



AN ASSESSMENT OF KNOWLEDGE, ATTITUDES AND PRACTICES OF FOOD HANDLERS IN FOOD KIOSKS IN RELATION TO FOOD HYGIENE IN ELDORET, KENYA

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ABSTRACT

This paper is based on a study conducted in Eldoret Municipality in Uasin Gishu District, Rift Valley Province, Kenya to assess the knowledge, attitudes and practices of food handlers in food kiosks in relation to food hygiene. The lax monitoring of sanitary standards in food kiosks in Eldoret Municipality had raised questions regarding the personal hygiene practices of food handlers as well as the environmental hygiene of their premises. For data collection, questionnaires for food handlers working in food kiosks and consumers of kiosk food, sanitary evaluation of premises as well as bacteriological tests of water, food contact surfaces, food, food handler's hands and throat samples were employed. The majority of food handlers had no formal food hygiene training and did not have a high level of general food hygiene knowledge, hence behavioural practices were lagging behind. Moreover, majority of the food did not meet the sanitary standards prescribed by Kenyan legislation. Recommendations were made to improve the knowledge, attitudes and practices of food handlers and consumers, to maintain the sanitary standards in the food kiosks and to provide for the establishment of governmental policies, programmes and strategies and the sensitization of political figures.

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INTRODUCTION

Development of Food Kiosks in Kenya

The development of food kiosks in Kenya emerged from open vending and hawking of food done at gatherings during national days, community ceremonial functions and market days. This encouraged individual operators/vendors to construct temporary and removable structures in which they could shelter while conducting the sale of their foods. However, some food vendors wanted more permanent places that provided protection against adverse weather conditions like rainfall and scorching sun, prevention of food from damage, spoilage and contamination by weather elements and where they could easily be located by their regular customers while feeling sense of ownership. Eldoret town has experienced the expansion of the informal sector both in terms of daily and periodic market activity and a proliferation of trading on the streets. The expansion has included three main and interrelated trends in the occupation of space, namely (1) the intensification of the commercial activity in and around existing daily market locations; (2) the emergence of new market sites for daily and periodic market activity, and (3) the invasion of the streets particularly on periodic market days. According to Ogero (2003), the food kiosk structures are not in keeping with the provisions of metropolitan growth.

The factors promoting the rapid expansion of the informal commerce in Kenya are:

- Economic situation of the country, population growth and rapid urbanization with subsequent socio-economic changes (World Health Organisation, 1996b).
- The inability of individuals to find a viable and more lucrative economic activity.
- Political goodwill with subsequent government policy on the improvement/development of the Jua Kali sector (informal sector) (Eldoret Municipality Report, 1986a).
- Government's conditions for offering loans for small scale business and that the operators must have structures from which to operate before approval and issue of the loan.
- Lack of proper control (Food and Agricultural Organisation, 1989a; Carolissen-MacKay, 1998).
- People working away from home and therefore many people get their food near their places of work (Mukhola, 2000, p. 12; Gerald, 1997, p. 1847-1848; Jacques & De Swart, 1993, p. 2).
- The changing trends in peoples lifestyles. Initially kiosk food was mostly consumed as a mid-day meal. Recently eating trends and lifestyles indicate that kiosk food serve, breakfast as well as dinner (Mukhola, 2000, p. 14). Food kiosks serve as places where people gather to eat, relax,

socialize and share views (World Health Organisation, 1996a).

The kiosk food enterprise is a modified form of street food vending in Kenya. In Eldoret Municipality, kiosk food service is often carried out on unauthorised locations within urban areas in makeshift structures or stalls along the street, in the vicinity of industrial areas, a bus terminus, building construction sites, hospitals, schools and courts (Gnammon-Adiko, 1996, p. 14-20; Winarno & Allain, 1991). The concentration of kiosk foods is higher in the Central Business District and the network distance between any two kiosk foods varies from a half meter to 100m and 500m in the peri-urban area (Researcher's own observation, 2002). Kiosk food operators normally buy their raw material from the local market and/or from local farmers (Winarno & Allain, 1991).

### Critical Issues on Food Kiosks and Food Safety

The increase in consumer needs with the subsequent increase of food kiosks are increasingly offering challenges to both health of consumers and local authorities as there is no proper control in this informal sector. Therefore, poor hygiene practices, including low standard of environmental hygiene and sanitation of equipment and utensils, improper handling and cleaning of food, improper storage and low standards of personal hygiene (Marriot, 1999, p. 57) occur with the food kiosks with subsequent health concerns such as food borne diseases. Professor H.N. Mengech (2003), in an interview, explains that twenty two cases of salmonellosis (normally associated with food such as meat, milk and milk products, fish, and eggs) were reported to Moi Teaching and Referral Hospital, Eldoret in July 2003. Although some data exist, little or none is known about the level of knowledge of food proprietors and food handlers and the effect thereof on their attitudes towards practicing food hygiene and the sanitation (including maintenance) of the environment that the food is prepared in. Furthermore, the level of knowledge and the subsequent perception of consumers regarding food hygiene and food borne diseases are unknown. This paucity of information can only be addressed if studies like this one are conducted. From the above, the following sub-problems are associated with food kiosks:

- Lack of knowledge by food handlers working in the food kiosks.
- Ignorance, long working hours and poor incentives lead to poor attitude of food handlers in food kiosks.
- The temporary nature of the food kiosks as they are made of timber off-cuts, card boards, old galvanized corrugated iron sheets in walls and roofs, and earthen/concrete floors.
- Lack of legislation/enforcement by the local authority, the Municipal Council of Eldoret.
- Poor locality/surrounding of the food kiosks, for example, most of the food kiosks are bordering undeveloped areas, Jua Kali areas.
- Poor hygiene practices within the food kiosks.
- Lack of basic services in food kiosks for example, water, toilets, drainage, solid waste management and road networks.

