بسم الله الرحمن الرحيم

Sudan University of Science and Technology
Scientific Research Council
Research Proposal Form

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Date of submission	**Research area**	**Serial number**

Section One: General information

Title of the Research Project:

Application of the hazard analysis of critical control points (HACCP) concept in the control of micro-biological quality of meat in slaughterhouses

Title in Arabic:
تطبيق تحليلِ خطرَ نقاطِ السيطرةِ الحرجةِ (HACCP) كمفهوم في السيطرةِ علي الاحياء الدقيقةِ الملوثة للحومِ الابقار في المسالخ

College:
Veterinary Medicine and Animal Production

Department:

Veterinary Medicine and Animal Surgery

Project Language	Project Duration	Project Budget
English	**Two years**	**3000,000 SD**

Principle Researcher:

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Signature: **Date:**

Participant Researchers:

	Name	Instituation
1	**Dr. Khalad Radwan**	**College of Veterinary Medicine and Animal Production**
2	**Dr. Imad Mohammed Taher**	**College of Veterinary Medicine and Animal Production**
3	**Prof. Imad Elamin Aradaib**	**University of National Rabat**

Head of the Research Unit:

Name: Signature: Date:

Dean of the College:

Name: Signature: Date:

Section Two: Project Description

1/ Summary:

The conditions for the food industry, in general, are changing. Especially in industrialized countries, the safety and quality of food is increasingly becoming an issue of concern to the consumer. This project describes the impact of the farm-to-table concept and the implementation of HACCP plans throughout the food production chain on animal production and veterinary profession, using the example of the beef production chain. This project will examine the laws and regulations that govern the beef industry in an effort to decrease the incidence of foodborne illness of microbiological origin. The first section of the project will address the nature of foodborne illness, how it is contracted, its seriousness, its prevention, and what can be done further to prevent it from occurring. The second section will provide an in-depth look at some specific pathogens that cause foodborne disease and that can be contracted from beef products (such as *E. coli*), and, where appropriate, specific laws and regulations that target the pathogens and the diseases they produce will be discussed. The third section of the project will address the critical aspects of the beef industry and beef production process; in this section, we will address laws and regulations that are specific to the beef industry, as well as their particular shortcomings and strengths. Section four will contain concluding thoughts.

2/ Justification:

Recent changes in world legislation legally mandate HACCP in slaughter plants. This research will provide a sound scientific basis on which to develop and implement effective HACCP in abattoirs.

3/ Goals:

To estimate the prevalence and levels of bacteria of public health concern on cattle and sheep carcasses as currently produce under meat inspection regulations.

4/ Specific Objectives:

1/ To collect data which provide a general microbiological profile of cattle carcasses for selected microorganisms of various degrees of public health concern.

2/ To use the information and knowledge gained as a reference for further investigations and evaluation of new prevention programe.

3/ To compare dressing processes for the identification of hygienically superior practices; and to verify the efficacy of hygienically superior practices through their implementation in hygienically inferior processes;

4/ Develop microbiological procedures for identifying the hygienic condition of cleaned equipment and devise procedures and apparatus for effective, routine cleaning of items of meat plant equipment which are currently cleaned inadequately;

5/ Determine the impact of the raw meat processing and storage conditions in the retail environment upon bacterial contamination and growth, quality deterioration and case life with a view to developing procedures to enable meat merchandisers to reduce spoilage losses and improve the safety of consumer-ready meats.

5/ Literature Review:

Animal production is relevant with respect to farm income and the position of the sector in the market, but also with respect to the quality and safety of products of animal origin, related to public health. Animal production is part of a chain of food production. Therefore, producers have to take consumer expectations and demands in the domains of animal health, welfare and environment into account. A different attitude for production has to be adopted; this attitude can be visualized in good farming practice, GFP, codes. Farmers who focused on quality in its broadest sense need a system supporting them in their management and control of quality risks. Generally speaking, there are three systems for that purpose: GFP, ISO and HACCP (Noordhuizen, 1999).

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When the hypothesis followed relates to animal health being a feature of quality, or else welfare and environmental issues, and then animal health

care can be executed following quality control principles. The HACCP concept is well suited for quality control at farm level, involving risk identification and risk management. The monitoring and surveillance system of critical control points in the animal production process is the most important tool in this procedure. Principles for HACCP application as well as certification fitness of HACCP are elaborated upon. They are illustrated by using food borne disease in slaughterhouse objective for a HACCP approach. It is further discussed that, in addition to animal health and quality, animal welfare and environmental issues could also be covered by a HACCP-like system is an integrated manner. Ultimately, the HACCP modules could end up in an overall ISO certification (Noordhuizen, 1999).

The appearance of diseases caused by foodborne pathogens is increased due to industrialisation and centralisation of food production and supply, international trade, etc. (Tauxe, 1997). In developed countries the most common foodborne pathogens are Salmonellae, *Staphylococcus aureus*, *Clostridium perfringens* and *Campylobacter* spp. (Altekruse *et al.*, 1997). Foods implicated in outbreaks caused by these pathogens are mainly of animal origin, including meat, eggs, milk and their products Food borne illness is not at all new. In fact, gastrointestinal and foodborne illnesses have a lengthy history. Citing of such illnesses can be found, for example, in the Bible, in early Greek and Roman writings, and in the codes of the Egyptians and Phoenicians (Doyle *et al.*, 1997).

