

Pseudomonas, Stenotrophomonas, Burkholderia

Introduction

The taxonomy of the genera *Pseudomonas*, *Stenotrophomonas*, and *Burkholderia* is largely distinct and constantly changing, yet there are many common features that these genera exhibit – for example, they cause nosocomial infections. The individual genera are further classified into higher units, namely the families *Pseudomonadaceae*, *Burkholderiaceae*, *Xanthomonadaceae*, the orders *Pseudomonadales*, *Burkholderiales*, *Xanthomonadales*, and the classes *Gammaproteobacteria*, and *Betaproteobacteria*.

General characteristics

The genera **Pseudomonas**, **Stenotrophomonas**, and **Burkholderia** belong to the non-sporulating gram-negative bacteria. According to the structure of the bacterial wall, they appear pink in Gram stain. They are strictly aerobic microorganisms, requiring oxygen for their life. They get their energy by splitting glucose, i.e. aerobic oxidation. However, some bacteria, such as *Pseudomonas aeruginosa*, have the ability to form biofilms in the human body that allow them to persist in the macroorganism.

Morphology

The shape of these Gram-negative bacteria is usually in the form of slender, slightly curved rods. Older bacteria may form coccoid structures that further form pairs or short chains. In order to move actively, most bacteria are equipped with flagellums. An exception is the non-moving *Burkholderia mallei*.

Cultivation

Bacteria of the above-mentioned genera are relatively easy to cultivate, mainly due to their aerobic nature. They commonly grow on blood agar, on Endo agar, even on ordinary peptone agar. An important condition for the cultivation of these representatives is sufficient humidity. For successful cultivation, it is preferable to incubate the bacteria at 30 °C. The commonly used temperature of 35-37 °C could cause the colony to be covered by other accompanying microflora for which a higher temperature is optimal. The only distinctive features that can be observed in some cultured colonies are pigment colouration or a characteristic odour.

Enzymes

Another important feature of the described bacteria is the production of enzymes including proteases, lipases, and elastases. All are characterized by the production of catalase and most have been shown to have cytochrome oxidase activity. Certain types of enzymes are of high medical significance because they damage the macroorganism – such as pyochelin.

Pathogenesis and epidemiology

Infections caused by members of the genera *Pseudomonas*, *Stenotrophomonas*, and *Burkholderia* do not usually affect healthy individuals. The disease usually affects individuals with weakened immunity. In such cases, an infection can lead to death. The spread of infection occurs most often in health care settings where microorganisms colonize endotracheal catheters, flexilla, or indwelling catheters. Thus, members of each genus can be referred to as agents of nosocomial infections.

Therapy

Therapy of diseases caused by these gram-negative bacteria is quite difficult. The microbes show high resistance to antibiotics.

Specific genera

- *Pseudomonas*
 - *P. aeruginosa*
 - *P. alcaligenes*
 - *P. fluorescens*
 - *P. mendocina*
 - *P. putida*
 - *P. stutzeri*
- *Stenotrophomonas*
 - *Stenotrophomonas maltophilia*

- *Burkholderia*
 - *Burkholderia cepacia*
 - *Burkholderia mallei*
 - *Burkholderia pseudomallei*

Links

References

- POVÝŠIL, Ctibor – ŠTEINER, Ivo, et al. *Obecná patologie*. 1. edition. Praha : Galén, 2011. 290 pp. Chapter 13 : Obecná onkologie. pp. 133-190. ISBN 978-80-7262-773-8.
- VOTAVA, Miroslav, et al. *Lékařská mikrobiologie speciální*. 1. edition. Brno : Neptun, 2003. 495 pp. Chapter 1.1: Gramnegativní nefermentující bakterie. pp. 29-37. ISBN 80-902896-6-5.
- KAYSER, Fritz H. – BIENZ, Kurt A.. *Medical Microbiology*. 1. edition. Germany : Thieme, 2005. 268 pp. pp. 308-311. ISBN 9781588902450.
- SEDLÁK, Kamil – TOMŠÍČKOVÁ, Markéta. *Nebezpečné infekce zvířat a člověka*. 1. edition. Praha : Scientia, 2006. 167 pp. pp. 147-148. ISBN 80-86960-07-2.

External links

- Burkholderia description page (pathema.jcvi.org) (http://www.jcvi.org/cms/research/past-projects/pathema/overview/?page=burkholderia_description)
- Recent advances in the treatment of Pseudomonas aeruginosa infections in cystic fibrosis (ncbi.nlm.nih.gov) (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3087692/>)
- Taxonomy browser (ncbi.nlm.nih.gov) (<https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi>)