A. **Harmful algae: effects of alkaloid cyanotoxins on animal and human health.** *Toxin Reviews* 29(3-4): 99-114, 2010.

Notes: Cyanobacteria are bloom-forming prokaryotic microorganisms producing cyanotoxins – secondary metabolites toxic to aquatic and terrestrial animals and also humans. Alkaloid cyanotoxins are: neurotoxic anatoxin-a, saxitoxin and cytotoxic cylindrospermopsin, which inhibits protein synthesis in various cell types and neurotoxic saxitoxin. These substances are very harmful to many animal species. Moreover, they may accumulate at high concentrations in various tissues of aquatic animals such as bivalves and fish, which can be a source of intoxication for predators and humans. This review presents the current state of knowledge on the effects of alkaloid cyanotoxins on different animal species and human health.

Atmar, R.L. **Noroviruses: State of the art.** *Food and Environmental Virology* 2(3): 117-126, 2010.

Notes: Noroviruses are a common cause of both endemic and epidemic gastroenteritis. These highly infectious viruses usually cause self-limited disease, but chronic infections occur in highly immunocompromised patients and unusual manifestations are also being described in some populations. Histoblood-group antigen expression is now recognized as an important susceptibility factor for many norovirus strains, but a correlate of acquired immunity to infection or illness has not yet been identified. Currently, treatment and prevention strategies rely on nonspecific measures. However, virus-like particles containing capsid antigens are undergoing evaluation as a vaccine candidate for illness prevention. This article reviews the biologic properties, epidemiology, clinical features, host susceptibility, diagnosis, and treatment and prevention of norovirus infection.

Pinto, R.M., Costafreda, M.I., Perez-Rodriguez, F.J., D'Andrea, L., and Bosch, A. **Hepatitis A virus: State of the art.** *Food and Environmental Virology* 2(3): 127-135, 2010.

Notes: Hepatitis A is the most common among all hepatitis worldwide in spite of an efficient vaccine and improved hygiene. Shellfish-borne outbreaks are still of major concern causing hundreds of cases and huge economical losses in the present context of global food trade. Hepatitis A virus (HAV) is a unique picornavirus with many differences in its molecular biology including both its incapacity to induce the inhibition of the cellular protein synthesis and a highly biased and deoptimized codon usage with respect the cell. The final goal of this intriguing strategy seems to be the need for a fine-tuning control of the translation kinetics, particularly at the capsid coding region, and the underlying mechanism is the use of a right combination of common and rare codons to allow a regulated ribosome traffic rate thus ensuring the proper protein folding. Capsid folding is critical to warrant a high environmental stability for a virus transmitted through the fecal-oral route with long extracorporeal periods.

Maalouf, H., Pommepuy, M., and Le Guyader, F.S. **Environmental conditions leading to shellfish contamination and related outbreaks.** *Food and Environmental Virology* 2(3): 136-145, 2010.

Notes: Human fecal wastes contain a large variety of viruses that can enter the environment through discharge of waste materials from infected individuals. Despite the high diversity of viruses that are introduced into the environment by human fecal pollution, only a few have been recognized to cause disease in association with consumption of contaminated shellfish. To explain bivalve mollusks contamination, several factors including human epidemiology, virus persistence through sewage treatment plant, and shellfish uptake may be suggested. Considering different outbreaks described in the literature, the most common route for transmission is accidental contamination after heavy rainfall, when extra loads cause an overflow, and release of untreated sewage into the aquatic environment. Outbreak analysis also demonstrates the impact on shellfish consumption of some viral strain transmission and thus their impact on molecular epidemiology, especially for norovirus. To limit shellfish contamination and thus to protect the consumer, the most desirable and effective option is to reduce the viral input.

Boxman, I.L.A. **Human enteric viruses occurrence in shellfish from European markets.** *Food and Environmental Virology* 2(3): 156-166, 2010.

Notes: Different sources were consulted to obtain information on the occurrence of viruses in bivalve molluscs on the European market. Twenty-six peer-reviewed articles were identified reporting on the molecular detection of viral RNA in 4,260 samples in total. The data obtained will be presented geographically on virus types detected, the origin and treatment of the shellfish, and the detection technique applied. The data demonstrate that viral RNA can be detected in shellfish from polluted areas, in depurated shellfish as well as those for human consumption. The European Rapid Alert System for Food and Feed (RASFF) database was consulted as another source. Twenty-eight notifications were identified on the presence of hepatitis A virus or norovirus in shellfish on the European market. The most recent report of the European laboratory network was referred to, to gain insight into the laboratory capability at present for the analyses of shellfish on the presence of viruses. Approximately 67% of 27 participating laboratories obtained intended results for all samples, consisting of lenticules loaded with 10^3 copies norovirus (genogroup I (GGI) and/or genogroup II (GGII)) and/ or $1 \times 10^5 - 8 \times 10^4$ copies of hepatitis A virus. From 1993, there has been a continuous development of molecular detection techniques and tools have been described to ensure quality assurance. End product testing will, however, not be achievable. As depuration has been shown not to be effective for the complete elimination of viruses, shellfish should not be in contact with faecal contaminated water in order to minimise the risk of shellfish-transmittable viral diseases.

