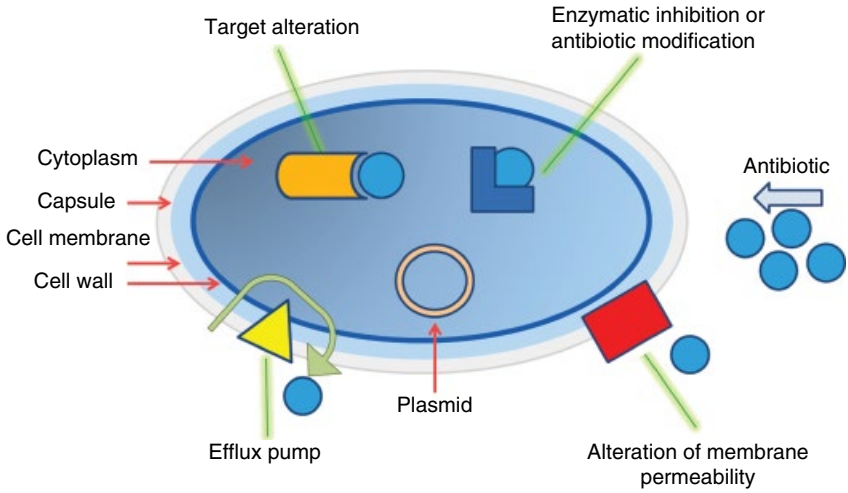

Figure 11.1 Main mechanisms of antibiotic resistance: modification of the target, enzymatic modification or inhibition of the antibiotic, active antibiotic expulsion (efflux pump), and change in membrane permeability.

multidrug resistance rate, usually called as *superbugs* or *superbacteria* (Simoneit et al. 2015; Viegas et al. 2015). This problem is greater in developing countries, due to lack of regulation or inefficient control of weak regulation (Chen et al. 2015).

The lack of new antimicrobial drugs in the market is an actual main concern, but the absence of new possibly efficient antibiotic drug to be released in the next years means that we will have a tricky task for future antibiotic supply with long-term effects (Blair et al. 2015; Höjgård 2012; Sharma and Towse 2011). According to Carvalho et al. (2017), microbial resistance to antibiotics is becoming possible: the bacteria are evolving and are now affecting unintentional hosts, such as domestic animals in urban areas.

Methicillin-resistant *Staphylococcus aureus* (MRSA), extended-spectrum β-lactamases (ESBLs), and carbapenem-resistant *Enterobacteriaceae* (CRE) are the most important antimicrobial-resistant bacteria with huge clinical impact on patient outcomes, public health, and healthcare (Hamilton and Wenlock 2016).

11.2 Objectives

Escherichia coli and *Klebsiella pneumoniae* are the main agents implicated in severe sepsis, including urinary infections, among other pathologies (Iredell et al. 2016). Modulation of the phenotype by host bacteria explains