

Mice receive human brain tissue

Will Dunham
REUTERS

WASHINGTON – Scientists have transplanted laboratory-grown human brain tissue into bioengineered mice in what they call an important advance for studying human brain development that may speed research into the causes and mechanisms of disorders such as profound autism, epilepsy, cerebral palsy and schizophrenia.

The researchers said the human tissue replicated key features of brain development including formation of functional neural networks after being transplanted into mice engineered to lack most of their own cerebral cortex, the brain’s outermost layer. They said this is significant because living human brain tissue is essentially inaccessible for research purposes for ethical reasons.

“This gives us a way to study human neural tissue across several levels, from genes and individual cell types to circuits and functional consequences in an animal. We can begin to ask how disease-associated human genetic changes alter neural development and circuitry and whether potential treatments can prevent or correct those changes,” said Stanford University neuroscientist Sergiu Pasca, senior author of the study published on Sept. 16 in the journal Nature.

The researchers in laboratory dishes fashioned miniaturized, three-dimensional “organoids” designed to reproduce key cell types and developmental

features of the human cerebral cortex. This part of the brain governs higher-level functioning such as cognition, language, attention and decision-making.

They did so by reprogramming skin or blood cells to become stem cells capable of transforming into almost any cell type in the body.

In bioengineering the mice, the scientists employed a genetic strategy that blocked development of most of the cells that normally give rise to the cerebral cortex and the hippocampus, a brain structure crucial for memory formation.

“The space normally occupied by the mouse cortex allowed us to transplant human cortical organoids shortly after birth and gave the human tissue room to grow extensively,” Pasca said. “In these mice, the human grafts generated a broad diversity of cortical cell types and established functional connections throughout the mouse nervous system.”

The kinds of cortical cells generated included a rare type, called von Economo neurons, considered vulnerable in some forms of dementia.

Research terminology

“One point I would emphasize is the terminology,” Pasca said. “Descriptions such as humanized mice, mice with human brains or mini-brains are not accurate representations of what we have created. These animals retain a mouse nervous system, but they contain a larger volume of human cortical tissue that develops, integrates and forms connec-



Researchers said experiments studying brain development using mice adhered to ethical guidelines focused partly on “animal welfare.”
LEON KUEGELER/REUTERS FILE

tions within it.”

The researchers called them “xenocortical” mice, referring to the “foreign” transplanted human cortical tissue.

“Cortical organoids give us an experimental window into human brain development and disease. They are not miniature brains and do not reproduce the full complexity of the human brain, but they allow us to study human neural cell types and developmental processes that would otherwise be extremely difficult to access,” Pasca said.

This approach could be especially useful for studying disorders that begin during brain development such as autism, epilepsy, schizophrenia and cerebral palsy, as well as environmental inju-

ries such as oxygen deprivation occurring around the time of birth, according to the researchers.

They exposed the mice to oxygen deprivation as a first application of this research model.

The developing human brain can be highly vulnerable to oxygen deprivation. When it occurs during pregnancy or around birth, it can have major neurological consequences including contributing to cerebral palsy and increasing the risk of epilepsy or autism, Pasca said. But mice can be resilient to levels of oxygen deprivation that injure human neural tissue.

“In the xenocortical mice, a period of low oxygen caused substantial injury to human cortical cells and was accompanied by abnormalities in gait and motor coordination,” Pasca said, while ordinary lab mice experienced no such effects from low oxygen.

The researchers said the experiments adhered to ethical guidelines focused on two issues in particular.

“The first is animal welfare: the scientific question has to justify the use of animals, suffering must be minimized and experiments should only be performed when the information cannot adequately be obtained with alternative approaches,” Pasca said.

“The second is whether introducing increasingly complex human neural tissue into an animal nervous system could lead to unexpected, emergent or novel properties that would require additional ethical consideration,” Pasca said.

Prison

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transferred them to other detention facilities or other countries.

Facilities that house detainees for Immigration and Customs Enforcement are supposed to comply with applicable standards, which are established in the Florida Model Jail Standards and ICE’s National Detention Standards.

Alligator Alcatraz staff were not even sure which standards they were or were not using to hold detainees at the time of the inspection, according to the final inspection report.

Because of the uncertainty about what standards were to be used at Alligator Alcatraz, there was also ambiguity about the treatment and daily living conditions detainees faced, the report said.

The inspection found that from July 17, 2025, to Jan. 18, 2026, 79 detainees were confined in small cages that had approximately 18 square feet of floor space for ranging periods of time.

These “restrictive” spaces have been deemed inhumane. According to the report, facility staff used these cages to give detainees time alone to “de-escalate.” One detainee spent time in such a cage because they “failed to comply with a lawful command.”

The report noted such an enclosure was “highly unconventional and does not align with standards for humane treatment,” adding “use of these small metal enclosures for any reason is unprecedented among detention facilities OIG has inspected and presents significant risks to detainee health and safety.”

The inspection also found detainees were living in “cramped” conditions, with less than half the space legally required.

Standards for dormitory housing units require at least 75 square feet of floor space per inmate, whereas the housing units in the Florida facility were about 28 square feet per detainee, which is “well below the required minimum,” the report said.

Detainees were kept in the housing units for the majority of their time in the facility, leaving only for the following reasons:

- Mealtime – three times per day for 90 minutes
- Recreation – three days per week, one hour per day
- Showers – three times per week
- Medical reasons

The general population housing structures were windowless, and there were eight housing units inside each structure. These housing units, designed to hold 32 detainees, were surrounded by metal fencing on all sides and the top.

In order to meet legal standards, each housing unit would need to house a maximum of 11 detainees.

Special management units of 16 cells were surrounded by metal mesh that measured at 8 feet by 7 feet, each holding one detainee.

In addition to being kept in cramped dormitories, detainees were subjected to drinking contaminated water and eating food at risk of spoiling, according to the report.

Detainees told inspectors they did not have access to clean water and drank from dirty cups. Clean drinking water is a requirement by National Detention Standards.

Inspectors also observed that freezers containing perishable foods were functioning at temperatures higher than 0 degrees, which may result in food spoilage that consequently results in foodborne illnesses among detainees and staff.

Detainees also are supposed to have access to an hour of recreation per day for five days a week, whereas Alligator Alcatraz detainees were given only three days per week.

Those being housed in the special management unit were allowed to leave for escorted bathroom use, legal appointments or medical appointments. One detainee in the unit reported being confined for eight days straight without recreation.

Special management unit detainees also did not have access to legal materials, preventing detainees from contacting legal representation, the report said.

Showers were limited to Mondays, Wednesdays and Fridays, preventing detainees from maintaining their personal hygiene, according to the inspection report, and bugs infested the shower facilities.

The Office of Inspector General made 10 recommendations to address the violations observed in the January inspection. Upper management at DHS responded to the inspection report by saying ICE would consider the recommendations. However, since the facility had been shut down June 15 – more than two months before DHS upper management acknowledged the report – all 10 recommendations were closed.

“The report reveals the depraved disregard for life that drove enormous hu-



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PHOTOS PROVIDED BY THE DEPARTMENT OF HOMELAND SECURITY OFFICE OF INSPECTOR GENERAL



Small cages that did not meet federal standards were used in Alligator Alcatraz to confine detainees, an inspection report said.

man suffering and extensive environmental destruction in the Everglades,” said Elise Bennett, an attorney at the Center for Biological Diversity.

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