Greening, G.E. and McCoubrey, D.J. **Enteric viruses and management of shellfish production in New Zealand.** *Food and Environmental Virology* 2(3): 167-175, 2010.

Notes: In New Zealand shellfish are a significant food resource and shellfish are harvested for both recreational and commercial use. Commercially harvested Greenshell mussels (*Perna canaliculus*) and Pacific oysters (*Crassostrea gigas*) from aquaculture farms dominate consumption in New Zealand. Other commercial species include cockles (*Austrovenus stuchburyi*) and surf clam species which are wild harvested. The consumption of shellfish has been associated with gastroenteritis outbreaks caused by noroviruses following faecal contamination of growing waters with human waste. In New Zealand, since 1994 over 50 norovirus outbreaks linked to consumption of either New Zealand commercially grown oysters or imported oysters have been reported. An IEC/ISO 17025 accredited method for detection of noroviruses in bivalve shellfish was established in 2007. This method has been used in outbreak investigations to analyse implicated shellfish, in virus prevalence surveys and monitoring programmes, and commercially for product clearances. Surveys have shown that enteric viruses occur frequently in non-commercial shellfish, especially near sewage out-falls and following sewage discharge events. Viral source tracking methods have assisted in identifying pollution sources. The commercial shellfish industry operates under the Bivalve Molluscan Shellfish Regulated Control Scheme (BMSRCS), administered by the New Zealand Food Safety Authority. Recently regulatory measures were introduced into the BMSRCS to manage viruses. These include the closure of harvest areas for at least 28 days after human sewage contamination events and norovirus outbreaks. These management strategies, coupled with new information on norovirus prevalence in shellfish, have helped to improve the quality and safety of New Zealand shellfish.

Woods, J.W. and Burkhardt, W. **Occurrence of norovirus and hepatitis A virus in US oysters.** *Food and Environmental Virology* 2(3): 176-182, 2010.

Notes: Noroviruses (NoV) and hepatitis A virus (HAV) are the leading causes of non-bacterial gastroenteritis in shellfish consumers worldwide. This study determined the seasonal and geographical distribution of NoV (genogroups I and II) and HAV in live U. S. market oysters. Samples were analyzed to determine the occurrence and levels of NoV and HAV using RT-qPCR and conventional RT-PCR. NoV and HAV were detected in 3.9 and 4.4%, respectively. NoV genogroups I and II were detected, with genogroup II predominating. Sequencing identified genotypes II.4, II.3, and II.7. The GII.4 strain showed \geq 98% similarity with 2006-2007 circulating strains, Minerva and Laurens. HAV sequences from the 5' non-coding region (NCR) of the genome were from genotypes I, II, or III. The incidence of NoV in oysters harvested from Atlantic Coast states was higher than that in oysters from other regions and its occurrence was greatest during the cooler months (December to February). HAV was detected at a higher frequency in shellfish harvested from the Gulf Coast and also predominated during cooler months. The seasonal occurrence of viruses in this study corresponded to the reported incidence of shellfish-associated viral illnesses. This investigation provides an overview of the occurrence and distribution of NoV and HAV in U.S. market shellfish.

Richards, G.P., McLeod, C., and Le Guyader, F.S. **Processing strategies to inactivate enteric viruses in shellfish.** *Food and Environmental Virology* 2(3): 183-193, 2010.

Notes: Noroviruses, hepatitis A and E viruses, sapovirus, astrovirus, rotavirus, Aichi virus, enteric adenoviruses, poliovirus, and other enteroviruses enter shellfish through contaminated seawater or by contamination during handling and processing, resulting in outbreaks ranging from isolated to epidemic. Processing and disinfection methods include shellfish depuration and relaying, cooking and heat pasteurization, freezing, irradiation, and high pressure processing. All the methods can improve shellfish safety; however, from a commercial standpoint, none of the methods can guarantee total virus inactivation without impacting the organoleptic qualities of the shellfish. Noroviruses cause the majority of foodborne viral illnesses, yet there is conflicting information on their susceptibility to inactivation by processing. The inability to propagate and quantitatively enumerate some viral pathogens in vitro or in animal models has led to the use of norovirus surrogates, such as feline calicivirus and murine norovirus. During processing, these surrogates may not mimic the inactivation of the viruses they represent and are, therefore, of limited value. Likewise, reverse transcription-PCR has limited usefulness in monitoring processing effectiveness due to its inability to identify infectious from inactivated viruses. This article (a) describes mechanisms of virus uptake and persistence in shellfish, (b) reviews the state-of-the-art in food processing strategies for the inactivation of enteric viruses in shellfish, (c) suggests the use of combined processing procedures to enhance shellfish safety, (d) highlights limitations in research data derived from virus surrogate studies and molecular assay procedures, and (e) recommends enhanced funding for human volunteer studies and the development of assays to detect viable viruses.