### Food Safety Control

The World Health Organisation (1996b) has declared that "... access to nutritionally adequate and safe food is a right of each

individual." Therefore, governments have a responsibility to ensure that a safe, nutritious food supply is continuously available at economic prices to enable the public to choose healthy and enjoyable diets (Van der Heijden *et al.*, 1999, p. 709). Van der Heijden *et al.* (1999, p. 709) further states that the "discharge of this responsibility involves a wide range of regulatory and advisory activities" which affect producers, processors, distributors, retailers and consumers in order to prevent the sale of unsafe food. Preventive approaches to assure food quality and safety include (Wilcock *et al.*, 2004; Soriano *et al.*, 2002; Van der Heijden *et al.*, 1999, p. 647; Marriot, 1999, p. 75-88; Shapton & Shapton, 1993, p. 10):

- Improvement of food kiosk structures and related infrastructures.
- Practicing Good Manufacturing Practice (GMPs).
- Applying the Hazard Analysis and Critical Control Point (HACCP) system principles.
- Applying Quality control/certification procedures (ISO 9000 series).
- Following specialized monitoring for safety procedures.

The globalisation of trade in food has increased the demand for more international uniformity and harmonization in food standard specifications and food regulatory procedures (Van der Heijden *et al.*, 1999, p. 647). However, in Kenya existing laws and regulations governing the hygienic preparation, handling/processing (including additives, packaging and labelling), storage, distribution and sale of food (including novel foods) are fragmented as they are administered by various departments namely:

- a) The Ministry of Health that is responsible for:
  - Food, Drugs and Chemical substances Act, Cap 254 of 1992. This Act governs the manufacture, sale and importation of all foodstuffs from a safety or human health point of view.
  - The Public Health Act, Cap 242 of 1986, which deals with hygiene aspects of food premises and the transport of foodstuffs.
- b) Ministry of Agriculture that is responsible for:
  - The Meat Control Act, Cap 356.
  - Pesticide Act, Cap 346.
  - Dairy Act, Cap 336.
- c) Local Authority:
  - Local Government Act, Cap 265 of 1986.
  - Hotels and Restaurant Act, Cap 494 of 1972.
  - The Eldoret Municipal by-laws 1955.
  - Environmental Protection by-laws 2000.
  - Effluent control by-laws 2000.
  - Solid waste management by-laws 2001 (3,7,8,9).
- d) Kenya Bureau of Standards:
  - Develops and implements the Kenya Bureau of Standards Act, Cap 496 of 1981.
- e) The Kenya Plant Health Inspectorate Service.

### Regulation of Kiosk Foods

The regulation of the informal sector including kiosk foods, in terms of practice, policy and access to resources is crucially lacking. The laws applicable to the formal food sector are not suitable to be extended and applied to the informal sector (food kiosks). Therefore, the laws and regulations governing food safety and quality in authorised and licensed premises

(formal sector) are applied to the food kiosks in the informal sector. However, Nangalama (2003) is of opinion that the laws lack proper direction and guidance for their application in the informal sector by the implementing agents; making it difficult to apply and thus leading to biased and arbitrary decisions by law enforcers. It is required by the both central government and local authorities that businesses are issued with trade licenses in terms of the Trade Licenses Act, Cap 497 of 1990 and the Local Authority Act, Cap 265 of 1986. The process of licensing a food kiosk involves application followed by carrying out health inspections and issuing of a health certificate, approval, payment of licensing fees and the issue of the license. In order to improve and maintain food sanitation in the informal sector, there is therefore a need to formulate and introduce new legislation which will control all food premises and handling.

### **Role of the Environmental Health Officer**

According to Koren (1991, p. 81), an Environmental Health Officer uses the knowledge and skills of the natural, behavioural and environmental sciences to prevent disease and injury; and to promote human well being. In terms of food control, Environmental Health Officers have powers to enter any food premise at any reasonable time in order to conduct the following food control duties (Kenya Food, Drugs and Chemical substances Act, Cap 254, of 1992; Public Health Act, Cap 242 of 1986; Kenya Building Code of 1997; Kenya Meat Control Act, Cap 356):

- Inspection of food premises and food.
- Sampling of food.
- Seizure and condemnation of food which in his/her opinion is not of the nature and substances demanded by the consumer and detain as long as is necessary.
- Review building plans.
- Provide health education.
- Air pollution control due to open fires and other emissions.
- Control of food borne disease outbreaks.
- Insect and rodent control.
- Enforce environmental and public health laws and prosecute those who contravene the law.

In Eldoret, all of these food control duties together with all the other responsibilities as previously indicated, are expected to be carried out by an Environmental Health Officer compliment of ten (10), making food control exceptionally difficult, hence inadequate coverage of expected environmental health and food services (Nangalama, 2003).

### **Food Contamination**

Alli (2000, p. 7) and World Health Organisation (1997, p. 6) define contamination as “the introduction or occurrence of a contaminant in food environment”, whereas Bekker (2003b, p. 303) and McSwane, Rue & Linton (2000, p. 7) define contamination as the presence of substances or conditions in the food that threatens the wholesomeness of food and can be harmful to humans.

### **Factors Influencing Food Contamination**

World Health Organisation data (www.med.osaka-u.ac.jp/doc/0157/whorules, 15 August 2003) indicate that only

a small number of factors related to food handling are responsible for a large proportion of food contamination and food borne disease episodes everywhere and include:

- Preparation of food several hours prior to consumption, combined with its storage at temperatures which favour growth of pathogenic bacteria and/or formation of toxins (Jay, 2000, p. 412; Davies & Board, 1998, p. 140-146; Lawrie, 1998, p.122).
- Insufficient cooking or reheating of food to reduce or eliminate pathogens (Frazier & Westhoff, 1988, p. 66; Nickerson & Rosinilli, 1980, p. 135).
- Cross contamination (Marriott, 1999, p. 55-65; Davies & Board, 1998, p. 158-168; Lawrie, 1998, p. 121).
- People with poor personal hygiene handling the food (Marriott, 1999, p. 56; Frazier & Westhoff, 1988, p. 66; S.A., 1977).
- Preparation, cooking, storage, serving of food using dirty utensils/equipment (McSwane, Rue & Linton, 2000, p. 9; Frazier & Westhoff, 1988, p. 66; S.A., 1977).

