Bringing Research to LIFE

In Brief

CCAC recognizes U of M professor

Physiology professor Dr. Edwin Kroeger has received The Canadian Council on Animal Care's 2008 Harry Rowsell Award for Outstanding Service.

The Harry C. Rowsell Award for Outstanding Service to the Canadian Council on Animal Care is the highest honour given to individuals who have made truly exceptional contributions to the CCAC and its programs. This is a very impressive Award given to only two other Canadians since its start in 2003.

Fulbright Award

University of Manitoba researchers Dr. Warren Cariou and Dr. C. Emdad Haque have been awarded 2008 Fulbright Visiting Chair Awards. Canada-U.S. Fulbright Visiting Research Chairs are awarded to prominent Canadian and American scholars who wish to conduct research, work with faculty and graduate students, and if they choose, offer guest lectures and teach while at select American and Canadian universities. Coincidentally, both professors will undertake their respective studies at Arizona State University (ASU).

Upcoming

Internal Grants Writing Workshop

Thursday, Sept.11, 2008
1:30pm - 2:45 pm

For more information, please contact Kathryn Bartmanovich @ 480-1409 or Kathryn Bartmanovich@ umanitoba.ca

SSHRC Strategies for Social Sciences and Humanities Disciplines

with Dr. Rick Linden, Department of Sociology, University of Manitoba

Tuesday, Sept. 16, 2008
10am-11am

210 Helen Glass Centre

To register, please contact Brent Deere @ 474-8390 or brent_deere@umanitoba.ca by Monday, Sept. 8, 2008

It's not revenge... it's science

BY SEAN MOORE
Research Communications Officer

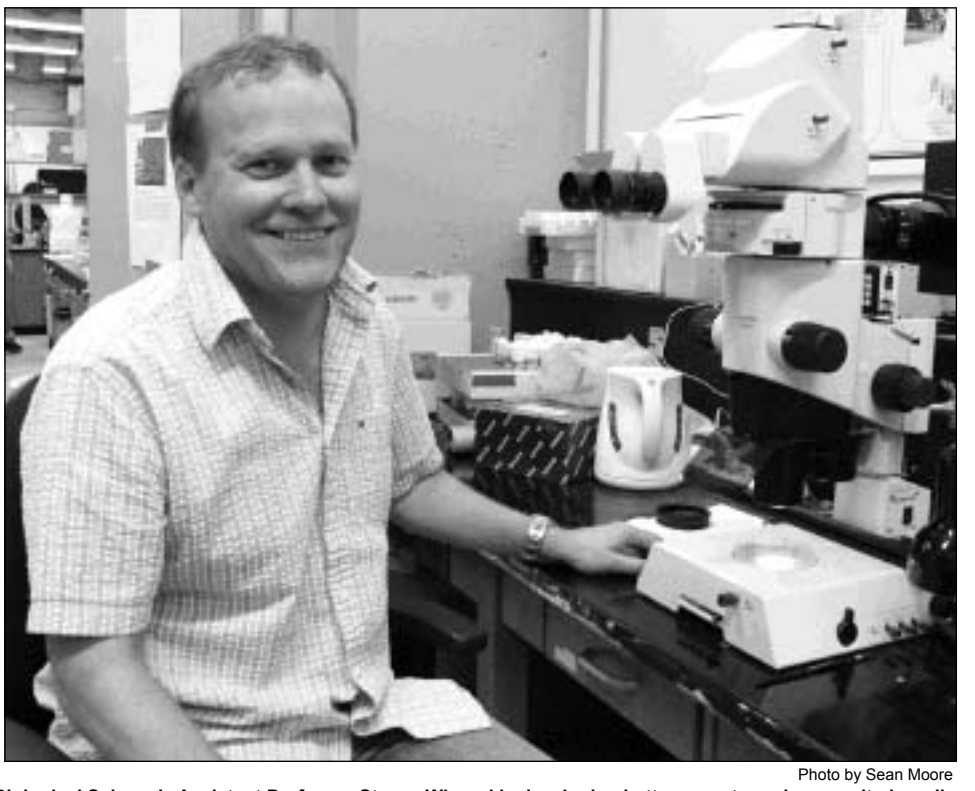

Photo by Sean Moore
Biological Science's Assistant Professor Steven Whyard is developing better ways to curb mosquito breeding.