A number of costs and consequences are associated with foodborne illness. First, there are the costs of investigation and testing and costs and consequences to families and society taken together (which are attributable to loss of productivity, absenteeism, pain, suffering, death, and direct costs of illness). Businesses that produce and sell contaminated foods bear significant costs. Finally, individuals bear varying costs as a direct consequence of the adverse impact that foodborne illness has on their health. (Billy and Wachsmuth, 1997)

It is difficult to know the true number of foodborne illness cases and resulting costs. First foodborne illness is seriously underreported. Most foodborne illness goes undiagnosed and unreported because many individuals fail to visit a doctor when they fall ill, or doctors fail to issue specific diagnoses.((Billy and Wachsmuth, 1997)

Healthy animals often have organisms that can cause foodborne illness as a natural part of the flora of their gastrointestinal tracts. Contamination of foods can occur during processing and manufacturing because of equipment malfunctions or failure to clean or sanitize equipment properly, improper use of cleaning materials, and rodent or insect infestations.(Ali, 2007)

Food can become contaminated at any point during the food chain, though particularly during production, transportation, and preparation, by cross-contamination, improper storage, and poor personal hygiene and hand washing.(Elhassan, 2006)

Recent outbreaks of food borne illness and studies by expert groups have established the need for fundamental change in meat and poultry inspection programme to reduce the risk of food borne illness. Risk assessments provide the most effective means of identifying how specific pathogens and other hazards may be encountered throughout the farm-to-table chain and of measuring the potential impact of various interventions. In addition, these assessments will be used in the development and evaluation of HACCP systems. (Billy and Wachsmuth, 1997)

NASA wanted a program with “zero defects” that would ensure the foods being consumed by astronauts in space were safe. NASA and Pillsbury evaluated the existing systems for guaranteeing food safety and discovered that these programs, even when testing large samples of finished products, were producing “a relatively large percentage of potentially hazardous products (Billy and Wachsmuth, 1997)

The concept of Hazard Analysis and Critical Control Point (HACCP) is a system that enables the production of safe meat and poultry products through the thorough analysis of production processes, identification of all hazards that are likely to occur in the production establishment, the identification of critical points in the process at which these hazards may be introduced into product and therefore should be controlled, the establishment of critical limits for control at those points, the verification of these prescribed steps, and the methods by which the processing establishment and the regulatory authority can monitor how well process control through the HACCP plan is working. The history of the development of HACCP is reviewed, and examples of practical applications of HACCP are described.(Hulebak and, Schlosser. 2002)

Hazard Analysis Critical Control Points (HACCP) is a systematic approach to the identification, assessment, and control of hazards that was developed as an effective alternative to conventional end-point analysis to control food safety. It has been described as the most effective means of controlling food borne diseases, and its application to the control of microbiological hazards has been accepted internationally. (Ropkins and Beck 2002)

At a basic level of understanding, HACCP is a mechanism, a method for industry to control the production process from start to finish preventing contamination and ensuring food safety, rather than detect problems upon completion of production

Hazard analysis critical control points (HACCP) provides a preventive and cost-effective approach to food safety control, which is integrated into the actual design of the process rather than dealing with end product

testing: Codex Alimentarious Commission (1997a) underlines HACCP as the necessary process to ensure food safety.

6/ Key Words:

Food borne, HACCP, Contamination, Carcasses

7/ Methodology:

Samples

All sampling will be carried out in two abattoirs . This facility will be considered representative of an export and local abattoisr in Khartoum state.

Beef carcass

Samples (*n*=792) will be taken between September 2007 and August 2008 from beef carcasses on the slaughter/dressing line immediately before carcasses were placed in the chill (*n*=12/week) .Each sample consisted of four pooled 5 cm^2 sub samples, excised from the carcass at the rump, flank, brisket and neck. Samples were transported back to the laboratory and processed within 2 h.

Microbiological analyses

All samples will be evaluated for aerobic plate counts (APC), total coliform counts (TCC), *E. coli* counts (ECC). Count Plates will be incubated for 48 h at 35°C and colonies will be counted manually. *E. coli* counts and TCC will be counted according to manufacturers' instruction following 24 h incubation at 35°C. The minimum detection level for determining APC, TCC, or ECC will be 10 CFU/g (1 CFU visible at a 10^{-1} dilution). *S. aureus* counts will be obtained by plating samples on Baird-Parker agar (Becton, Dickinson and Company, Franklin Lakes, and NJ).

Statistical analyses

Bacteriological counts will be transformed into log CFU/g before performing statistical analyses and all counts will be reported as log CFU/g. Mean and standard deviation values will be calculated on the assumption of a log normal distribution of counts (**Brown et al., 2000**). All analysis of variance main effects will be in single-factor models.

8/ References:

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Washington, DC

Section Three: Researchers and their Responsibilities:

Researchers	Qualification	Academic Status	Main Specialty	Responsibilities
Dr. Khalad	Ph.D holder	Assistant	Bacteriologist	Microbiological

Radwan		Professor		analysis
Dr. Imad Mohammed Taher	Ph.D holder	Assistant Professor	Biochemistry	Biochemical analysis
Prof. Imad Elamin Aradaib	Ph.D holder	Professor	Molecular Biology	Molecular analysis