Käferstein *et al.* (2000, p. 4) indicates that contamination can be through direct or indirect routes and can result in food borne diseases such as salmonellosis (*Salmonella* spp), campylobacteriosis (*Campylobacter jejenu*), *Escherichia coli* (0157:H7) gastroenteritis, shigellosis (*Shigella* spp.), cholera (*Vibrio cholerae*), brucellosis (*Brucella* spp.), amoebiasis, poliomyelitis, listeriosis (*Listeria monocytogenes*) and cryptosporidiosis (*Cryptosporidium* spp.) (Jay, 2000, p. 423-588; Marriott, 1999, p. 21-35; Frazier & Westhoff, 1988, p. 428; Gracey, 1981, p. 174-176).

### **Food Establishments/Premises**

An establishment can be defined as any building(s) or area(s) in which food is handled and the surroundings under the control of the same management (Alli, 2004, p. 11; South African Bureau of Standards, 2001, p. 2). Moreover, in terms of regulation 918 of the South African Health Act 63 of 1977, Regulation 918 of 1999, a Food premise means a building, structure, stall or other similar structure, and includes a caravan, vehicle, stand or place used for or in connection with the handling of food. Bekker (2003, p. 18b) elaborates further that the premises of a food service operation also refer to the:

- Processing area and all other areas where food is prepared, stored, and served.
- Areas where equipment is washed and stored.
- The dressing or locker rooms for employees and toilet rooms.
- The area for garbage disposal.

In South Africa and in several other countries in the world, food premises (including the informal market) should be approved by relevant authorities, i.e. the Health Authorities (Department of Health, South Africa, 1997, p. 65). However, although the formal food premises are approved and licensed in Eldoret, it is not the case with the food kiosks (Nangalama, 2003; Researcher's experience).

### **Location of Establishment and Equipment**

In accordance with the National Board of Experts-HACCP, The Netherlands (2002, p. 7), and supported by other

sources (Alli, 2004, p. 94; Bekker, 2003b, p. 19; South African Bureau of Standards, 2001:8; Food and Agricultural Organisation, 1997, p. 12; Kenya Public Health Act, Cap 242 of 1986; South African Health Act No. 63 of 1977, Regulation 918 of 1999), an establishment shall not be located anywhere where it is clear that there is a threat to food safety or suitability. In particular, establishments shall normally be located away from:

- Environmentally polluted areas and industrial activities which pose a serious threat to contamination of food.
- Areas subject to flooding unless sufficient safeguards are provided.
- Areas prone to infestations of pests.
- Areas from which waste, either solid or liquid, cannot be removed effectively.

It is further required by the World Health Organisation (1999), and supported by Alli (2004, p. 110-111; National Board of Experts-HACCP, The Netherlands (2002, p. 27), that equipment shall be located so that it:

- Permits adequate maintenance and cleaning,
- Functions in accordance with its intended use,
- Facilitates good hygiene practices, including monitoring,
- 

#### **Internal Design and Layout of Establishment**

The internal design and layout of an establishment shall permit good hygiene practices, including protection against harmful cross-contamination (Alli, 2004, p. 95-96). The basic requirements for the internal design and layout that a premises should comply with are (Bekker, 2003b, p. 23-26; National Board of Experts-HACCP, The Netherlands, 2002, p. 28; South African Bureau of Standards, 2001, p. 8-12; Food and Agricultural Organisation, 1997, p. 12; Kenyan Public Health Act, Cap 242 of 1986; South African Health Act No. 63 of 1977, Regulation 918 of 1999; Kenyan Building Code of 1997):

- Structures shall be built of durable materials and be easy to maintain, clean and where appropriate, disinfect.
- The surfaces of walls and partitions shall be made of smooth durable and impervious materials. Walls and partitions shall have a smooth surface that will ease cleaning. Exposed service pipes should not obstruct or prevent cleaning.
- The surfaces of floors shall be made of smooth durable and impervious materials. Floors shall be constructed to allow adequate drainage and cleaning.
- Ceilings and overhead fixtures shall be constructed and finished to minimise the build up of dirt and condensation and the shedding of particles.
- Windows shall be easy to clean, constructed to minimise build up of dirt and where necessary, fitted with removable and cleanable insect-proof screens.
- Doors shall have smooth, non-absorbent surfaces and shall be easy to clean and disinfect
- Working surfaces that come into direct contact with food shall be of sound condition, durable and easy to clean, maintain and disinfect. They shall be made of smooth, non-absorbent materials.

- Temporary/mobile premises (such as food kiosks) shall be designed and constructed to avoid, as far as is reasonably practicable, contaminating food and harbouring pests.

#### **Design of Equipment**

Equipment and re-usable containers coming into contact with food shall be designed and constructed of durable non-toxic materials that will allow adequate and repeatable cleaning and disinfection to avoid the contamination of food. Equipment should be movable or capable of being disassembled to allow for maintenance, cleaning, disinfection, and, inspection for pests. Equipment used to cook, heat, cool, store or freeze food shall be designed to achieve the required food temperatures as rapidly as necessary in the interests of food safety and suitability. It is further important that the equipment are well maintained at all times (Bekker, 2003b, p. 112-127; National Board of Experts-HACCP, The Netherlands, 2002, p. 28; South African Bureau of Standards, 2001, p. 17; Food and Agricultural Organisation, 1997, p. 12; Department of Health, South Africa, 1997, p. 65; Kenya Food, Drugs and Chemical Substances Act, Cap 254 of 1992, Kenya Public Health Act, Cap 242 of 1986; South African Health Act No.63 of 1977 and Regulation 918 of 1999).

