THE PHENAZINE PRODUCTION BY *PSEUDOMONAS* BACTERIA

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Antibiotic substances are microbial metabolic products that selectively inhibit the bacterial growth and microscopic fungus and tumor cell development. The antibiotic formation is one of the antagonism forms (McDougald et al. 2008).

The most perspective group of antibiotic producing bacteria is the *Pseudomonas* genus is characterized by ability to synthesize more than 300 different antimicrobial substances, such as pyocyanin – blue fluorescent pigment (*Pseudomonas aeruginosa*), chlororaphine (green), oxychlororaphine (yellow) – similar chemical compounds (*Pseudomonas fluorescens*), phenazine-1-carboxylic acid – yellow pigment, promotes cell biofilm growth (*Pseudomonas aureofaciens*), iodinin – is blue-purple pigment (*Pseudomonas iodinum*), aeruginosin – red pigment (*P. aeruginosa*), 2-hydroxyphenazine-1-carboxylic acid – the orange pigment (*Pseudomonas chlororaphis*) (Budzikiewicz H., 2009).

The most famous and intensively studying *Pseudomonas* antibiotics are phenazines (Stewart A., 2008).

Phenazines that belong to the secondary metabolites are the low weight N-heterocyclic molecules. They are synthesized by different *Pseudomonas* species: *P. aeruginosa*, *P. fluorescens, P. chlororaphis* etc. Their synthesis has been detected in bacteria belonging to some other genera and classes and even Achaea (Bordi K., 2011).

The phenazine derivatives are characterized by the ability to generate active oxygen forms leads to the manifestation of their antibiotic activity. So, pyocyanin, forming a complex of bivalent ions, in particular Mg (II), passes through the cell membrane inside and can attach electrons. Thus, the electron transport and cellular respiratory pathway interruption occurs (Bentzmann M., 2012).

Phenazines can also play the role of signaling molecules of *P. aeruginosa*. While two homoserine lactone autoinducers and quinolone signals synthesize during the exponential microorganism growth phase, phenazines, including pyocyanin, begin to form during the stationary phase and activate genes that control the *quorum sensing* system (Franklin E., 2013).

Phenazines, which are formed by pathogenic *Pseudomonas* species, are their virulence factors (Budzikiewicz H., 2009). One of the reasons phenazine-mediated cytotoxicity is their ability to interact with nucleic acids. These compounds have structural similarity to the known aromatic intercalators.

In addition, phenazines, especially pyocyanin that is synthesized by *P. aeruginosa*, used as electronic transporters for other bacteria and support the electrochemical energy production in microbial fuel cells (Audzi O., 2008). Analysis of microbial fuel cells showed that phenazines also help the survival of *P. aeruginosa* under the oxygen limiting conditions.