

# Revolutionary drug delivery

**Scientist's research holds promise in transporting medicines across the blood-brain barrier**

By Lisa Spellman

A black-and-white picture of Alexander "Sasha" Kabanov, Ph.D., and his father hangs just a few inches above the UNMC scientist's head in his office.

One can't help but notice this simple photograph of Dr. Kabanov, standing proudly but humbly next to his famous father, Victor Kabanov, Ph.D., a Russian polymer scientist.

And while Alexander Kabanov has made a name for himself in the scientific community, he credits his father for influencing his journey into science.

"As a teenager it was inspiring to hear him talk

healthy cells and easily carried into diseased cells. These synthetic polymers were also found to increase the sensitivity of certain cancer cells to chemotherapeutic drugs.

The promising discoveries motivated Dr. Kabanov to form Supratek Pharma, Inc., in 1994. Under the guidance of Dr. Kabanov and his friend and colleague Dr. Valery Alakhov, the Montreal-based pharmaceutical company uses the discoveries they made in Moscow as a roadmap to create new nanomedicines.

The company is currently in the process of conducting phase II clinical trials in England, Dr. Kabanov said.

After Supratek was established, Dr. Kabanov began to look for new research opportunities in the United States. He came across a magazine posting for a job at UNMC involving micro-molecular drug delivery.

"A visionary group of people led by Dean Clarence Ueda decided that drug delivery is the future and something the College of Pharmacy should focus on," Dr. Kabanov said.

In 1994, he and his family moved to Omaha. Since then, Dr. Kabanov has continued to work with nanomedicine and how it can be used to deliver drugs across the blood-brain barrier to treat diseases affecting the brain.

"The very same mechanism which makes cancer cells resistant also hinders the transportation of drugs across the blood-brain barrier," Dr. Kabanov said.

The brain, Dr. Kabanov explained, is protected by a formidable barrier made up of hundreds of tiny capillaries that pump out foreign substances, including therapeutic drugs. While this barrier is nature's way of protecting the brain, said Dr. Kabanov, it also makes it very difficult to treat diseases, such as brain tumors, because the drugs are pumped out before they have a chance to take effect.

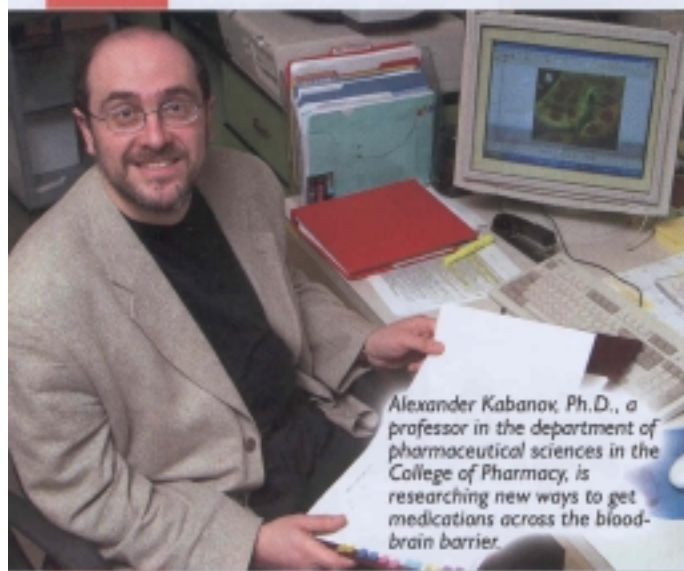
In Omaha, he teamed with Donald Miller, Ph.D., associate professor of pharmaceutical sciences, and other UNMC scientists to further this research. Dr. Kabanov has discovered that the polymers that enable better drug delivery in cancer cells in other parts of the body also enable passage of therapeutic drugs to the brain by temporarily shutting down the pumps that would kick the drug back out of the brain.

While Dr. Kabanov calls Omaha home, he still misses Moscow. His parents live there and his 19-year-old daughter, Masha, is a student of literature at Moscow State University.

When he is not at the office or in the lab, Dr. Kabanov said he tries to spend as much time with his wife, Tatiana, and two younger daughters, Dasha, 10 and Natasha, 2.

He also enjoys learning and writing about his ancestry, a labor of love he started three years ago for his children and future grandchildren.

"It will be important for them to know where they came from," Dr. Kabanov said.



Alexander Kabanov, Ph.D., a professor in the department of pharmaceutical sciences in the College of Pharmacy, is researching new ways to get medications across the blood-brain barrier.

Photo by David Squitieri/Photography

about science – he would make the most complex things clear," said Dr. Kabanov. "He made science incredibly interesting."

Eventually, the two would collaborate on research projects together at Moscow State University, where the elder Dr. Kabanov still teaches and where Alexander earned a master's degree in chemical enzymology in 1984 and a Ph.D. in 1987.

Today, the younger Dr. Kabanov is exploring revolutionary ways in which drugs can cross the blood-brain barrier, focusing on mechanisms through which debilitating neurodegenerative diseases can be treated.

At Moscow State, Dr. Kabanov first began using polymers to create drug and gene delivery systems. He and his colleagues discovered ways to combine a drug with tiny polymer particles so the medicine would be protected from deterioration, prevented from attacking