#### **Water Supply**

An adequate supply of potable water with appropriate facilities for its storage, distribution and temperature control, shall be available wherever it may come in contact with food contact surfaces, is used as an ingredient or in the making of ice and steam (Alli, 2004, p. 99-100; World Health Organisation, 1997, p. 19). De Zuane (1990, p. 5) describes potable or "drinking" water as the water delivered to the consumer that can be safely used for drinking, cooking and washing. Kirkwood (1998) describes four criteria for declaring water is safe for human consumption:

- Free from microbiological contamination.
- Does not have chemical concentrations greater than prescribed limits.
- It is available in sufficient quantities to enable adequate domestic hygiene.
- It meets local standards for taste, odour and appearance, clean, accessible, sufficient and affordable water is critical for realizing the health benefits of water (Khalipa & Onya, undated, p. 11).

Potable water shall, as a minimum, meet the national (Kenya Food, Drugs and Chemical Substances Act, Cap 254 of 1992 and/or international specifications or legislation i.e. the World Health Organisation Guidelines for Drinking Water Quality (Van der Heijden *et al.*, 1999, p. 115-118; Food and Agricultural Organisation, 1997, p. 12; De Zuane, 1990, p. 478-481). Kenya does, however, not possess any specific standard documented but uses the World Health Organizations standards. In Eldoret Municipal area, major problems are experienced with illegal connections, pipe burst and leakages and financial constraints, often increasing the burden of fetching water from unreputable sources by women and children (Absolom & Elkana, undated). This water is also used by food kiosks (Researcher's observation).

### **Drainage and Effluent**

A suitable drainage systems, complying with the requirements of the Kenya Building Code of 1997; Kenya Food Drugs and Chemical Substances Act, Cap 254 of 1992; South African Health Act No.63 of 1977, Regulation 918 shall be available, designed, constructed and maintained in such a way as to avoid contamination of food products and potable water supply (National Board of Experts-HACCP, The Netherlands, 2002, p. 28). In addition, properly installed trapped floor drains should be provided in all areas where water is spilled on the floor during normal operations or where floors are cleaned to facilitate cleaning and removal of waste water (Bekker, 2003b, p. 60).

### **Ventilation**

Adequate natural or mechanical ventilation complying with the Kenya Building Code of 1997, sections 150-166; Kenya Food Drugs and Chemical Substances Act, Cap 254 of 1992, regulation 8(d) should be provided to minimise air-borne contamination of food (e.g. from aerosols and condensation droplets), control ambient temperatures, control humidity and control odours (Alli, 2004, p. 97; National Board of Experts-HACCP, The Netherlands, 2002, p. 28; Bekker, 2003b, p. 66; South African Bureau of Standards, 2001, p. 14; Food and Agricultural Organisation, 1997, p. 12).

### **Lighting**

Adequate provision of both natural and artificial lighting enhances the food operations to be carried out in a hygienic manner (Alli, 2004, p. 97). The minimum standard of lighting to be provided in all food preparations, storage and dishwashing areas is an illumination level of 215 lux measured at 900 millimetres above the floor level (Kenya Food, Drugs and Chemical Substances Act, 1992, Cap 254, regulation 8(2)(c), Kenya Building Code of 1997). Light bulbs and light fixtures suspended over food material in any stage of production shall be protected to prevent contamination of the food in case of breakage (Bekker, 2003, p. 66; National Board of Experts-HACCP, The Netherlands, 2002, p. 29; South African Bureau of Standards, 2001, p. 17; Food and Agricultural Organisation, 1997, p. 15; Kenya Food, Drugs and Chemical Substances Act, Cap 254 of 1992, regulation 9(4), South African Health Act No. 63 of 1977, Regulation 918 of 1999).

### **Storage**

Adequate facilities for storage of food ingredients and non-food materials (e.g. cleaning materials, lubricants, fuels) must be provided separately. These facilities shall be designed and constructed and maintained to (Alli, 2004, p. 99; National Board of Experts-HACCP, the Netherlands, 2002, p. 29; Kenya Food, Drugs and Chemical Substances Act, Cap 254 of 1992, regulation 8(2)(a) and Second Schedule regulation 14(c) and 15(c); South African Health Act No.63 of 1977, Regulation 918 of 1999):

- Permit adequate maintenance and cleaning.
- Avoid pest access and harbourage.
- Enable food to be effectively protected from contamination.
- Provide the necessary environment to prevent spoilage.

- Ensure that malicious or accidental contamination of food products with harmful materials is prevented.

### **Sanitary Facilities**

Toilet facilities near work areas provide good personal hygiene, reduce lost productivity and permit closer supervision of employees (McSwane, Rue & Linton, 2000, p. 292; Kenya Food, Drugs and Chemical Substances Act, Cap 254 of 1992, regulation 11(k). Adequate, suitable and conveniently located change rooms, toilets and ablution facilities shall be provided at all food establishments (Alli, 2004, p. 98; South African Bureau of Standards 049, 1989, p.16). It is further required that such facilities shall be well ventilated, well lit and shall not open directly onto food handling areas (Kenya Food, Drugs and Chemical Substances Act, Cap 254 of 1992, regulation 8(2); Kenya Building Code, sections 150-166 and section 190).

