

The recent spate of food scares has made the European consumers wary of food safety issues. New regulations by the European Commission aim at tightening and harmonizing food/feed safety measures in the 15+10 member states of Europe. This paper aims at providing insight on the recent and upcoming regulatory measures that are likely to impact the aquaculture feed/food chain in and outside Europe.

Emerging Food Safety Measures in Europe:

What Should Aqua Feed Manufacturers Know?

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Food scares are easier to prevent than to cure

The confrontation of the European consumer with a number of disastrous food scares during the past decade, such as BSE (bovine spongiform encephalopathy) and dioxins, have resulted in drastic measures by European policy makers to improve feed and food safety regulations. These measures are in response to the increasing awareness of the European consumer and are crucial for the sustainable development of the agriculture industry which has suffered heavy economic losses. The approximate long-term cost of BSE for Europe has been estimated to be close to 100 billion Euros (Gill, 2004). Aquaculture industry is as vulnerable to food scares as was recently demonstrated by the worldwide damage to farmed salmon markets due to the publication of Hites and co-workers in the journal, *Science*. Hites reported that salmon produced in Europe had higher levels of PCB, dioxin, toxaphene and dieldrin than those produced in America, and that even the least contaminated farmed salmon from America had higher levels of pesticide residues compared to wild salmon. Restoring consumer confidence in farmed salmon has proven difficult on the

short term despite scientific criticism on the study and the confirmation of safe levels of contaminants in farmed salmon by European, American and British authorities monitoring food safety issues. It is obvious that food scares are easier to prevent than to cure.

Understanding regulatory changes

Recent and upcoming feed regulations in the EU envisage the harmonization across the 25 EU member countries and upgrading of feed regulations to protect human health, animal welfare and the environment. Since 2000 and the latest by 2006, an increasing number of EC directives are regulating the selective ban of animal proteins, the total ban of all antibiotic growth promoters, registration and labeling procedures for feed additives and genetically modified organisms (GMO) and their derivatives, feed hygiene measures, the establishment of the feed safety rapid alert system, obligatory notification of potentially dangerous feed contamination, traceability and maximum residue levels for contaminants. Registration procedures for feed additives and GMO products involve risk assessment and scientific evaluation by expert panels. These panels will be coordinated by the recently constituted European Food Safety Authority (EFSA). The findings will be reviewed with regard to risk management procedures by the commission and the member state authorities. The progress of the various scientific panels can be followed through non-confidential summaries published on the EFSA web site.

The EU's food safety agenda for the coming years definitely present a challenge for the timely acceptance/implementation by national legislation in all member states and their adoption by the feed milling industry. A recent example is the enforcement of EC directive 2002/2/EC on labeling of feed ingredients. This directive obliged the European animal feed manufacturers to list all ingredients in the feed by name and percentage on the feed label by November 6, 2003. At the time this paper is published, the different member states are still at different stages of adapting the directive into national legislation. Several court cases are challenging the principle of the regulation. The UK High Court has nullified the local UK interpretation of 2002/2/EC, whereas Italy and France have rejected the directive. The resulting confusion in the unified European feed market led to the temporary freezing of the implementation. Despite these "start-up" problems, it is clear that food safety, traceability and accountability will remain a priority of policy makers in the EC.

Animal proteins banned

As a result of the BSE outbreak, the EC decided to ban the use of animal protein in animal feed from January 2001 onwards. The original, temporary ban (Council decision 2000/766/EC – 4/12/00) included the prohibition of meat-, bone-, blood-, hoof- and hornmeal, poultry offal meal, feather meal, dry greaves, dried plasma and other blood products. Fish meal is not allowed in ruminant diets because of the fear of adulteration with meat- and bone meal. The ban has become permanent, but since it has been shown that certain animal protein sources do not present a risk of BSE, the list of prohibited animal proteins has been reviewed. The latest EC regulation (2003/1234/EC; implemented Sept 1, 2003) allows a number of animal proteins under very specific conditions of origin, destination and processing conditions of the by-product as well as the type of feed. For example blood products from non-ruminant origin and produced under a strict quality control

scheme are allowed as ingredients for fish feed manufactured in exclusive fish feed factories. Currently, a modified microscopic method, which should allow the detection of traces of animal-derived proteins in fishmeal and feeds, is being evaluated in a ring test involving several locations. If the results show that the method is effective, a relaxation of the ban on the use of fishmeal for ruminants will be considered.

