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INTERNATIONAL FEDERATION OF ENVIRONMENTAL HEALTH

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Many thanks to all contributors to this issue of Environment and Health International

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PRESIDENT'S COMMENTS

Colm Smyth

It is an honour and a privilege to present my first communication in Environment & Health International.

Earlier this year in June the Environmental Health Officers Association hosted the 9th World Congress on Environmental Health in Dublin, Ireland. The congress attracted over five hundred delegates from around the world. Delegates from over thirty-five countries attend the weeklong event. Of particular note is the fact that, for the first time nearly fifty percent of the delegates were from overseas. This, I believe, contributed enormously to the success of the event and made it a truly international affair. There were over eighty five presentations made at the congress covering a wide variety of environmental health topics, including tobacco control, food safety, housing and health, waste management, sustainability to mention but a few. As presentations become available they are being place on the congress website at www.ifeh2006.org. On behalf of the Federation I would like to thank the Environmental Health Officers Association in Ireland for organising and hosting a very successful Congress

On the theme of the World Congress congratulations to the Lithuanian Union of Hygienists & Epidemiologists who were successful in their bid to host the 2012 Congress in Vilnius.

We all know that environmental health hazards do not recognise national boundaries. We are also aware of the devastating impact that disasters, both natural and tragic have on people and the environment. The Federation must be well placed to assist the international relief agencies in providing humanitarian assistance when called upon. In addition we must also proactively promote our unique expertise in areas such as water supplies, housing and health, sanitation, food safety, waste management and vector control etc.

The Federation, through Environmental Health in Disasters & Emergencies (EHiDE) is working with a number of aid agencies, Concern in Ireland, Oxfam in the UK, to develop a register of environmental heath professionals that will be available to all international aid agencies. In addition we are working with a number to training agencies to develop a training needs assessment tool, for professionals to develop the skills necessary to work in disaster situations. The Federation has over thirty-six national associations representing several thousand individual members around the world and we must strive to provide a focal point for environmental health professionals wishing to assist in disaster and emergency relief.

Tobacco consumption is the single biggest preventable cause of death worldwide. It respects no one, young or old, rich or poor. World wide over five million deaths annually are attributed to tobacco use and in the next twenty-five years it will be responsible for over one hundred and twenty five million deaths. This equates to the population of thirteen IFEH member countries being totally wiped out.

Moreover the preamble to the WHO Framework Convention on tobacco control recognises the role of health professional organisations in tobacco control….

"The special contribution of non-governmental organisations not affiliated to the tobacco industry, including health professional bodies, environmental and consumer groups, academic and health care institutions to tobacco control efforts nationally and internationally and the vital importance of their participation national and international tobacco control efforts this quotation appears to be incomplete as at present it is meaningless

So what of our role? I believe the Federation must actively promote the anti tobacco message on the world stage. As health professionals we have the opportunity to help people change their habits and our involvement is essential to successfully curbing the tobacco epidemic. After all as enforcement professionals and educators we are ideally placed to make an important contribution.

At the recent World Congress the Federation was challenged to sigh up to the WHO "Code of Practice on Tobacco Control for Health Professional Organisations". I believe this is a challenge we must rise to and play an active role in the global anti tobacco alliance.

The first day of this year's Council meeting in Dublin in June was a first for the Federation. We dispensed with the formalities to undertake a strategic review of the role, purpose and direction of the Federation. The day was organised by Ray Ellard and the workshop review facilitated by Jim Cumiskey. The day was extremely successful and highlighted many issues. The Secretary who is now seeking nominations form the Regional Groups onto the Strategic Working Committee has now received the report on the day's proceedings. The resultant agreed documents will be the blue print of Federation activity over the coming years and every member is encouraged to continue to contribute positively to the development of the strategy over the coming months.

This year we witnessed a number of changes to the Board of IFEH. After ten (two as President and eight as Secretary) years dedicated service to the Federation Michael Halls finally locked away his pen and paper and stepped down as Honorary Secretary. Mike's dedication, enthusiasm and wholehearted commitment to the development of Federation were unstinting. On behalf of the member organisations and the Board we wish him a long and healthy retirement.

Raymond Ellard representing the Environmental Health Officers Association (EHOA) of Ireland was elected at the Council meeting in Dublin in June to the position of Honorary Secretary. Ray is a longstanding EHOA delegate to IFEH and will no doubt bring his unique style to his new position. The new President Elect, Bernard Forteath, representing the Royal Environmental Health Institute of Scotland, formally took up his position on the Board in June. Also Stephen Cooper, representing the Chartered Institute of Environmental Health was re-elected as Honorary Treasurer. We look forward to working with all the officers and members of the Federation over the next two years.

