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LYSOCYME AND ANTILYSOZYME ACTIVITY OF ENTEROBACTERIA ISOLATED FROM FERROUS MILK PRODUCTS

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Abstract

The nosocomial incidence of purulent-septic infections at present, due to a number of objective circumstances, has a significant increase. This article focuses on the study of the lysozyme and antilysozyme activity of Enterobacteria, which are known to cause nosocomial infections. This problem requires constant attention to the study of opportunistic or opportunistic bacteria that cause nosocomial infections. Studies aimed at the detection of bacteria belonging to the Enterobacteriaceae family in milk and dairy products made it possible to isolate 252 cultures belonging to this family. Among the isolated enterobacteria were representatives of the species Escherichia coli, Enterobacter aerogenes, Enterobacter cloacae, Citrobacter freundii, Serratia marcescens, Yersinia enterocolitica. The aim of the work was to reveal the distribution of the ability of isolated cultures to produce lysozyme and antilysozyme, which are pathogenicity factors. The findings of this study are expected to contribute to a better understanding of the pathogenicity factors of Enterobacteria, thus facilitating the development of effective strategies to prevent nosocomial infections caused by these microorganisms.

Keywords: Anti lysozyme, bacterium, enterobacter, lysozyme, pathogenicity, strain

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1. Introduction

Currently, infectious diseases in hospitals are traditional, “Classic” and purulent-septic - quite common. There are a lot of literary sources in which it is indicated that the nosocomial incidence of purulent-septic infections at present, due to a number of objective circumstances, has a significant increase. This problem requires constant attention to the study of opportunistic or opportunistic bacteria that cause nosocomial infections (Aishanov, 2011; Blieva, 2018). A successful fight against nosocomial infections can be based on a single organizational system for the whole country, which should include the efforts of specialists in various fields of clinical and preventive medicine, as well as measures taking into account the general and specific aspects of the development of the epidemic process in hospitals and identifying the ways of circulation of these microorganisms (Boziev, 2019).

2. Problem Statement

Studies aimed at the detection of bacteria belonging to the Enterobacteriaceae family in milk and dairy products made it possible to isolate 252 cultures belonging to this family (Gabrilovich, 1989, 1993). Among the isolated enterobacteria were representatives of the species Escherichia coli, Enterobacter aerogenes, Enterobacter cloacae, Citrobacter freundii, Serratia marcescens, Yersinia enterocolitica.

3. Research Questions

Conditionally pathogenic microorganisms are often found in the composition of normal microflora and cause diseases mainly when the body's natural resistance decreases (Gabrilovich, 2009; Gairabekova, 2019a). Pathogenicity is largely controlled by the bacterial genome, and the term “virulence” is used to determine the degree of pathogenicity (Gairabekova, 2019b). The implementation of pathogenicity by a microbe depends both on the susceptibility of the macroorganism and on the influence of environmental factors (Gairabekova, 2020a). Numerous studies show that among opportunistic microorganisms there are strains that are both incapable of exhibiting pathogenic properties and possessing a wide range of pathogenicity factors, therefore, from the point of view of their virulence, many types of opportunistic bacteria cannot be considered as homogeneous. Virulent strains practically do not differ from avirulent strains of the same species. Pathogenicity for opportunistic microorganisms in many cases is not a sign of the species, but characterizes only a specific strain (Gairabekov, 2019; Gairabekova, 2020b).

4. Purpose of the Study

In microbiology, the main fundamental direction is the study of the pathogenicity of microorganisms. At present, it is known that pathogenic bacteria produce a wide range of substances that directly damage or kill macroorganism cells, as well as facilitate the penetration of bacteria into the host organism by overcoming its defense mechanisms (Gairabekov, 2016a, 2016b). In recent years, the etiological significance of a number of opportunistic bacteria in the occurrence of infectious processes of various localization has been established. One of the main problems of practical medicine is the solution of issues of prevention, diagnosis and treatment of diseases caused by Gram-negative conditionally

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pathogenic microorganisms of the Enterobacteriaceae family, which also include the bacteria Hafnia alvei. Representatives of Hafnia alvei are widely distributed in the environment (R. K. Gairabekov, 2011, 2010a). Some researchers classify them as natural inhabitants of the intestine (Gairabekov, 2010b), they can also be the cause of nosocomial infections, severe diseases in children of the first year of life (Gairabekov, 2010b), in patients with immunodeficiency (Gairabekov, 2009), postoperative complications, urosepsis (Sukhova, 1974), pneumonia (Gairabekov, 2010c), complications after organ transplantation (Gairabekov, 2010c). The problems of morbidity associated with Hafnia alvei are largely determined by the multiple antibiotic resistance of cultures and, accordingly, the nosocomial nature of the spread of infection (Sukhova, 1974).

