Antibacterial Activity of Lactobacillus acidophilus Strains Isolated from Honey Marketed in Malaysia against Selected Multiple Antibiotic Resistant (MAR) Gram-Positive Bacteria

Mohamed Mustafa Aween
Asma Saleh Elmabrok

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Antibacterial Activity of *Lactobacillus acidophilus* Strains Isolated from Honey Marketed in Malaysia against Selected Multiple Antibiotic Resistant (MAR) Gram-Positive Bacteria

Mohamed Mustafa Aween, Zaiton Hassan, Belal J. Muhialdin, Yossra A. Eljamel, Asma Saleh W. Al-Mabrok, and Mohd Nizam Lani

**Abstract:** A total of 32 lactic acid bacteria (LAB) were isolated from 13 honey samples commercially marketed in Malaysia, 6 strains identified as *Lactobacillus acidophilus* by API CHL50. The isolates had antibacterial activities against multiple antibiotic resistant’s *Staphylococcus aureus* (25 to 32 mm), *Staphylococcus epidermis* (14 to 22 mm) and *Bacillus subtilis* (12 to 19 mm) in the agar overlay method after 24 h incubation at 30 °C. The crude supernatant was heat stable at 90 °C and 121 °C for 1 h. Treatment with proteinase K and RNase II maintained the antimicrobial activity of all the supernatants except sample H006-A and H010-G. All the supernatants showed antimicrobial activities against target bacteria at pH 3 and pH 5 but not at pH 6 within 72 h incubation at 30 °C. *S. aureus* was not inhibited by sample H006-A isolated from Libyan honey and sample H008-D isolated from Malaysian honey at pH 5, compared to supernatants from other *L. acidophilus* isolates. The presence of different strains of *L. acidophilus* in honey obtained from different sources may contribute to the differences in the antimicrobial properties of honey.

**Keywords:** antimicrobial activity, lactic acid bacteria, honey, *Lactobacillus acidophilus*

**Introduction**

The continuous use of antibiotics as antimicrobial chemotherapy for more than 50 years ago has been a leading reason for the increase of average life expectancy. However, disease-causing microbes that have become resistant to antibiotic drug therapy has become an increasing public health problem worldwide (Hsueh and others 2005). To encounter such bacterial resistance to antibiotics, natural health remedies and supplements have been studied extensively in finding potential antimicrobial properties as alternative therapeutic agents (Mandal and others 2010). Honey has been used since ancient times as food and become an effective natural remedy for certain ailments, such as, treatments of some protozoa, and viruses (Molan 1992a; Cooper and others 2002; Blair and Carter 2005). It is suggested that the acidity and enzymatic generation of hydrogen peroxide (Molan 1992b) and the aromatic acids and phenolic compounds present contribute to the antimicrobial activity of honey (Weston and Brocklebank 1999). The antibacterial properties of honey were reviewed in depth by Molan (1992a, 1992b) and again briefly by Armstrong and Otis (1995), McCarthy (1995), and Molan (1995).

The microorganisms in honey has been reviewed by Snowdon and Cliver (1996), however, the microbiota associated with honey is still not fully understood. Several studies have reported the presence of lactic acid bacteria (LAB) isolated in honey and honey bee. *Lactobacillus* and *Bifidobacterium* were isolated from stomach of honeybees (Eva and others 2007). *Gluconobacter* and *Lactobacillus* were isolated from ripening honey (Ruiz and Rodriguez 1975), and *Lactobacillus, Streptococcus, Leuconostoc,* and *Pediococcus* were isolated from Ethiopian honey wine (Bekele and others 2006). Recently, these bacteria were also isolated in honey bee-gut (Audisio and others 2011). These microorganisms possess interesting properties not only for the food industry but also for the benefit of health (Naidu and others 1999). It is believed that naturally occurring LAB from different sources are known to produce different compounds that have the ability to inhibit the growth of both bacteria and fungi (Muhialdin and others 2011). Antimicrobial activity of both heated (100 °C for 10 min) and pH adjusted (4 to 9) cell free supernatant of LAB isolated from vacuum