UVic KNOWLEDGE
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AFRICAN SLEEPING SICKNESS RESEARCH

Slaying the sleeping dragon

by Kirsten Rodenhizer & Leah Pence

UVic biochemistry professor Terry Pearson calls African sleeping sickness a sleeping dragon — it sleeps for long periods of time, only to wake up and flare into an epidemic. Pearson and his research team are fighting to slay the dragon.

There have been two sleeping sickness epidemics in the past 120 years, each of which killed nearly a million people. And recently, the beast has awoken to create another epidemic. As of October 2000, more than 500,000 people are infected, and another 60 million are at risk.

Pearson, who is working on a vaccine for the disease, says sleeping sickness is a "disease that has changed a continent," yet few people outside of Africa know anything about it.

"Can you imagine what would happen if 500,000 North Americans were infected?" asks Pearson. "We just wouldn't tolerate it."

Although scientists have known for more than a century that African sleeping sickness is caused by a deadly parasite called the African trypanosome, there is still no vaccine. But Pearson and his research group are working to develop just such a vaccine.

The African trypanosome is carried in the tsetse fly, which looks much like a small horsefly. The fly carries the parasite and passes it on to new victims when it bites, similar to the way mosquitoes spread malaria.

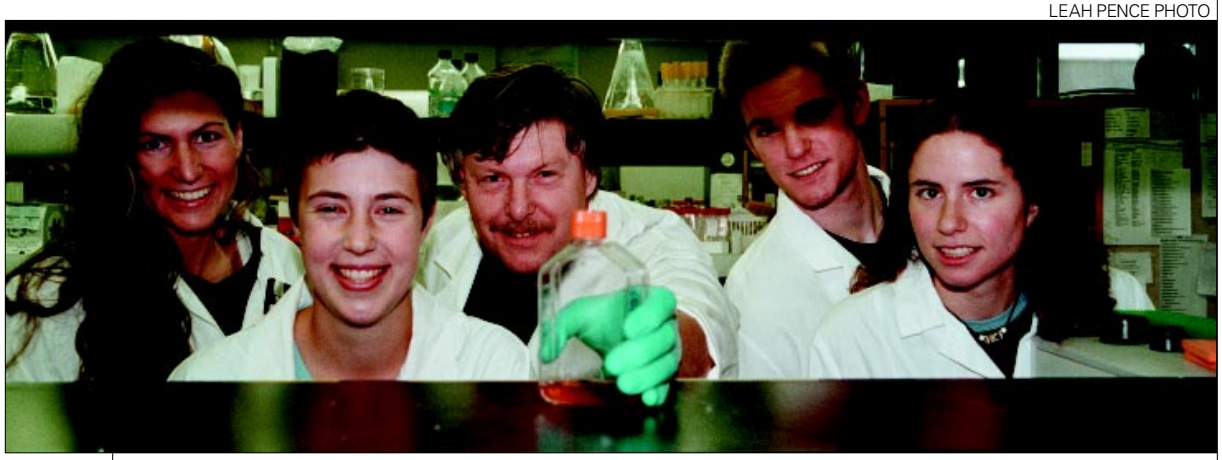
African trypanosomes are unique microorganisms because they are so hardy. Through a process called "antigenic variation," they can alter their surface molecules, or coat, to resist the body's immune response.

"The parasites have evolved to avoid immune response," says Pearson. "They're very clever that way. They've got a good head start on us, having survived in mammals for millions of years."

The immune system can't recognize the parasites until their numbers in the blood are extremely high. It fights most of them off, but the remaining few adapt, or create new coats, and multiply again. This continues with wave after wave of parasites.

"Eventually the immune system wears out, and the parasite numbers keep getting higher and higher until they invade the central nervous system, ultimately causing death," says Pearson.

LEAH PENCE PHOTO



Pearson and his research team (l—r): Lee Haines, Morag Stewart, Pearson, Mike Hunter, Jen Chase

The parasites can create more than a thousand different surface coats to protect themselves against the body's immune response. This makes it virtually impossible to develop a normal vaccine, which would be useless as soon as the parasite adapted.

