› RESEARCH IN BRIEF

A new model of UTI

Urinary tract infection (UTI) is common in children, and caused primarily by uropathogenic *Escherichia coli* (UPEC). UTI's can lead to severe pyelonephritis, which can cause renal scarring and lead to chronic conditions like hypertension and chronic kidney disease. Although preclinical models of UTI's exist (particularly in female mice), most are inherently resistant to severe kidney infection, making it difficult to study the effects of potential treatments. A new mouse model of pyelonephritis has recently been developed by David Hunstad and colleagues at Washington University, St. Louis, with results of the model published in the latest issue of *Disease Models and Mechanisms (Dis. Mod. Mech.* **10**, 1371–1379; 2017).

Using their new model, the team tested an antibiotic treatment strategy using ceftriaxone, and found that the treatment regime completely eliminated infection of the kidneys and bladder, although a fraction of mice still had persistent histological abscesses after treatment. The group hopes this new model platform will enable a wider test of therapies for and understanding of severe pyelonephritis.

Amping up nucleic acid isolation outside of the lab

The ability to isolate and amplify nucleic acids is a cornerstone technique in molecular biology. However, the difficulty in extracting nucleic acids from biological material has largely limited the method to laboratory environments.

To address this shortcoming and take nucleic acid isolation outside, Jose Ramon Botella and colleagues at the University of Queensland, Australia, developed a simple, equipment-free dipstick method for rapidly extracting DNA and RNA from animals, plants, and microbes under a diverse range of conditions (*PLoS Biol.* **11**, e2003916; 2017). The method is based on strips of cellulose-based filter paper, which can bind nucleic acids and hold on to them during washing of contaminants. The technique provides a cheap and widely accessible method for researchers in the lab and the field to extract nucleic acids for amplification and study.

A new hydrogel sealant that protects vision after eye damage

Traumatic eye damage can cause devastating secondary injuries if left untreated. Common methods for treating damage to the eye, including sutures and other adhesives, are time-consuming and require special equipment and training; luxuries that certain patients, such as soldiers or others in war-torn areas, cannot afford.

Publishing in *Science Translational Medicine* (**9**, eaan3879; 2017), Niki Bayat and colleagues developed an alternative material, made up of a temperature-responsive synthetic hydrogel that can serve as a temporary sealant.

Using data from rabbit models of open globe injury, the team demonstrates that the hydrogel can seal and preserve intraocular pressure (critical for preventing retinal detachment), and after gelation, the sealant can then be easily removed using cold water. The team hopes the gel can serve to temporarily heal wounds in combat or low-resource settings, before further treatment.

Waking up the brainstem

Using a combination of genetic, physiologic, and anatomic methods in mice, researchers led by Cliff Saper at Harvard Medical School have identified a brainstem circuit of specific neurons that express calcitonin gene-realted peptide (CGRP) that are responsive to increased levels of CO2, and can cause arousal from sleep (*Neuron* **96**, 1153–1167; 2017). Identification of this new group of neurons may serve as a new target to help clinicians treat sleep apnea, which involves abrupt wakefulness with increasing concentrations of CO2 in the blood.

The team applied both chemogenetic activation and optogenetic inhibition of these cells and their specific circuits, to probe the specificity of their response properties and ability to generate wakefulness in the presence of increasing concentrations of CO2.

PDX gives pause

A culture dish is a far cry from the complexity of the human body, so cancer researchers looking for a system that might better capture the cellular and molecular changes that tumors undergo can take advantage of patient-derived xenograft (PDX) models, mouse lines that have been engrafted with cancerous human cells, to model a cancer's progression and to test potential treatments. But a new study urges caution (*Nat. Genet.* **49**, 1567–1575; 2017). Researchers at the Broad Institute in Cambridge, MA took a close look at how the genetics of over a thousand PDX tumors from 24 different cancers changed over time. Just like tumors maintained *in vitro*, the way the tumors evolved once engrafted into mice diverged from that observed in human patients. The results underscore that, as closely related as mouse and man might be, no model is perfect.

Let it rip

Asexual planarian flatworms are capable of quite the reproductive feat: whenever they want to reproduce, they tear themselves apart at the middle and regenerate into two new worms. Scientists have known about this bilateral fission for decades, but not how it's actually accomplished. Finding the answer just took a little more patience (*Proc. Natl. Acad. Sci. USA* **114**, 10888–10893; 2017).

The University of California, San Diego team took continuous pictures of decapitated planarians (they reproduce just fine without a head but seem to dislike light when intact) over the course of two weeks. After months of recording, they had enough images of fissioning worms to detail the biomechanical process: the worms constrict their mid-sections (dubbed "waist formation") and then pulsate to create tensile stress that tears across the thin point. A few days later, the ruptured ends gives way to their missing halves.

Details in the delivery

Increases in c-section delivery have researchers wondering if babies might be missing out on any benefits conferred from vaginal delivery, especially as it relates to early microbial exposure, and if any missing microbes as a result of c-sections might contribute to obesity or disorders like Type 1 diabetes as the child grows. A new study from the New York University School of Medicine compared the weights and microbial composition of mouse pups born vaginally to those delivered via c-section in a recent study published in *Scientific Advances* (**3**, eaao1874; 2017). Overall, c-section pups gained 30 percent more weight than their counterparts (for females, it was a 70% surplus), and had lower microbial diversity in their fecal samples, suggesting that exposure—or lack thereof—to the mother's microbiome during delivery can have repercussions as offspring develop.

Twilight eyes

Most vertebrate retinas contain two types of photoreceptors: rods, for vision in dim light, and cones, for bright. Each photoreceptor contains different light-sensitive opsin genes that enable sight throughout 24-hour cycles. Deep sea fishes, which spend their days in the murky depths and, if they forage near the surface do so at night, have lost their cones. But the pearlside bucks the nighttime foraging trend: they rise towards the photic zone to feed during twilight. This behavior left researchers questioning how these fish see in the presence of sunlight. Recent transcriptome analysis of two pearlside species, one from the fjords of Norway and a second from the Red Sea, revealed that the fishes' eyes combine opsins typical of both rods and cones into a single, uniquely adapted new structure (*Sci. Adv.* **3**, eaao4709; 2017).