

## Beneficial biological warfare

**Antoine Danchin**

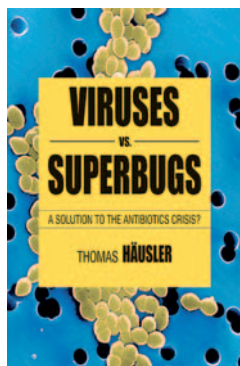
**Viruses vs. Superbugs: A Solution to the Antibiotics Crisis?**

by **Thomas Häusler**

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A fatherless child, the Great War and its horribly infected wounds, locusts in Mexico, Beria and Stalin, and the Institut Pasteur: these are some of the odd ingredients that make a book fascinating to read. And

not simply for fun or suspense, but because *Viruses vs. Superbugs: A Solution to the Antibiotics Crisis?* reveals enigmas and debates about the status of biology in our time. How do we make discoveries? How do we apply research? Do we devote enough time to reflection? Just half a century after the spread of antibiotic therapy, which has delivered us from most infectious diseases, microbes have slowly regained momentum in their attack on humans, animals and plants. As well as looking for new drugs using the now pervasive knowledge of genome sequences, it might be time to reconsider forgotten approaches. Remarkably, an investigation into the history of science might revive an old concept of biological warfare.

In an extremely lively and interesting way, Thomas Häusler describes an approach by Félix d'Hérelle—an improbable investigator of French-Canadian descent who

supported his own research at the Institut Pasteur and organized a biological fight against locusts in Mexico in the early 1900s. Häusler also reports that a tradition of biological fighting, on the basis of ideas that had little to do with genetics—as can be expected in the home of Trofim Lysenko—was maintained in Stalin's homeland, Georgia. In an interesting turn of history, after a long period of decadence, it has been resurrected there today. These stories have all the ingredients of a John Le Carré spy novel, which makes *Viruses vs. Superbugs* fascinating to read while raising many important, albeit unsolved, biological questions.

But let us start at the beginning. While at war, d'Hérelle discovered that wounded soldiers often died not from the direct effects of their wounds but from infection. In particular, the infamous gaseous gangrene took a huge and horribly painful toll. While isolating bacteria at the Institut Pasteur in Tunis in 1915, d'Hérelle made a major observation: when he grew layers of bacteria on agar plates, he sometimes found them spotted with clear zones—*les taches vierges* (virgin spots). The director of the Institute, Charles Nicolle—later to be awarded a Nobel Prize—suggested that this might be due to viruses. Following the convention of constructing names from Greek roots—a practice unfortunately forgotten today—d'Hérelle named them *bactériophages* (from φαγεῖν, to eat).

d'Hérelle then had a stroke of genius: if these phages eat bacteria in the laboratory, why not in the field? Häusler gives us a vivid description of infected wounds (caused by guns in 1914–1918, or by surgery, today, when nosocomial infections prevail), and describes how d'Hérelle suggested that a direct infusion of bacteriophages could result in a cure when traditional means—and, today, the best antibiotics—had failed. A remarkable feature of *Viruses vs. Superbugs* is that Häusler does not make dogmatic statements. Although reports indicate that the cure worked, he points out that a proper

statistical assessment of the treatment is lacking. Instead of advocating the self-praising behaviour of charlatans, he shows that doubt still exists. But he also shows that what has been observed repeatedly around the world suggests that one should seriously consider d'Hérelle's approach.

The second half of *Viruses vs. Superbugs* reports another exceptionally interesting story, that of the systematic use of phages in Tbilisi, Georgia. Georgiyi Eliava took the helm in 1923, introduced phage therapy three years later, after having visited d'Hérelle in Paris, and developed it on an industrial scale. He later died miserably at the hands of KGB murderers at the peak of Stalinist purges. The treatment fell into disgrace—both because it was too successful and because Eliava received support primarily from people who Stalin decided to eliminate—and phage therapy disappeared. It is true that this was the point at which penicillin, streptomycin and anti-tuberculosis drugs (isoniazid and rifampicin) were about to appear. So why continue to use an approach that required such a huge amount of work? After all, researchers in Georgia had collected more than 2,000 different phage strains, and had to painstakingly identify those that would be active against each disease of every patient.

Häusler then picks up the subject of the incurable bacterial diseases facing us today. Why not reconsider all this history, revise clinical trials, and use this interesting approach? Häusler conveys this message in a very convincing way. Not only should one read *Viruses vs. Superbugs*, but also we should launch serious research programmes on the subject; the government of Georgia (and several other places in the world) has already started to do so.

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