

ORNL image analysis prowess advances retina research

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Armed with a new ability to find retinal anomalies at the cellular level, neurobiologists at St. Jude Children's Research Hospital have made a discovery they hope will ultimately lead to a treatment for cancer of the retina.

While much work remains, Oak Ridge National Laboratory's specialized tracing algorithm allows researchers to analyze thousands of cells instead of just a few dozen. This tool has helped reveal a previously undiscovered role of Rb, the [retinoblastoma tumor](#) suppressor gene in the developing retina. The findings are detailed in a paper published in the [Proceedings of the National Academy of Sciences](#).

"Our paper shows that horizontal neurons known to be deficient in this gene exhibited abnormalities in the way their [dendrites](#) – the arms that connect to other cells – were organized after a certain number of days after birth," said the Department of Energy lab's Ryan Kerekes, one of the authors. The images of mouse retinas were acquired using confocal microscopy while The Jackson Laboratory provided the mice.

To make their discovery, Kerekes, ORNL colleague Shaun Gleason and postdoc Mahmut Karakaya developed a computer program and automated tool that traces the very complex and intricate dendritic arbor. This tool allows scientists to draw a line along each branch in the neuron's tree of connectors so the branch can be measured in terms of length, angle and other parameters.

"Previously, this was a very time-consuming and labor-intensive process," Kerekes said. "Existing commercial software tools were not tuned to this particular data and, as a result, produced too many tracing errors."

As a result, only a handful of cells could be analyzed in sufficient detail, according to Kerekes, who noted that the ORNL tracing algorithms achieves the level of accuracy required to analyze thousands of developing neurons.

Retinoblastoma is caused by a mutation in a gene controlling cell division, causing cells to grow out of control and become cancerous. It is most commonly found in children 2 and younger.

While this paper focused on cancer of the [retina](#), Gleason noted that this research focuses on a number of retinal developmental issues.

More information: "Retinoblastoma (Rb) regulates laminar dendritic arbor reorganization in retinal horizontal neurons," available at <http://www.pnas.org/content/early/2011/12/08/1108141108.abstract>.

Provided by Oak Ridge National Laboratory

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