1. INTRODUCTION

Isolation and screening of microorganisms from naturally occurring processes have always been the most powerful means for obtaining useful cultures for scientific and commercial purposes (Vanden et al., 1993). This hypothesis is true in case of lactic acid bacteria (LAB), which are extensively used in the manufacture of different types of fermented foods and in probiotic food preparations. Since, they are used by man from ancient days and they prove health benefits and designated as GRAS (Generally Recognized as Safe) organisms. The genus *Lactococcus* is facultative anaerobic and belongs to the family *Streptococcaceae*, it is characterized by Gram-positive bacteria, arranged in pairs and short chains, with the ability to produce lactic acid (Furutan et al., 1993; Fihman et al., 2005). According to (Teixeira et al., 1996), LAB has been isolated from subclinical mastitis in cows. The LAB widely isolated from various sources like milk and milk products and many other sources. During lactic acid fermentation these LAB not only have their effect on food and flavor but they are also known to produce chemical compounds with antimicrobial activity, such as bacteriocins. Bacteriocins of LAB are considered as safe natural preservatives or bio preservatives, as it is assumed that they are degraded by the proteases in gastrointestinal tract (Cleveland et al., 2001).

LAB is regarded as a major group of probiotic bacteria (Collins et al., 1998; Metchnikoff, 1908; Tannock, 1998; Schrezenmeir and de Vrese, 2001). The probiotic concept has been defined by Fuller (1989) to mean a live microbial feed supplement which beneficially affects the host animal by improving its intestinal microbial balance, Salminen *et al.* (1999) have proposed that probiotics are microbial cell preparations or components of microbial cells that have a beneficial effect on the health and well-being of the host. Several *lactobacilli, lactococci* and *bifidobacteria*
are held to be health-benefiting bacteria (Rolfe, 2000; Tuohy et al., 2003), but little is known about the probiotic mechanisms of gut microbiota (Gibson and Fuller, 2000). LABS constitute an integral part of the healthy gastrointestinal (GI) microecology and are involved in the host metabolism (Fernandes et al., 1987). Fermentation has been specified as a mechanism of probiotics (Metchnikoff, 1908; Gibson and Fuller, 2000). LAB along with other gut microbiota ferment various substrates like lactose, biogenic amines and allergenic compounds into short-chain fatty acids and other organic acids and gases (Gorbach, 1990; Gibson and Fuller, 2000; Jay, 2000).

LAB synthesizes enzymes, vitamins, antioxidants and bacteriocins (Fernandes et al., 1987; Knorr, 1998). With these properties, intestinal LAB constitutes an important mechanism for the metabolism and detoxification of foreign substances entering the body (Salminen, 1990). The health-promoting effects of LAB are strain specific and result in different mechanisms to produce beneficial health impacts LAB have been found to control intestinal disorders, partially due to serum antibodies IgG, and secretory IgA and IgM enhancing immune response (Amster et al., 1994; Kimura et al., 1997; Perdigon et al., 1999; Grangette et al., 2001; Cross, 2002). Certain strains of LAB can intermittently translocate across the intestinal mucosa without causing infection (Berg, 1995), thus influencing systemic immune events (Cross, 2002). Evidence has been presented that some lactobacilli can directly stimulate the immune system on the gut mucosal surface via localized GI tract lymphoid cell foci Perdigon et al., (1999). Morishita et al. (1971) demonstrated that intestinal origin LAB established in the digestive tract of germ-free chickens better than did non-intestinal LAB strains. Several reports have been made on LAB surviving the GI tract of humans and animals (Drouault et al., 1999; Klijn et al., 1995; Yuki et al., 1999). A number of mechanisms work to prevent harmful bacteria from growing on and
attaching to the intestinal epithelium: production and secretion of antimicrobial agents such as bacteriocins and organic acids (Fooks et al., 1999; Reid, 2001), adherence via competition for the binding sites and steric hindrance (Boris et al., 1998; Bezkorovainy, 2001; Schrezenmeir and de Vrese, 2001) and barriers interfering with pathogens and hence promoting the elimination of harmful bacteria (Boris et al., 1998), reported vaginal LAB strains being able to self-aggregate in a process mediated by surface proteins or lipoproteins, depending on the strain. In addition, strains adhered to vaginal epithelial cells, interfered with other bacteria and coaggregated with tested pathogens in vitro.

*Lactococci* belong to the lactic acid bacteria (LAB) and naturally occur in grass and in mouths and udders of cows (Teuber, 1995). During milking they can be transferred to the milk and are found in some cheese specialties made of raw milk (Perreten et al., 1997; Florez and Mayo, 2006; Fortina et al., 2007). They cause human infections such as septicemia, osteomyelitis and endocarditis in immunocompromised patients (James et al., 2000; Mofredj et al., 2000). In such cases, a successful antibiotic treatment is necessary. Antibiotics are widely used in dairy cows to prevent or treat infectious diseases like mastitis and metritis. Under this selective pressure, *Lactococcus* may acquire antibiotic resistance and survive antimicrobial treatments, and subsequently also act as reservoir for antibiotic resistance genes for other bacteria.

While the antibiotic resistance situation of *Lactococcus* directly isolated from milk is not well documented, resistant strains have been reported to be present in raw milk cheese (Teuber et al., 1999; Florez et al., 2008). One of these strains, *L. lactis* K214, harbored a multidrug resistance plasmid pK214 which contains the tetracycline
resistance gene tet (S), the chloramphenicol resistance acetyltransferase gene catp C223, the streptomycin adenylyl transferase gene str and the multidrug transporter gene mdt (A) (Perreten et al., 1997). Mdt (A) was shown to confer resistance to macrolides, lincosamides, streptogramins and tetracycline in L. lactis (Perreten et al., 2001) and has not been detected in other species to date.

Therefore, the present study was undertaken to isolate, identify, characterize and to investigate antimicrobial activity of bacteriocins producing lactic acid bacteria. Bacteriocins are natural antimicrobial peptides which act on various pathogenic microbes. Commensal bacteria, with a broad spectrum of antimicrobial activity, have previously been isolated from healthy bovine udders and suggested as potential anti-mastitis agents. Recently the application of bacteria as potential therapeutic against mastitis has gained interest.