

**T.V. Meleshko**

**INFLUENCE OF NUTRITIVE REQUIREMENTS OF LACTOBACILLI  
ON LACTIC ACID PRODUCTION**

Supervisors: PhD Yamborko H.V., PhD Kotlyarova L. B.

Lactic acid bacteria (LAB) constitute a group of gram-positive, nonsporing microorganisms, which produce lactic acid as the major end product during the fermentation of carbohydrates. *Lactobacillus* species are essential to the dairy industry, where they are used in the preparation of cheeses, yoghurt and other fermented milk products.

Lactic acid bacteria can be classified into two groups: homofermentative and heterofermentative. While the homofermentative LAB convert glucose almost exclusively into lactic acid, the heterofermentative LAB catabolize glucose into ethanol and CO<sub>2</sub> as well as lactic acid. The homofermentative LAB usually metabolize glucose *via* the Embden-Meyerhof pathway (*i.e.* glycolysis). Only the homofermentative LAB are available for the commercial production of lactic acid.

Lactobacilli are extremely fastidious organisms, adapted to complex organic substrates. They require not only carbohydrates as energy and carbon source, but also nucleotides, amino acids, and vitamins for their growth in a defined medium. Their complex nutrient requirements are usually satisfied in natural or complex growth media by the addition of different compounds such as peptone, meat and yeast extract. There are several growth-stimulation factors that have a considerable effect on the production rate of lactic acid. The mixture of amino acids, peptides, and amino acid amides usually stimulates the growth of LAB, and the resulting growth rates are much higher than those obtained with free amino acids. Fatty acids also influence LAB growth, and phosphates are the most important salt in lactic acid fermentation. Ammonium ions cannot serve as the sole nitrogen source, but they seem to have some influence on the metabolism of certain amino acids. Since minerals do not seem to be essential to LAB growth, the amount found in commercial complex media is usually sufficient. Temperature and pH are also important factors influencing LAB growth and lactic acid production. In general, the desirable characteristics for industrial LAB are the abilities to rapidly and completely convert cheap raw materials into lactic acid with minimal nutritional requirements and to provide high yields of preferred stereoisomer without by-product formation.

It is necessary to supplement the fermentation media with sufficient nutrients for rapid lactic acid production. The most common nutrient for lactic acid production is yeast extract, but this may contribute significantly to an increase in production costs. As an alternative to yeast extract, corn steep liquor, a by-product from the corn steeping process, has been used successfully for lactic acid production. Rice bran and wheat bran play important roles as effective nutrients for lactic acid production, because they usually contain several nutritional factors as well as fermentable carbohydrates.