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The use of vaccines and chemicals in Italy

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Abstract. Italy is one of the major fish producing countries in the Mediterranean area. It produces 39,700 tonnes/year of trout, 19,700 tonnes/year of sea bass and sea bream, 1700 tonnes/year of eels and almost 5000 tonnes/year of other salt water and fresh water species. Several pathologies affect such species, therefore it is often necessary to undertake antibiotic treatments (tetracycline, flumequine, sulphonamides, amoxicillin) or to arrange vaccination programmes against the principal bacterial pathologies (vibriosis, pasteurellosis, red mouth disease, lactococcosis). Notwithstanding the several on-going research projects aimed at creating new types of vaccines, problems exist related to the high costs of product registration and the fact that the use of chemicals registered in other countries of the EU is very difficult.

Keywords. Aquaculture production – Diseases – Therapy – Vaccines.

Utilisation de vaccins et de produits chimiques en Italie

Résumé. *Une production de 39 700 tonnes/an de :truites, 19 700 tonnes/an de loups de mer et daurades, 1700 tonnes/an d'anguilles et 5000 tonnes/an d'autres espèces de poissons d'eau douce et d'eau de mer fait que l'Italie soit un des principaux producteurs de poisson de la Méditerranée. Les pathologies de ces espèces sont nombreuses et il faut donc effectuer des traitements thérapeutiques avec des antibiotiques (tétracycline, fluméquine, sulfamide, amoxicyline) ou préparer des programmes de vaccination pour les principales pathologies bactériennes (vibriose, pasteurellose, yersiniose ou red mouth disease, lactococcose). Bien qu'il existe de nombreux projets pour la mise au point de nouveaux vaccins, les principales difficultés sont celles qui concernent les coûts élevés pour l'enregistrement des produits et l'impossibilité, du point de vue pratique, d'utiliser des remèdes enregistrés dans les autres pays de l'UE.*

Mots-clés. *Production aquacole – Maladies – Thérapie – Vaccin.*

I – Aquaculture production

Among the Mediterranean countries, Italy was one of the first countries to switch from an extensive farming of marine species, as was the case with sea bass and sea bream, to an intensive farming, both in concrete tanks and in off-shore cages. Moreover, for 30 years Italy, along with France, has been considered the most important producer of trout producing, in the 1990's, up to 50,000 tonnes/year.

The principal farmed fish species and their corresponding production are summarized in Table 1.

With 39,700 tonnes/year trout is still the major species farmed, despite the increasing costs and marketing problems which cause constant damage to the commercialized product. Italy is the fourth Mediterranean country after Greece, Turkey and Spain producing sea bass and sea bream with 19,700 tonnes/year.

In recent years the production of eels has dropped from 4500 tonnes/year in the 1990's to 1700 tonnes/year at present (2007). Such a reduction has mainly been caused by strong competition from the Danish and the Dutch, who, due to their intensive technologies of water circulation, have more than doubled their production, notably decreasing the final cost of the product. The production of other fish species (such as sturgeon, catfish, carp, sole, shi drum, etc.) is quite moderate with up to only several hundred tonnes/year.

Table 1. Aquaculture production (tonnes) and number of farms in 2007

Species	Total production (t)	Intensive (t)	Extensive (t)	Number of farms
Trout	39,700	39,700	–	350
Sea bass	9,900	9,400	500	96
Sea bream	9,800	9,200	600	96
Eel	1,700	1,600	100	10
Catfish	700	700	–	30
Carp	600	600	–	<20
Sturgeon	1,350	1,350	–	<20
White sea bream	400	400	–	5
Others[†]	2,000	2,000	–	No data available

[†]Striped bass, pike, shi drum, mullet, sole, etc.

II – Main diseases (fresh water)

The principal pathologies of the species reared in fresh water are summarized in Table 2.

Table 2. Main diseases in fresh water species

Disease	Diffusion (% of farms infected)	Economical impact	Trend
VHS	10<30	Medium	↑
IHN	10<30	Low	↔
IPN	10<30	Low	↑
Sleeping Disease	<10	Low	↑
Lactococcosis	>30	High	↔
RTFS-BCWD	>30	High	↔
ERM	>30	Medium	↑
BKD	<10	Low	↔
PKD	10<30	Low	↔
Ichthyophthiriosis	10<30	Low	↔
Saprolegniosis	10<30	Low	↔

Among the widely spread viral diseases which are able to cause a significant economical impact IPN, VHS and IHN must be noted. IPN may be responsible for serious losses in fry (Bovo and Giorgetti, 1979; Hill, 1982; Ghittino, 1985; Quaglio, 1989; Bovo *et al*., 2001) while VHS, although causing minor losses compared to the past when it was endemic in many areas, still represents a serious threath in affected farms where significant losses may occur in market sized fish. IHN is a diseases affecting mainly juveniles while in large sized (>100 g) subjects it is able to cause chronic mortality.

The latest reports confirm an increase of sleeping disease which, although causing a low chronic mortality, (<10%) could provoke muscular lesions leading to depreciation in the value of the filleted product and poor growth rates, because the fish affected by this disease do not eat for 30-40 days.

In recent years, the principal pathologies in trout breeding appear to be lactococcosis, caused by *Lactococcus garvieae* and rainbow trout fry syndrome (RTFS) caused by *Flavobacterium psychrophilum* (Inglis *et al.*, 1994). The first disease causes losses of 30-50% in large sized individuals (Ceschia *et al.*, 1992; Ghittino and Prearo, 1992; Prearo *et al.*, 2001), whereas the

second disease penalizes notably the fry with losses exceeding 30% (Sarti *et al*., 1992; Bronzati, 2000).

