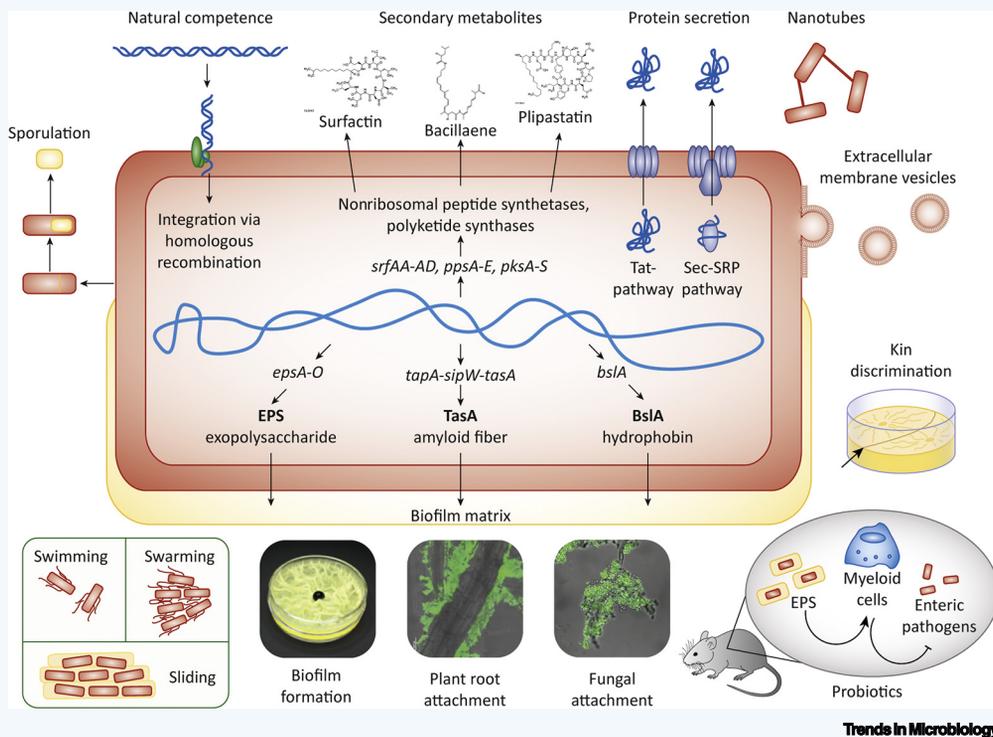


*Bacillus subtilis*Ákos T. Kovács<sup>1,\*</sup><sup>1</sup>Bacterial Interactions and Evolution Group, DTU Bioengineering, Technical University of Denmark, Soltofts Plads Building 221, Kongens Lyngby 2800, Denmark**KEY FACTS:**

Originally named *Vibrio subtilis* in 1835 by Christian Gottfried Ehrenberg; in 1872 renamed *Bacillus subtilis* by Ferdinand Cohn.

First sequenced genome of a Gram-positive bacterium; single 4.2 Mbp chromosome with a G+C content of 43%. The genome contains around 4200 genes, though only 253 of them are essential for cultivation in the laboratory.

Antibacterial and antifungal activities are evoked by the bioactive secondary metabolites, including surfactin, plipastatin, or bacillaene.

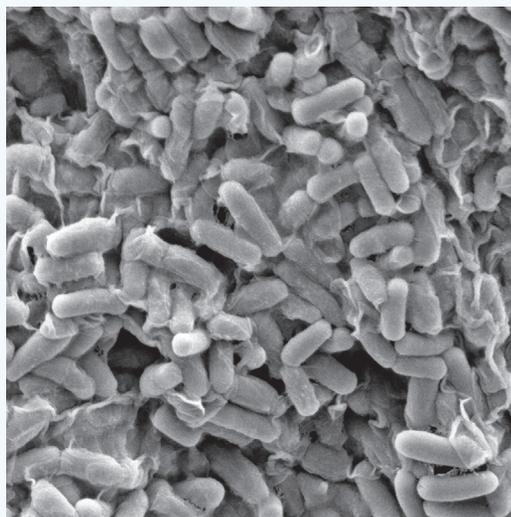
It was discovered during the second World War that *B. subtilis* can be used to treat dysentery. Secreted exopolysaccharides evoke probiotic properties to prevent disease and inflammation by enteric pathogens.

Versatile spreading behavior in the laboratory includes peritrichous flagellum-dependent single-cell motility and multicellular rafts of swarming cells, in addition to sliding facilitated by exopolysaccharide, surfactin, and hydrophobin.

Its easy cultivation properties and robust secretion machinery make *B. subtilis* a superior production platform for various enzymes, generating up to 20–25 g of proteins per liter of medium. These enzymes are used in dairy, baking, animal feed, textile, and laundry industries or as therapeutics.

Biofilm repellency surpasses the wettability of Teflon and is due to the matrix components, including exopolysaccharide, amyloid fiber, and a small hydrophobin protein, BslA. This latter surface-active protein could even delay melting of ice cream.

*Bacillus subtilis* became the most studied species in the genus *Bacillus* due to its natural competence for uptake of extracellular DNA that facilitates simple genetic modification and occurrence of sporulation, one of the first studied bacterial cell differentiation processes. The dormant spores can survive harsh circumstances (high temperature, desiccation, UV, and  $\gamma$ -radiation), predation by microorganisms and macroorganisms, or even extraterrestrial conditions. *B. subtilis* can be isolated from various environments, from soil to marine habitats, and utilized in various applications from enzyme production and food fermentation to plant biocontrol. *B. subtilis* is a model microorganism for studying cell division, protein secretion, surface motility (swimming, swarming, and sliding), biofilm development, attachment to plant root or fungal hyphae, secondary metabolite production, cytoplasm exchange via intercellular nanotubes, extracellular vesicle release, and kin-discrimination.



Trends in Microbiology

**TAXONOMY AND CLASSIFICATION:**

**KINGDOM:** Bacteria  
**PHYLUM:** Firmicutes  
**ORDER:** Bacillales  
**FAMILY:** Bacillaceae  
**GENUS:** *Bacillus*  
**SPECIES:** *Bacillus subtilis*

Rod-shaped, Gram-positive, catalase-positive, spore-forming bacterium

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