1.3 Chirality in Antibacterial Agents

J-M Paris, Ecole Nationale Supérieure de Chimie de Paris, Paris, France

Glossary

Cephems Compounds possessing the same nucleus as that of natural cephalosporins.

DNA topology In order to be compacted within the cell, DNA is super coiled, topisomerases are enzymes in charge of the control of this super coiling.

Gram negative bacteria Bacteria that cannot be stained by the Gram technique, their wall comprises a cytoplasmic membrane, a thin layer of peptidoglycan and an outer membrane that prevents large molecule to enter the cell.

Gram positive bacteria Bacteria that can be stained by the Gram technique, their wall comprises a cytoplasmic membrane and a thick layer of peptidoglycan.

Penams Compounds possessing the same nucleus as that of natural penicillins.

Peptidoglycan Polymeric material which strengthens the bacterial wall, it is specific to bacteria, there is no equivalent structure in mammalian cells.

Streptomyces Bacteria found predominantly in soil and decaying vegetation, they possess a complicated secondary metabolism.

1.3.1 Introduction

Chirality plays an important role in the recognition phenomenon between the biologically active molecule and its target; this is particularly the case of antibacterial molecules which act on bacteria by binding to cellular targets (*see* Chapters 1.1 and 1.2).

A review on the significance of the stereochemistry of antimicrobial agents was published in 1996; it deals with the impact of stereochemistry on the biological activity.[1] The goal of this Chapter is not to exhaustively cover all the aspects of chirality in antibacterial agents, but to show characteristic examples on the importance of chirality either in terms of biological activity or in terms of chemical synthesis. The fabulous progress of structural biology during these last decades enables a more and more precise insight into the interaction between an active molecule and its biological target; this is a revolution for medicinal chemists on their route to design new drugs, particularly in terms of stereochemistry.

Each paragraph deals with a family of antibacterial agents classified according to their mechanism of action. The last paragraph is dedicated to the recent use of antibacterial agents as chiral selector in chromatography techniques; since chiral antibacterial molecules, produced on large-scale for therapeutic use, can be a valuable source of chiral agents which can now be used as chiral phases.