Mice roam to assert their individuality

Experience can shape the brain over time through plasticity, or alterations to the brain's structure and function. Research now suggests that this process may promote individuality, even among genetically identical organisms, giving rise to different 'personalities'.

Gerd Kempermann and his colleagues at Technische Universität Dresden (Germany) decided to study changes in the brain that result from experience by looking at the growth of new neurons in the hippocampus of adult mice. As a marker of the mice's experience, they used exploration of an enriched environment. Because plasticity can result from both environmental and genetic influences, they studied mice with identical genetic backgrounds.

The researchers housed 40 mice for 3 months in a complex enclosure with an area of 5 m^2, consisting of five levels, each filled with objects designed to encourage activity and exploration. The mice were tagged with radio-frequency infrared transponders so that their locations could be monitored by 20 antennas distributed over the entire environment.

The team came up with a measure they called 'roaming entropy', which quantified the likelihood of finding a mouse in a given location at a given time, to score the adventurousness of each mouse. Among the group of genetically identical mice, individuals that explored the environment more broadly grew more new neurons in the hippocampus than the less adventurous mice (*Science* **340**, 756–759; 2013). They also had significantly more growth of another type of brain cell called astrocytes. Greater overall distance travelled was also associated with greater brain plasticity. This finding supports the idea that the main function of plasticity in adult brains is to shape connectivity according to individual needs, thereby improving adaptability to a given environment over the course of one's life.

Although the mice in the study were genetically identical, some variation must occur at a very early stage that makes them more or less prone to explore. The researchers suggest that small epigenetic changes to the genome early in life may lead to increasingly greater genetic differences

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over time, owing to the cumulative effects of the choices individuals make in the course of their lives.

Partly for this reason, the scientists caution that their findings may be difficult to replicate precisely. They explain in the article, "The magnitude of individual differences observed in replications of this experiment is likely to vary across studies: As the members of each new cohort individualize, their 'society' will also be shaped in a slightly different, individual way."

Kara Rosania

AN ASPIRIN A DAY KEEPS CANCER AT BAY?

Regular use of aspirin may prevent the progression of breast cancer, according to results of a study done by researchers in Kansas City. The study found that aspirin significantly reduced the growth of tumors in mice. It also slowed the growth of breast cancer cell lines *in vitro*. Gargi Maity (Veterans Affairs Medical Center, Kansas City, MO) presented the results on 21 April 2013 at the annual meeting of the American Society for Biochemistry and Molecular Biology, held in conjunction with the Experimental Biology 2013 conference (Boston, MA).

Aspirin, or acetylsalicylic acid, is used to treat or prevent a number of different conditions, including heart attack and stroke. Its role in the prevention and treatment of cancer has intrigued researchers since it was found that people who regularly used aspirin were less likely to develop colorectal cancer, squamous cell esophageal cancer and prostate cancer. There is also anecdotal evidence to suggest that breast cancer is less likely to return in women who use aspirin. But the physiological mechanisms underlying these effects are not well understood.

The Kansas City study found that aspirin may interfere with cancer's ability to take on an aggressive state. In a mouse model of cancer, treatment with aspirin inhibited the formation of stem cells, which are believed to drive tumor growth and spread. Destruction of stem cells is critical in preventing cancer regrowth, but many cancer chemotherapies fail to target stem cells, allowing relapse.

The researchers also evaluated the effects of aspirin on two different breast cancer cell lines. One of the lines tested is a relatively uncommon but difficult to treat form of the disease called triple-negative breast cancer. These cancer cells lack receptors for the hormones estrogen, progesterone and Her2. "We are interested in triple negative breast cancer because the prognosis is very poor," said Sushanta Banerjee (University of Kansas Medical Center), senior author of the study. The study also looked at a line of hormone receptor–positive breast cancer cells.

In lab tests, aspirin blocked the proliferation of both cell lines. Aspirin also improved the effectiveness of tamoxifen, a drug commonly used to treat hormone receptor–positive breast cancers.

Banerjee commented that aspirin's efficacy in preventing cancer growth may be due to its ability to attack multiple metabolic pathways. "Cancer is not a single-gene disease," he says.

Because aspirin has side effects, researchers must assess whether the positive effects of regular use of the drug outweigh the risks.

Monica Harrington