A sweat protein fights Lyme disease!

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Recent biochemical research reports that human sweat contains a protein that neutralizes the bacteria that causes Lyme disease. However, a third of the human population produces a less active mutated variant of this protein, making them more likely to develop the disease.

Lyme disease is an infection caused by the bacteria (*Borrelia burgdorferi*), transmitted by the bite of an insect, the tick (*Ixodes scapularis*). Although it originally primarily affected residents of the northeastern United States (the disease was first described in the town of Lyme in Connecticut, hence its name), the disease has become over the last 20 years increasingly common in southern Quebec.

The milder winters that accompany global warming have in fact allowed the tick to expand its territory towards the north, where it reproduces by parasitizing different animals (deer and mice, in particular).

The interaction of the tick with the white-footed mouse (*Peromyscus leucopus*) is particularly problematic, because this mouse constitutes the natural reservoir of the bacteria responsible for Lyme disease. By parasitizing these animals, the tick becomes a carrier and vector of the bacteria and can then transmit it during contact with a human.

DISEASE WITH VARIABLE SYMPTOMS

Lyme disease is generally manifested by the presence of a migrating red rash (erythema), shaped like a bull's eye (central redness surrounded by a pale ring and an external halo), followed by the appearance of flu symptoms (fever, headache, fatigue, muscle pain).

The clinical course of the disease, however, varies greatly from one individual to another, with some showing no or few symptoms, while others develop severe forms of the disease which can persist for months or even years, despite intensive treatment with antibiotics.

NATURAL ANTIBACTERIAL

To better understand this phenomenon, researchers examined whether there were genetic variations that could make some people more susceptible to Lyme disease.

Using a genomic bank including 617,731 people, of whom 25,355 had been affected by the disease, they observed a very strong correlation between this risk and the presence of variations in the gene coding for a protein of the secretoglobin family, called SCGB1D2 (1).

This link is interesting because secretoglobins are a family of proteins that play roles as immune sentinels on the surface of certain organs, such as the lungs and skin. In this case, the researchers determined that this secretoglobin is produced mainly by the cells of the sweat glands and is therefore present on the surface of the skin, therefore ideally located to stop infection by the bacteria responsible for Lyme disease.

It seems that this is indeed the case: when the researchers exposed the bacteria to a normal version of secretoglobin, they observed a significant inhibition of the proliferation of the bacteria. On the other hand, when it is the mutated version of the protein (the one associated with an increased risk of disease) that is used, the proliferation of the bacteria is much less affected.

These differences have repercussions on the risk of developing the disease: mice injected with bacteria pre-exposed to mutant secretoglobin developed Lyme disease, while animals injected with bacteria pre-exposed to the normal version of secretoglobin were not infected and remained healthy throughout the duration of the study.

The main message is this: the protein identified by the study therefore seems to act as a natural antibacterial agent, secreted in sweat, which manages to counter infection by the bacteria responsible for Lyme disease. The greater susceptibility of certain people to developing severe forms of this disease could therefore be caused by the production of a biochemically less active form of this antibacterial agent.

In addition to its scientific importance for understanding the clinical course of Lyme disease, this discovery could have very concrete applications, for example in the manufacture of creams containing these natural antibacterial agents to prevent the development of the disease or treat as soon as possible at the early stages, after the tick bite.

(1) Strausz S et al. SCGB1D2 inhibits growth of Borrelia burgdorferi and affects susceptibility to Lyme disease. Nat. Commun. 2024 ; 15 : 2041.

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