Watch out for mould

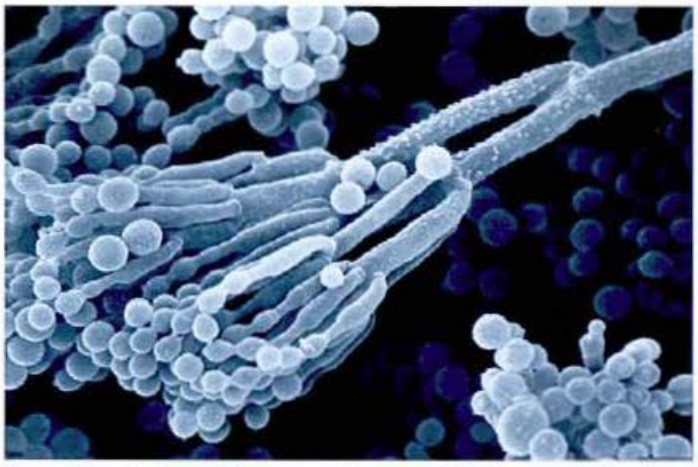
Have you ever wondered how it is that dogs can rummage through garbage bags, eating every unappealing object in sight, and yet not get sick?

Well, the fact is that sometimes they do. Take the case of Tom, a 1-year-old Siberian husky. Tom's garbage-eating habits finally got the better of him one day when he tore open a 2-week-old bag of rubbish and found a hamburger bun, which was covered in grey-green mould.

A few hours after consuming it he was a changed dog. He acquired a staring gaze, was probably hallucinating, and suffered from severe muscle tremors. He also had great difficulty standing.

Tom's owner took him to a vet and described the incident with the garbage. The remaining portion of the mouldy bun — a mere 6 grams — was kept for analysis. From the symptoms, and the fact that the dog had no signs of gastrointestinal disturbance, the vet suspected that the animal was suffering a poisoning rather than an infection.

To find out what within the mouldy bun had caused the dog's condition the CSIRO Division of Food Processing in Sydney was called in. Due largely to the expertise of Dr John Pitt and Dr Ailsa Hocking, a reference centre for food spoilage and toxigenic fungi exists there. Questions involving fungi and their toxins in food are frequently referred to the Division.



A scanning electron microscope close-up of the fungus-producing spores.

In this case, Dr Hocking set to work and grew the fungus in culture, and identified it as a species called *Penicillium crustosum*.

Many fungi produce toxins, and species of the famous mould *Penicillium* are no exception. (See *Ecos* 49 for more information about mycotoxins.) Work by Dr Pitt in 1979 had shown that *P. crustosum* produces, among other things, a toxin called penitrem A.

This is a powerful substance; in sheep and pigs an injected dose of penitrem A as small as 25 μg per kg of body weight can cause tremors of the whole body in just a few minutes. In dogs, apparently, the figure is 125 μg per kg. The anaesthetic drug pentobarbitone (a barbiturate) can block the action of the toxin, provided it is given soon enough. Nobody knows exactly how penitrem A exerts its effect, although it presumably influences an aspect of nervous transmission.

Using chromatography to separate all the compounds extracted from the fungus, Mr Noel Tobin, in collaboration with Dr Hocking, found that penitrem A, along with other penitrems, was indeed present in the bun, at a concentration of about 35 μg per gram.

The culprit: *Penicillium crustosum* growing in a Petri dish.

As Tom weighed about 20 kg, and had probably consumed about 100 g of the mouldy bun, his dose of penitrem must have been about 175 μg per kg of body weight. That is larger than the injected dose known to cause tremors in dogs. It was lucky that the unsuspecting animal had not found several such mould-ridden buns, as very high doses of this mycotoxin will kill within a few hours.

In the case of Tom, the vet sedated him and then, because the muscle tremors continued, gave him phenobarbitone. On the second day the dog could stand more steadily and the tremors were gone.

However, he continued to sleep for long periods and

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appeared agitated when awake. Any sort of exercise brought back the muscle tremors. His head wobbled, and he growled and became aggressive towards his owner when anything excited him. (Previously he had not behaved like this.) His complete recovery took about 2 weeks.

If you think that you have nothing to learn from Tom's story, then think again. Fungi produce a whole range of organic compounds to help them survive in a hostile world, and most of these are toxic to something.

Penicillin (a product of another species of *Penicillium* mould) kills bacteria, which are some of the principal competitors of fungi in the harsh world of microbiology. The fact that many *Pencillium* species also make substances toxic to animals may be coincidental — for example, if they are by-products of metabolism — or may be a deliberate ploy to stop themselves from being eaten by tiny predators such as mites.

You may be partial to deliberately mould-ripened cheeses, like Danish blue and Camembert, where the species used are also from the genus *Penicillium*. These fungi are quite safe and have been used in cheese-making for centuries, but don't let that fool you into thinking that you can eat any old piece of mouldy cheese.

According to Dr Hocking, *P. crustosum* is widespread and is commonly implicated in food spoilage. It may well be that it is involved in some cases of suspected food poisoning in people. So check for mould — and tell your dog to do the same!

Roger Beckmann

Intoxication by tremorgenic mycotoxin (penitrem A) in a dog. A.D. Hocking, K. Holds, and N.F. Tobin. *Australian Veterinary Journal*, 1988, **65** (3), 82–5.