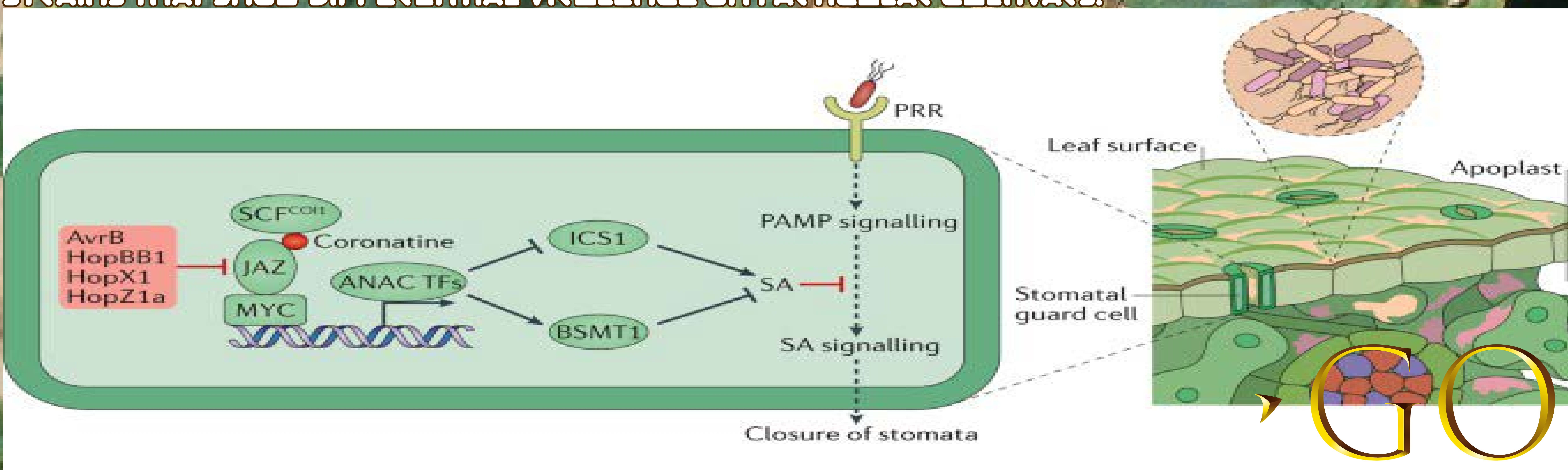
My Cell Wall Structure/Gram Stain Reaction

Pseudomonas syringae is a rod-shaped Gram-negative bacteria with a very broad host range infecting over 180 plant species. Pseudomonas syringae is an extremely common bacterial plant pathogen. It is a widely used model, partially owing to the early availability of genome sequence for various strands. Pseudomonas syringae is capable of infecting many different plants, but a single strand will typically only infect one or a few. Much of the specificity has been connected to the dozens of effector proteins produced by the type III secretion system, which helps mediate the bond that this pathogen has with living plant cells.

Pseudomonas syringae is known as a plant pathogen, but it can also be located in environmental repositories such as water which it employs for a long-distance dispersal around the planet. Pseudomonas syringae can be classified into strains that cause diseases on distinct plants called pathovars. These pathovars can be infinitely divided into races which are strains that show differential virulence on particular cultivars.



Pseudomonas syringae is found globally throughout the water cycle. In addition to agricultural waters, it has been isolated from glacial snow back, rivers, and other sources of water that are far from crops. One physiological property that starts to contribute to the spread is ice nucleation. This is a property where an individual or a few cells produce a surface protein that's actually capable of ordering water molecules to promote them freezing at a slightly warmer temperature than that water would freeze otherwise. This is thought to contribute to cloud formation and other movements of water with associated cells on a global scale. On a more local scale, this property can lead to increased frost damage. On a more positive note, this trait has also been adapted commercially to use in making artificial snow. This does not require the use of living cells.

Thinking about the many environments where Pseudomonas syringae can be found, it can colonize different plant habitats as well as being found in chance water sources. These represent various biotic and abiotic challenges to survival. Even a single plant or a single leaf represents multiple potential habitats at the scale of an individual cell. So for a typical infection cycle, cells land on the leaves surface often through rain splash or movement from plant debris. Cells can reach relatively high population sizes on the leaf's surface.

