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Drain flies: a nuisance or a threat to public health?

In general, the sight of a small fly on the rim of a cup of coffee causes little alarm to the coffee drinker. The fly is generally brushed away without so much as a thought. But should the drinker be worried? Professor Moray Anderson, consultant entomologist at Killgerm and a member of the Pest Technical Advisory Board, reviews new research which suggests these flies could indeed be a public health pest of significance.
Small flies on coffee cups or anywhere else for that matter tend to be ignored, unless present in high numbers and causing a nuisance.

If the fly on that coffee cup had happened to be a housefly, then there may be more concern. This is because for a number of years there has been sound evidence illustrating the role of domestic and peri-domestic flies, such as the housefly (Musca domestica), in the transmission of many bacteria which are the causative agents of many food-borne illnesses.

However, the small fly in the picture on page 25, resting on the edge of the coffee cup is a fruit fly, Drosophila funebris. So, should the coffee drinker be concerned?

For fruit flies you need to ‘think small’! They are black flies frequently grouped, along with other small flies, as belonging to the group known to those working within the public health pest control industry, as ‘drain flies’.

An umbrella term

The designation ‘drain flies’ is an umbrella term for a number of commonly overlooked, yet cosmopolitan, small flies that are associated with moist, highly organic environments including drains, sewage treatment facilities, rotting vegetation and animal and human excrement.

Drain flies include species from a number of different families of flies:

- The fruit flies, Family Drosophilidae;
- The scuttle flies, Family Phoridae;
- Owl midges or moth flies, Family Psychodidae;
- The lesser dung flies, Family Sphaeroceridae
- Flies of the Family Sepsidae.

It is fair to say that drain flies have in the past been frequently considered to be only present in small numbers, merely constituting a slight nuisance and to be of little public health importance.

A recent study (Davies, M P, 2014, Isolation and characterisation of bacteria associated with flying insects in hospitals, with particular emphasis on Clostridium difficile PhD thesis University of Aston) has shown that, far from these flies being an insignificant nuisance, they are, in fact, the most common fly species found within hospital premises.

They far outweigh, in their numbers, flies like blowflies, houseflies, etc. In hospital premises there are numerous areas where these flies can find sites to exploit for their juvenile stages to complete their life cycle. They are, in fact, therefore much more numerous than is generally thought.

Their presence in large numbers, whilst it may constitute a nuisance does not, in itself, necessarily pose a health threat. The reason why houseflies are considered a health threat is, as mentioned above, the fact that they are frequently carrying on their exoskeleton, or in their gut, many bacterial pathogens which can cause food-borne illness in humans.

Drain flies and bacteria

Between 2006 and 2010 a number of environmental health masters students at the University of Birmingham carried out a series of research experiments to try to discover if drain flies do carry bacteria and, if so, do the bacteria they carry pose any threat to public health.

The experiments carried out were set up in order to discover the following:

a) Are there bacteria present on drain flies?

b) Are there bacteria of the group Enterobacteriaceae** present on the flies?

c) If bacteria were present were the numbers of bacteria detected on the flies of public health significance?

** (Enterobacteriaceae – this group of bacteria are often termed ‘indicator organisms’. Their presence on foods can be an indication of poor hygiene practices and post processing contamination by faecal and related enteric material. Within the group are many of the bacteria which cause food-borne infection in humans.)

Microbiology

The microbiological assays carried out on the flies started with a series of tests to indicate the aerobic colony count technique and the total viable count of bacteria on the flies. These assays provided an indication of the overall micro flora found on the fly samples.

In all cases tested the results from these experiments showed high levels of bacterial flora on all the drain flies.

The second set of experiments carried out on drain flies collected from a wide range of natural habitats including hospitals, domestic...
and commercial kitchens and school kitchens showed that all the drain flies tested did have bacteria from the Enterobacteriaceae group present.

The standards set by PHLS (Public Health Laboratory Service) state that, if the Enterobacteriaceae colony counts exceed 104 CFU (Colony Forming Units) on any ready-to-eat foods (excluding fresh fruits and vegetables or sandwiches containing salad vegetables), they are deemed unacceptable.

High levels of bacteria found

The levels of the bacteria on the drain flies in all the experiments showed levels of Enterobacteriaceae much higher than the acceptable rate of 104 CFU.

The public health implications of this can be speculated upon.

Amongst the bacteria within this group are those which commonly cause food poisoning or food-borne infection. Food-borne infection is an active infection resulting from the ingestion of pathogen-contaminated foodstuffs.

Food poisoning is an international issue, causing not only serious illness and even death, but it also has great economic impact including putting additional strain on health services and time spent recovering away from the normal everyday activities such as education and work.

Frequently when there are outbreaks of food poisoning it is extremely difficult to pinpoint the cause of the outbreak. It is never routine when there are outbreaks of food-borne illness to check the local fly populations for bacterial load. Perhaps this should be routine, since the presence of examples of Enterobacteriaceae on so many of the small flies samples at such high concentrations suggests drain flies have a role in contamination of food stuffs and food preparation areas.

Control of drain flies

Drain flies are extremely common flies in domestic premises, hospital kitchens, school kitchens, etc and they are often ignored when pest control strategies are implemented.

The successful control of drain flies frequently involves changes to the structure of buildings, soil pipes and drainage systems. Therefore, for control to be wholly successful it is important to establish a system of cooperation between the pest control personnel and those in charge of the fabric of the buildings in which the problems have been detected.

Damp areas beneath machinery should be dried up and all accumulations of organic matter within the area where the drain flies have been located, no matter how small, must be removed. Only then should insecticidal treatment be carried out.

These damp, organic-rich areas are the locations where the larvae will be feeding and developing and unless these areas are tackled the development will continue and adult flies will continue to appear. The larvae of these flies are around 1-1.5 mm long and can be located in tiny gaps, feeding on what looks like exceedingly small reservoirs of food. Areas may have the appearance of being exceedingly clean and still have small amounts of organic matter present which can sustain populations of drain fly larvae.

It is also highly probable that it is within these areas of rotting organic matter that the adult flies pick up the bacteria which are found on their external surfaces.

Conclusions

These preliminary studies looking into the possibility that these flies could be of public health significance have shown that the flies do indeed have the capability of carrying bacteria of significance. In addition, it has been shown that the flies examined in these studies all had high counts of such bacteria.

It is not unreasonable therefore to suggest that drain flies are of public health significance. As mentioned above, it may be a worthwhile exercise when environmental practitioners are carrying out microbiological assays of premises where high bacteria counts have been encountered that samples of any flies present should also be assayed.