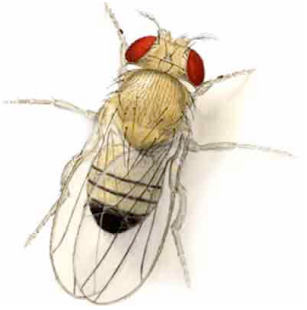
Viruses: now boarding transatlantic fruit flies



BY **JENNIFER CARPENTER**

Almost every fruit bowl in every home has one or two bothersome fruit fly visitors. Fruit flies have been minor annoyances to humans for thousands of years feeding on the food wasted by humans. They followed nomadic people as they spread out of Africa 10,000 years ago and thrived in Europe, when humans planted orchards and vineyards to make cider and wine. And, as people continued to explore the world, fruit flies stowed away on our ships, living on supplies of wine and fruit, spreading to the New World and beyond. However, few people know that fruit flies have stowaways of their own — viruses. By studying these viruses and their association with fruit flies, biologists hope to improve our understanding of how viruses, which are a major cause of global disease, can spread around the world.

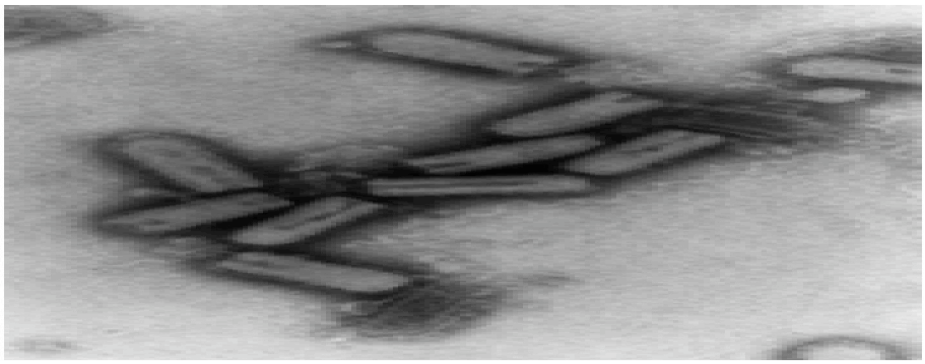
The virus that I am interested in, the sigma virus, was first discovered in the 1930s, when French scientists collecting wild flies noticed that they did not wake up after being anesthetised with carbon dioxide [1]. To begin with, scientists thought that this sensitivity to carbon dioxide was due to a genetic mutation in the fly, but a clever researcher showed that he could transmit carbon dioxide sensitivity if he mashed a fly up and injected it into another fly. The carbon dioxide sensitivity was infectious! The infectious agent turned out to be the sigma virus.

Inside the cells of infected fruit flies, the sigma virus uses the cell's machinery to replicate and transmit itself from parent to offspring in both eggs and sperm. Infected flies suffer few ailments, although they produce fewer viable eggs. But what makes this virus useful to biologists is how easy it is to test for the presence of the virus by exposing a fly to carbon dioxide and looking to see if it wakes up.

This is where I come in. As a first step to investigating the virus, I began to wonder how common it is in the wild, and how often it is transported around the world. So my colleagues and I collected fruit flies from different continents to look for the virus. This involved heading out to orchards to catch fruit flies, bringing them back to the lab and exposing them to carbon dioxide. If a fly died from this exposure, we mashed it up to remove the virus and sequence the virus's genome. It turns out that the sigma virus is more common than we thought; we found it in flies from strawberry fields, orange groves and even someone's kitchen [2]! But what is more intriguing is how similar the different strains of the virus are, even when you compare North American to European viruses.

Viruses have very fast mutation rates and so can evolve rapidly. This means that if two viruses are separated, they can very quickly become very different from each other. The close similarity of the viruses collected on both sides of the Atlantic suggests that the viruses have crossed the Atlantic at least once. It is possible that these viruses are constantly crossing the ocean and mixing with the native viral populations. We can think of them as transatlantic jetsetters, cruising the oceans in their own form of transport — the fruit fly, which, these days travel in banana-filled container ships.

Why do we care about a virus that infects fruit flies? Understanding the spread of a disease in fruit flies (whose genetic makeup is well understood) allows us to understand better the spread of diseases in more complex animals including farm livestock and ourselves. This has to be good news for everyone involved in producing healthier livestock and improving human health. And as humans travel more, and the food we eat travels more, there is more opportunity to spread disease. Recognizing how frequently diseases are carried from country to country is important for protecting humans from infectious diseases.



So next time you see a fruit fly flitting around your glass of wine, think how far that little fella has travelled and what passengers he might be carrying before you swat him! ■

1. L'Heritier, P.H. and G. Teissier, *Une anomolie physiologique hereditaire chez la Drosophile.* . C.R. Acad. Sci. Paris, 1937. **205**: p. 1099-1101.
2. Carpenter, J.A., Obbard, D.J. Maside, X. and Jiggins, F.M., *The recent spread of a vertically transmitted virus through populations of Drosophila melanogaster.* Molecular Ecology, *In Press*.