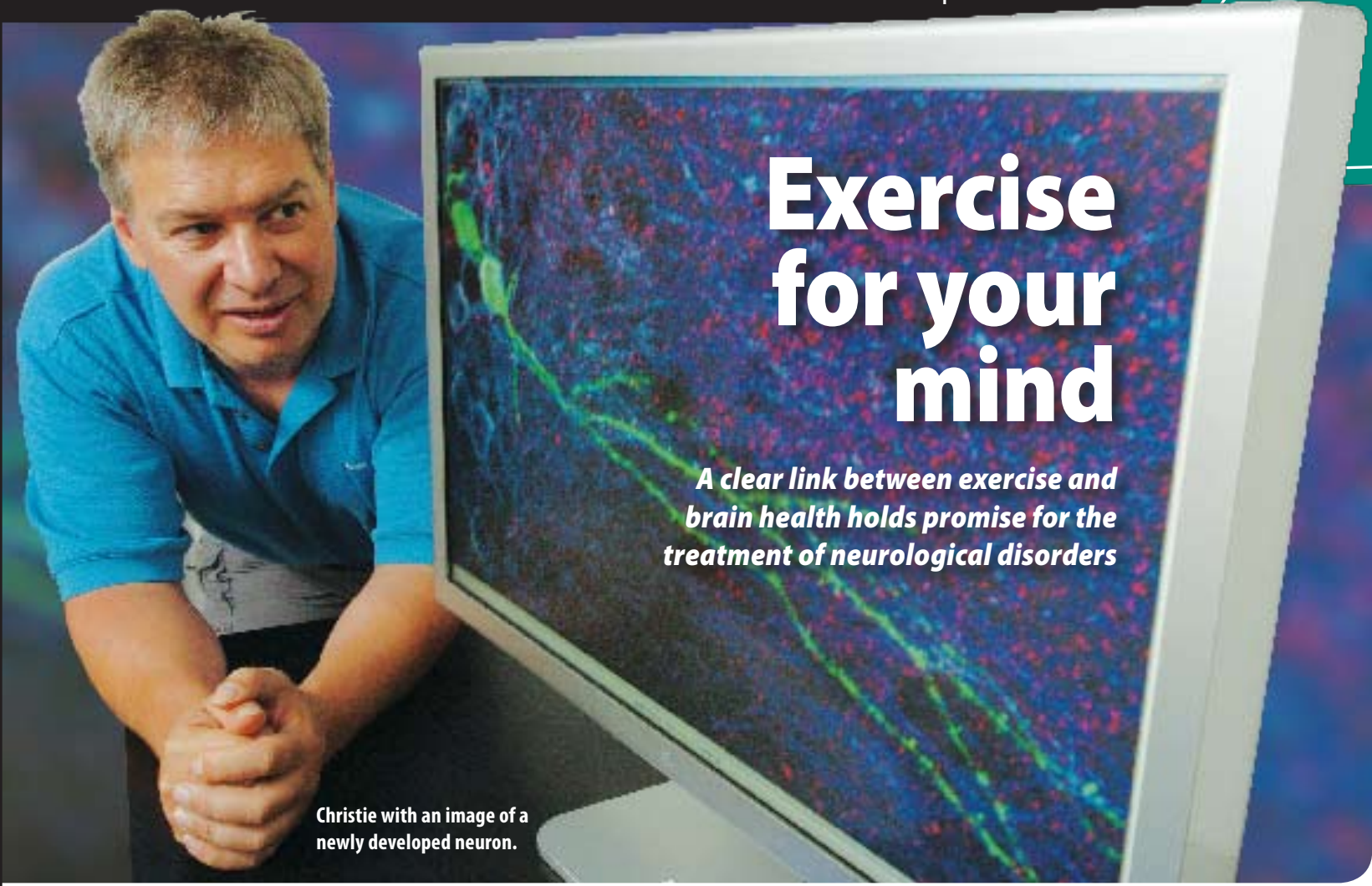

DIANA NETHERCOTT

Exercise for your mind

A clear link between exercise and brain health holds promise for the treatment of neurological disorders

Christie with an image of a newly developed neuron.

by Sheila Potter

In case you needed one, here's another good reason to exercise—it can make you smarter.

Dr. Brian Christie, a neuroscientist with the University of Victoria's Island Medical Program, was one of the first researchers to discover that exercise stimulates the growth of brain cells in the hippocampus, an area of the brain involved with learning and memory.

The finding debunked the long-held belief that our brains aren't able to produce new cells—known as neurons—as we age.

"We now know that new neurons are produced continually throughout our lives and that this process can be ramped up or dampened by our lifestyles," says Christie. "In other words, the better we take care of our brains, the better they function."

Christie studies the biological mechanisms in the brain that are activated by exercise. A deeper understanding of these mechanisms may ultimately result in new approaches to establishing, maintaining and even enhancing brain cells and their connections as we age.

The applications of Christie's research are astonishingly broad. Exercise seems to reduce the impact of any stress on the brain, whether the stress comes from a hard day at work or from neurological disorders such as Alzheimer's disease, autism, stroke or fetal alcohol spectrum disorder (FASD).

FASD refers to birth defects caused by the use of alcohol during pregnancy. Its symptoms include growth retardation, characteristic facial features and brain damage.

"FASD is a tricky problem, because a lot of women don't know they're pregnant and don't know the dangers of alcohol," says Christie. "The bottom line is that no amount of alcohol is safe when you're pregnant."

The link between FASD and exercise first occurred to Christie at a medical conference. "The presenter was describing how children with FASD have fewer neurons in their hippocampus, and that these neurons are less branched," he says. "These are the direct opposites of the positive effects of exercise. It was a definite 'Ah-hah' moment."

Using sophisticated microscopy and protein chemistry techniques, Christie and his team have demonstrated that exercise promotes the growth of new neurons in FASD brains, and that these neurons are better able to communicate with each other.

In fact, Christie was surprised by how big a difference exercise makes for FASD compared to other brain disorders he has studied. He believes daily exercise should be a key treatment for FASD, guessing that an hour a day, continuous or broken up, might be enough.

Christie notes that FASD can be very difficult to diagnose and children showing symptoms are often misdiagnosed with attention-deficit hyperactivity disorder (ADHD). These kids are typically discouraged from running around for fear they will get overexcited—clearly a bad strategy given his findings.

Christie and his team are now looking at the effects of different amounts of alcohol at various stages of pregnancy. They're also investigating sex differences—it's possible that testosterone makes developing brains more susceptible to alcohol damage, making FASD worse in boys.

Christie's research is supported by the Canadian Institutes of Health Research, the Natural Sciences and Engineering Research Council and the Michael Smith Foundation for Health Research.

EDGEwise

The human brain contains more than 100 billion brain cells, or neurons, each linked to as many as 10,000 other neurons.

As we grow older we lose neurons and branches of cells called dendrites, that allow communication between cells. In humans, these losses start around ages 60 to 65.

Christie's research has shown that exercise can induce long-term structural and functional changes in the connections between brain cells. Exercise won't cure a disease, he says, but can slow down its progress and improve mental capacity.

In Canada an estimated 3,000 babies a year are born with FASD, and about 300,000 people are currently living with it. There is no cure. The lifetime costs of extra health care, education and social services associated with the care of an individual with FASD are as high as $1.4 million (US)

UVic researchers were awarded more than $106 million in outside research grants and contracts in 2007/08. This more than doubles the annual research support of the previous five-year period.