

Characterization of a marine lactic acid bacterium *Lactococcus lactis* subsp. *lactis* isolated from the pufferfish

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Lactococcus lactis is known as a lactic acid bacterium found in various environments including fermented dairy products and plant surfaces and used worldwide for the manufacture of fermented dairy products, such as in the cheese-making process. Recently, *L. lactis* strains were isolated from intestinal tracts of freshwater [1] and marine fishes [2]. To clarify the characteristics of these *L. lactis* strains (freshwater fish-derived strain, FF; marine fish-derived strain, MF), the phylogenetic relationship and phenotypic variations were compared with the *L. lactis* subsp. *lactis* strains derived from cheese starter culture (CS). Phylogenetic analysis based on nucleotide sequences of partial 16S rRNA gene demonstrated that the three *L. lactis* subsp. *lactis* strains derived from different sources were highly identical to that of *L. lactis* subsp. *lactis* (ATCC 19435^T). The fermentation profile of FF and MF determined using the API 50 CH system was similar to that of cheese starter-derived strain except for fermentation of several sugars. These strains also showed different growth rate at various culture temperatures and halotolerance: MF strains > CS strain > FF strain. In addition, all the strains derived from different sources could grow in MRS broth with static culture and on MRS-agar plates under aerobic conditions at 40 °C, while the MF and CS strains, except for the FF strain, could grow on MRS-agar under aerobic conditions at 40 °C (Table 1). These differences in the phenotypic variations of *L. lactis* subsp. *lactis* strains may be due to the ability of adaptation to various environments.

Table 1. Effects of temperature on growth of the *L. lactis* subsp. *lactis* strains derived from different sources

Source	25 °C culture			40 °C culture		
	MRS broth	MRS-agar plate		MRS broth	MRS-agar plate	
		Aerobic	Anaerobic		Aerobic	Anaerobic
Marine fish intestine (MF)	+ ¹	+	+	+	+	+
Freshwater fish intestine (FF)	+	+	+	+	–	+
Cheese starter culture (CS)	+	+	+	+	+	+

¹ +, growth observed; –, no growth observed after 5-day culture.

References:

- [1] Sugita, H., Ohta, K., Kuruma, A. and Sagesaka, T. 2007. An antibacterial effect of *Lactococcus lactis* isolated from the intestinal tract of the Amur catfish, *Silurus asotus* Linnaeus. *Aquac. Res.* 38: 1002-1004.
- [2] Itoi, S., Abe, T., Washio, S., Ikuno, E., Kanomata, Y. and Sugita, H. 2008. Isolation of halotolerant *Lactococcus lactis* subsp. *lactis* from intestinal tract of coastal fish. *Int. J. Food Microbiol.* 121: 116-121.