Inhibiting Bacteria Infection in Healthcare Devices through Surface Chemistry Treatments and Fluid Flow Control

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Technology description

Researchers in the Departments of Molecular Biology and Mechanical and Aerospace Engineering at Princeton University have designed new methods to effectively inhibit the entry, spread and growth of bacteria.

The entry of pathogenic bacteria into fluid-filled networks of the body causes serious infection and sepsis. In particular, sepsis is one of the most expensive conditions to treat in hospitals, costing more than $20 billion in 2011. Also, Pseudomonas aeruginosa is a major cause of hospital-acquired infections, burn infections, and cystic fibrosis infections. Researchers at Princeton have discovered a mechanism by which P. aeruginosa invades and spreads through branched fluid flow networks that mimic vasculature. Additionally, they discovered that P. aeruginosa uses a combination of motility modes to move upstream, laterally and downstream on surfaces, enabling it to spread and grow rapidly in branched flow networks common to physiology and medical devices.

This innovation describes a surface treatment, which combines surface chemistry modification and understanding the influence of the geometry of a flow network, to adhere and immobilize P. aeruginosa in liquid flow networks. It has been proven that growth and dispersal in a vascular-like network is inhibited by this treatment. The innovation includes suggestions for fluid network designs to inhibit flow-driven upstream migration of bacteria. As many other pathogenic bacteria possess similar motility structures, this process is likely to be effective toward a broad range of pathogens. This process can limit the spread of bacteria in healthcare devices and in human, animal and plant vasculatures, thereby reducing the potential for infection and sepsis.

Application area

1. Medical devices

2. Catheter tubes

3. Intravenous lines

4. Water supply lines

5. Patients’ wound sites

Advantages

- Effective infection control
- Compatible with most surface materials
- Simple treatment process

Institution

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