Bernard J Forteath

President Elect of the International Federation of Environmental Health

Senior Vice President of The Royal Environmental Health Institute of Scotland

Bernard entered the environmental health profession as a student in 1965. He qualified in 1969 and worked in a number of local authorities in Scotland before becoming Director of Environmental Health with Renfrew District Council in 1978. Subsequently he became Director of Environmental Services with Renfrewshire Council, where he was responsible for environmental health, trading standards, waste management, parks and recreation, and catering and cleaning in all Council owned properties. He took early retirement earlier this year having completed over 40 years service in local government, 28 years of which as the Director.

Bernard has been involved in the Institute and its predecessor organisations for over 40 years. Prior to the merger in 1983 of two organisations to form what is now the Royal Environmental Health Institute of Scotland, he held various positions in the Scottish Institute of Environmental Health, principally as President in 1980.

He served as Honorary Secretary of the Institute in its early days and was elected President in 1988. He was heavily involved in the preparatory work leading to the Institute being awarded a Royal Charter and Chartered status for its Environmental Health Officer members. In November he began a second term as President of REHIS, only the third person to do so.

Bernard's involvement with the Federation goes back to 1982 when the late Eric Foskett invited him and Mike Halls to lunch, to discuss the possibility of setting up an International Federation. He remembers that first meeting well, particularly Eric's boundless energy, enthusiasm and vision. That was the start of his involvement with the Federation and he has been one of the Institute's representatives on the Federation Council for many years. When the Regional Groups were first formed he was Secretary of the Euro-Cypria Group and held that position until it merged with the Nordic group to form what became the Europe Group, now the European Federation of Environmental Health.

He is an enthusiastic supporter of the IFEH and he is looking forward, over the next few years, to working closely with members of the Council to increase the membership of the Federation in particular from Third World countries, and to expand and improve the influence that the Federation could have on environment and health throughout the world.

The Eric Foskett Award to Kia Regner

Ms Kia Regner, Sweden was presented with the Eric Foskett Award by President Jerry Chaka at the Congress Dinner held at University of Dublin during the World Congress in June 2006.

The recipient of the Eric Foskett Award, which is named after the founder of the IFEH (omit and the award), must have made a notable contribution to the work of the International Federation of Environmental Health by helping it to fulfil its aims and objectives.

Driving force in supporting IFEH

Kia Regner has been a driving force in promoting international environmental health co-operation, and in supporting IFEH as a worldwide network for environmental health professionals, both nationally and internationally, indeed even before IFEH was inaugurated (omit full stop and replace with comma) Nordic co-operation laid a foundation to future IFEH development. Kia was also the first female president of the IFEH elected at the IFEH World Congress in Stockholm in 1998 for which organization and success she carried a major responsibility.

Holistic approach

That IFEH should be appreciated as an active, transparent and open organisation for member organisations from countries all over the world has always been in her focus. The connection between environmental problems and their impact on health, and indeed public health, is all too often neglected. Kia has always adopted a holistic approach to issues of environment & health and has tried to ensure that the different professions involved are recognised as essential for being successful in preventing or handling environmental health effects. Kia's efforts in bringing environmental health into different national and international contexts have been extensive and a lot of her private life has been dedicated to this task.

Environmental health competence vital

As honorary officer or advisor in different organisations, for instance IMPEL and EEHC she always takes the opportunity to promote both the importance of qualified environmental health professionals and of IFEH as an organisation, having regard to its motto "Caring for the environment in the interest of world health".

Kia Regner is the Honorary Public Relations Officer (PRO) of IFEH, and the international representative of Yrkeforeningen Miljo Och Halsa (YMH), the Swedish Association of Environmental Health Professionals (SEAHP) for which she was chairperson between 1982 and 2002.

Assessment of Water Quality Parameters for Motshane River, Ngweny Industrial Site in Swaziland

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ABSTRACT

The study involved determining the current water quality characteristics of Motshane River, which runs through the Ngwenya Industrial Site. The research was experimental in design and qualitative methods of analysis were used. Data was collected through sampling several sites of Motshane River and samples were analyzed at the Ministry of Natural Resources & Energy Water Laboratory. The analyses for all parameters were done using the "Standard Methods for the Examination of Water and Wastewater" (19th Edition, American Public Health Association, Washington).

The results obtained showed that generally, Motshane River water characteristics were within an environmentally acceptable range, with only alkalinity exceeding the stipulated levels by only a few units. These excessive levels were however attributed to agricultural activities that were taking place along the river course.

Hence the study has created a reference information database that will be used in future monitoring. This will enable early and easy detection of industrial pollutants and prompt action towards polluters.

INTRODUCTION.