Steven Whyard does something patio-goers and campers can only dream of: he sticks needles into living mosquitoes.

"I take some satisfaction in injecting mosquitoes. Most of my students do too. We use micro needles and when we sit down and inject, there's a sense of payback for all those mosquito bites," the zoologist said.

Whyard studies the molecular pathways involved in mosquito reproduction and development and, in a separate study, the molecular pathways of West Nile Virus transmission. Ultimately, he wants to develop genetic techniques (specifically RNA interference) that can control mosquito populations so that indiscriminately harsh pesticides can be shelved.

"I don't ever aspire to mosquito genocide. It's not feasible either. Mother Nature has a way to ensure no species is eliminated that easily. Every effort we've made to control mosquitoes using pesticides has eventually failed because they acquire resistance. The challenge is to develop some new control methods to circumvent the increasing resistance."

The key is to use a control method that has a diverse arsenal. Such a method is available if you take a genetic approach, for mosquitoes have 16,000-odd genes from which to select, and Whyard suspects, using data garnered from experiments on fruit flies, that at least a few dozen mosquito genes can now be targeted for "silencing".

To silence, or turn off, a gene Whyard uses RNA interferences (RNAi).

RNA is, among other things, a liaison between DNA and proteins – shuttling messages from the cell's DNA within the nucleus to its cytoplasm, where proteins are made. By interrupting RNA's role within cells, Whyard is turning off genes involved in the reproductive cycle or in the sexual development of the mosquitoes.

RNAi is induced if a double-stranded form of RNA is introduced into the cell. Most RNA is single-stranded so this new form gets the attention of the cell's internal "immune" system. Special proteins first dice the double-stranded RNA into segments 21 nucleotides (genetic letters) long and then the fragments are unzipped, and the cell scans of all of its RNA molecules for any sequences that match the double-stranded RNA sequences. Once found, the proteins destroy the target RNA and the single gene is thus silenced.

Submitted Photo
The subject of study, Aedes aegypti.

Submitted Photo

There are about 3,000 species of mosquito worldwide and the ones in North America are generally not serious disease vectors. Although about 40 species can carry West Nile Virus in Canada and the USA, only a few species, such as our local Culex tarsalis are threats to humans.

Whyard currently works with another vector species, Aedes aegypti (not present in Manitoba) because the Culex species is a stubborn breed: in his first attempt to rear a clutch to adulthood, the caged mosquitoes refused to eat a blood meal and starved to death. He will tweak the rearing conditions and try again though.

Once Whyard finishes discovering suitable target genes for silencing, the question is how best to deliver the double-stranded RNA to the mosquitoes in the lab.

"We've been looking at a fast way to do it and it involves what's known as a gene gun. We stick a plate of mosquito embryos under it, push a button, and tiny one micron beads are fired onto the plate.

"They're coated with the DNA or RNA that you want to deliver into the cells. The gene gun blasts the beads right into an embryo and once the beads are in there, the double stranded RNA can detach from the beads and induce RNAi."

So in a few seconds, the tool can render a thousand mosquitoes sterile. But how can sterile buggers be bred?

"We got a number of ways to keep them fertile while they are in captivity. When we need a large number of sterile males, we can produce them in the next generation. We keep the sterility genes turned off until we throw the switch," he said.

"One thing we can do is maintain two strains of mosquitoes that possess different parts of the sterility genetic construct. These two strains are fertile, but if they are crossed together, all of their progeny will be sterile."

What's more, since only females suck blood and therefore transmit disease, Whyard is investigating how he can manipulate the genetic pathways involved in sex determination so that he can tailor broods to be all-male.

But wait, there's more.

Whyard is also investigating some novel compounds found in mosquito semen that may be of interest to medicine – antifungal and antimicrobial agents. And the seminal fluid also contains a sex peptide that goes straight to the female's brain where it tells her she has mated and arrests her libido until she lays her eggs, much to the contentment of the male.

If this peptide were sprayed onto larval holding ponds, in theory, it could trick young females into thinking they were mated and they would not produce any offspring. And for some species of mosquitoes that only take a blood meal after mating, this peptide could curb their desire to bite, and that would make all of us, no doubt, content.

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Comments, submissions and event listngs to: lindsay_fagundes@umanitoba.ca
Phone: (204) 474-9020 Fax (204) 261-0325