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SESSION: The role of ecotoxicology in fisheries science and aquaculture (I) [marc berntssen]

TITLE: Emerging contaminants and toxins in aquaculture: how modern analytical tools may aid to ensure food and environmental safety

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ABSTRACT: As a result of governmental incentives and technological developments, aquaculture has become a well-established and strongly growing segment in food production. To date, about 45% of worldwide fish supply is provided through aquaculture, but a continuously increasing trend may still be noted. In this regard, a deepened knowledge on adequate feed formulations, growth conditions, and disease management is of outmost importance. However, the intensified aquaculture process requires a high input of diverse resources, which may strongly impact the environment as well as food safety. Indeed, various chemical agents such as antibiotics, herbicides and algaecides are used, aiming at the promotion of the cultivated species by eliminating their major competitors. Although this strongly advances production, some adverse side-effects may be noted. For example, the administration of antibiotics, used to kill or inhibit the growth of bacteria, may also affect nontargeted species and induce antibiotic resistance. These antibiotics are generally present in the feed formulations, together with diverse other substances such as pharmaceuticals, anaesthetics, vitamins, and pigments, which may all accumulate in the environment. The same is true for herbicides and algaecides, frequently applied to control aquatic weeds, algal blooms and fouling organisms. As such, a variety of biological active and possibly toxic chemicals are introduced in the environment and may accumulate in edible species. Hereby, lipophilic emerging contaminants tend to bio-accumulate, whereas hydrophilic compounds are mostly converted to metabolites or derivatives, which may exert even more toxic effects than the parent compounds. In this context, the increasing prevalence of toxin producing species (algae blooms) is also assigned substantial significance as the produced biotoxins may strongly affect seafood growth rate, death rate and food safety. \nWithin this context, large-scale research is necessary to acquire valuable insights on 1) the presence of contaminants in our marine environment and aquaculture production systems, 2) the uptake, bioaccumulation and metabolisation of bioactive substances by (edible) species, and 3) the health risks associated with these substances and their derivatives. Hereby, new tools for monitoring (e.g. passive samplers) as well as high-end analytical instruments (e.g. high-resolution mass spectrometry for profiling and fingerprinting) are becoming indispensable to acquire a correct view on the impact and importance of contaminants. During this keynote, the urge of contaminant analysis and adequate monitoring will be demonstrated using practical examples. From this, current shortcomings and future needs for a better food safety warranting and sustainable production will be proposed.