Diagnosis of an infected patient

Health & Medicine

DIAGNOSIS OF AN INFECTED PATIENT (Anatomical differences among bacteria) of (affiliation) Location of University:

DIAGNOSIS OF AN INFECTED PATIENT

This paper discusses the anatomical differences among three kinds of bacteria which are the Bacillus, Escherichia, and Mycoplasma. The discussions here are in relation to a hypothetical patient with an infection who needs to be diagnosed on what is causing his ailment and so if the bacterium is correctly identified, then a proper treatment protocol can be implemented for a cure. A sputum sample of the infected patient had been obtained for a laboratory examination.

The bacterium Bacillus is a rod-shaped bacteria and can form long chains; it is also the prokaryotic type of bacteria, meaning its cells lack a membrane-bound nucleus. The Bacillus is a very resilient bacterium because it can produces spores (actually, oval endospores which are not true spores) which remain dormant over long periods of time and then re-activated whenever the right environmental conditions are present for it to reproduce again. Its spores can theoretically be dormant for many years in the soil but can still infect after a lapse of several decades. Bacillus can be either aerobic (oxygen-reliant) or facultative anaerobic (having ability to be aerobic or not). It is gram-positive when stained although some Bacillus are gram-negative too.

Escherichia differs from Bacillus in that it is non-spore forming, gram-negative when it is stained, and it is facultatively anaerobic although it is like Bacillus in being rod-shaped also in form when viewed under the microscope. Many strains under the Escherichia species are known human pathogens which cause many urinary tract infections (UTI) as well as common intestinal

ailments like diarrhea and dysentery. However, some strains are beneficial and known also by the alternative living arrangement called commensal which is a relationship between two kinds of organisms where one organism benefits without necessarily harming the other organism.

Mycoplasma is the smallest known bacteria and do not have a cell wall which allows it to be flexible enough and take many different shapes, depending on its environment. It is also resistant to most medicinal drugs which specifically target cell walls synthesis like penicillin or antibiotics as its lack of a wall prevents a precise targeting mechanism for a drug to work on it. It is considered as one of the smallest living cells ever discovered and many of its strains are cause of ailments as it is pathogenic and parasitic. Mycoplasma is anaerobic (survives without oxygen) and it is gram-positive when stained. It was mistakenly thought to be a fungus when first known because of its fungus-like characteristics. The lack of a cell wall is the single most distinguishing feature of mycoplasmas which differentiate them from all other prokaryotes (Razin, 1983).

There are three types of stains used today for laboratory analysis: the simple stain, the differential stain, and lastly, the specific stain (or acid-fast stain). In the case of the three kinds of bacteria in this paper discussion, it is the differential stain that is used to determine the specific infectious bacteria of the patient. It was first developed by Dr. Hans Christian Gram back in 1884 and differentiates bacteria by their Gram stain ability to absorb or lose the color of the stain. It is a gram-positive bacteria when the stain used (usually crystal violet called gentian) is retained by the cell walls which have lower lipid content and the laboratory sample turns purple. It is a gram-negative bacteria when the sample turns pink because these kinds of bacteria have a

higher lipid content in their cell walls and as a consequence no longer have the ability to absorb the stain that is being used since their cell walls are already full to the limits with lipids (Lindh et al., 2009). It is just a simple procedure to do a laboratory analysis of a given sample. Smear a small sample of the sputum on a slide and then heat it a little bit to prevent washing off and then apply the stain. It is usually the crystal violet that is used as a primary stain and then iodine is added which is the mordant (any substance that facilitates the dye or stain to stick to the tissue or cells). Alcohol or acetone (as a de-colorized) is then applied to try to wash out or remove the stain. The last step is to apply safranin (or basic red 2) which is a red counterstain to the sputum sample. If the bacteria is gram-negative, the sample will turn pinkish as the red counterstain is diluted while if bacteria is gram-positive, the laboratory sample will turn purple as the crystal violet stain is retained or absorbed by the thick cells walls with less lipids of that kind of bacteria (Tortora et al., 2012).

References

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