resistance will reach 10 million by the year 2050, thus surpassing, for instance, the mortality rate of cancer (O'Neill 2014).

Traditionally the problem of antibiotic resistance among pathogens has been viewed from the clinical microbiology perspective, e.g. as mainly associated with the therapeutic use and overuse/misuse of antibiotics in humans and animals. While this is certainly one of the contributing factors (Goossens et al. 2005), the problem must be contemplated in its entirety and from a broader evolutionary and ecological prospective (Aminov and Mackie 2007; Aminov 2009). In a Darwinian selection sense, the dilemma is very simple: more is the use of antibiotics, greater are the chances for selection of antibiotic resistance. Unlike the vertical inheritance of selected traits in macroorganisms, however, the main mechanisms of antibiotic resistance among bacteria are acquired horizontally. Because of this, antibiotic resistance genes selected in one ecological compartment can be transferred to other compartments aided by the extensive horizontal gene transfer (HGT) mechanisms operating in the microbial world (Aminov 2011, 2012).

23.2 Agriculture as the Largest Consumer of Antimicrobials

Several independent assessments suggest that a considerable proportion of antimicrobials produced are used in food animals for nontherapeutic purposes such as prophylactic, metaphylactic, and growth promoting (Landers et al. 2012; Krishnasamy et al. 2015). For example, an estimated half of the 210 000 tons of antibiotics produced in China are supposedly used in food animals, while the corresponding proportion in the United States may reach up to 80% (Collignon and Voss 2015). The proportion analogous to the latter can also be seen in Canada. According to the Canadian Integrated Program for Antimicrobial Resistance Surveillance (CIPARS), among antimicrobials distributed for use in Canada, 79% were intended for use in production animals (food animals and horses), 20% were intended for people, and less than 1% was intended for use in companion animals (CIPARS 2013). In Europe, about 70% of all antimicrobials are administered to animals raised for food production. According to a recent joint report compiled together by several European agencies (European Centre for Disease Prevention and Control [ECDC], European Food Safety Authority [EFSA], and EMA), among a total of 11 381.83 tons of antimicrobials consumed in 26 EU/EEA countries in 2012, only 3 399.8 tons was consumed by humans, while the amount fed to animals was more than twofold greater, at 7 982.0 tons or 70% of the total (ECDC, EFSA, and EMA 2015). From these data we may conclude, therefore, that the contemporary animal production systems in developed countries consume approximately 70–80% of antimicrobials produced. This model of animal production