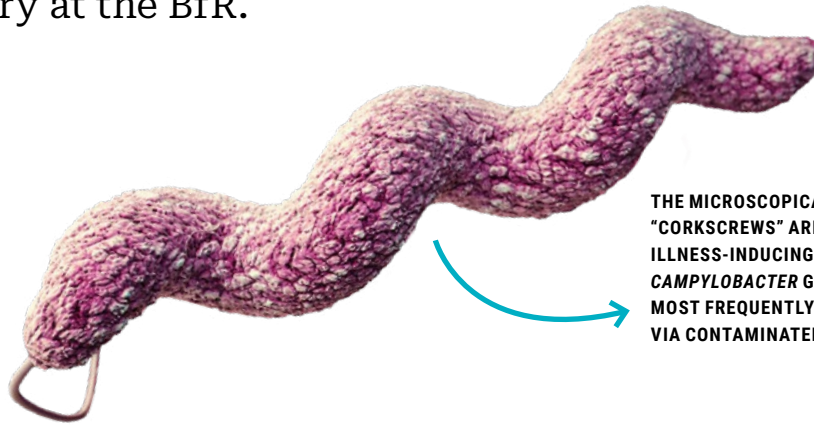


Disease-causing corkscrews

Despite being the most common pathogen causing bacterial foodborne infections, *Campylobacter* is not particularly well known among the general public: a visit to the *Campylobacter* National Reference Laboratory at the BfR.



THE MICROSCOPICALLY TINY "CORKSCREWS" ARE POTENTIALLY ILLNESS-INDUCING BACTERIA OF THE *CAMPYLOBACTER* GENUS. THEY ARE MOST FREQUENTLY TRANSMITTED VIA CONTAMINATED FOODS.

Looking through the microscope, there initially does not appear to be much to see. More specifically, one sees only blurry, pale fibres. Can those really be the microbes? Only after adjusting the microscope do they begin to take form. Initially just vague shapes, they grow clearer and more defined. Wow! Like tiny worms, they wriggle and team across the field of view. Some of them appear to be in a particular hurry and disappear as quickly as they appeared.

"They're very special," says Dr Kerstin Stingl with a note of admiration in her voice. "Even just the way they're shaped: they look similar to corkscrews and that shape is what makes them faster and more flexible." The microbiologist's affection for what are actually quite unpleasant entities is purely professional. After all, the microscopically small corkscrews dancing so cheerfully through the world are the potentially pathogenic bacteria of the *Campylobacter* genus. They are typically transmitted via contaminated foods and cause watery and sometimes even bloody

diarrhoea. In rare cases, there may even be complications as serious as Guillain-Barré syndrome, chronic inflammation of the nervous system. In total, 48 species of *Campylobacter* are currently known.

AN ESTIMATED 40,000 CASES PER YEAR

The public is less familiar with *Campylobacter* infections than those caused by, for example, *Salmonella*. Perhaps this is partly due to the complicated name. However, the bacterium is the most common cause of foodborne diarrhoea illnesses. Each year, around 40,000 to 50,000 cases are reported to the Robert Koch Institute. The species *Campylobacter jejuni* accounts for 80 to 90 percent of infections, with *Campylobacter coli* coming in second (roughly eight percent).

Dr Kerstin Stingl and her deputy Dr Janine Heise lead the National Reference Laboratory (NRL) for *Campylobacter* at the German Federal Institute

Disinfectants

They should generally not be used to clean kitchens. Typically, they offer no additional benefits compared to classical cleaning products and can contribute to the development of resistant bacteria. Disinfectants should only be used if recommended by a doctor or the Health Department in case of illness.



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for Risk Assessment (BfR). The laboratory monitors the microorganism, including its spread, timely detection, and its resistance to antibiotics. Its work also encompasses research into different species and variants of the pathogen as well as the development of laboratory standards. When it comes to “Campy”, the NRL sets an important standard for Germany.

EVERY SECOND CHICKEN IS "CONTAMINATED"

Campylobacter species live in the intestines of many animal species and typically pose no danger to them. They tend to only stay inside humans for a short time. The main risk stems from contaminated chicken. “*Campylobacter jejuni* or *Campylobacter coli* are in every second chicken,” says biologist Dr Janine Heise. “During slaughter, they can be transferred from the intestine to the muscle meat and can infect human consumers in this way.” Cross contamination is one of the greatest risks. This involves bacteria from raw chicken being

Kitchen sponge

Keep dry and replace it regularly in order to limit multiplication of microorganisms.

transferred to other foods, such as salad, due to a lack of caution. However, the risk can be greatly decreased by following the rules of kitchen hygiene (see interview in this issue).

What if there were efforts to start with the chickens themselves in order to lower the risk of an infection? "Several attempts have been made to keep *Campylobacter* out of farms," says Heise. "But that has so far proved to be very difficult, because

the bacteria enter their hosts through a variety of ways, including insects." Stingl adds that the European Union has been trying since 2018 to reduce the amount of contamination in chicken during processing by introducing tests and criteria for monitoring of chicken skin for *Campylobacter*. "Unfortunately, I don't think we'll manage to get *Campylobacter* out of the food chain any time soon." One of the contributing reasons is the fact that it is not currently possible to vaccinate chickens against the bacterium.

ONLY LITTLE OXYGEN

Campylobacter not only uses oxygen, but also nitrate, fumarate, and other substances to generate energy. This flexibility is vital when it comes to surviving in animal intestines, a low-oxygen environment. However, the bacterium cannot fully do without

CROSS CONTAMINATION IS ONE OF THE GREATEST RISKS. THIS INVOLVES BACTERIA FROM RAW CHICKEN BEING TRANSFERRED TO OTHER FOODS, SUCH AS SALAD, DUE TO A LACK OF CAUTION.



© Cutting board: Popova Olga, Salad: progressman, Knife: Rajakhalid, Chicken: Oleksandr Pokusai @adobestock

CAMPYLOBACTER JEJUNI
OR CAMPYLOBACTER COLI
ARE IN EVERY SECOND
CHICKEN.



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oxygen, as the process of replicating its genetic information is dependent on it. It is difficult to grow the bacterium, because it can thrive in neither normal air nor strictly anaerobic conditions. In the specific incubators of the NRL and with special nutrient media, however, it is possible to keep the microorganisms alive and to multiply them in order to study their characteristics and also use them for laboratory proficiency tests (PTs). Laboratories working in the field of food safety participate in these PTs in

order to verify the quality of their performance of detection methods.

And there is one more peculiarity that characterises these microbes. They do not only use the typical “vertical” gene transfer via cell division. “*Campylobacter* have an extraordinary capacity to perform horizontal gene transfer,” explains Stingl. “This means that the bacterium can pick up genetic information excreted or left behind by other bacteria and incorporate it into its own genome.” *Campylobacter* recognizes the genetic information of related species which provide a special kind of biochemical decoration for their DNA and thus identify themselves. Such a “gene donation” increases the diversity of the population and thus the chances of survival, for instance through increased resistance against antibiotics. At the NRL, research is conducted to

understand the underlying processes of genetic exchange.

Sometimes, the extended genetic “refreshment” with other species renders species identification difficult. The bacterium seems to place no value on a pristine pedigree. A fast and well-camouflaged master of transformation, one might caution to “never judge a book by its cover.” But that is, of course, an unscientific perspective.

Kerstin Stingl and Janine Heise conclude by reiterating that “they are certainly very special microorganisms.” —

Raw? Please don't!

Poultry should never be consumed raw. Instead, it should always be cooked through. The same is true for other raw meat. The BfR also discourages the drinking of raw milk.

More information



BfR information
 “*Campylobacter*”