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Pyruvate kinase as a new target for anti-caries agents

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Background: In oral cavity conditions, cariogenic bacteria *Streptococcus mutans* are characterized by altered metabolism compared to cells found in physiological flora. The metabolism of *Streptococcus mutans* is based on glycolysis, which also occurs in presence of oxygen (a phenomenon known as the Warburg effect). The low concentration of oxygen (<2%), i.e., hypoxia inside the biofilm, increases expression of genes encoding glycolytic enzymes and inhibits the oxidative phosphorylation. Pyruvate kinase (PK), one of the enzymes involved in glycolysis, is considered as an enzyme conditioning the rate of the whole process since it is activated by glucose-6-phosphate, a substrate of glycolysis.

Material & Methods: Pyruvate kinase from *S. mutans* ATCC and 40 clinical strains was purified, precipitated and estimated fluorimetrically. Here, we revealed the activity and regulation of PK in mixed bacterial biofilm species, and discussed how these properties enabled the regulation of PK for cariogenic biofilm proliferation and caries progression consequently. Clinical strains were isolated from children with caries. Mixed biofilm assay was carried out according to current protocols in microbiology.

Results: PK activity was higher (1.65 mU/mg of protein) in the mixed cariogenic biofilm species compared to the single and mixed physiological biofilm types (1.15 mU/mg of protein vs. 1.33 mU/mg of protein).

Conclusions: It was demonstrated that the pyruvate kinase activity is increased in mixed cariogenic biofilm species. *Streptococcus mutans* are more resistant to glycolytic enzyme inactivation occurring in mixed cariogenic biofilm species (including *Streptococcus sobrinus*, *Lactobacillus acidophilus* and *Actinomyces viscosus*) compared to mixed physiological biofilm types. Inhibition of glycolytic enzymes might be an essential step in the reduction of mixed cariogenic biofilm species which could be a useful tool in caries prophylaxis.

Biography

Palina Vyhouskaya is currently a PhD student at the Jagiellonian University, Poland. She is a Member of the Scientific Students Association of Laboratory Diagnosticians, where she gains experience and practice connected with modern research methods used in Medicine.

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