However, the parasites don't adapt or change coats when inside the tsetse fly. So the research team has been studying molecules on the surface of parasites taken from inside flies, instead of from inside human bodies. This may enable them to develop an "altruistic" vaccine to prevent tsetse flies from spreading the disease to more than one victim.

This altruistic vaccine would allow a person's body to create antibodies against the fly form of the parasite. After a bite, the parasites would still enter the bloodstream and adapt, causing infection, but the fly would carry away antibodies in the blood meal that could interact with the parasite in the fly, preventing it from infecting someone else.

"It wouldn't help the immunized person but the vaccination might prevent transmission," he says.

Pearson and his research team receive most of their funding from the Natural Sciences and Engineering Research Council of Canada.

EDGE/WISE Early diagnosis

Dr. Terry Pearson's UVic research team has also been working on creating inexpensive, durable and easy-to-use diagnostic tests to improve the chances of early diagnosis of African sleeping sickness. If the diagnosis is made early enough there is a greater chance that patients will take measures to combat the disease before the parasites make their way from the bloodstream into the cerebo-spinal fluid and the brain.

"Only a small number of people are currently tested on an annual basis — fewer than five per cent of those at risk," says Pearson.

Misdiagnosis remains a pervasive problem because of the nature of the disease. A patient infected with the disease will often feel sick in waves, which correspond to the buildup and decline of parasites in the blood.

Patients tend to seek help when they feel well enough to walk and talk — times when parasite numbers are low in their blood. At that stage, the disease can't be detected, and patients go home with an incorrect diagnosis. When they fall sick again, they may go to a different doctor because the last one didn't help, and the process repeats itself.

"It can persist like this for several years. The person just gets sicker and sicker and then dies," says Pearson. "The disease can take from months to years to kill."

If tests were more easily available and simpler, enabling more people to administer them from more locations, the number of early diagnoses would increase and many more people would survive.

FACTS FROM THE EDGE

- Sleeping sickness endangers 60 million people in 36 sub-Saharan countries and will kill at least 350,000 people this year.
- Tsetse flies can spread the disease to both people and livestock. Approximately $5 billion worth of cattle die of sleeping sickness each year, making it a huge socioeconomic problem.
- If the sleeping sickness is detected early, patients can sometimes be cured with arsenic-based drugs. However, since very few people in Africa have access to adequate health care and many are poor, few can benefit from the medication. Most of the 500,000 people now infected with African sleeping sickness will die.
- The UVic lab, along with collaborators in Belgium, Kenya and the United States, is looking at another approach to immunization involving a tiny region on the parasite — the flagellar pocket — that stores nutrients. By targeting this area, researchers hope they can starve the parasite and keep it from reproducing. Early results of tests done on laboratory mice show that this strategy holds great promise.

SHARPEN YOUR KNOWLEDGE

Medecins sans frontieres (doctors without borders) is the world's largest humanitarian orginisation. Their volunteers around the world work to see that people are gaining access to essential medicines. See **www.msf.org/advocacy/accessmed** for more information.

The website of the World Health Organization (**www.who.int/tdr**) provides excellent information on research and training in tropical diseases. Follow the link to African trypanosomiasis where there is information on the latest progress, publications and research grants.

ON THE EDGE OF YOUR SEAT

"Japan and the Asia-Pacific"
Lecture by Yuichi Kusumoto, Consul-General of Japan, Vancouver
Nov. 16, 12:30 p.m., Fraser Building (formerly Begbie Building), room 152
Info: 721-7020

"Nature by Design: The Future of Ecological Restoration"
Lansdowne Lecture by Dr. Eric Higgs, University of Alberta
Nov. 16, 7:30 p.m., David Strong Building (formerly Classroom Building) room C-103
Info: 721-7354

All events free and open to the public.
For further information, visit the online events calendar at **www.uvic.ca/events**

SPARK
Students Promoting Awareness of Research Knowledge

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