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Fish farm parasite drug threatens wildlife

A drug used to treat parasite infections at fish farms can contaminate the surrounding environment and threaten local wildlife, a new study shows. Following a week-long treatment at a Norwegian salmon farm, the authors found concentrations of an anti-sea-lice drug that were high enough to kill some crabs, shrimps and lobsters. However, they suggest the drug is not likely to pose a risk to humans.

Parasites kill and stunt the growth of fish and cause fish farms to lose money as a result. Salmon lice (*Lepeoptheirus salmonis*), for example, are a major problem in fish farms. Losses are estimated to exceed €180 million a year just in the Northern Hemisphere[1]. Infestations can be treated with medicated fish feed pellets containing anti-parasitic drugs. However, these drugs can end up in the local environment — either when they are excreted by fish or when pellets are left uneaten — and can harm other organisms.

Limits have been set in the EU for drugs to be used in farmed fish — and all other food-producing animals — to ensure that unacceptable quantities are not consumed by humans (under Commission Regulation EU 37/2010[2]). Levels of the anti-parasitic drug teflubenzuron must be below 500 micrograms per kg in farmed salmon.

A recent laboratory-based study led by the same research team behind this current study showed that the drug, which is used to deal with lice infestations as well as in crop protection, can kill lobsters and there is concern about the amount accumulating in sediments. In the current study, the researchers followed the fate of teflubenzuron after it was used on an actual farm to treat salmon in a Norwegian fjord north of Bergen, where the drug had not been used before.

The salmon were treated for seven days starting on 2nd February 2012. Between 1st and 23rd February, the researchers examined water, sediment and aquatic life near the farm.

They detected teflubenzuron in sediment collected underneath the farm, as well as in sediment from 250m, 700m and 1100m away. However, concentrations from underneath the farm were much higher than in the surrounding area. By 23rd February, 15 days after the end of the treatment, concentrations fell across all measurement sites.

By carrying out further tests in May and October, the researchers could calculate that the half-life of teflubenzuron in sediment is 170 days. A drug's half-life is the length of time that it takes for its concentration to decrease by half.

Teflubenzuron was detected in the majority of wild species assessed, but polychaete worms, king crabs (*Lithodes maja*) and a fish, saith (*Pollachius virens*), contained the highest amounts. According to the researchers, the concentrations in king crabs, shrimp and two types of lobster were high enough to be fatal when they are moulting (shedding their exoskeleton). The drug is known to interfere with the synthesis of chitin, which is a component of the exoskeletons of moulting animals.

Eight months after the treatment ended, concentrations in all wild fish were below the limits of detection. It was still detectable in polychaete worms and crustaceans, but at a lower level.

In the EU, the safe limit for human consumption of teflubenzuron is 0.01 mg per kg of body weight per day[3]. The researchers calculated that if a 60kg person ate 200g of saith containing the levels of the drug detected in their study, this would equate to 45% of the person's daily limit. By comparison, teflubenzuron applied to crops may be consumed at between 14–76% of the limit, depending on a person's diet.

1.Costello, M. J. (2009) The global economic cost of sea lice to the salmonid farming industry. *Journal of Fish Diseases* 32: 115–118. DOI: 10.1111/j.1365-2761.2008.01011.x.

2.COMMISSION REGULATION (EU) No 37/2010 of 22 December 2009 on pharmacologically active substances and their classification regarding maximum residue limits in foodstuffs of animal origin.

3. EMEA (1997). Teflubenzurone, summary report (1), EMEA/MRL/221/97-Final, The European Agency for the Evaluation of Medicinal Products.