

# Microbiology- slp



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## Differences and Similarities in the Structure and Evolution of *Lactobacillus bulgaricus* and *Escherichia coli*

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### Introduction

A bacterium is a single-celled organism (a prokaryotic cell) and it is usually smaller than eukaryotic cell. Prokaryotic cells differ from eukaryotic cells in regard to their structure and evolution. However, the prokaryotic cells also differ in their structure and evolution. For instance, there are different shapes of bacteria cells such as rods, spheres, and spirals. Other than the differences in their shapes, there are some bacteria that stain positive (gram-positive bacteria) and others stain negative (gram-negative bacteria). In this paper, the differences and similarities in the structure and evolution of *Lactobacillus bulgaricus* and *Escherichia coli* will be discussed.

### Classification

Both *Escherichia coli* and *Lactobacillus bulgaricus* are bacteria; however, *Escherichia coli* are gram-negative bacteria and *Lactobacillus bulgaricus* are gram-positive bacteria. *Escherichia coli* are gram-negative bacteria, which inhabit the intestines of healthy animals and humans (Canadian Medical Association Journal, 2000). Majority of the *Escherichia coli* serotypes are not pathogenic; however, those that lead to diseases are grouped and classified based on their pathogenic mechanisms. Presently, there are six *Escherichia coli* pathotypes known to cause diarrhea in human beings, and they include enteroinvasive *E. coli*, enteropathogenic *E. coli*, enterohaemorrhagic *E. coli* (EHEC) (shiga toxin-producing *E. coli* [STEC]), enterotoxigenic *E. coli* (ETEC), diffusing adhering *E. coli*, and enteroaggregative *E. coli* (Naicker, Olaniran, and Pillay, 2011).

However, pathotypes of *E. coli* such as ETEC and STEC are potent pathogens linked with mortality and waterborne disease outbreaks in humans (Naicker, Olaniran, and Pillay, 2011). On the other hand, *Lactobacillus delbrueckii* subspecies *bulgaricus* is a gram-positive bacterium, and it is closely associated to *L. acidophilus*, *L. acetotolerans*, *L. amylophilus*, *L. gasseri*, *L. helveticus*, and *L. amylovorus*. The ratio of GC content in *L. delbrueckii* subsp. *bulgaricus* is higher (49-51 percent) than the other species (34 – 46 percent) in this phylogenetic tree (The Regents of the University of California, 2012).

### Structure

The structure of both *Escherichia coli* and *Lactobacillus bulgaricus* are the same. Both bacteria are rod shaped, and they are non-spore forming. However, there are differences that distinguish *Escherichia coli* from *Lactobacillus bulgaricus*. *Escherichia coli* are non-spore forming rod bacteria. Most of the strains possess peritrichous flagella, fimbriate and motile. A capsule in the form of mucoid is usually present. They are usually serotyped based on their antigenic structure, that is, they are classified based on their lipopolysaccharide. The lipopolysaccharide O is the somatic antigen, H is the flagellar antigen, and K is the capsular antigen. *E. coli* have non-flagellar appendages referred to as pili. It is important to note that some rods are flagellated, and others are not but in the case of *E. coli*, they do not possess flagella. They also possess endotoxins just like the other gram-negative bacteria. Endotoxins are less toxic than exotoxins, and they are generally released in soluble form when the bacteria is growing and freed when the bacteria lyses. It is important to note that there are particular strains of *E. coli* that produce exotoxins (Nagaraja, 1999).

*Lactobacillus delbrueckii* subsp. *bulgaricus* cell is a nonmotile rod with rounded edges. They usually occur singly and in short chains. *Lactobacillus bulgaricus* generally contain internal granulation demonstration with methylene blue stain, which makes it a gram-positive bacterium. The surface growth of the cell (*Lactobacillus bulgaricus*) is greatly improved by anaerobiosis or reduced oxygen pressure. They are obligately homofermentative and grow well at a temperature of 45°C (Bergey and Boone, 2009). Other important features of this species are that it is non-spore forming and facultatively anaerobic. The specie is acid tolerant, and it is unable to synthesize porphyrins. It has a strictly fermentative metabolism, and lactic acid is the main metabolic product.

#### References

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