### **Waste Management**

Improper removal, storage and disposal of waste can result into contamination of food, equipment, potable water and may attract breeding of pests (South African Bureau of Standards, 2001, p. 16; Food and Agricultural Organisation, 1997, p. 14; Kenya Food, Drugs and Chemical Substances Act, Cap 254 of 1992, regulation 7(1)). Therefore, there should be designated containers with covers, if necessary, for collection of waste and garbage and for their temporary storage until disposal. These containers should be properly identified, and be made of durable, impervious material and maintained in a sanitary condition (Alli, 2004, p. 99; South African Bureau of Standards, 2001, p. 17; Department of Health, South Africa, 1997, p. 65; Kenya Food, Drugs and Chemical Substances Act, Cap 254 of 1992, regulation ii (e and f), Cap 242 of 1972, sections 127 & 128, South African Health Act 63 of 1977, Regulation 918 of 1999). It is stated further that there should be no leakage from waste containers and that waste collection containers located on the grounds outside of the building should be maintained so that they are not sources of contamination or pest infestation (National Board of Experts-HACCP, The Netherlands, 2002, p. 28). The facility shall be soundly built of durable impervious materials and be easy to maintain clean and where appropriate disinfect/permit good hygiene practices, including protection against harmful cross-contamination.

### **Maintenance and Cleaning**

The establishments and equipment shall be kept in an appropriate state of repair and condition to (National Board of Experts-HACCP, The Netherlands, 2002, p. 31; South African Bureau of Standards, 2001, p. 10; Food and Agricultural Organisation, 1997:12; Kenya Food, Drugs and Chemical Substances Act, Cap 254 of 1992, regulation 10 and 11; South African Health Act No. 63 of 1977, Regulation 918):

- Facilitate all sanitation procedures.
- Function as intended, particularly at critical steps.
- Prevent contamination of food, e.g. from metal sharps, flaking plaster, debris and chemicals.

It must however be done in such a way that it will avoid contamination of ingredients, products or packaging material, minimizing the risk of pest infestation and also permit effective cleaning before continuing with processing.

The necessary cleaning methods and materials will depend on the nature of the maintenance conducted. Cleaning chemicals should however be handled and used carefully and in accordance with manufacturers' instructions and stored, where necessary, separated from food, in clearly identified containers to avoid the risk of contaminating food (World Health Organisation, 1997, p. 22; South African Bureau Standards 049, 1989, p. 18). Food grade detergents should be used in cleaning (Bekker, 2003b).

### **Cleaning**

Cleaning of a food establishment is a fundamental and important part of the operations and entails the removal of bacteria as well as soluble i.e. salt, sugar, etc and insoluble particles i.e. oil, food particles, grease, grime, etc matter, residues and dirt that may be a source of contamination (Marriott, 1999, p. 131-134; Kenya Food, Drugs and Chemical Substances Act, Cap 254 of 1992, regulation 13, Shapton & Shapton, 1985, p. 164). Cleaning is normally done in different phases namely (Alli, 2004, p. 104-107; Marriott, 1999, p. 298):

- Pre-clean : Removing excess soil by sweeping, wiping or pre-rinsing.
- Main clean : Loosening of the surface Grease and dirt using a detergent.
- Rinse : Removal of loose dirt and detergent.
- Disinfection : Destroying bacteria/other organisms.
- Final rinse : Removal of disinfectant.
- Dry : Preferably natural by evaporating dry.

To provide for the different stages of cleaning it is advisable to draw up a cleaning programme that will provide for (Alli, 2004, p. 104; National Board of Experts-HACCP, The Netherlands, 2002, p. 31; South African Bureau of Standards, 2001, p. 20; Shapton & Shapton, 1985, p. 160):

- Ensuring that all parts of the establishment are appropriately clean, and shall include the cleaning of cleaning equipment. Therefore, adequate facilities, suitably designated, shall be provided for cleaning food utensils and equipment and shall have an adequate supply of hot and cold potable water.
- Specifying all areas, items of equipment and utensils to be cleaned.
- Specifying the responsibilities for particular tasks, including method and frequency of cleaning.
- Continual and effective monitoring for suitability and effectiveness.

Although cleaning chemicals is used as cleaning aids, water still remains the main cleaning agent (Shapton & Shapton, 1985, p. 163-171) and should therefore be potable, complying with standards as previously indicated. Cleaning chemicals shall be of the food grade type (Alli, 2004, p. 106; Bekker, 2003b, p. 114) and shall be stored, where necessary, separately from food, in clearly identified containers to avoid the risk of contamination of food (National Board of Experts-HACCP, The Netherlands, 2002, p. 28).

### **Pest Control**

The availability of food and water encourages pest harbourage and infestation (Alli, 2004, p. 107; World Health Organisation, 1997, p. 23). It is further stated that good hygiene practices should be employed to avoid creating an environment conducive to pests. Good sanitation, inspection of incoming materials and good monitoring can minimize the likelihood of infestation and thereby limit the need for pesticides (Alli, 2004, p. 87-119; World Health Organisation, 1997, p. 23). The benefits of proper cleaning and sanitising of equipment and utensils, time and temperature controls and food handling can all be wasted if insects and rodents are allowed to contaminate foods and food contact surfaces. There is therefore a need for a pest control program in food establishments (McSwane, Rue & Linton, 2000, p. 300, National Board of Experts-HACCP, The Netherlands, 2002, p. 31-32).

### **Food Handling**

Food handling is defined as manufacturing, processing, producing, packing, preparing, keeping, offering, storing, transporting or displaying for sale or for serving (South African National Health Act 63 of 1977, Regulation 918 of 1999). Increased handling of food is responsible for a more complicated and critical challenge of protecting food from contamination (Marriott, 1999, p. 343). Good hygiene practice in food preparation and service plays an important role in ensuring food safety. This is achieved by following general rules of good food hygiene and other approaches like HACCP ([www.med.osaka-u.ac.jp/doc/0157/whorules.htm](http://www.med.osaka-u.ac.jp/doc/0157/whorules.htm): 15 August 2003). Marriott (1999, p. 3) states that poor hygienic practices can contribute to outbreaks of food borne illnesses. It is therefore important that the food establishment management/owner provide methods and means of handling that prevent damage to or deterioration or contamination of any food product (South African Bureau of Standards, 2001, p. 13). In Figure 2.8 the different stages of food handling from purchasing and receiving to serving are demonstrated.

