Researchers use brain organoids to study pediatric brain tumors

29 January 2020

Hundreds of Organoids (miniature brains) were grown in the laboratories of the University of Trento to study the genetic mechanisms responsible for the most common brain cancer affecting children. Credit: ©AlessioCoser for University of Trento

Hundreds of miniature brains were grown in the laboratories of the University of Trento to study the genetic mechanisms responsible for medulloblastoma, the most common brain cancer affecting children. The results of a collaborative research effort, coordinated by the University of Trento and carried out with Sapienza University and Ospedale pediatrico Bambino Gesù in Rome and Irccs Neuromed, were published today in *Nature Communications*.

Researchers are at work to find effective treatments to help young patients with brain tumors. Hundreds of brain organoids have been developed in the laboratories of the University of Trento to understand the genetic mechanisms responsible for these hard-to-treat diseases.

The research team, coordinated by Luca Tiberi of the Armenise-Harvard Laboratory of *Brain* Disorders and Cancer at the University of Trento, has developed a new strategy to study medullablastoma.

The research team included personnel from Sapienza University of Rome, Ospedale pediatrico Bambino Gesù in Rome, and Irccs Neuromed-Istituto neurologico mediterraneo in Pozzilli (Isernia). The organoids were used to create in vitro tumor models, and the results will make it possible to advance brain cancer research, as in the near future, the large-scale production of in vitro tumors could provide a low-cost method for screening new drugs.

"Creating brain tumor organoids is very difficult, and requires the specific scientific capabilities that the Cibio department managed to attract and develop in its research laboratories," said Tiberi, the research team coordinator. "Organoids generated from skin or blood cells and shaped like irregular spheres the size of a small peanut were grown by the University of Trento and examined and characterized with Sapienza University of Rome and Ospedale pediatrico Bambino Gesù in Rome. They can show signs of disease and provide a model of the tumors affecting young patients.

The research team coordinated by Luca Tiberi of the Armenise-Harvard Laboratory of Brain Disorders and

Cancer of Cibio Department of the University of Trento developed a new strategy to study brain tumors of childhood. Credit: ©AlessioCoser for University of Trento

"We have also grown organoids from the cells of healthy donors, and these gave us the opportunity to understand some of the genetic mechanisms responsible for the onset and development of brain tumors. In particular, the study confirmed the key role of two proteins (Otx2 and c-Myc) and investigated the efficacy of a number of therapeutic options (based on the drug Tazemetostat)," said Tiberi. "These in vitro tumors will help us fine-tune research on the genes that cause cancer and on possible prevention and treatment strategies. Organoids give us the opportunity to study brain tumors without using experimental animals in a context that is similar to a real-patient scenario. They can be a reliable tool for developing personalized therapies."

Brain tumors in childhood

Brain tumors are the first cause of death from cancer in children. They are very aggressive and require a multidisciplinary and integrated approach. While significant progress has been made in treating these tumors, surviving patients may suffer long-term side effects that significantly compromise their quality of life. When the tumor reappears after some time, therapies are usually ineffective. Medulloblastoma, the focus of this study, is the most common malignant brain tumor in children affecting the central nervous system. The survival rate at five years from the diagnosis of medulloblastoma is around 70 percent.

More information: Modeling Medulloblastoma in-vivo and with human cerebellar organoids, *Nature Communications* (2020). DOI: 10.1038/s41467-019-13989-3