

## Thème 1 – Génétique et évolution

### 1-B - La complexification des génomes : transferts horizontaux et endosymbioses ?

#### Biofilms : hot spots of horizontal gene transfer

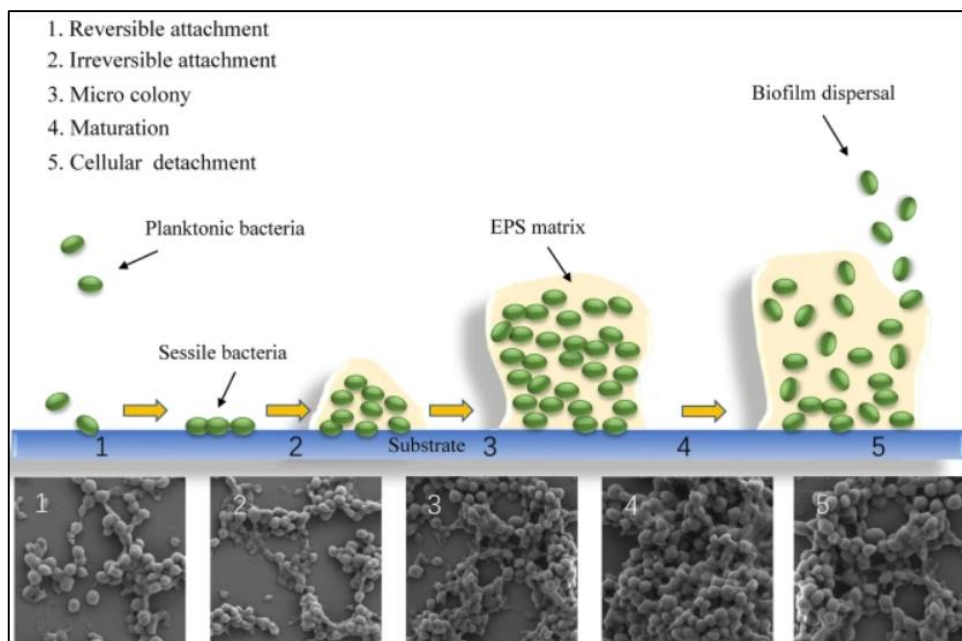
Show how horizontal gene transfer in bacteria influences human health.

##### Document 1. Biofilm organization.

Bacteria classically have been considered unicellular organisms, but in nature, they prefer to form highly structured multicellular communities, termed biofilms, to survive in harsh environments. Diverse bacterial species can live together in close proximity in biofilms, where the cells show remarkable and distinct features that are not seen in their planktonic form: heterogeneity of gene expression, division of roles in the community and enhanced tolerance to antibiotics. Bacterial cells in biofilms are embedded at a high density within a matrix of extracellular polymeric substances (EPSs). EPSs are biopolymers produced by the cells within biofilms, and typically are composed of exopolysaccharides, amyloid-like proteins, lipids and extracellular DNA. Many studies have shown that bacteria frequently exchange antibiotic-resistant genes (ARGs) in biofilms. ARGs often are encoded in mobile genetic elements such as conjugative plasmids and bacteriophages. Horizontal gene transfer is thought to be driven by three major mechanisms: conjugation, natural transformation and bacteriophage infection.

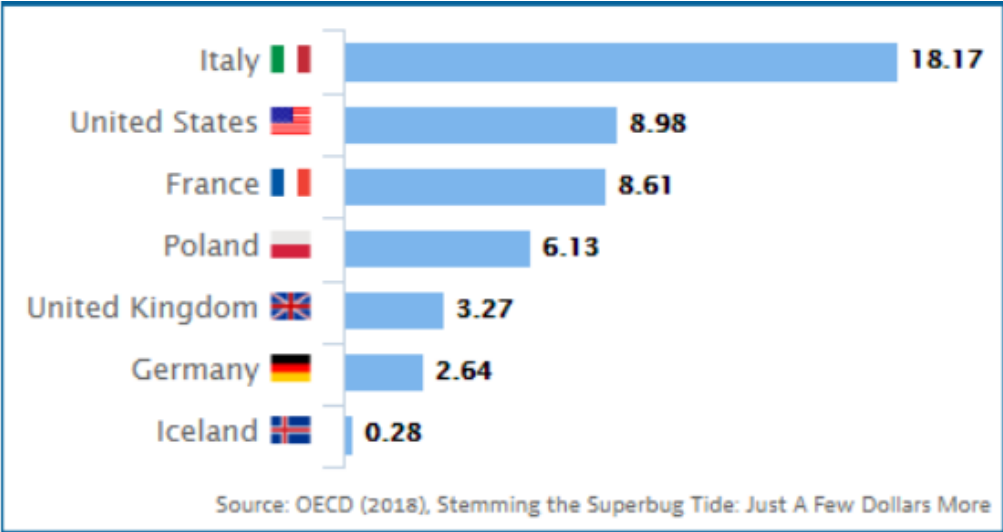
<https://academic.oup.com/femsec/article/96/5/fiaa031/5766226>

**Document 2.** Schematic diagram and scanning electron micrograph of different steps in the biofilm formation of the bacteria *Streptococcus suis* on a catheter's surface.



[https://www.researchgate.net/figure/Schematic-diagram-and-scanning-electron-micrograph-of-different-steps-in-the-biofilm\\_fig1\\_344170660](https://www.researchgate.net/figure/Schematic-diagram-and-scanning-electron-micrograph-of-different-steps-in-the-biofilm_fig1_344170660)

**Document 3.** Predicted deaths due to antimicrobial resistance 2015-2050 (AMR\* mortality rate per 100,000 persons)



<http://www.oecd.org/newsroom/stopping-antimicrobial-resistance-would-cost-just-usd-2-per-person-a-year.htm>

\*AMR : antimicrobial resistance