### **Purchasing**

Bekker (2003, p. 143) and McSwane, Rue and Linton (2000, p. 113) argue that for a sanitation programme to be effective, it should start with a sound food supply. The person entrusted with purchasing, should therefore buy the product that is best suited for the job; buy the proper quantity of the item; pay the right price for the item; buy from only reputable and dependable suppliers; and should have knowledge of products and market conditions. Food is purchased from local market, butcheries, farmers, and suppliers.

### **Receiving**

Personnel responsible for receiving products must carefully inspect all incoming food supplies to make sure they are in sound condition, free from filth, spoilage, damage, insect infestation and are at proper temperatures. Deliveries that do not go for immediate use should be stored at once in an appropriate storage area. Foods that are damaged e.g. dented cans should be rejected (Bekker, 2003b, p. 144; McSwane, Rue & Linton, 2000, p. 116; National Board of Experts-HACCP, The Netherlands, 2002, p. 27). In addition to the

above inspections to be carried out, the following is of importance when inspecting the high risk foods normally sold (as also targeted for the purpose of this study) at the food kiosks in Eldoret.

### **Storage**

All foodstuffs undergo unwanted changes during storage if not kept under proper conditions (Heijden *et al.*, 1999, p. 325). Cool refrigeration, frozen and dry storage are among the methods of food preservation. Cool storage refers to storage at temperatures above freezing, from about 16 °C down to -2 °C while frozen refers to storage at temperatures -18 °C or below to maintain food (Potter & Hotchkiss, 1998, p. 163). Dry storage refers to holding of foods above ambient temperatures. Dry storage is used in the storage of food grains such as maize, beans, flour and potatoes. The perishable foods are obtained on daily bases for use.

### **Preparation**

Food preparation may be defined as the act/process of having food ready for use and entails washing, cooking, cooling, reheating, holding and serving food. It is further stated that food is prepared using specified raw ingredients of the right quality for the purpose ([www.web1.msu.edu/imp/modtd.html](http://www.web1.msu.edu/imp/modtd.html), 5 May 2005; ([www.Answers.com](http://www.Answers.com) 5 May 2005; [www.web1.msu.edu/imp/modtd.html](http://www.web1.msu.edu/imp/modtd.html) 5 May 2005).

### **Serving of Food**

Food should be handled, served or sold with clean equipment and utensils i.e. tongs, forks, spoons or disposable gloves (Marriott, 1999, p. 344) and never handled with bare hands (Department of Health, South Africa, 1997, p. 67). Utensils/cutlery should be clean and dry and not handled by touching the food contact surfaces (McSwane, Rue & Linton, 2000, p. 150; Department of Health, South Africa, 1997, p. 67) and plates filled with food should not be stacked on top of the other during display, storing or serving (Department of Health, South Africa 1997, p. 67). Good personal hygiene should always be practiced when serving food, by wearing a clean uniform and hair restraint and wash hands after handling money and before handling food again (National Board of Experts, The Netherlands, 2002, p. 32; McSwane, Rue & Linton 2000, p. 150).

## **MATERIALS AND METHODS**

The study was confined to food kiosks in the Central Business District of Eldoret Municipality, Uasin Gishu District, Rift Valley Province. The selected sites included the Jua Kali areas (open busy industrial areas) of the Central Business District within Eldoret Municipality. Due to its sensitivity to contamination and spoilage, only food kiosks (n=30) where preparation, cooking and selling of cooked beef, cooked fish, cooked chicken and milk are carried out was randomly selected by using the simple random selection. Food handlers (n = 61) found working in, and consumers (n = 63) found eating in the food kiosks were randomly selected by using the simple random selection technique and asked to participate in the research. Questionnaires were administered by interviewing each of the participants. Samples from food

handler's hands, throats and noses were collected from individual food handlers found working in the food kiosks at the time of study. The study was designed to be mainly experimental in nature and the methods applied during the study included hygiene evaluations of the food kiosk and environment, questionnaires, sampling and analysis as well as interviews. Hygiene evaluation to determine the hygiene status of the food kiosks (n=30) and environment, was carried out by using an evaluation form. Questionnaire forms (n=61) were administered to two randomly selected (simple random selection technique) food handlers per kiosk (however, with one kiosk an extra person volunteered to participate) to determine their knowledge, attitude and practices with regards to food hygiene. Interviews were conducted in addition to the questionnaire and evaluation forms. Samples of milk (n=13); water (n = 12); cooked chicken (n=33), red meat (n=32), fish (n=12); food contact surfaces (n=32), handlers hands (n=60) and throat swabs (n=20) were taken for microbiological analyses. Samples were analyzed to determine microbiological status and hygiene status of the kiosks. Aseptic techniques were used to prevent contamination and to get accurate results. Data was coded and analysed using statistical package for social scientist (SPSS) and Microsoft Office Excel 2003 to obtain descriptive statistics.

## **RESULTS AND DISCUSSION**

### **Food Handlers**

Of the 61 food handlers, working in the food kiosks (n = 30) that the questionnaire was administered to, 56.8% were female and 43.2% were male with a mean age of 25 years, and a range of 10-45 years. Regarding education, 60.6% had primary school education, while only 39.4% had received education at secondary school level. The workers had an average of nine months experience working at the food kiosk during the time of the study. However, 60% had some previous experience working in other food establishments that included hotels, school kitchens and eating houses.

