

The detection and expression of enterotoxin-encoding *lth* gene among *Klebsiella* spp. isolated from diarrhoea

Research Article

Adriana Janczura, Danuta Smutnicka, Adam Junka*, Grażyna Gościńskiak

Department of Microbiology,
Medical University of Wrocław,
50-368 Wrocław, Poland

Received 16 March 2012; Accepted 03 October 2012

Abstract: Background: Currently, when isolated from diarrheal stool, *Klebsiella* spp., a member of the *Enterobacteriaceae* family, is treated as a physiological flora even when it occurs in monoculture. The possibility of transfer of virulence plasmids from diarrheal *E. coli* strains to the *Klebsiella* strains inhabiting the gastro-intestinal tract provokes a question of whether these bacteria can be the etiological factor of diarrhoea. Methodology: 152 *Klebsiella* spp. strains were used in this study. The presence of the *lth* gene coding heat-labile enterotoxin (LT) in the plasmids of *Klebsiella* spp. strains was detected using PCR, whereas the expression of the toxin was evaluated by measuring the cytopathic effect induced by the LT toxin in Chinese Hamster Ovary (CHO) cell lines. Results: The *lth* gene was detected in 8.5% of the investigated *Klebsiella* strains. 77% of these strains were able to produce the cytopathic effect in the CHO cell lines. Surprisingly, part of the strains with no *lth* gene detected, were also able to cause above mentioned effect. Conclusions: The results of our studies suggest that *Klebsiella* spp. isolated from the gastro-intestinal tract may be an etiologic factor of diarrhoeas.

Keywords: *Klebsiella* strains • Intestinal tract • Enterotoxin production • Diarrhoea

© Versita Sp. z o.o.

1. Introduction

Knowledge about the production of heat-labile enterotoxin (LT) by *Klebsiella* spp. and about the role of this toxin in the pathogenesis of diarrhoea is insufficient. For many years, *Klebsiella* spp. has been regarded exclusively as physiological intestinal flora. Therefore, even when isolated from diarrheal stools in monoculture, these microorganisms were not treated as an etiological factor of gastrointestinal tract infections. In 1975, the first data on the ability of *Klebsiella pneumoniae* isolated from patients suffering from tropical sprue to secrete enterotoxin [1] were published. It was proved that the enterotoxin's activity induces water and electrolyte secretion and causes structural changes in the intestinal mucosa in various animals [2]. In 1976, the heat-stable (ST) toxin and the heat-labile (LT) toxin were discovered [3]. In 1983, Klipstein and Engert proved that partially

purified filtrates of LT toxin producing strains are able to stimulate water and electrolyte secretion in the intestines of rats. Moreover, it was shown that oral administration of LT toxin-producing strains to piglets lead to severe diarrhoea [4]. In 1986, Koo *et al.* [5] discovered a toxin produced by *Klebsiella pneumoniae* isolated from patients suffering from burn wounds. This toxin was heat-labile and cytotoxic to cell cultures. The cytotoxic effect was not neutralised after the administration of serum against Shiga toxin [5]. With the exception of the above reports, there are no data concerning *Klebsiella* spp. LT enterotoxins playing a role in the pathogenesis of diarrhoea. The aim of the present paper was to assess the ability of *Klebsiella* strains isolated from children suffering from diarrhoea to produce LT enterotoxin and further, to evaluate the ability of these strains to cause diarrhoea. The assessment was performed by detecting the *lth* gene and by measuring this gene expression.

* E-mail: junad@op.pl