



SEARCHING *for* ALTERNATIVES

story and photo by Elizabeth Kumru

As you read these words, electrical impulses are lighting up the inside of your brain like a super-charged pinball machine.

Impulses race along hundreds of connections that link 100 billion neuron cells, rushing messages to every cell in your body.

Neurons team with astrocytes and microglia to form the highly efficient mechanism of normal brain function.

Locked deep within this mechanism is the secret of how normal brain function turns into dysfunction.

How brain cells work together is the key that researchers in UNMC's Center for Neurovirology and Neurodegenerative Disorders (CNND) hope will unlock the door to understanding neurodestructive diseases, such as Alzheimer's, Parkinson's and AIDS-related dementia.

But these cells, which are 20 times smaller than the diameter of an average strand of hair, also have been the focus of controversy for the past year. Until recently, the source of primary human brain cells for this specialized research has been from elective abortions.

UNMC researchers are working to change that by breaking new ground in medical research.

A rapid autopsy program, one of four in the United States, was initiated at UNMC in August. Two of the three cells – microglia and astrocytes – have been obtained successfully through protocols adapted or developed by CNND researchers. Neurons remain elusive to this process so far.

"There aren't any published articles that document recovery of mature neurons from the rapid autopsy procedure," said Anuja Ghorpade, Ph.D., senior scientist in the CNND. "Only a handful of institutions in the world have ever been able to

successfully isolate cells from rapid autopsies.

“If we’re successful in procuring all three cell types for alternative sources, we will literally be making scientific history.”

Neurons are the most difficult of the brain cells to obtain from rapid autopsies because they form connections between other neurons and become part of a collective network. When scientists have tried to separate the neuronal cells of babies or adults who have died, the cells are only viable for a couple hours.

This contrasts to how neurons react early in their development when they can survive quite well as individual cells, Dr. Ghorpade said.

Once isolated, astrocytes can be multiplied in cell culture,

but neurons and microglia cannot. Keeping those cells alive is essential in trying to find ways to prevent, treat or eliminate neurodegenerative disorders.

For cells from a rapid brain autopsy to be suitable for research, the autopsy must be performed within two hours of a person’s death.

Astrocytes and microglia are the support cells for neurons, while neurons are the most critical cells for brain function. Neurons work to receive and

send out electrical signals throughout the body and are instrumental for normal thinking and motor function.

Since the rapid autopsy program began, UNMC has performed a total of seven procedures, Dr. Ghorpade said.

To develop the program further, William Brown II was hired in October to serve as coordinator of UNMC’s rapid brain autopsy program. He is now coordinating UNMC’s two brain bank programs – the Gift of Hope for AIDS research and the Brain Endowment program for geriatric research.

A 1999 graduate of Bellevue University, Brown expects to complete his master’s degree in public administration soon from the University of Oklahoma. Prior to coming to UNMC, Brown worked six years at Ehrling Bergquist Hospital in Bellevue, where he held several laboratory and managerial positions.

As coordinator, Brown has worked hard to integrate the rapid autopsy program into the various departments at UNMC/Nebraska Health System involved in the procedure. These departments include the Neonatal Intensive Care Unit, the Adult Intensive Care Unit, the Pathology/Microbiology Department, pastoral care and the Acute Bereavement Team.

Brown’s primary responsibility is to approach families concerning brain tissue donations when a death is imminent. In addition, he has spoken to the Alzheimer’s Association, nursing homes and other hospitals throughout the community about how they can participate in the rapid autopsy program. He also will be developing materials detailing the program.

“For the rapid autopsy program to succeed, we are dependent on patients and families making courageous decisions to donate cells under extremely stressful situations,” Brown said.

“The decision to donate cells would be similar to what happens when families elect to donate a loved one’s organs. Our organ donor program has flourished over the years, so we’re hopeful the public will be just as receptive to the rapid autopsy program,” he said, adding that he also will coordinate his efforts with the organ donor program.

Although pleased with the early success of the rapid autopsy program, Dr. Ghorpade said much more work needs to be done.

“We feel strongly that rapid autopsies represent our best chance for finding alternative tissue sources,” Dr. Ghorpade said. “The rapid autopsy procedure can be very time- and labor-intensive. It took about 15 hours to do each of our first five procedures. In addition, these are procedures that can’t be planned in advance.”

Dr. Ghorpade and Brown are on-call 24-7-365 – 24 hours a day, seven days a week and 365 days a year. In addition, four teams, each consisting of a pathology assistant and two CNND technicians, rotate being on call.

Already, UNMC has reallocated more than \$400,000 in its quest for alternative tissue sources. These expenditures include the purchase of a microscope as well as the hiring of other support personnel to help meet the increased workload resulting from the use of alternative sources.

Because fetal tissue has not been received from its Nebraska provider since mid-September, UNMC has made arrangements to receive the tissue from the Birth Defects Research Laboratory at the University of Washington.

The Seattle-based tissue program is funded by the National Institutes of Health and has provided tissue to scientists for nearly 40 years. The program is a major supplier of embryonic and fetal tissue for NIH-funded investigators and operates in full compliance with all relevant laws and regulations, including those of the American Association of Tissue Banks.

It provides tissues only for grant-funded research (including NIH research) in programs based at universities and non-profit research institutes. No tissue is distributed to pharmaceutical companies or biotechnology firms. Since its inception, the University of Washington program has provided tissues to nearly 50 universities or research institutes. *d*

FOR MORE INFORMATION ON HOW PEOPLE CAN BECOME DONORS TO THE RAPID BRAIN AUTOPSY PROGRAM, CALL (402) 559-3358.

UNMC’s fetal cell research seeks to understand how brain cells are damaged and to find ways to regenerate these damaged brain cells in neurodestructive diseases such as Alzheimer’s disease and AIDS-dementia. Currently, about 77,000 Nebraskans have Alzheimer’s disease, and the number is expected to more than double in the next 30 years. Nebraska ranks among the top four states in the percentage of people age 85 years and older. It’s estimated that more than 5 percent of Nebraska’s population suffers from some sort of neurodestructive disease.