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HYDROXYAPATITE PATTERNS IN THE DEVELOPMENT OF INNOVATIVE BACTERIAL DIFFERENTIATION STRATEGIES

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Modern food microbiology emphasizes rapid and automatic methods for measuring the number of microorganisms. To estimate the number of microorganisms, depending on their metabolism, various methods such as deep seeding (colony counting), enzyme-linked immunosorbent assay (ELISA), etc. are widely used in the food industry [1]. However, despite the sensitivity and selectivity of these methods, their disadvantages are cost, duration and difficulty in execution. Whereas rapid identification of bacteria is very important in many areas of health and safety. Thus, studying bacterial metabolites *in situ* during their cultivation with targeted release of nutrients from hydroxyapatite (HA) structures offers an alternative method to detect bacteria and develop strategies to manage their behavior for practical purposes. This study has the potential to expand our knowledge of bacterial physiology and contribute to the development of innovative biotechnological solutions. In turn, this will enable the development of various sensors for the detection of bacterial growth [2]. Research on the efficacy of nutrients to stimulate bacterial growth can find its application in various fields and can significantly improve the health and standard of living of the population.

The system we are developing is focused on the study of bacterial metabolites (lactic acid, for example) *in situ* during cultivation with targeted release of substances from HA structures that allow to regulate the rate of substance release. In this case, biopolymeric molecules create a specific structure and surface charge for adsorption and growth of bacteria. Formation of GA patterns was carried out under sterile conditions. It was determined that for bacterial growth it is necessary to form Lisegang rings from HA in the following medium: agar (10 g/L), glucose, concentration 0.5% mol/L, with the addition of 50 μmol/L bromothymol blue or 50 μmol/L phenol red at a concentration of $5 \cdot 10^{-5}$ mol/L. After seeding the lactic acid bacteria, a change in the color of the indicator was observed, indicating that the bacteria grow and produce lactic acid, which affects the pH of the system and changes the color of the samples.

Thus, a technique for the formation of ordered structures for the delivery of nutrients to bacteria was obtained. It is shown that the obtained structures allow not only to detect the presence of bacteria *in situ*, but also, in the future, will allow to automatically determine the number of bacteria noninvasively.

List of sources used:

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