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Perinatal transmission of HIV can lead to cognitive deficits

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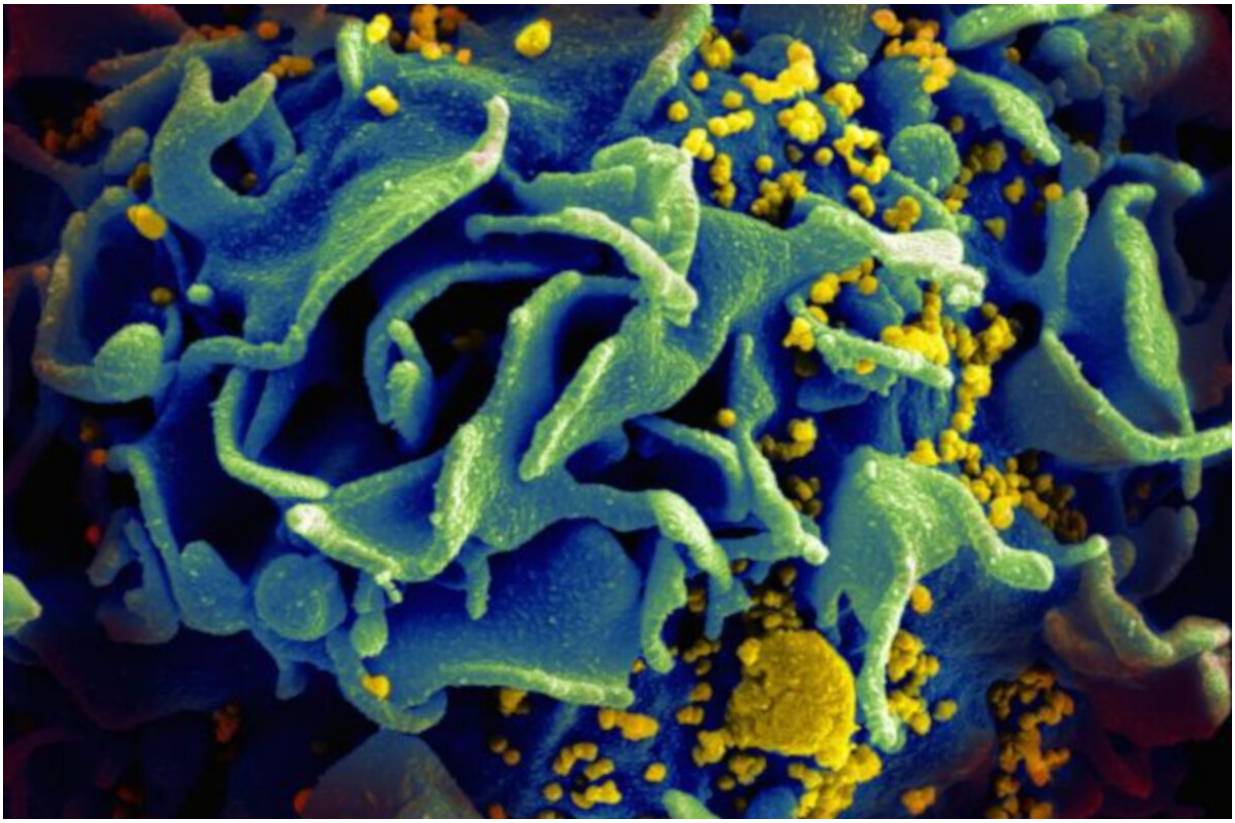

Microscopic image of an HIV-infected T cell. Credit: NIAID

Perinatal transmission of HIV to newborns is associated with serious cognitive deficits as children grow older, according to a detailed analysis of 35 studies conducted by Georgetown University Medical Center

neuroscientists. The finding helps pinpoint the geographic regions and factors that may be important for brain development outcomes related to perinatal HIV infection: mother-to-child HIV transmission during pregnancy, labor and delivery, or breastfeeding.

The findings appear in *eClinicalMedicine*.

Mostly because of advances in antiretroviral therapies, AIDS, which is caused by HIV infection, has largely become a chronic disease rather than a life-threatening condition. Worldwide, there are nearly 3 million children and adolescents living with HIV and over 300,000 new HIV infections that occur annually.

"Despite achieving a perinatal HIV transmission rate of less than one percent, the U.S. continues to face racial and ethnic disparities in perinatal HIV infection that require ongoing commitment in order to eliminate them," says the study's senior author Xiong Jiang, Ph.D., an associate professor in the Department of Neuroscience at Georgetown University Medical Center.

"Even more concerning are the gaps in the diagnosis and treatment of perinatal HIV infection in low and middle-income countries that are the result of disparities in access to care, procurement of antiretroviral drugs, suboptimal viral suppression particularly in young children, and high rates of significant co-morbidities such as tuberculosis and malnutrition."

To better understand the impact of perinatal HIV disease on cognitive development, in a meta-analysis study that was led by Sophia Dahmani, a third-year medical student at the Georgetown University School of Medicine, the researchers analyzed the results of nearly three dozen studies published between 2012 to 2023 that included over 4,000 perinatally-infected HIV people, over 2,300 HIV-exposed but uninfected

people, and nearly 2,500 HIV-unexposed, uninfected people. The investigators based their cognition analyses on neurological scores of the children when they reached an average age of around 11 years old.

The study focused on test scores from three cognitive domains that tightly correlate with one another and play crucial roles in childhood development: executive function, which generates plans, solutions to problems, and organizes structures that guide future action; working memory, which is how someone processes, uses and remembers information on a daily basis; and the speed at which someone processes information.

Compared to the two uninfected groups, perinatally HIV-infected children and adolescents had significant impairments in processing speed (a "Hedge" score of -.64, where -.2 is a small effect, -.5 is a medium effect and -.8 is a large effect), working memory (-.69), and executive function (-.35). Additional analyses suggested that the deficit for processing speed negatively correlated with a country's gross national income (GNI) per capita—in other words, the lower the GNI per capita of that country, the more severely affected the processing speed for people with perinatal HIV living in that country.

"There are many ways to help children and adolescents living with HIV to receive high quality education so that they can have constructive and independent lives," says Jiang. "The introduction of early childhood education programs, academic accommodations whereby teachers provide more time during exams to account for reduced processing speeds, and caregiver training programs could help improve the long-term cognitive and functional outcomes of these children and adolescents."

The researchers say that a future direction in this field is to encourage better and bigger studies on perinatal HIV in more countries so that

experts don't need to rely on combining multiple smaller studies for their analyses. They say this will require collaborative efforts from the World Health Organization, the United Nations and governments of both low to middle-income as well as high-income countries.

More information: Cognitive impairment in children and adolescents living with perinatal HIV disease in the ART era: a meta-analysis Article (Meta-analysis), *eClinicalMedicine* (2024).

Provided by Georgetown University Medical Center

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