

these animals were positive for ESBL-producing bacteria. Hammerum et al. (2014) verified that ESBL-producing *E. coli* were detected in 19 of the 195 farmers who were taking care of Danish pigs. One possible explanation is the transfer of ESBL-producing *E. coli* or plasmids between pigs and farmers.

As mentioned earlier, the increase of ESBL-producing bacteria in humans, animals, and their surrounding environments is of global concern (Seni et al. 2016). *Escherichia coli* pathogenic strains may cause many different infections in food animals, affecting the skin, urinary tract, central nervous system, and cardiovascular system (Frye and Jackson 2013). Colibacillosis is particularly preoccupant because this disease has significant morbidity and mortality in swine and poultry (Bustamante et al. 2003; Silva et al. 2011).

11.6 Consequences and Future Strategies to Brace the Antibiotic Backbone

Antimicrobials have revolutionized the first clinical treatment of infections, in the 1940–1950, caused by bacterial agents, promoting a decrease in the number of pathogens or preventing the proliferation of pathogenic strains (Cantas et al. 2013; Poeta 2006).

AMR presents different problems and concerns for humans. The reduction of the efficacy of the treatments related to the increase of the duration of hospitalization (longer treatments and more invasive), causing higher costs per treatment, and ultimately the complete inefficacy of the drug treatments cause the mortality of patients, particularly for immunocompromised patients, e.g. of cancer therapy or after transplantation (Freire et al. 2016). It can be potentially lethal for epidemics (which can be spread globally), will be more frequent, and will reach to more people, increasing the morbidity and mortality and creating a huge impact in the human society.

The nosocomial infections and other bacterial diseases are a major cause of death in the developing world (Okeke et al. 2005; Sosa et al. 2010). The same authors add that poverty is “a major force driving the development of antimicrobial resistance.” Moreover, antimicrobials can often be purchased without prescription. Furthermore, some drugs are counterfeit, while others do not have any active ingredient or a correct dose (Centers for Disease control and Prevention 2013; Hajjou et al. 2015).

Recent studies show that antibiotics affect the normal microbiome, causing different kinds of effects in human health, particularly obesity (Grupper and Nicolau 2017; Poulsen et al. 2017). These authors add that the use of antibiotics by children less than two years old has been linked to an increased risk of early childhood obesity.

Another main consequence is that no new effective antibiotics has been developed and introduced in the pharmaceutical market in the last years to