Also enteric red mouth disease (ERM), without appropriate vaccination prophylaxis, is able to cause a significant mortality rate and additional costs due to antibiotic treatment.

Among the parasitic diseases proliferative kidney disease (PKD) must be mentioned since it appears to be quite widely spread and against which no treatment exists.

III – Main diseases in salt water

The principal pathologies of salt water species are summarized in Table 3.

Table 3. Main diseases in salt water species

Disease	Diffusion (% of farms infected)	Economical impact	Trend
VER/VNN	10<30	Medium	↔
Winter Disease	<10	Low	↔
Lymphocystis	<10	Low	↔
Vibriosis	>50	High	↔
Pasteurellosis	>50	Medium	↔
Oodiniosis	>50	Medium	↑
Diplectanosis	>50	Medium	↑
Myxosporidiosis	10<30	Medium	↑
Argulosis	<10	Low	↔
Caligosis	<10	Low	↔

Without doubt the most important viral disease appears to be viral encephalopathy and retinopathy (VER) of sea bass (Bovo *et al*., 1998,1999; Maltese *et al*., 2002; Maltese and Bovo, 2007). This disease is particularly detrimental for shi drum, whilst sea bream are apparently still immune to VER. In the past four years, it has been seen that outbreaks are increasing all over Italy, also affecting individuals older than one year and with some cases in winter time (Borghesan *et al*., 2003).

Vibriosis (*Listonella anguillarum*) and pasteurellosis (*Photobacterium damselae* subsp. *piscicida*) appear to be the principal bacterial pathologies which are very harmful mainly when affecting fry (Bronzati, 2000; Manfrin *et al*., 2002), but fortunately these bacterial diseases are kept under control due to the widespread use of vaccination.

Among parasitic diseases, oodiniosis (*Amyloodinium* spp.) and diplectanosis (*Diplectanum aequans*) deserve to be mentioned not only for their high incidence (>50%) but also for their notable resistance against any kind of treatment or prevention measures. Within the *Myxosporidiosis*, the only disease of any importance is caused by *Myxidium leei* in sea bream, against which there is no treatment.

IV – Methods of control

At present only four antibiotics are officially registered in Italy (amoxicillin, flumequine, oxytetracycline and tetracycline) and one potentiated sulphonamide (sulphadiazine + trimethoprim) to be used as a premix in the formulation of medicated feed.

Vaccines against red mouth disease and vibriosis are also registered, both for immersion and for i.p. injection, and there are two autovaccines against lactococcosis (Ghittino *et al.*, 2002;

Manfrin *et al.*, 2006). They are all vaccines inactivated with formalin (bacterin formalin killed autovaccine) with or without adjuvant.

A vaccine against pasteurellosis is undergoing validation by a pharmaceutical company that is already commercializing it in other Mediterranean countries, while studies for experimental vaccines are on-going, particularly against RTFS, lactococcosis and pasteurellosis.

Good results have been obtained through the use of a DNA experimental vaccine against IHN and VHS (G. Bovo, pers. comm.), which has been i.m. injected in individuals of only a few grams.

Furthermore, other projects are on-going, along with other international research groups, for the creation of vaccines to be given orally through microencapsulation of the antigen and in association or not with immune stimulating treatments (Pacor *et al*., 2000; Gatta *et al*., 2001).

At present a major problem is caused by low levels of protection which compel the fish farmer to carry out the first vaccination treatment by immersion or by injection with all the difficulties and the costs that are related to such procedures.

However, in Italy, due to vaccination, as in the majority of the Western fish producing countries, antibiotic therapy is used less and only in case of real need. The aim of the producers is to reduce the use of chemicals and to improve the state of health of their animals by strengthening hygienic measures and the activities of vaccination prophylaxis.

Another matter to consider is treatment against parasites, since the actual regulation in force states that no pharmacological molecule should be permitted in Italy for the treatment of fish that are destined for human consumption. While waiting for the Italian Ministry of Health regulations to improve the subject and because of the fact that some products, such as formalin, sodium percarbonate and hydrogen peroxide, are already registered and used by other European Countries (e.g. Great Britain and Norway) and USA (with the approval of the very strict FDA), in order to avoid severe suffering and anomalous mortality in young individuals, or those still far from the end of the production cycle, some of these products are used occasionally.

V – Needs for the future

In the near future it will be necessary to strengthen research for the creation of new vaccines against RTFS and lactococcosis that in recent years have caused great problems in the fresh water aquaculture sector.

Furthermore, also, the creation of vaccines to combat IHN, VHS and IPN could help the fish farmer to reduce the impact of such diseases and the Veterinary Service to review and improve restoration plans in the areas where these diseases are to be eradicated.

In the salt water sector, an effective vaccine to combat VER could help the farmers to contain the disease that is difficult to control only with the application of strict hygienic health measures.

Another need, particularly felt by the producers, concerns the opportunity to have new antiparasitic products at their disposal and to enable the use of active ingredients already officially registered in other countries, whether they are in the EU or not.

In fact, the principle of mutual recognition is more theoretic than practical and the many bureaucratic obstacles discourage the majority of pharmaceuticals companies from undertaking any registration procedure.

The harmonization of the regulations related to the registration of chemicals and faster procedures, as well as a residues control programme, are the goals that must be reached within a few years in order to avoid the penalization of natural production in respect to other European partners.

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