› RESEARCH IN BRIEF

Evolutionarily conserved cortical processing during sequencing learning

Brain processing of sequences of sensory information is critical for human communication. Yukiko Kikuchi, from Newcastle University, and colleagues show that the oscillatory signatures of brain activity in auditory cortex—of monkeys and man—during sequence learning and processing share a similar signature (*PLoS Biol* **15**, e2000219; 2017).

Using local field potential recordings in monkeys and humans trained to recognize sequences of nonsensical words (what the authors refer to as an "artificial grammar"), they show that neural oscillations show striking similarities, especially in coupling of low-frequency phase and high amplitude gamma oscillations. The results demonstrate conserved auditory mechanisms in processing complex and learned sequences of sensory information between rhesus macaques and humans, and may provide a guide to future work trying to untangle how complex forms of communication can arise from the brain.

Linking nutrients and the microbiome to feeding behaviors in flies

There are perhaps no decisions more fundamental decisions affecting an animal's survival and fitness than when to eat and mate. New work in *Drosophila* by Carlos Ribeiro and colleagues at the Champalimaud Centre for the Unknown, Lisbon, Portugal shows the complex, but important, link that nutrients and the microbiome can play in driving these choices (*PLoS Biol* **15**, e2000862; 2017).

Using a defined diet controlling the levels of essential amino acids (eAAs), the group shows that, unsurprisingly, *Drosophila's* appetite for amino acids increases when they are deprived of eAAs. However, when commensal gut microbes, specifically *Acetobacter pomorum* and *Lactobacilli*, are concomitantly modulated, they buffer this increase in appetite, suggesting the feeding behavior is driven not just by seeking sources of nutrients, but is also dependent on the relative levels of specific gut microbes.

A mouse's house may help reduce tumor burden

Studies of enriched environments for animals typically have a welfare bent, aiming to improve their general well-being. More recent research has also demonstrated specific biological changes that correlate with enriched environments, including changes in neuronal cell populations and improved learning.

Benjamin Bice *et al.* now show that mice engineered to have colon tumors can have significantly extended life-spans and smaller tumor burdens when kept in enriched environments (*Cell Rep.* **19**, 760–763; 2017).

Tumor loads were significantly decreased in male mice compared to female, and evidence in the paper suggests that a molecular pathway involved in wound repair may be implicated (the authors also show significant changes in gut microbiota when animals were placed in enriched environments). Although intriguing, the results have a long way to go before making the leap, as suggested by the authors, that enrichment could be used as a therapeutic in humans.

A new tool for tuning into vocalizations

Although your average lab mouse doesn't appear to say much, at least to human ears, the reality is that they can have have a rich repertoire of ultrasonic vocalizations (USVs). By recording and analyzing these USVs, especially under different conditions and social circumstances, insight can be gained into how these furry creatures communicated outside their more common modes (like scent-marking). But collecting and analyzing USVs can be a challenge, especially to non-experts.

To help bring USV analysis to the masses, Pat Levitt and colleagues have created an open-access software platform that allows researchers to generate mouse UV repertoires, as well as analyze features of UVs, like similarity metrics (*Neuron* **94**, 465–485; 2017). Known as MUPET (for Mouse Ultrasonic Profile ExTraction), the MATLAB-based add-on allows researchers to analyze and compare specific syllables and time-stamp vocalization features. In addition to mice, the team hopes the tool will be adapted for use with other species.

Turn-over in the gut

The enteric nervous system controls the workings of the gastrointestinal tract, but has long been a puzzle. Researchers have observed neuron death, but no one had been able to document neurogenesis, leaving many to believe that what we're born with is all we get. Research from Johns Hopkins suggests otherwise (*Proc. Natl. Acad. Sci. USA* 2017; doi: 10.1073/pnas.1619406114).

After confirming the extent of neuron loss in murine small intestines with different staining and fluorescence techniques—up to a third die over the course of a week—the team had to determine how the total number managed to stay constant. They looked to Nestin, a stem cell marker known from the central nervous system. A Nestin-GFP reporter mouse line revealed expression in the intestines, leading to new neurons and a life cycle for future investigation.

A new rodent for hypoxia research

Humans are generally not well adapted to hypoxia. Drops in oxygen can be environmental—from high altitudes or deep depths—or a result of medical complications, like strokes or embolisms. Mice don't do much better; just 15 minutes at 5% oxygen is lethal. But that's not the case for all rodents. The naked mole rat, whose subterranean chambers aren't always so conducive to the circulation of fresh air, can tolerate extremely low oxygen levels. New research identifies how (*Science*, **356**, 307–311; 2017).

The researchers measured metabolic changes in naked mole rats completely deprived of oxygen, a state they can survive in harm-free for 18 minutes. Anoxia prompted the animals to switch their fuel to fructose, which can be metabolized without oxygen, raising the question of whether humans—also capable of fructolysis—can be induced to make the same metabolic switch.

Social buffering in zebrafish

Familiar conspecifics can be reassuring—whether staring down a predator or a packed auditorium. This social buffering is present in most species that evolved to live in groups, or in the case of fish, shoals. A zebrafish exposed to an adverse stimulus will either freeze or begin swimming erratically; a Portuguese team tested how those responses changed with the presence of others (*Sci. Rep.* **7**, 44329; 2017).

The team exposed a focal fish to a scent cue that causes fear, alone and in the olfactory and visual presence of other zebrafish. Seeing other fish was calming, though just smelling them helped too. A look at the brain showed activation of regions that correspond to those involved with fear and stress responses in mammals, suggesting zebrafish can effectively model the neurobiology behind social buffering.

Social networks and disease transmission

Individual animals are invaluable for understanding a disease and its potential treatments. But populations have a role to play too. Social networks can inform how an infectious disease spreads in the first place. An analysis of social network models offers new insight (*Proc. Natl. Acad. Sci. USA* **114**, 4161–4170; 2017).

Using published data for 43 different species—from arthropods to rodents to dolphins and chimpanzees—the researchers calculated modularity and then modeled how fragmentation and cohesion within subgroups influenced disease burden. They found a threshold—subcommunities can "trap" and delay disease spread to the larger population, but only among networks that are both highly fragmented and cohesive. An understanding of a social network's underlying structure can thus aid effective responses to disease outbreaks.