Chapter 19

Water Quality Impacts of Abattoir Activities in Southern Africa

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ABSTRACT

The meat processing produces solid, liquid and gaseous wastes from stockyards, abattoirs and packing plants contain blood, fats, protein, gut contents, heavy metals, antibodies, hormones and other substances. Solid and liquid wastes can lead to an impairment or disruption of water eco-functionality and a preponderance of disease-causing organisms. In developing nations, many abattoirs dispose of their waste directly into streams or rivers and also use water from the same source to wash slaughtered meat. Most solid, liquid and gaseous wastes are released into the immediate environs of the abattoir. This chapter is a literature review of the impact of untreated slaughterhouse wastewater on water quality in selected areas of Southern Africa. The review shows that abattoir activities significantly reduced the physical, chemical and microbiological quality of water bodies. Although an improvement of the water quality was observed downstream, this was a result of self-purification and dilution effects.

INTRODUCTION

The killing of cattle, sheep, pigs, goats, poultry and other equine animals to supply meat for human consumption is a common practice in Southern Africa. Abattoir waste contains high levels of organic matter due to presence of manure, blood, fats, grease, hair, grit or sediments and undigested feeds. Blood and fats contribute mostly to organic load; blood is also a major contributor of nitrogen content in the effluent. It can also contain high level of salts, phosphate, nitrates, trace or heavy metals, bacteria, viruses and other microorganisms (Muhirwa et al., 2010; Kosamu, Mawenda & Mapoma, 2011). Abattoir effluent affects water, land or air quality if proper disposal practices are not followed. Improper waste disposal reduces oxygen in water, thereby endangering aquatic life. It can lead to animal diseases being transmitted to
humans through contact with animal faeces. Pollution of the environment in the vicinity of the abattoir as well as reduced quality of health of residents in the local area result in elevation of excessive coughing, typhoid fever, diarrhoea, and malaria and muscle pains (Benker-Coker & Ojior, 1995). Noise pollution is also associated with abattoir activities (WHO, 2011). Respiratory and mucous membrane effects are common in areas close to intensive swine operation (Itodo, Awulu & Harrison, 1999). Thus, surface and ground water quality in vicinity of the abattoirs can be adversely affected by effluents.

**BACKGROUND**

Meat processing, slaughtering and processing remain critical in ensuring that consumers receive a hygienically safe product. Production processes for meat products have been shown to have a significant impact on the environment, accounting for between 15% and 24% of greenhouse gas emissions (Mittal, 2006). Abattoirs are an important industry in Africa’s domestic meat supply and export industry, as well as employment opportunities to many communities. Abattoir effluent is known to degrade the quality of receiving water bodies. Waste from abattoirs changes the microbiological and physico-chemical water quality parameters such as pH, temperature, electrical conductivity, salinity, turbidity, total dissolved solids (TDS), total suspended solids (TSS), dissolved oxygen (DO) and coliforms (GDARD, 2009). The effluent characteristics of the abattoir are nutrients and biologically active constituents which pose a considerable challenge for water resources management particularly the delivery of essential water, sanitation services and environmental protection. Nitrates are very high in the abattoir wastewater especially at the evisceration and slaughter step where the urine and undigested stomach content concentrated in nitrate was mixed in wastewater streams (Mittal, 2004). This is because wastewater streams for these processes consist of mixed intestinal contents and blood with a high content of nitrates. This chapter focuses on the environmental effects of meat processing in general. In particular, it highlights how meat processing contributes to changes in water quality.

**Water Quality**

Water quality describes the physical, chemical, biological and aesthetic properties of water which determine its fitness for a variety of uses and for protecting the health and integrity of aquatic ecosystems. The quality of any body of surface or ground water is a function of either or both natural influences and human activities. Levels of water quality are assessed in terms of: physical characteristics e.g. color, temperature, taste, turbidity, hardness and smell or odor which are determined by senses of touch, sight, smell and taste; chemical characteristics such as conductivity, dissolved salts and oxygen demand; and biological e.g. amount of micro-organisms present such as bacteria, protozoa and algae parameters (WHO, 2011). The definition of water quality takes into account the fact that even when water is polluted say with sewage, depending on the level of the contaminant, it can be used for other purposes such as agriculture.

**Environmental Pollutants from Abattoirs**

An abattoir is loosely defined as any registered facility that is responsible for the conversion of animals to meat via a slaughtering process. This includes livestock, poultry and special classes of animals, e.g. crocodiles and game (GDARD, 2009). The slaughtering process remains critical in ensuring that consumers receive a hygienically safe product.