My Pathogenic Nature

Pseudomonas syringae comprises both pathogenic and non-pathogenic isolates. The key difference to this is the occupancy of a type III secretion system. This is a macromolecular complex that spans both the inner and outer membranes of the bacterial cell and has a pilus that extends to the host cell which is used to implant bacterial effector proteins. Bacterial effectors are key to Pseudomonas syringae's success as a pathogen. Effectors are proteins that alter hosts' cell functioning. Essentially, bacterial effectors work to stifle plant defenses and support the bacteria's dissemination throughout the plant.

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DIAGRAM OF INFECTION PROCESS

FIGURE 1: A SIMPLIFIED DIAGRAM OF THE INFECTION CYCLE OF PSEUDOMONAS SYRINGAE.

- A. A DIAGRAM OF HEALTHY PLANT LEAVES.
- B. BACTERIAL CELLS ON A LEAF SURFACE, ILLUSTRATING AGGREGATION OF SOME BACTERIA NEAR A TRICHOME.
- C. BACTERIA PENETRATING OPEN STOMATE.
- D. CROSS-SECTION OF A LEAF SHOWING BACTERIA COLONIZING THE PLANT APOPLAST.
- E. EXTENSIVE MULTIPLICATION OF BACTERIA IN THE APOPLAST OF A LEAF.
- F. VISIBLE DISEASE-ASSOCIATED NECROSIS AND CHLOROSIS.

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Normal gut microbiota
Diversity
Secondary bile acids–synthesizing microbes
Primary bile acids
Secondary bile acids
Dormant C. difficile spore
Germinating C. difficile spore
C. difficile (vegetative growth)
No toxin production
Broad spectrum antibiotic perturbation of gut microbiota
Diversity
Secondary bile acids–synthesizing microbes
Primary bile acids
Secondary bile acids
Dormant C. difficile spore
Germinating C. difficile spore
C. difficile (vegetative growth)
Toxin production
Inflammation of gut epithelium

2. Environmental microbiology is the investigation of the creation and physiology of microbial networks in the climate. The climate implies the dirt, water, air and residue covering the planet and can likewise incorporate the creatures and plants that occupy these regions. It additionally incorporates the investigation of microorganisms that exist in counterfeit conditions, for example, bioreactors. 1% of the microbial species on Earth. Microorganisms can get by in the absolute most limit conditions on earth and some can endure high temperatures, frequently above 100°C, as found in springs, dark smokers, and oil wells. Some are found in freezing natural surroundings and others in profoundly salt saline, acidic, or basic water. A normal gram of soil contains roughly one billion (1,000,000,000) microorganisms addressing presumably a few thousand animal types.

3. Ecological MICROFLORA Microorganisms exceptionally affect the entire biosphere. They are the foundation of environments of the zones where light can't approach. In such zones, chemosynthetic microorganisms are available which give energy and carbon to different living beings there. Some microorganisms are decomposers which have capacity to reuse the supplements. So, microorganisms have an uncommon part in biogeochemical cycles. Microbes, particularly microorganisms, are critical as in their cooperative relationship (either certain or negative) effectsly affect the biological system. Microorganisms are financially savvy specialists for in-situ remediation of homegrown, farming and mechanical squanders and subsurface contamination in soils, silt and marine conditions. The capacity of every microorganism to debase harmful material relies upon the idea of every pollutant. Since most locales are commonly involved various poison types,

4. Microorganisms that contain chloroplasts and do photosynthesis, similar to green growth and single-celled plants, measure carbon dioxide and produce energy for themselves and most other life on Earth. Soil microorganisms separate plant and creature matter into more modest and more modest particles, in the end transforming it into issue that different living beings can use as supplements.

5. SOIL MICROFLORA It is the external, free material of earth's surface which is unmistakably not the same as the hidden bedrock and the locale which backing vegetation. Soil is the area which upholds the vegetation by offering mechanical help and supplements needed for development. The dirt is perhaps the most powerful locales of organic connections in the nature. It is the area where the majority of the physical, natural and biochemical responses identified with disintegration of natural enduring of parent rock occur. Soil microbiology is the investigation of organic entities in soil, their capacities and what they mean for soil properties. The populace structures in the movement of microorganism are to a great extent managed by soil properties and by environment and vegetation Microbes in the dirt are critical to us in keeping up soil ripeness/efficiency, cycling of supplement components in the biosphere and wellsprings of mechanical items like proteins, anti-infection agents, nutrients, chemicals, natural acids and so on simultaneously certain dirt organisms are the causal specialists of human and plant illnesses.

