

Bacteria stop sheep dip poisoning fish and bees

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Bacteria can be used to break down used sheep dip, preventing bees and fish from dying because of soil and river contamination, scientists heard today at the Society for General Microbiology's Autumn meeting being held this week at Trinity College, Dublin.

Most modern sheep dips are based on natural insecticides found in chrysanthemum flowers that have been manufactured synthetically since the 1970s called pyrethroids. These pyrethroids are commonly used in household products like head lice shampoo, ant powders and fly sprays as well as agricultural products designed to control insects.

"Synthetic pyrethroid compounds are far less toxic to humans than other insecticides, such as the organophosphates formerly used for removing disease-causing insects from sheep but they are actually a thousand times more toxic to fish," said Dr Mairin Cannon from University College Dublin, Ireland. "They may also cause cancer in people, according to the US Environmental Protection Agency".

"Just one cupful of used sheep dip could wipe out all the fish in an entire river", said Dr Cannon. "The current advice is to dilute sheep dip with two parts of water to one part dip, then spread it on a designated area of land well away from water courses. This allows specialised bacteria in the soil to degrade the sheep dip over the next couple of months, hopefully before it can get into rivers or streams".

However in rural economies in Ireland, where agriculture provides over

10% of employment and economic turnover, and in upland Wales or Devon where sheep are a major farming activity and sheep dips are routinely used to control parasites, heavy rainfall can cause used sheep dip to leach out into waterways and sediments where it can kill huge quantities of fish.

Synthetic pyrethroids are also extremely toxic to aquatic invertebrates such as leeches, water snails and beetles and are particularly toxic to bees which can lead to problems with pollination. Once the poison is absorbed by these animals it can move up the food chain, accumulating as it goes. "In order to prevent pollution of this kind, we looked at bacteria taken from sheep dip contaminated soils in the hope that they could degrade the pyrethroids in the sheep dip before it is spread on land", said Dr Cannon.

30 different bacteria were isolated from sheep dip polluted soil and dipping tanks. Previously, similar bacteria had been found to degrade synthetic pyrethroids at low concentrations. Dr Cannon tested the bacteria to see if they could degrade the pyrethroids at higher concentrations before the sheep dip was diluted. They found 8 different bacteria that could break down the pyrethroid compounds in the sheep dip tank under laboratory conditions.

"One type of bacteria originally taken from a sheep dip tank degraded 75% of the compound, which is unprecedented" said Dr Cannon. "We think these bacteria could be added into sheep dip tanks to break down the insecticides prior to land disposal. We know they can survive because they originally came from inside a sheep dip tank".

"It is vital that we do our utmost to prevent fish kills in the future", said Dr Cannon. "Most recently there have been several reports of fish kills as a result of sheep dip pollution in the UK. The best way to degrade synthetic pyrethroids in an environmentally friendly manner is to use

these naturally occurring bacteria before the dip gets out into the environment. This could prevent a cascade of detrimental effects to fish, bees, aquatic invertebrates and ultimately humans".

Source: Society for General Microbiology

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