### **Food Handlers and Food Safety**

The study established a significant breach between food hygiene and safety and the translation of a wide range of knowledge of food handlers to actual practices. This is primarily attributed to financial considerations being more of a priority than food safety (Kotchevar & Terryl, 1985, p. 7) as most food handlers and their families are totally reliant for their financial support on food kiosk enterprising (Khubeka *et al.*, 2001, p. 127; Mosupye & Von Holy, 1999, p. 1278-1284). It is therefore quite restrictive for them to put food safety considerations before their economic needs. The assessment of food handlers in the food kiosks revealed deficiencies in knowledge, attitudes and practices in the areas of washing hands, food handling, cooling/reheating, temperature control, food borne diseases, mode of transmission and prevention. These deficiencies can be ascribed to a total lack of training (none received any formal food hygiene training), or limited training these workers received, or negative attitudes influenced by the desire to survive (Kalua, 2001, p. 50). Control or preventative measures require change in behaviour which is difficult to adopt. It is only knowledge, attitude and practices (KAP) studies that capture this information and

possible barriers which can be used to redefine intervention programs (Quick *et al.*, 1996, p. 878).

### **Trade Licences**

None of the food kiosks were in possession of the trade license issued by Central Government and few (30%) were in possession of the municipal trade license. This may be due to lack of proper direction and guidance for their application in the informal sector (Food and Agricultural Organisation, 2001; Carolissen-MacKay, 1998); therefore, leading to biased and arbitrary decisions by law enforcers (Nangalama, 2003).

### **Role of Environmental Health Officer**

Although food handlers were found to have a positive attitude towards Environmental Health Officers, a lack of staff and the high number of food kiosks prevent effective control and education (Nangalama, 2003).

### **Food Borne Illnesses**

All food handlers were aware that consumers could become ill by eating contaminated food. However, a clear lack of knowledge was evident regarding food borne illnesses, the associated symptoms and the prevention thereof.

### **Personal Hygiene**

Although all of the food handlers knew that it was essential for them to be clean in body, most did not understand that food handlers can be a source of contamination (Jay, 2000, p. 17-18; Davis & Board, 1998, p. 18) and that contaminated hands can be a source of diarrhoeal pathogens (Laborde *et al.*, 1993, 251). This explains the observation that most (90%), although washing facilities were provided in the majority of the food kiosks, never washed their hands and that 95% of them commonly used their bare hands to serve cooked food. The World Health Organisation's Ten Golden Rules ([www.med.osaka-u.ac.jp/doc/0157/whorules.htm](http://www.med.osaka-u.ac.jp/doc/0157/whorules.htm), 15August 2003) require hands to be washed regularly with soap in clean water. It has been shown that hand washing significantly reduces enteropathogen transmission (Butz *et al.*, 1990, p. 347). All food handlers were aware that they should be medically examined and issued with health certificates (Kenyan Public Health Act, Cap 242 of 1986). Many of the food handlers did not understand the importance of medical examination in terms of spread and prevention of food borne diseases. They were medically examined because it is a legal requirement (caps, 242 and 254, LOK). However, the frequency of medical examinations conducted was uneven, hence defeating the positive intended purpose. Food handlers can play a significant role in the prevention and control of food borne diseases if they can understand the basic rules of food hygiene (WHO Ten Golden Rules) and take the initiative of being the custodians of their own health.

### **Food Preparation**

Food preparation includes the receiving of a sound food supply, the cleaning thereof, manipulation (cutting, mincing, among others), cooking, storage and serving. All the food kiosks procure their food supply from the open air markets

(mostly live chicken, vegetables and fruit), butcheries, fish vendors and directly from farmers (live chicken, milk, fruit and vegetables). None of the food supply is inspected on receiving for suitability as advised (National Board of Experts, The Netherlands, 2002, p. 27; McSwane, Rue & Linton, 2000, p. 116). Live chicken were found to be slaughtered both inside and outside the food kiosks as the need arises, thus creating an unhygienic environment conducive for the attraction of pests (Alli, 2004, p. 107). Washing of the target foods (fish, red meat and chicken), vegetables and fruits occurred in the same pots (sufurias) used for cooking. The cleaning/washing of these pots was done by using the same water several times. In general the washing was under unsatisfactorily and unhygienic conditions; therefore increasing the chance of cross-contamination (Marriott, 1999, p. 55-65; Davies & Board, 1998, p. 158; Lawrie, 1998, p. 121). Cutting and chopping, of both raw and cooked food was done using the same boards, therefore increasing the chance of cross contamination (Marriott, 1999, p. 55-65; Davies & RonBoard, 1998, p. 158; Lawrie, 1998, p. 121). Only 4.92% of the food handlers indicated raw food to be a source of contamination, clearly indicating a lack of knowledge (Bedworth & Bedworth, 1992, p. 376).

Food is cooked at high temperatures through frying (meat, fish, chicken and chips) (, using re-used oil (100% of food kiosks) and boiling (milk, fish, meat, vegetables) and mostly served hot. Food is, however, often left to cool and then reheated before serving. According to the Kenyan Food, Drugs and Chemical Substances Act, Cap 254 of 1992, food should be kept under such conditions as to prevent contamination and the development of pathogenic and/or toxigenic micro-organisms prevention (Alli, 2004, p. 85). It was, however, found that although 78.7% of the food handlers indicated that food should be covered during holding/storage and 70.5% indicated the practicing of high standards of hygiene is important to prevent contamination, this was not practiced. Further, only 13% identified separate storage of cooked and raw food as important for preventing cross contamination ([www.med.osaka-u.ac.jp/doc/0157/whorules.htm](http://www.med.osaka-u.ac.jp/doc/0157/whorules.htm), 15August 2003; McSwane, Rue & Linton, 2000, p. 114) and therefore resulting in poor storage where 93.3% did not have separate storage facilities for both raw and cooked foods. Regarding temperature control, only 8.2% perceived temperature control to be of importance to prevent the growth of micro-organisms. Although food that was kept hot, was found to be above 63 °C, therefore at temperatures that will prohibit the growth of micro-organisms (McSwane & Linton, 2000, p. 114), the food that was left to cool down or served cold, were kept at temperatures that fall within the "danger zone" (between 7 °C and 63 °C) and therefore vary ideal for the support of microbial growth. These results are supported by those observed by Luyt (1995, p. 1) and Mukhola (2000, p. 78). Tasting of food during cooking is a common practice during food preparation. Although 80.6% of the food handlers indicated that tasting should take place by putting a portion on a plate and then to taste it, observations revealed that most of them put a small portion on the palm of their hands and lick it without washing their hands thereafter. This practice may however serve as a source of cross contamination (Marriott, 1999, p. 55-65; Davies & RonBoard, 1998, p. 158; Lawrie, 1998, p. 121).

