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GAVIN PUBLISHERS

Food & Nutrition Journal

Short Commentary

Can HY and Can MF Food Nutr J 4: 205.
DOI: 10.29011/2575-7091.100105

Antibiotic Resistance in Foodborne Pathogenic Bacteria: Public Health and Economic Implications

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Citation: Can HY, Can MF (2019) Antibiotic Resistance in Foodborne Pathogenic Bacteria: Public Health and Economic Implications. Food Nutr J 4: 205. DOI: 10.29011/2575-7091.100105

Received Date: 29 August, 2019; **Accepted Date:** 16 September, 2019; **Published Date:** 24 September, 2019

Many pathogenic bacteria become antibiotic-resistant as a result of irrational and overuse of antibiotics in people and livestock animals. Antibiotic resistance causes many health problems and economic losses around the world. Antimicrobial resistant bacteria can be found everywhere and can be spread from livestock animals to people with foods of animal origin.

Food Safety and Public Health Implications

Multiple antibiotic resistance properties of the most common foodborne pathogenic bacteria, for example, *Salmonella*, *Campylobacter*, and *Escherichia coli O157:H7* have been increased in last few decades. Antibiotic resistance occurs usually through genetic mechanisms. Antibiotic resistance is vertically transferred by plasmids and transposons during host cell division or horizontally transferred by transduction, conjugation and transformation between pathogenic and non-pathogenic bacteria. The increasing resistance to antibiotics and the rapid spread of this resistance among the pathogenic bacteria is a very important problem that threatens human health all over the world.

When antibiotics are overused and misused by veterinarians, health workers and animal owners in livestock husbandry, they threaten the human health with residues they had left in foods (in milk and meat). Allergic reactions, toxic symptoms, changes in the intestinal flora, reproductive disorders, carcinogenic, mutagenic and teratogenic effects and development of resistant bacteria can be observed in people who consume foods containing drug residues. The effectiveness of the antibiotics that causes the emergence of resistant bacteria decreases. As a result, it will be difficult to treat antibiotic-resistant infections in humans in the future.

Economic Implications

The economic impacts of the antibiotic resistance have not yet been sufficiently emphasized to date, but must be addressed. Today, million kg of antibiotics are used for food animals and human consumption, and it causes billion dollars of economic damage worldwide each year. The question that comes to mind is how resistance can make such a big impact on our world.

When we look at the adverse economic effects of the resistance, three different dimensions have been draw attention. The first one is public health issues (I), which can be summarized as prolonged hospitalization, loss of labor productivity and higher health care costs. The second one is animal health issues (II), can be exemplified with increasing diseases control expenditures and productivity losses in livestock enterprises. The third one is related to food and livestock industry and show itself especially in dairy and slaughterhouses with decreases in product quality and quantity.

Recommendations

It is not easy to manage this problem effectively due to complex character of the issue. Today, monitoring of antibiotic residues in foods of animal origin is not only sufficient for controlling the antibiotic resistance. Because, new resistance mechanisms have been emerging in pathogenic bacteria through genetic changes. In this case, it may be necessary to use new control strategies for isolation of resistant bacteria from non-resistant strains and determination the origins of resistant microorganisms. To prevent the spread of the resistant bacteria through the food chain, some practices such as good hygienic practices and good manufacturing practices must also be required at all steps of production and processing of foods from animal sources.

Awareness regarding antibiotic resistance at all levels of society should be increased by traditional and social media. Strict control and clear regulations about the usage of antibiotics by the relevant ministries can be another effective way to reduce antibiotic overuse and economic losses. Furthermore, rational planned biosecurity programs at farm level can provide serious benefits for animal food chain and public health mostly due to reducing use of antibiotic against infectious diseases.