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Scientists Restore Brain Cell Activity

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In a radical experiment, scientists have **restored brain circulation** and some **cell activity in pigs' brains**, hours after the animals died in a slaughterhouse.

- The results, though done in pigs and not humans, **challenge the long-held view** that, after death, brain cells undergo sudden and irreversible damage.
It was held that the brain cannot long survive without blood. Within seconds, oxygen supplies deplete, electrical activity fades, and unconsciousness sets in. If blood flow is not restored, within minutes, neurons start to die in a rapid, irreversible, and ultimately fatal wave.
- In the study, the researchers **developed a novel system** for studying intact, postmortem brains, dubbed **BrainEx**.

BrainEx

- It's a **network of pumps that pipe** a synthetic solution — a substitute for blood — into the brain's arteries at a normal body temperature.
- The brains were placed in the BrainEx system 4 hours after the pigs' death, and were allowed to "perfuse" with the synthetic blood substitute for 6 hours.
- During this time, the BrainEx system not only preserved brain cell structure and reduced cell death, but also restored some cellular activity.
For example, some cells were metabolically active, meaning they used glucose and oxygen and produced carbon dioxide. Other cells reacted with an inflammatory response when stimulated with certain molecules.
- In contrast, the **brains** that were **not treated with BrainEx rapidly decomposed**.

Ethical concerns

- Although scientists are a **long way from being able to restore brain function** in people with severe brain injuries, if some restoration of brain activity is possible, then the **definition of brain death** will need to be changed.

- **More guidelines is required** around the ethical issues raised by the study, which raises long-standing assumptions about what makes an animal — or a human — alive.
- One concern is also of **how to detect consciousness** and how long systems like BrainEx should be allowed to run.

Significance

- The work could provide scientists with **new ways of studying the brain**, allowing them to examine functions in the entire, intact brain in a way that hasn't been possible before.
 - This in turn could help scientists **better understand brain diseases** or the **effects of brain injury**.
- However, the researchers stressed that they **did not observe any kind of activity** in the pigs' brains that would be needed for normal brain function or things like awareness or consciousness.

Way Forward

- Because the study lasted for only 6 hours, **more research is needed** to know whether BrainEx can **preserve brains for longer than this time**.
- In addition, a lot of questions remain about **how similar this model is to the brain environment**.
 - The system does **not use real blood**, and the brain is not bathed in fluid as it is inside the skull.
- The new technology opens up **opportunities to examine complex cell and circuit connections** and functions that are lost when specimens are preserved in other ways.
 - The work also could **stimulate research on ways to promote brain recovery after loss of blood flow to the brain**, such as during a heart attack.