A little more than half (52.4%) of the food handlers indicated that dirty equipment and utensils to be a source of contamination. However, ninety-five percent (95%) of food handlers do not use utensils to serve food, but rather use their bare hands, thereby again increasing the chance of cross contamination, bearing in mind that the majority do not wash their hands on a regular basis as previously discussed (Marriott, 1999, p. 55-65; Davies & RonBoard, 1998, p. 158; Lawrie, 1998, p. 121). Furthermore, most of the equipment, utensils and surfaces that comes in direct contact with food were cracked, chipped, dented or rusty. It was also observed that the washing of equipment, utensils and surfaces was poorly done by not using soap and the use of re-used cold water.

### **Water Supply**

The infrastructural development in terms of water provided to food kiosks is limited. Food kiosks do not have an adequate supply of portable water (Alli, 2004, p. 1999; Kirkwood, 1998) with appropriate facilities for its storage, distribution as required by the Kenyan Food, Drugs and Chemical Substances Act, Cap 254 of 1992. Communal water points are however available in the vicinity, from which 85% of the food kiosks obtain their water from. The remaining 15% obtain water from water vendors of which the source is unknown. Although water analysis revealed that the water obtained from the communal taps are of a good microbiological standard and in compliance with the standard (Kirkwood, 2000; Kenyan Food, Drug and Chemical Substances Act, Cap 254 of 1992; DeZuane, 1990, p. 5) through effective treatment, the water is kept in open water containers of different sizes, increasing the opportunity for contamination (Jay, 2000, p. 17-18; Marriot, 1999, p. 55-65). The water is then scooped out of the containers and used for all activities such as washing of food, cooking, and etcetera. This may be due to the fact that only 6.5% of the food handlers indicated contaminated water as a source of contamination. In addition, only 27% of the food handlers were aware that the treatment of water is used to prevent food contamination and subsequent food borne illnesses.

### **General**

In general, food handlers appeared to have a positive attitude towards food hygiene. Although most (95%) were of opinion that practicing food hygiene was important in their kiosks, it was evident that this was not practiced and that the drive to generate an income was more important (Kotcheval & Terry, 1985, p. 7). Not practicing proper food hygiene may also be related to the suspicion and fear observed that may lead to a negative attitude (Luthans, 1989, p. 170; Holy Bible). It is, however, also clear that the food handlers lack knowledge regarding food hygiene principles and the application thereof seriously. This is also evident from the fact that 95% of the food handlers acknowledged the need for training in order to improve the hygiene, safety and quality of the food (Kalua, 2001, p. 49; Whetten & Cameron, 1995, p. 56). The mentioned findings are in line with the researcher's hypothesis regarding training and the subsequent lack of knowledge and the impact thereof on the attitude of food handlers resulting in poor hygiene practices and the preparation of food under poor hygiene conditions.

## **CONCLUSION AND RECOMMENDATIONS**

Although the improvement of the kiosk food industry is complex in nature because of the difficulties discussed above, the following recommendations are made:

- Due to the serious public and environmental concerns arising from this study, the lack of governmental policies and protocols regarding food kiosks and the subsequent enforcement (including the provision of resources) need to be addressed as a matter of urgency. It is clear that food kiosks cannot be wished away and that this industry should be supported as it contributes to employment and the general economy of Eldoret. Therefore the findings of the foregoing research should be brought to the attention of the government at all levels.
- The municipality of Eldoret has the responsibility of monitoring sanitary standards in food kiosks. This responsibility cannot be relegated because of the country's economy and the lack of Environmental Health Officers. Political figures should be sensitised to the need for upholding sanitary standards as well-informed politicians can better influence food kiosk operators in their wards and constituents (Pfannhauser & Reinhart, 2000, p. 5; Venatesh & Davis, 2000, p. 187).
- Town planning strategies to make provision for the kiosk food industry (and other informal sectors) that include zoning and the provision of proper infrastructure (water, sanitation, waste disposal and electricity) should be formulated and implemented.
- A programme initiated by all levels of government to improve the current structures and the environment should be sought for in collaboration with the food kiosk operators. Crude structures should over a period of time be replaced with more permanent structures that make provision for proper ventilation, illumination, storage facilities, hand wash facilities, waste disposal and toilets (Kenyan Public Health Act, Cap 242 of 1986).
- Training in food hygiene is essential for food handlers because of the health and financial risk associated with poor food hygiene (McSwane, Rue & Linton, 1998, p. 3). Adequate training strategies should be established, implemented and maintained to improve the knowledge and resulting attitude and practices of food handlers and food consumers. Food handling behaviours associated with major food borne pathogen control factors can serve as a framework for developing food safety curricula and evaluation materials for food safety educational programs. The behaviour list will also help educators focus their efforts on the most critical food handling behaviours.
- The Eldoret Municipality's Environmental Health Department should intensify health education regarding food hygiene to both food handlers and consumers (Venatesh & Davis, 2000, p. 187).
- Means to address the suspicion/fear for removal with food kiosk operators should be found in order to assure stability in this industry, thereby improving on

the attitude and subsequent cooperation of the food kiosk operators and the enforcing officers.

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