5. Research Methods

To determine the contamination of dairy products with enterococci, staphylococci and pathogenic enterobacteria, we examined milk, sour cream (homemade sour cream is high concentration cream), cottage cheese and cheese, which were kindly provided to us by relatives and friends in various villages of the Chechen Republic. Both freshly produced product samples and products with a long shelf life were analyzed. In total, 282 samples of dairy products were examined, while 5632 studies were carried out. Samples were taken in compliance with the norms and requirements of the "Methodological recommendations for the organization of industrial microbiological control at dairy industry enterprises" approved by the head of the federal service for supervision in the field of consumer rights protection and human well-being, the chief state sanitary doctor of the Russian Federation G.G. Onishchenko February 7, 2008 (Sukhova, 1974). From the product samples prepared for the study, quantitative inoculations were made, which were made from serial dilutions in physiological saline on kanamycin azide-esculin agar (CAE-agar), yolk-salt agar (G.N. Chistovich, 1952) (Yakushenko, 1991) and on solid medium Assol-Liberman (R.V. Epshtein-Ligvak, 1973) (Gabrilovich, 2020). Crops were incubated at 37°C for 16-48 hours (Chistovich, 1952). The total bacterial contamination of the product was determined by counting colonies on CAE or Assol-Lieberman, which do not inhibit the growth of microbes. Identification of microorganisms was carried out on the basis of cultural, biochemical and, in some cases, serological properties of isolated microorganisms. The pathogenicity factors of isolated enterobacteria were studied according to the methods presented in the works of Gabrilovich I.M. et al., Gairabekova R.Kh. et al., Blievoy L.Z. et al., Bozieva V.B. et al. and others (Molochaeva et al., 2023; Yakushenko, 1991).

6. Findings

Bacteriological examination for the presence of microbes of the intestinal group was carried out at all successive stages of sour cream production (Chistovich, 1952; Sukhova & Koroleva, 1974). The total number of microbes in the milk entering production and the finished product was within the normal range.

Among 59 cultures of citrobacteria isolated from dairy products, strains secreting lysozyme were identified 13 i.e. 22.03% (Gabrilovich, 2020).

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The ability to produce antilysozyme was characteristic of 27 out of 59 studied cultures of citrobacteria, which is 45.76%.

No lysozyme-producing strains were found among the 19 studied cultures of serrations isolated from fermented milk products (Z. Iriskhanova et al., 2022).

The ability to produce antilysozyme was characteristic of 15 strains, out of 19 cultures of serrations isolated from fermented milk products, i.e. 78.8%.

Of the 76 cultures of Yersinia enterocolitica studied by us, 12 cultures produced lysozyme, which is 15.8%. 38 cultures were antilysozyme active; 65.8% (Z. I. Iriskhanova, A. A. Ataeva, et al., 2021). A quantitative study of anti-lysozyme activity showed that the studied Yersinia cultures are characterized by anti-lysozyme activity in the range from 1 to 6 μg/ml.

7. Conclusion

We isolated 51 cultures of Escherichia from lactic acid products, of which 19 strains produced lysozyme, which amounted to 37.2%, 47 strains had antilysozyme activity, i.e. 92.1% (Z. I. Iriskhanova, M. A. Takaeva, et al., 2021).

We assigned 47 cultures of Enterobacter aerogenes, Enterobacter cloacae species isolated from fermented milk products, 21 cultures belonged to the Enterobacter cloacae species, and 26 strains to the Enterobacter aerogenes species. The ability to produce lysozyme was characteristic of 4 strains of Enterobacter cloacae, which is 19.04%. Among the cultures of Enterobacter aerogenes, there were 7 such strains, which is 26.9%.

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