Water – A finite resource

Water quality management is multidimensional. It embraces planning, design, construction, operation and maintenance. It must also be conducted within the constraints of technology, social goals, laws and regulations, political viewpoints, environmental concerns and economic realities. In concept, water quality management is simple, the trouble is that the boundaries of the physical systems that must be dealt with often differ markedly from the political boundaries that affect how water is used and developed. Furthermore, many historical, social, legal and organizational factors have been narrowly focused and constrain, if not preclude, good water quality management (Viessman and Hammer, 1998).

Water is a finite resource and it is very important for the present generation to use it sustainably. Water is part of or rather has a direct link with the ecosystem. Water forms the base of all natural environmental processes; hence an effect on the water quality will have a proportionate impact to the ecosystem. Water is a moving body of matter; hence not only the surrounding environment will be affected, but even downstream, miles away from the source of impact (www.bcn.boulder.co.us, 2005)

According to Manahan (2000), anthropogenic processes are the major culprits when it comes to water pollution. Humans are unable to use water and discard it back to the environment the way it was or even in a better status. Manahan (2000), further states that some of these pollution impacts even affect other human water users on the other end, and at times this may lead to increased mortality rates. It is therefore important to give more attention to preventive rather than remedial approaches to solving water problems. In the long run, considerable cost saving and reduction in environmental degradation can be expected.

OBJECTIVES

Broad Objective

To develop an information database for water quality parameters of Motshane River for creating a reference point to safeguard the river from pollution by influx of industries in Ngwenya.

Specific Objectives

To assess water quality and come up with a database which will act as resource information for future analyses.

To provide information which would help in developing early monitoring strategies for industrial influx in Ngwenya, which may present pollution threat to the river.

To evaluate the current water quality status of the river, and hence identify crucial points where the river may need environmental attention.

To recommend ways to safeguard the river from pollution by influx of industries.

Problem Statement and Justification

Ngwenya is a small but one of the fast developing towns in Swaziland, and hence it has attracted industries, most of which are under construction. Industrial operations vary in nature, from those which are simple, have non-hazardous discharges, which might not have a significant impact to the environment, up to those with complex operations which yield discharges of hazardous waste which in turn tend to be a threat to the environment (www.clarkwater.com 2005). Rivers normally are the most affected by these impacts of pollution of all the ecosystem's constituents. This is made worse by the fact that rivers are able to transport the waste from the source of discharge, far downstream where actual impacts may then take place (Viessman and Hammer, 1998).

Hence this study will help in providing a database of those significant water quality characteristics so that as the industries start operating, these characteristics can be re-assessed to find out if the industrial influx affected the values from their original levels. In the past, the water quality of surrounding water bodies in industrial sites had not been assessed before the industries started operating. This has caused a problem whereby the local environmental authority has not been able to have a database at hand which they would have used to compare current water quality and water quality before industries started operating. The study focuses on the Ngwenya industrial site, where most industries are currently under construction and quite a lot more will follow soon or later. The industries including textile and clothing manufacture and motor vehicle engineering will operate in the Ngwenya Industrial Site.

Literature review

Industrial influx is one of the major indicators of development in a country, and this is the same for Swaziland, whereby the country is at a process of industrialization. The Matsapha Industrial Site is the biggest and the oldest, whilst the Nhlangano and Ngwenya Industrial Sites are still under development.

Most development strategies come with both (omit their) pros and cons. Much as we would like to see our small country developing in terms of industrialization, at the same time we should consider in depth the impacts to the environment which are brought about by the industrial operations.

Most of these impacts are long-term and some may even be irreversible. It is therefore of great concern that (omit we do) every available measure is used to ensure that there are no such impacts to our environment, or at least they are reduced to a safe insignificant level (www.ems.psu.edu 2004).

According to the Swaziland Investment Promotion Authority website (2004) industries which had been confirmed that they will soon be operating in Ngwenya include textile and clothing industries and motor vehicle engineering plants. Both these types of industries produce quite a reasonable and significant amount of effluent. This study focuses in particular on discharges of the effluent to Motshane River.

Industrial Waste Volumes and Water Quality

Throughout history, the quality of drinking water has been a factor in determining human welfare (Manahan, 2000). Faecal pollution of drinking water has frequently caused waterborne diseases that have decimated the populations of whole cities. Although there are still occasional epidemics of bacterial and viral diseases caused by infectious agents carried in drinking water, waterborne diseases have in general been well controlled. Currently, waterborne toxic chemicals pose the greatest threat to the safety of water sources especially in industrialized nations (*www.h2ou.com/h2wtrqual.htm*, 2005)

Industrial waste volumes are highly variable in both quantity and quality, depending principally on the product produced (Viessman and Hammer, 1998). Since very little water is consumed in industrial processing, large volumes are often returned as waste water (effluent). This wastewater may include toxic metals, chemicals, organic materials, biological contaminants and radioactive materials.

