Infection through subterfuge

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Has everyone been aware of these genes? I've read at least 4 different articles stating totally different ways borrelia can beat/evade the immune sytem.
I'll post them when I get a chance.

Researchers reveal how Lyme disease bacteria hide from immune systems

Paul Tadich

Thursday, June 02, 2005

In the sci−fi classic Invasion of the Body Snatchers, an alien plague silently commandeers the bodies of its unsuspecting victims. Now, a group of researchers has shown how a real−life parasite multiplies undetected in infected people by cleverly subverting the body's immune system.

Seppo Meri, a professor of immunology at the University of Helsinki, has discovered why nearly one−third of people with Lyme disease do not show any symptoms until the bacteria that cause it have colonized the entire body. "These bacteria are able to spread all the way to the brain," he said in interviews.

Lyme disease, contracted by approximately 10,000 North Americans each year, is caused by ticks harbouring a type of bacteria called Borellia. Most victims of tick bites who become infected break out in a telltale ring−shaped rash. But 30% of victims suffer no symptoms until the bacteria have multiplied out of control. Acute arthritis and facial paralysis can result. A course of antibiotics can usually set things right, but in about 10% of cases these symptoms are irreversible.

Professor Meri's team, working in Sweden and Finland, studied the behaviour of Borellia to figure out how it avoids getting gobbled up by the body's defences once it has established a beachhead underneath the skin.
In most cases, white blood cells −− also called leukocytes −−rush to the site of an infection to do battle with foreign bacteria. But when Borellia is the culprit, leukocytes are often nowhere to be seen.

Prof. Meri's team found that when Borellia enters the body it activates the expression of two genes, OstE and Crasp1. The proteins generated by these genes stick out from the surface of the bacteria like the bristles on a kiwi.

The bloodstream is filled with a protein called complement factor H, which normally binds to the surface of foreign bugs, acting as a beacon for leukocytes to attack. But OstE and Crasp1 neutralize this protein, making Borellia invisible to the white blood cells. Then the real trouble begins.

"In the second phase," said Prof. Meri, "the bacteria very silently spread around the body −− they go to the blood and then they spread to joints, the eye, the brain and the skin. Then there is the third phase, where the bacteria multiply in organs and cause their destruction."

What most surprised Prof. Meri was Borellia's cleverness in adapting to its environment. "These bacteria behave very dynamically," he said. "When we grow them in the lab in cultures, they lose the protective molecules. As soon as they are in the human [body], they up−regulate the protective molecules." Borellia is also smart enough not to waste energy manufacturing OstE and Crasp1 when it's living in the tick gut.

Prof. Meri hypothesizes that OstE and Crasp1 genes are turned on and off depending on the temperature. In the lab dish and in the tick gut it's relatively cold, so the genes are silenced. In the body, however, things get hot enough to trigger their expression.

So it's hardly surprising that these ingenious bacteria have evolved a sophisticated "conjugation" mechanism to share their clever genes with the entire community −− otherwise known as sex.

Like humans, Borellia bacteria store their hereditary information on strands of DNA, organized into chromosomes. But unlike us, bacteria often contain tiny pieces of circular DNA −− called plasmids −− that are separate from the chromosomes. The OstE and Crasp1 genes are located on one of these plasmids. By joining together, bacteria can transfer these plasmids from one individual to another, a process analogous to a sperm entering an egg.

Because there are several strains of Borellia bacteria −− different variants are prevalent in Europe and North America, for example −− it's likely one strain first evolved these genes and then passed them around to other types of Borellia through bouts of bacterial intercourse.

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