

Scientists track neurons to predict and prevent diseases

March 30 2009

Researchers at the Department of Energy's Oak Ridge National Laboratory and St. Jude Children's Research Hospital are looking at how developing nerve cells may hold a key to predicting and preventing diseases like cancer and Alzheimer's and Parkinson's disease.

St. Jude scientists have linked movement and changes of [nerve cells](#), or [neurons](#), in the brains and retinas of young mice to certain diseases. Now, for the first time, they can use ORNL-developed software to analyze these vast amounts of data in record time.

"St. Jude has identified neuron shape abnormalities and neuron migration issues that are linked to specific diseases," said Shaun Gleason of ORNL's Measurement Science and Systems Engineering Division. "However, because they have so much data, they can't study it in great detail."

Gleason said ORNL is working with Michael Dyer of St. Jude's Department of Developmental Neurobiology to develop computer software that will automate the process of tracking changes in the shape and position of neurons over time.

One of Gleason's group members, Ryan Kerekes, already has written software to track the movement of neurons by homing in on each cell's centrosome—a key cellular structure. This will enable the software to scour a sequence of video images at high speed, looking for specific patterns of migration, Gleason said.

"For example, a member of the St. Jude staff took several weeks to analyze the image data generated by three experiments using a largely manual approach," Gleason said. "Our algorithm can analyze the same data set in approximately two minutes with almost identical results."

"When St. Jude researchers analyze their images, they look for several specific changes, but there may be much more relevant information in those images that they don't have the ability to look for. Our software is designed to help them find this information in a more efficient and objective manner, so they can understand more of what's going on earlier in the developmental process."

The next stage in software development will be focused on automatically detecting when and how neurons branch or grow. Branching patterns and branch orientations can be critical to distinguishing between normally developing neurons and those with the potential to cause disease, Gleason said.

"The ultimate goal of this research is to develop computational tools that recognize how neurons change and move in ways that are unexpected or abnormal, so that neuroscientists at St. Jude and elsewhere can develop ways of addressing these changes to treat and ultimately to prevent neurological diseases," Gleason said. "This research team, being composed of image and computational analysis experts at ORNL and experienced neuroscientists at St Jude, is in a great position to solve some challenging problems in a unique way."

Source: Oak Ridge National Laboratory ([news](#) : [web](#))

Citation: Scientists track neurons to predict and prevent diseases (2009, March 30) retrieved 10 April 2024 from <https://medicalxpress.com/news/2009-03-scientists-track-neurons-diseases.html>

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