**CHAPTER: 1**

**INTRODUCTION**

The emergence of bacteria resistant to antibiotics is common in areas where antibiotics are used (Schwartz *et al.*, 2002). Antibiotics are used extensively to prevent or to treat microbial infections in human and veterinary medicine. Apart from their use in aquaculture, they are also employed to promote more rapid growth of livestock (Ku¨mmerer and Henninger, 2003). In the United States, it is estimated that the amount of antimicrobials used in food animal production is greater than the amount used in humans. The FDA has communicated that about 28.8 million pounds of antibiotics were sold and distributed for use in food animals in 2009 (FDA, 2009). Heavy use of antibiotics for medical and veterinary purposes (White *et al.*, 2000; Balagué and García Véscovi, 2001) as well as the domestic and agricultural use of pesticides and related compounds (Balagué and García Véscovi, 2001) caused significant antibiotic contamination of the natural environment and consequent development of resistance in communities. Antibiotics are not, on the whole, being used carefully: there is inappropriate clinical use, inappropriate livestock practice and lack of surveillance. The problem is compounded by poor hygiene practices which allow resistant bacteria to spread from person to person and from animal to animal (IP/A/STOA/FWC/2005-28). The use of antibiotics in agricultural animal production is often blamed to contribute predominantly to the community acquired antibiotic resistance in the human population. One of the ways multi-resistant bacteria may be introduced into the biocoenosis and into humans via environment (Böhm *et al.,* 2004).

A variety of substances such as pharmaceuticals, radionucleides and solvents are used in hospitals for medical diagnostics, disinfection and research. After application many non-metabolized drugs are excreted by the patient and enter into wastewater. The micro flora of hospital wastewaters is composed by saprophytic bacteria from the atmosphere, soil, medical devices and water employed in the hospital practice; the pathogens are mainly released with the patient excreta (Nuñez and Moretton, 2007). Bacteria have developed different mechanisms to render ineffective the antibiotics used against them. The genes encoding these defense mechanisms are located on the bacterial chromosome or on extra chromosomal plasmids, and are transmitted to the next generation. Genetic elements, such as plasmids, can also be exchanged among bacteria of different taxonomic aliation (Davison, 1999).Horizontal gene transfer by conjugation is common in nature (Barkay, *et al.*, 1995), or in technical systems, where the density of bacteria is high (hospitals, slaughter houses etc.) and so, accordingly, is the chance of two suitable bacterial cells coming close to each other (Muela *et al.*, 1994). Use of urban wastewater (sewage) in agriculture is a centuries old practice (Murtaza *et al.*, 2010). In countries, where treatment and safe effluent disposal facilities are limited, sewage is used to irrigate fodders, ornamental and food crops including vegetables (Ensink *et al*., 2004). Wastewater treatment allows waters to be reused for irrigation in agriculture or released directly in aquatic environments. Sludge produced throughout the detoxification processes may also be used afterwards as a fertilizer. The presence of antibiotic-resistant bacteria in effluents (Schwartz *et al.,*2003; DaCosta *et al.,*2006)as well as high levels of antibiotic compounds in wastewater treatment plants have been addressed in several studies, creating a growing concern about their impact on animal and human health (Moura *et al.,* 2007).

Antibiotic and drug resistance in medicine generates significant health and economic impacts (Colloquium Report, 1999). A high percentage of hospital-acquired infections are caused by highly resistant bacteria such as methicillin-resistant *Staphylococcus aureus* (WHO, 2012).Water-borne bacterial pathogens such as *E. coli* 0157, *Salmonella spp*., *Shigella* *spp*. and *Vibrio cholerae* can lead to diarrhoeal outbreaks that may have serious medical and economic (livestock) implications (WHO, 2000). Every year, two million Americans acquire bacterial infections during their hospital stay, and nearly 100,000 Americans die from them. Seventy percent of these infections are resistant to the drugs commonly used to treat them ([www.louise.house.gov/index](http://www.louise.house.gov/index), 2011). Antimicrobial-resistant infections add 6.4-12.7 hospital days per patient and $26 billion to $35 billion total in healthcare costs (Roberts *et al.*, 2009). *Escherichia* *coli* is the primary causative agent of cellulitis, septicemia, and air sacculitis in poultry and *Salmonella* is the causative agent of pullorum disease, fowl typhoid and fowl paratyphoid (Gomis *et. al*., 1997).*Staphylococcus* causes synovitis, navel and yolk sac infections in poultry. Therefore, these are the most significant poultry bacterial pathogen. These bacteria species(s) also infect a wide host range (www.merckvetmanual.com)*.* This problem is further compounded by the increasing incidence of pathogens with antibiotic and/or drug resistance (DePaola *et al.,* 1995).

In majority cases, effluent (drain water) is discharged directly in water bodies in low-lying areas, natural khals (canal) and rivers with storm water for natural degradation without any treatment. Paddy, cauliflower, gourd, sweet pumpkin are the main products that are grown by wastewater. In the most cases, the people are getting better yield than the fresh water irrigation one but there is a danger of serious health hazard due to contamination of vegetables by resistance bacteria. The source could possibly be the mixing of sewage lines with drinking water supply. Presence of multidrug resistant *E. coli, Salmonella* and *Staphylococcus* in drinking water can act as a vehicle to disseminate antibiotic resistance to other bacteria. On the other hand, arthropod vectors may transmit the resistance bacteria from drain to open food un-hygienically prepared besides the roads, rivers or other natural water source areas. Considering the above facts present study was undertaken to fulfill the following aims and objectives:

1. To detect the prevalence of *E. coli*, *Salmonella* and *Staphylococcus* in effluent of hospitals and slaughterhouses.

2. To know the resistance pattern of *E. coli*, *Salmonella* and *Staphylococcus* from those environmental samples*.*