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Okun Lab

Help Us Advance Research: Participants Needed for Our Clinical Study In Israel

Every Mother Carries a Story. Some Stories Can Change Science.

Pregnancy creates a unique biological connection between mother and child, one that may leave traces for many years. In the Okun Laboratory at Bar-Ilan University, we are conducting a clinical study investigating whether biological signals exchanged during pregnancy may have lasting effects on a mother's health, with a particular focus on the relationship between **Down syndrome, pregnancy, and Alzheimer's disease**.

We are currently recruiting **women who are currently pregnant with a child with Down syndrome**, as well as **mothers of children with Down syndrome up to age 10**. Participation involves **a single blood sample and a brief medical and family history questionnaire**. Using advanced genetic, immunological, and molecular approaches, we hope to uncover biological mechanisms that have never before been studied in humans and, ultimately, contribute to a better understanding of women's brain health and Alzheimer's disease.

You can help even if you are not eligible to participate. If you know a family member, friend, colleague, physician, organization, or community that may be

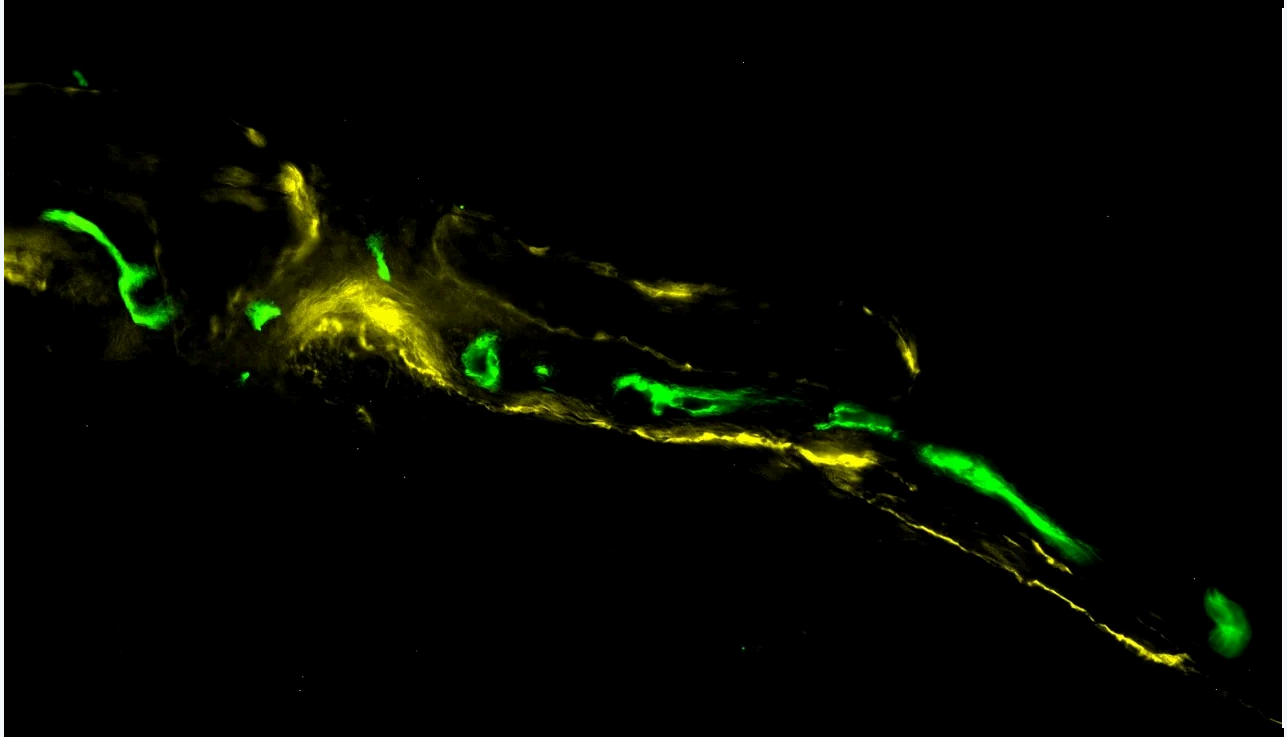
relevant, we would greatly appreciate you sharing the study with them. Information about the study and the participation form are available through the Clinical Trial tab of our laboratory website.

Interested in participating or learning more?

Study information & registration — English

מידע על הצטרפות למחקר — עברית

Inside Our Research



Hidden Highways Between the Skull and the Brain: A New Perspective on Down Syndrome

The brain is not as isolated from the body's immune system as once believed. Recent discoveries have revealed a surprising connection: tiny channels running through the skull bone, containing blood vessels that connect the bone marrow inside the skull directly to the protective membranes surrounding the brain, known as the meninges. These channels allow immune cells to migrate from the skull's bone marrow into the meninges, where they can participate in immune surveillance and inflammatory responses.