Undesirable substances

Undesirable substances in animal feed are defined as "substances, with the exception of pathogenic agents, which present a potential danger to animal or human health or to the environment or could adversely affect livestock production". The maximum allowable levels for a wide variety of substances including heavy metals, aflatoxins, anti-nutritional factors, pesticides, seeds and fruits of certain plant species are regulated by Directive 2002/32/EC on the basis of the precautionary principle. Original levels have been amended based on a review by the Scientific Committee on Animal Nutrition (SCAN) in Directive 2003/57/EC and 2003/100/EC. Particularly dioxin levels are of high relevance for aquaculture due to their high levels in marine ingredients associated with their accumulation in the marine food chain (Directive 2003/57/EC; Table 1).

Table 1: Maximum levels for dioxin according to Directive 2003/57/EC (sum of polychlorinated dibenzo-para-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) expressed in World Health Organization (WHO) toxic equivalents)

	Maximum content in WHO-PCDD/F-TEQ/kg
All feed materials of plant origin including vegetable oils and by-products	0.75 ng
Minerals	1.0 ng
Animal fat, including milk fat and egg fat	2 ng
Other land animal products, including milk and milk products, egg and egg products	0.75 ng
Crude fish oil	6 ng
Fish, other aquatic animals, their products and by-products (except fish oil and fish protein hydrolysates containing more than 20% fat)	1.25 ng
Compound feeds (except for fur animals, pet food and fish)	0.75 ng
Feeds for fish and pet foods	2.25 ng
Fish protein hydrolysates containing more than 20% fat	2.25 ng

The 25-State European Union



Maximum levels of trace elements

In the light of the evolution of scientific and technical knowledge, the maximum content of trace elements authorized earlier in feeds was re-examined by the SCAN and regulated in Commission Regulation 1334/2003. Maximum allowable levels of iron, cobalt, copper and zinc were decreased compared to the previous legislation to minimize the adverse effects on human health and the environment (Table 2).

Table 2: Maximum content of trace elements in feeds for aquaculture species according to Commission Regulation 1334/2003 (valid for all species, unless specified)

Element	Maximum content of the element in mg/kg of complete feeds	
	Prior to 2004	Changes effective from January 2004
Iron -Fe	1250	750
Cobalt - Co	10	2
Copper - Cu	35	Fish: 25
		Crustaceans: 50
Manganese - Mn	250	Fish: 100
		Other species: 150
Zinc -Zn	250	Fish: 200
		Other species: 150
Selenium - Se	0.5	No Change
Iodine - I	Fish: 20	No Change
		Other Species: 10
Molybdenum - Mo	2.5	No Change

Additives

The upcoming EC regulation 1831/2003 on additives for use in animal nutrition (application date October 18, 2004) will strengthen control of all types of additives, but in particular it completes the EU's drive to phase out antibiotics as growth promoters. The new regulation prohibits the use of the four AGPs in use until now — monensin sodium, salinomycin sodium, avilamycin and flavophospholipol — from 2006 onwards.

EC has directed that additives must belong to one of the following five categories with a number of functional groups per category:

- (1) Technological additives: Preservatives, antioxidants, emulsifiers, stabilisers, thickeners, gelling agents, binders, anticaking agents, acidity regulators and silage agents
- (2) Sensory additives: Colors, flavors and appetizers
- (3) Nutritional additives: Vitamins, trace elements, amino acids and their salts, urea and its derivatives
- (4) Zootechnical additives: Digestibility enhancers (enzymes), gut flora stabilizers (pre- and probiotics) and substances that favourably affect the environment.
- (5) Coccidiostats and histomonostats

Additives that may be used in feed must be present on the EU-list of authorized additives. In order to receive an authorization, a complete registration dossier has to be filed with the European Food Safety Authority (EFSA). The studies should demonstrate the safety of use for the target species, for the handlers, and for consumers who eat food products obtained from animals that have received the additive. Further, there should be proof that the environment is not affected by the additive itself or by-products derived from the additive, either directly and/or excreted by the animals. Efficacy and residue studies must be performed on the target category of animals.

