

Research brief

Bed knobs and ICU room tricks

According to the findings of a study done in an acute-care ward in Indiana, USA, copper hospital beds might help prevent nosocomial infections. The trial had a crossover design in which the ward's 62 plastic-covered beds were swapped out for copper-plated ones. Swabs were taken from high-touch areas on all beds for an average of a week each. Despite daily cleaning, the plastic surfaces consistently exceeded safe bacterial counts, with copper beds harbouring, on average, 95% fewer bacteria than the conventional ones, maintaining these levels throughout a patient's stay.

Swarming staph

Findings from a new study have sent shudders through hospital corridors—or, more specifically, through any superbugs lurking in them. Using crystallography structural analysis and nuclear magnetic resonance spectroscopy, UK scientists elucidated the mechanism by which the potent bacterial enzyme lysostaphin kills methicillin-sensitive *Staphylococcus aureus* (MRSA). The enzyme targets two components of peptidoglycan in the bacterial cell wall (the pentaglycine crossbridge and peptide stem) with binding sites on opposite sides of lysostaphin's C-terminal SH3b domain. Multiple binding sites lead to clustering of the enzyme on the cell surface and rapid lysis and digestion of the bacteria. The researchers want to use this understanding to develop new treatments for MRSA and other resistant superbugs.

A target to rule them all?

HIV drug rilpivirine has been shown to stop HIV infection in human cells and in mice. The drug suppressed infection in human astrocytes by binding with and disrupting the function of an enzyme vital for replication in both Zika virus and HIV. Researchers then showed that

treatment with the drug protected mice from an otherwise lethal dose of Zika virus. Histopathological analysis of the animals' brains showed reduced viral RNA concentrations in the hippocampus, frontal cortex, thalamus, and cerebellum.

The bat reservoir

Both bats and people in rural northeast India have been shown to harbour antibodies against filoviruses, including Ebola virus. People in the area interact closely with bats in annual hunts for food and for traditional medicinal reasons. Researchers took serum samples from 85 people who participated in bat hunts and took blood and tissue samples from two local bat species, *Eonycteris spelaea* and *Rousettus leschenaultii*. Although researchers detected no viral genetic material, they found antibodies against filoviruses in about 6% of people and around 10% of bats. The findings suggest that bats are reservoirs for ebolaviruses (Ebola, Bundibugyo, and Sudan viruses) and Marburg virus in the region. They call for ecological surveillance to prevent human outbreaks.

Immunological amnesia

In experiments in ferrets and people, scientist have clarified how measles can wipe an individual's immunological memory against previously encountered pathogens. They sequenced antibody genes in blood samples from 26 children in the Netherlands, taken before and 40–50 days after infection, finding that specific immune cells present before measles were absent afterwards. They substantiated their findings in ferrets immunised against influenza, who were again susceptible after measles infection. In the context of low measles vaccination rates and increasing incidences of the infection, these findings highlight a dangerous domino effect in which populations might see increases in infections such as influenza,

diphtheria, or tuberculosis, even in those previously immune.

HPV for victory

Findings from a study in mice and human tissue samples suggest that, rather than being oncogenic, low-risk commensal human papillomavirus (HPV) on human skin might instead induce immune responses that protect from skin cancers such as squamous cell carcinoma. RNA and DNA in-situ hybridisation on human skin samples showed lower load and activity of 25 known commensal HPV viruses in cancerous samples versus healthy ones. To substantiate these findings, they exposed immunocompromised mice to skin cancer-causing chemicals or ultraviolet light and showed that the animals were protected by transfer of T cells against papillomavirus type-1 (MmuPV1) from immunocompetent mice or by direct MmuPV1 vaccination. The findings suggest the possibility of vaccination to protect at-risk, immunocompromised people from skin cancers.

Merry Christmas, Mr Mosquito

In a cunningly crafty mating strategy, males inject female mosquitoes with a plug to stop subsequent breeding. The plug forms a physical block and, according to the findings of a new study, contains a hormone that makes female mosquitoes more susceptible to infection with *Plasmodium falciparum*. Researchers experimentally infected female *Anopheles coluzzii* mosquitoes with the hormone (20-hydroxyecdysone) or a control carrier and confirmed that the hormone increases susceptibility to the protozoan parasite. That virgin females are less viable vectors of this human disease suggests that control programmes, which have traditionally targeted only the female carrier, might benefit from targeting males too.

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For more on **copper beds** see *Environ Microbiol* 2019; published online Nov 8. <https://doi.org/10.1128/AEM.01886-19>

For more on **lysostaphin killing** see *Nat Chem Biol* 2019; published online Nov 4. <https://doi.org/10.1038/s41589-019-0393-4>

For more on the **broad activity of rilpivirine** see *Mol Ther* 2019; published online Oct 11. <https://doi.org/10.1016/j.ymthe.2019.10.006>

For more on **filoviruses in Indian bats** see *PLoS Negl Trop Dis* 2019; published online Oct 31. <https://doi.org/10.1371/journal.pntd.0007733>

For more on **measles and immunological amnesia** see *Science Immunology* 2019; published online Nov 1. <https://doi.org/10.1126/sciimmunol.aay6125>

For more on **HPV and cancer protection** see *Nature* 2019; published online Oct 30. <https://doi.org/10.1038/s41586-019-1719-9>

For more on **mosquito susceptibility to plasmodium** see *PLoS Pathog* 2019; published online Nov 7. <https://doi.org/10.1371/journal.ppat.1008063>