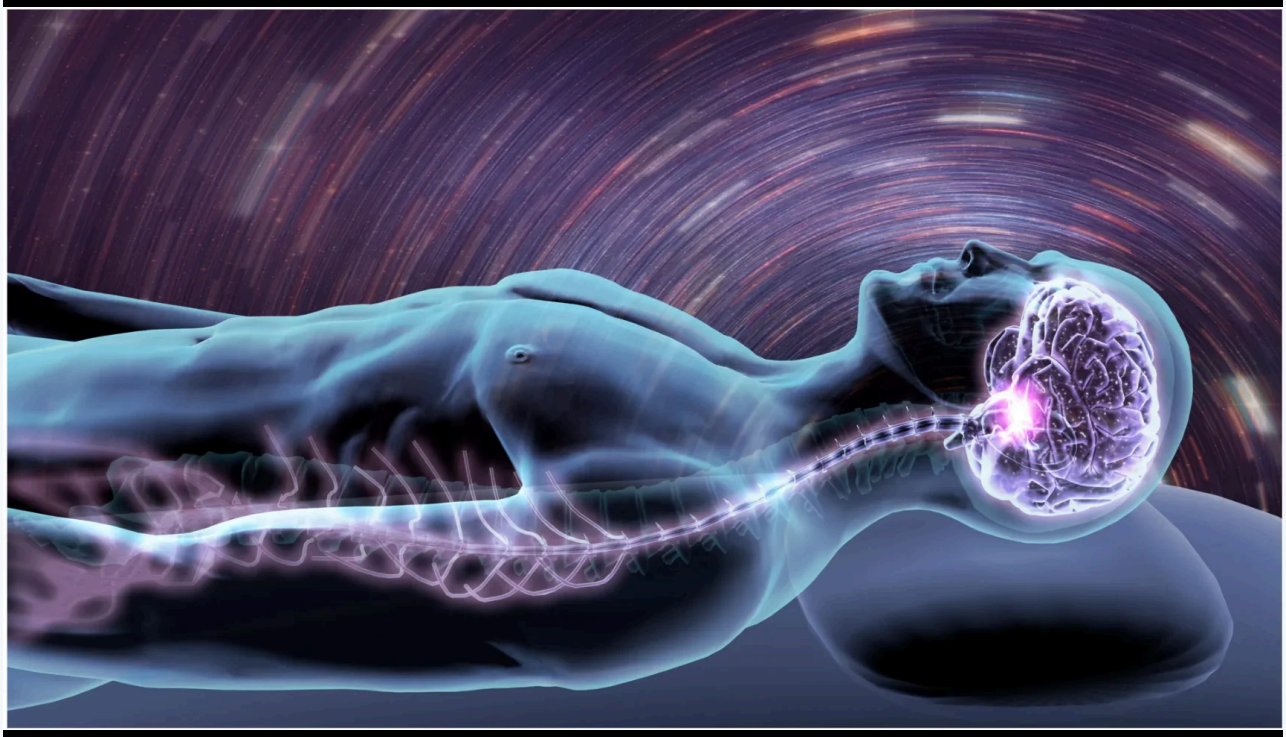
In this image from our lab, captured in a healthy five-month-old mouse, we can observe vascular-like structures (green) closely associated with the skull bone (yellow). We are interested in understanding how these vascular connections are organized and how they contribute to communication between the immune system and the tissues surrounding the brain.

Why is this particularly interesting for our research on Down syndrome? Individuals with Down syndrome carry an extra copy of chromosome 21, which contains several genes involved in immune regulation. Consequently, their immune systems often exhibit persistent inflammatory activity. They also face a remarkably high risk of developing Alzheimer's disease, frequently decades earlier than the general population. Interestingly, Down syndrome is also associated with abnormalities in bone development, formation, and remodeling. These seemingly distinct features illustrate how Down syndrome affects multiple biological systems, extending well beyond the brain.

Our lab studies how immune dysregulation contributes to cognitive decline in Down syndrome. The intricate connections between the skull, its bone marrow, and the meninges remind us that the brain does not function in isolation. Understanding how these neighboring tissues communicate, particularly during aging and inflammation, may provide important insights into the relationship between the immune system and brain health.

Image credit: Dolev Michaelovich. Fluorescent imaging of vascular-like structures (green) associated with the skull bone (yellow) in a healthy five-month-old mouse. The Paul Feder Okun Laboratory for Alzheimer's Disease Research.

Highlights From The Field



When the Brain's Immune Cells Steal Our Sleep: A New Clue in Alzheimer's Disease

Sleep disturbances are among the many challenges faced by people living with Alzheimer's disease, but **what actually causes them?**

A new study from the University of Kentucky suggests that the answer may lie not only in the buildup of amyloid-beta plaques, but also in the

brain's own immune system. Researchers discovered that **microglia**, the brain's resident immune cells, can become overactive in response to these plaques, triggering inflammation that disrupts deep, restorative sleep. Remarkably, when scientists temporarily removed most of these immune cells in mice with Alzheimer's-like pathology, the animals regained more than two hours of sleep per day, even though the amyloid plaques remained unchanged.

These findings suggest that inflammation, rather than amyloid accumulation alone, may play a central role in sleep disturbances associated with Alzheimer's disease. Since deep sleep is essential for memory, brain repair, and waste clearance, disrupted sleep may contribute to a harmful cycle of inflammation and further brain dysfunction.

Although the findings are still limited to animal studies, they open an exciting new direction for research: **could calming overactive immune cells help restore healthy sleep and protect the aging brain?**

Read Full Article

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