system that models splenic clearance, the authors found that there was greater retention (that is, clearance) of infected RBCs (iRBCs) from dry season samples than from wet season malaria samples. Mathematical modelling suggested that changes in iRBC–endothelial cell adhesion alone could explain differences in parasitaemia progression, through the effect of splenic clearance on circulating parasites. However, the RNA-seq data did not show a significant difference in the expression of parasite-encoded adhesion molecules between dry and wet season samples.

In sum, this study suggests that persistence of *P. falciparum* through the dry season involves reduced iRBC adhesion and increased splenic clearance, thereby maintaining parasitaemia below a threshold above which clinical symptoms occur or an immune response is triggered.

**Grant Otto**

**ORIGINAL ARTICLE** Andrade, C. M. et al. Increased circulation time of *Plasmodium falciparum* underlies persistent asymptomatic infection in the dry season. *Nat. Med.* https://doi.org/10.1038/s41591-020-1084-0 (2020)

**IN BRIEF**

**VIRAL INFECTION**

**Viral diversity in acute infection**

The diversity of virus populations during acute infection and, in particular, the number of genotypes initiating an infection, is unclear. Gelbart et al. developed an ultra-deep sequencing approach termed AccuNGS to sequence acute infection samples from 43 patients infected with the DNA virus cytomegalovirus (CMV) or the RNA viruses human immunodeficiency virus 1 (HIV-1) or respiratory syncytial virus (RSV). Diversity was lower for CMV than for HIV-1 or RSV, probably owing to lower mutation rates in DNA viruses than in RNA viruses. Using a haplotype-inference approach they developed, the authors found strong evidence for the presence of multiple haplotypes in the most diverse samples, suggesting that multiple founder viruses initiated these infections. Host hyper-editing of viral genomes represented another source of diversity in samples. The two approaches used in this study could aid in characterizing pathogen evolution during infection from clinical samples.

**ORIGINAL ARTICLE** Gelbart, M. et al. Drivers of within-host genetic diversity in acute infections of viruses. *PLoS Pathog.* 16, e1009029 (2020)

**BACTERIAL GENETICS**

**A function for retrons**

Retrons are bacterial genomic elements encoding a reverse transcriptase and a non-coding RNA (ncRNA). Despite their discovery more than three decades ago, the function of retrons remains unknown. Millman et al. found that many retrons are in close proximity in the genome to known phage–defence systems, suggesting that they are also involved in defence against phage infection. Retrons form a cassette that includes a reverse transcriptase, ncRNA and one or two genes encoding proteins that might function as effectors. Introduction of retrons and their effectors into an *Escherichia coli* strain lacking retrons provided defence against infection by various phages, by growth arrest or cell death. The authors showed that the defence mechanism of one retron involved sensing phage-mediated inactivation of the phage DNA-degrading RecBCD complex, which activated retron effectors and led to abortive infection.

**ORIGINAL ARTICLE** Millman, A. et al. Bacterial retrons function in anti-phage defense. Cell https://doi.org/10.1016/j.cell.2020.09.065 (2020)

**CLINICAL MICROBIOLOGY**

**Towards a chlamydia vaccine**

Chlamydia is the most common sexually transmitted bacterial infection in humans but is often asymptomatic. Left untreated, chlamydia infection can lead to serious complications, such as infertility, and thus vaccine development is a priority. Morrison et al. studied *Chlamydia muridarum* infection in mice, isolating a mutant *C. muridarum* strain (termed GIAM-1) that shows substantially reduced infection of the genital tract compared with that of the wild type. However, GIAM-1 efficiently infected the gastrointestinal tract, which induced robust humoral immunity against *C. muridarum*. Importantly, gastrointestinal tract infection with GIAM-1 protected mice against subsequent genital tract infection with wild-type *C. muridarum*. These results suggest that by manipulating tissue-tropism to obtain immunogenic bacterial strains that do not infect the genital tract, a live-attenuated vaccine for the human pathogen *Chlamydia trachomatis* might be obtainable.

**ORIGINAL ARTICLE** Morrison, S. G. et al. A genital infection-attenuated *Chlamydia muridarum* mutant infects the gastrointestinal tract and protects against genital tract challenge. *mbio* 11, e02770-20 (2020)