6. SOIL TYPES OF MICROORGANISMS IN SOIL: The dirt life forms are comprehensively arranged in to two gatherings viz soil greenery and soil fauna, the nitty gritty grouping of which is as per the following. Soil Organisms: Soil Flora a) Microflora: Bacteria, Fungi, Molds, Yeast, Mushroom, Actinomycetes, Streptomyces, Algae (e.g., BGA, Yellow Green Algae, Golden Brown Algae). Bacteria is grouped into I) Heterotrophic for example harmonious and non - advantageous N2 fixers, Ammonifier, Cellulose Decomposers, Denitrifiers II) Autotrophic for example Nitrosomonas, Nitrobacter, Sulfur oxidizers, and so on b) Macroflora: Roots of higher plants Soil Fauna • a) Microfauna: Protozoa, Nematodes • b) Macrofauna: Earthworms. moles, insects and others.

7. SOIL MICROORGANISM - BACTERIA: Bacteria are the most bountiful and prevalent living beings. These are crude, prokaryotic, minute and unicellular microorganisms without chlorophyll. Morphologically, soil microbes are separated into three gatherings viz Cocci (round/circular), (pole formed) and Spirilla/Spirillum (cells with long wavy chains). Bacilli are most various followed by Cocci and Spirilla in soil. Bacterial populace is one-portion of the absolute microbial biomass in the dirt going from 100,000 to a few hundred millions for each gram of soil, contingent on the physical, synthetic and organic states of the dirt. based on natural qualities arranged soil microorganisms by and large and microbes specifically into two general classifications: 1. Autochthonous (Indigenous species) 2. Zymogenous (fermentative).

8. Autochthonous bacterial populace is uniform and consistent in soil, since their nourishment is gotten from local soil natural matter for example Arthrobacter and Nocardia Zymogenous bacterial populace in soil is low, as they require an outer wellspring of energy for example Pseudomonas and Bacillus. The number of inhabitants in Zymogenous microorganisms increments steadily when a particular substrate is added to the dirt. They are cellulose decomposers, nitrogen using microscopic organisms and ammonifiers. Most of the microbes which are transcendently experienced in soil are systematically remembered for the three orders, Pseudomonadales, Eubacteriales and Actinomycetales of the class Schizomycetes. The most well-known soil microscopic organisms have a place with the genera Pseudomonas, Arthrobacter, Clostridium Achromobacter, Sarcina, Enterobacter and so on The another gathering of microorganisms regular in soils is the Myxobacteria having a place with the genera Micrococcus, Chondrococcus, Archangium, Polyangium, Cyptophaga.

9. • Bacteria are additionally arranged based on physiological action or method of nourishment, particularly the way in which they acquire their carbon, nitrogen, energy and other supplement prerequisites. • They are extensively partitioned into two gatherings : AUTOTROPHS: Autotrophic microorganisms are skilled combining their food from basic inorganic supplements, while heterotrophic microbes rely upon pre-shaped nourishment for sustenance. All autotrophic microbes use Co2 (from air) as carbon source and get energy either from daylight (photoautotrophs) for example Chromatrum. Chlorobium. Rhadopseudomonas or from the oxidation of straightforward inorganic substances present in soil (chemoautotrophs) for example Nitrobacter, Nitrosomonas, Thiaobacillus. HETEROTROPHS: Majority of soil microorganisms are heterotrophic in nature and determine their carbon and energy from complex natural substances/natural matter, rotting roots and plant buildups. They acquire their nitrogen from nitrates and alkali compounds (proteins) present in soil and different supplements from soil or from the breaking down natural matter.

10. Capacity OF BACTERIA: Bacteria achieve various changes and biochemical changes in the dirt and in this manner straightforwardly or by implication help in the nourishment of higher plants filling in the dirt. The significant changes and cycles in which soil microscopic organisms assume crucial part are: 1. Decay of cellulose and different starches, 2. Ammonification (proteins alkali), 3. Nitrification (alkali nitrites-nitrates), 4. Denitrification (arrival of free natural nitrogen), 5. Organic obsession of climatic nitrogen (cooperative and non-advantageous) 6. Oxidation and decrease of sulfur and iron mixtures.


THANK YOU!
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