

# Assessing the Biosafety of the New Probiotic Strain of *Bifidobacterium Crudilactis* 7-1C Isolated from Camel Milk



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**Abstract** The cooperative sector of the Russian Economy occupies a significant part of the dairy market, which actualizes the issue of milk production technology for these enterprises. The paper analyzes the biosafety of microorganisms based on the study of the pathogenicity and nature of the adverse effects of the new probiotic strain *Bifidobacterium crudilactis* 7-1C, first isolated from camel milk. The introduction of biosafety levels for industrial strains is associated with a more general problem—the need to develop a modern regulatory framework for certification and standardization of industrial strains, ensure control over their use in production, and create a mechanism for its implementation, conceptually consistent with world practice in this area. The paper presents the cultural and morphological features of this strain, data on the determination of potentially pathogenic features, in vitro, virulence, allergenic, and irritating effects on the sensitizing effect. According to the existing classification of strains, the new strain *Bifidobacterium crudilactis* 7-1C belongs to the fourth hazard class.

**Keywords** Probiotic · Biosafety · Normative base · Pathogenicity · *Bifidobacterium crudilactis* · Virulence

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A. V. Bogoviz et al. (eds.), *Frontier Information Technology and Systems Research in Cooperative Economics*, Studies in Systems, Decision and Control 316,  
[https://doi.org/10.1007/978-3-030-57831-2\\_113](https://doi.org/10.1007/978-3-030-57831-2_113)

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## 1 Introduction

Camel milk is widespread in Kazakhstan, where it is known for its medicinal and dietary properties (Faye et al. 2008). However, there are only a few studies on camel milk in terms of composition (Farah 1993; Faye and Esenov 2004; Ramet 1993). Camel milk is considered an antitumor, hypoallergenic drink (Shabo et al. 2005) with anti-diabetic properties (Agrawal et al. 2003). Additionally, camel milk is an important protein source for people living in some of the world's arid countries.

The most common types of bacteria in camel milk are *Lactococcus lactis* subsp. *lactis*, *Lactobacillus helveticus*, *Streptococcus salivarius* subsp. *thermophilus*, *Lactobacillus casei* subsp. *casei*, *Lactobacillus plantarum*, and *Leuconostoc mesenteroides* (Khedid et al. 2009).

The strains identified by biochemical methods in Kenyan camel milk, called *suusac*, were *Lactobacillus curvatus*, *Lactobacillus plantarum*, *Lactobacillus salivarius*, *Lactococcus raffinolactis*, and *Leuconostoc mesenteroides* subsp. *mesenteroides* (Tezira et al. 2005).

*Bifidobacterium* species are one of the most beneficial probiotic organisms that represent one of the most predominant bacteria in the human digestive tract (Hudault et al. 1994). It is known that most *bifidobacterium* species are non-pathogenic and are widely used as probiotics for humans and animals (Haghighi et al. 2005). It is also believed that they have anticarcinogenic, immunostimulating, and immunomodulating properties. Due to these health-promoting properties, many attempts were made to use these bacteria in foods and nutritional supplements. Many products containing *bifidobacterium* (fermented milk, lyophilized probiotics/synbiotics, yogurt, and other dairy products) are currently produced and marketed in various countries, especially in Japan, Europe, and the United States.

*Bifidobacteriums* are immobile, non-spore-forming, gram-positive, anaerobic, catalase-negative bacteria. Their cell morphology is usually called irregular. These are V- or Y-shaped rods resembling branches. *Bifidobacteriums* are found mainly in the digestive tract of humans and animals (Sneath et al. 1986; Okamoto et al. 2007). Some host-specific species are also found in the digestive tract of bees, bumblebees (Killer et al. 2009; Killer et al. 2011), and ruminants (Biavati and Mattarelli 1991). Some taxons (*B. crudilactis*, *B. aquikefiri*, and *B. mongoliense*) were isolated from raw cow's milk, raw milk cheeses, sheep's cheeses, kefir, and other traditional fermented milk products (Bunesova et al. 2014; Delcenserieetal et al. 2013; Laureys et al. 2016; Watanabe et al. 2009). There is no data on the isolation and characterization of *bifidobacterium* from camel milk. The paper presents the results of a study of the safety of a new strain of *Bifidobacterium crudilactis* 7-1C, first isolated from camel milk by the authors of this work.

The problem of the safety of microorganisms used in the biotechnological industry is relevant due to the expansion of the range of strains used. In a broad sense, biosafety includes the prevention of potential hazards of a biological agent, including microorganisms used in biotechnology (Sheina 2012).