Transitional measures allow for existing additives (approved according to previous regulation Directive 70/524) or ingredients previously not regarded as additives (e.g. amino acids) to remain on the market for one to seven years (depending on the type of authorization they had with the earlier regulation), after which they also need to re-apply to remain on the list of authorized substances.

GMO

European consumers have proven to be very sensitive to the use of genetically modified organisms (GMO) due to environmental, ethical and health hazard considerations. So far feeds consisting of or containing GMO were allowed in the EU but new directives have been set up in 2003 to regulate the safe use of GMO in food as well as feed (Regulation 1829/2003- in force since April 18, 2004). An additional regulation stipulates labeling requirements and traceability of GMO starting from the producer to ensure that correct information is provided to the end-user (Regulation 1830/2003). The use of authorized GMO products in feed needs to be labeled except when the proportion of GMOs is below the threshold level of 0.9% provided that this presence is adventitious or technically unavoidable. GMO ingredients, as well as additives composed of or derived from GMO ingredients, need to be approved through a safety assessment considering the molecular characterization of the GMO, its potential environmental impact following deliberate release, compositional and safety characteristics, potential toxicity and allergenicity of gene products and metabolites, and the nutritional assessment of the food and feed. Detailed registration procedures and transitional measures for existing GMO products are described in Regulation 641/2004. The full implementation of these regulations will benefit from ongoing standardization of PCR techniques among reference laboratories from different member states.

Further information and references

More background on the European Food Safety Authority:
<http://www.efsa.eu.int>

Published text of EU Directives and Regulations in the Official Journal of the European Union (OJ):
<http://europa.eu.int/eur-lex/en/index.html>

OJ references for cited EU Directives and Regulations (Issue/Page in the OJ – publication date)

Directives :

2000/766/EC : L306/32 – 7/12/00

2002/2/EC : L63/23 – 6/3/2002

2002/32/EC : L140/10 -30/5/2002;

2003/57/EC : L151/38 - 19/6/2003

2003/100/EC : L285/33 - 1/11/2003;

2003/1234/EC : L173/6 – 11/7/03

Regulations :

1334/2003: L187/11 – 26/7/2003

1829/2003: L268/1 – 18/10/2003

1830/2003: L268/24 – 18/10/2003

1831/2003: L268/29 - 18/10/2003

641/2004: L102/14 – 7/4/2004

Citations

Gill, C. 2004. BSE total cost? Feed International Feb 2004, p. 4.

Hites R.A. et al. 2004. Global assessment of organic contaminants in farmed salmon. Science 303, 226-229.

Note from the authors

The information given in this article is based on continuously evolving EC regulations and should be regarded as general and indicative.



Dr. Peter Coutteau obtained his Ph.D. in Biological Sciences at the Laboratory of Aquaculture & Artemia Reference Center, University of Gent in 1992. His doctoral and post-doctoral research was on the filter feeding biology of *Artemia* and bivalves, and lipid nutrition of bivalves, fish and shrimp. In 1997, he joined INVE Technologies NV, the R&D company of the INVE group, where he was responsible for coordinating the research and product development in the aquaculture division. His area of research in the company has led to the development of specialty premixes and feeds to improve nutrition and health in fish and shrimp. He is currently the Solution Manager for Farm Nutrition in the Aquaculture Nutrition business unit at INVE. He is responsible for the global coordination of R&D, product development, customer support and fish/shrimp feed mill projects. He has published more than 40 papers in peer-reviewed journals.



Ms. Ann Van Hauwaert graduated as a bio-engineer in 1991 at the University of Gent. After 6 years of shrimp R&D research in Ecuador in the framework of several bilateral development programs, she joined INVE Aquaculture in Belgium in the field of aquaculture premixes and concentrates in May 1998. She is currently part of the solution team of the Farm Nutrition unit, taking care of customer service, feed and concentrate formulation, and development of marketing tools. As member of the legal cell at INVE Technologies, she closely follows the changes in EU legislation.



A feature article on organic feeds by Dr. Steven Craig was planned for this issue. The article will be published in the next issue as there are some important, on-going developments in organic aquaculture and we wish to bring those to the attention of our readers.