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IN BRIEF

BIOFILMS

Biofilm exclusion of uropathogenic bacteria by selected asymptomatic bacteriuria *Escherichia coli* strains

Ferrières, L., Hancock, V. & Klemm, P. *Microbiology* **153**, 1711–1719 (2007)

Urinary tract infections (UTIs) are difficult to treat because the causative bacteria form biofilms and so are not readily killed by antibiotics. Most UTIs are caused by uropathogenic *Escherichia coli* (UPEC) strains and *Klebsiella* species. However, some *E. coli* strains colonize the urinary tract in the absence of disease, which produces asymptomatic bacteriuria (ABU). One ABU strain, *E. coli* 83972, has been used as a prophylactic to prevent UTIs. Ferrières and colleagues revealed that ABU strains formed larger biofilms than UPEC strains in microtitre plates, with urine as a growth medium, although the size of biofilms was unrelated to growth rates. In addition, ABU strains outcompeted both UPEC and *Klebsiella* strains in mixed-species biofilms. According to the authors, understanding the basis of the ability of ABU strains to outcompete UPEC and *Klebsiella* spp. could lead to the development of ABUs as an alternative therapy for UTIs.

BACTERIAL PHYSIOLOGY

Structural analysis of CsoS1A and the protein shell of the *Halothiobacillus neapolitanus* carboxysome

Tsai, Y. *et al. PloS Biol.* **5**, e144 (2007)

Carboxysomes increase the efficiency of carbon fixation in cyanobacteria and chemoautotrophic bacteria by colocalizing inorganic carbon substrates and the cellular enzymes that fix carbon inside cells. Carboxysomes are protein shells that resemble icosahedral virus capsids and comprise multiple copies of just a few substituent proteins. Solving the crystal structure of the *Halothiobacillus neapolitanus* carboxysome outer-shell protein CsoS1A to a resolution of 1.4 Å revealed that it forms hexameric units that pack into a layer. Pores that could permit bicarbonate or other negatively charged metabolites to cross the shell were visualized bound to sulphate ions, which are a similar size to bicarbonate. This structure provides a basis for investigating how molecules are transported in and out of the carboxysome by directed mutagenesis experiments. Although thinner than virus capsids, the authors speculate that carboxysomes might represent intermediates in the evolution of viruses.

HIV

Molecular umbrellas: a novel class of candidate topical microbicides to prevent HIV and HSV infection

Madan, R. P. *et al. J. Virol.* 09 May 2007 (doi:10.1128/JVI.02851-06)

Topical microbicides for the prevention of sexually transmitted infections are currently being developed and tested. These include Carraguard and Pro2000, both of which are polyanions that block the binding of HIV and herpes simplex virus type 2 (HSV-2) virions to cervical cells. HSV-2 is a major co-factor for HIV infection, and therefore therapeutics that tackle both infections are highly desirable. A group led by Betsy Herold have recently reported on the mechanisms underlying the anti-HIV and anti-HSV-2 functions of an umbrella compound, Spm8CHAS. Using cultured cervical cells Spm8CHAS was shown to prevent HIV infection and transfer of HIV to T cells, and to prevent both infection, replication (post-entry) and cell-to-cell spread of HSV-2. After application, this facially amphiphilic molecule was localized to the nucleus, unlike other microbicides, which cannot cross cell membranes. Finally, combining Spm8CHAS with two reverse-transcriptase inhibitors proved even more effective at reducing HIV infection while retaining anti-HSV activity.