Phage spread antibiotic resistance

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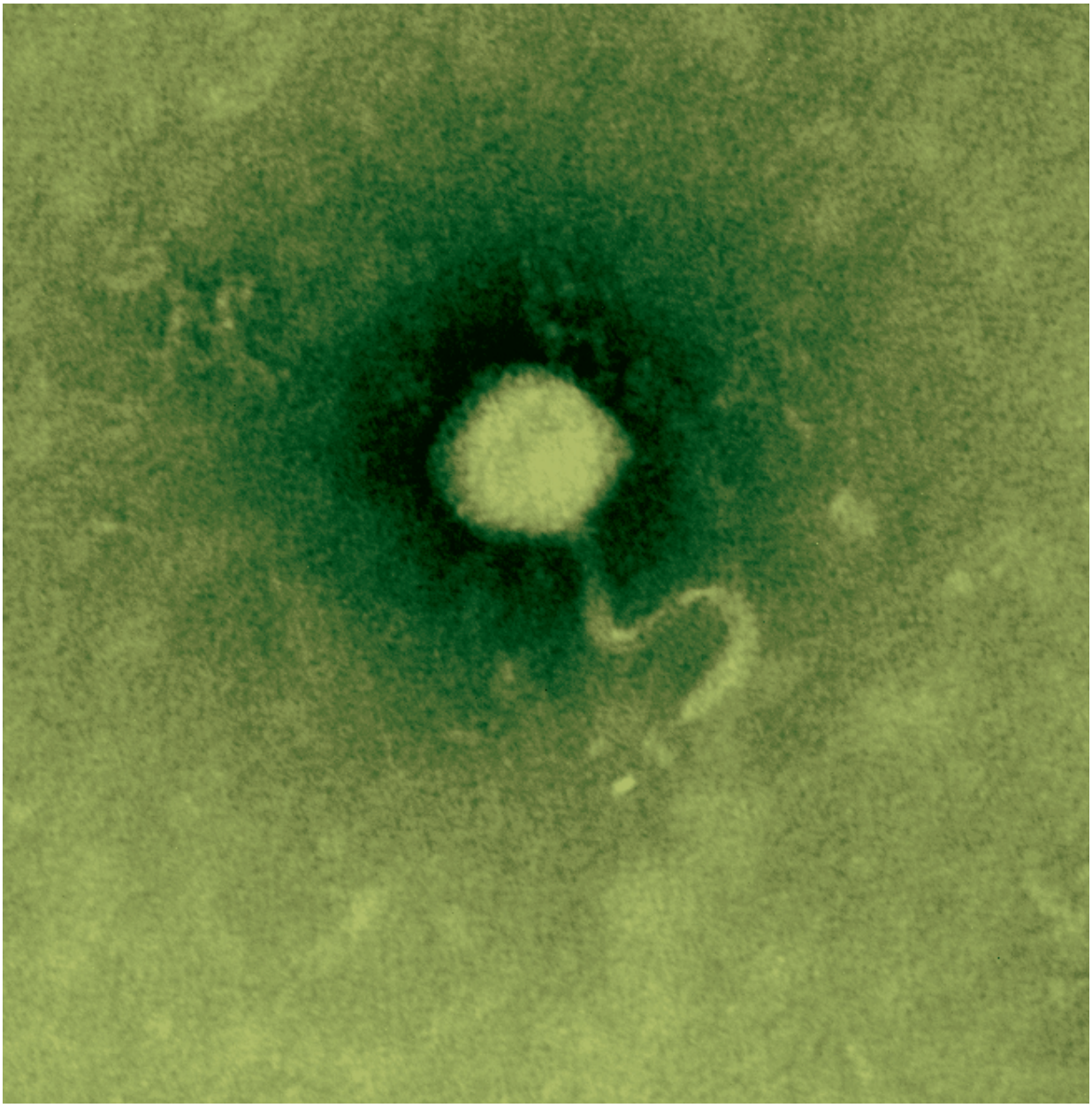

Phages infect bacteria and are able to transfer genes during this process. Credit:

Investigators found that nearly half of the 50 chicken meat samples purchased from supermarkets, street markets, and butchers in Austria contained viruses that are capable of transferring antibiotic resistance genes from one bacterium to another—or from one species to another. "Our work suggests that such transfer could spread antibiotic resistance in environments such as food production units and hospitals and clinics," said corresponding author Friederike Hilbert, DVM. The research is published ahead of print May 1, in *Applied and Environmental Microbiology*.

This was the first demonstration that a high proportion of phage randomly isolated from meat were able to transfer antimicrobial resistance among different bacteria, said Hilbert, who is a professor at the Institute for Meat Hygiene, Meat Technology and Food Science, at the University of Veterinary Medicine, Vienna, Austria. Phage are viruses that infect bacteria.

"One quarter of all phages isolated were able to transduce [transfer] one or more of the five antimicrobial resistances under study," said Hilbert. These included resistances to tetracycline, ampicillin, kanamycin, and chloramphenicol, as well as resistance to extended spectrum betalactam antibiotics. The results suggest that the number of phages that can transduce antibiotic resistance genes must be far higher, since the experiments were restricted to resistance to only five antibiotics via five randomly chosen phages per sample of chicken, said Hilbert.

"Strategies to combat antimicrobial resistance have enjoyed only limited success, and there are still many questions relating to how and when resistance transfer occurs," Hilbert writes. "The presence of phages that

transfer antimicrobial resistance could explain the failures to combat antimicrobial resistance."

Until recently, transduction of antibiotic resistance via phage was assumed to be a very minor source of the spread of resistance, said Hilbert. "New information from the sequencing of bacterial DNA has shown that transduction must be a driving force in bacterial evolution, and thus, quite common."

In the study, the investigators rinsed the chicken they had purchased, and then isolated coliphage, using the International Organization for Standardization (ISO) method for isolating such viruses from water, said Hilbert.

Unlike bacteria, which are true living creatures, viruses, including phages, can be thought of more as complex molecular machinery. As such, the latter are much more resistant to disinfectants, including those used in the food industry. Alcohol, in particular, is harmless to most viruses. "It is thus highly likely that phages survive under routine conditions of disinfection, not only in the food industry," Hilbert writes.

The research, Hilbert concludes, demonstrates that transduction is an efficient way to transfer antimicrobial resistance to *E. coli* in different environments. That, she says, needs to be addressed for concerns related to hygiene, sanitation, and public health.

More information: The full study is available at aem.asm.org/content/early/2015 … 872-15.full.pdf+html

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