Viessman and Hammer further state that industrial effluent has a great impact to the receiving water body, especially if discharged without any internal treatment from the discharging plant.

Water Uses and Water quality

Water quality can be defined in many aspects and it is important that its definition be understood. Water quality is the ability of a water body to support all appropriate beneficial uses. (www.crcwater.orgl - 2004)

Beneficial uses are the ways in which water is used by humans and wildlife; drinking water and fish habitat are two examples. If water supports a beneficial use, water quality is said to be good or unimpaired. If water does not support a beneficial use, water quality is said to be poor or impaired.

A key concept is that different beneficial uses have different needs. Most people believe good water quality means the water is pure and clean. This is partly true, especially when water is to be used for drinking. However, fish and wildlife have lots of other requirements. Fish must get all of their oxygen and food from water, and therefore need water that has enough oxygen and nutrients. Thus, good water quality implies that harmful substances (pollutants) are absent from the water, and needed substances (oxygen, nutrients) are present (*U.S. Environmental Protection Agency*, 1996).

Measures of water quality

After defining and understanding concepts of quality, there is then a need to move in-depth with quality by describing water quality parameters which are good monitoring tools when describing the water quality of a river, stream, or lake. Parameters that are measured for the basic routine monitoring are physical, chemical, and biologic properties. However, this study focuses on the physical and chemical properties of the water. The parameters of concern will be selected from the list and are those which shall have a relation or bearing to industrial wastes effluents.

Physical Measurements

Physical measurements include water temperature, depth, flow velocity, flow rate, and turbidity. These are all useful in analyzing how pollutants are transported and mixed in the water environment, and can be related to habitat requirements for fish and other aquatic wildlife. For instance, many fish have very specific temperature requirements, and cannot tolerate water that is either too cold or too hot (Carol, 1993).

Chemical Measurements

Chemical measurements include a wide range of chemicals and chemical properties. Most water chemistry tests measure concentration, defined as milligrams of chemical per liter of water (mg/l) (Viessman and Hammer, 1998).

Even the purest water contains countless chemicals, and it would be impossible to measure all of them. Water quality studies therefore focus on the chemicals that are most important for the problem at hand. In agricultural areas, studies measure chemicals found in manure, fertilizers, and pesticides. In an industrial area studies focus on measuring chemicals used by the nearby industries (Canter, 1995).

Water quality parameters

Below is the list of parameters which had been identified to have a direct link with industrial effluent, and each one of them is described in depth. These parameters are the ones which will be analyzed for in the samples. Many parameters would have been considered but these have a great role in supporting the surrounding ecosystem:

1. Temperature- Temperature is an important parameter in its affect on the solubility of oxygen in water, the rate of photosynthesis by algae and higher plants, the metabolic rates of aquatic organisms, and the sensitivity of organisms to toxic wastes, parasites, and diseases. To perform the test the temperature is taken at the testing point and then another temperature reading is taken one mile upstream. The test result is the difference in those two readings, the least difference having the highest quality rating. Significant increases in water temperature caused by industrial discharges of warm water, or by reduction of water flow where dams are operating, or soil erosion may eliminate cold-water aquatic species and increase large aquatic plant growth.

2. Total Dissolved Solids (TDS)- Rivers have solid particles in them called dissolved and suspended solids. The total dissolved solids test measures the amount of particles that are dissolved in the river water. The TDS ranges from 20 to 2,000 mg/L in rivers and may be higher in groundwater. High levels in drinking water may cause objectionable tastes and have laxative effects. Water is tested for TDS because excessive amounts may be unsuitable for aquatic river life and poor for crop irrigation, in addition to being unsuited for drinking water. It may cause foaming or may corrode some metals. The quantity of TDS in a body of water depends on several factors, including: the precipitation contributing to the body of water (Rainwater is almost pure with less than 10 ppm TDS.), the type of soil and rock the water passes over, and human activities. The major dissolved substances found in water that can cause the above problems are the positively charged ions of sodium, calcium, magnesium, potassium and iron and the negatively charged ions of chloride, bicarbonate, carbonate and sulfate.

3. Turbidity- Turbidity is the measurement of lack of water clarity. Turbidity is the result of suspended solids in the water. Suspended solids are variable, ranging from clay, silt, and plankton, to industrial wastes and sewage. A rough measure of turbidity can be made with a Secchi Disk, but more accurate measurements need to be taken with a turbidimeter. Turbidity is measured in NTUs, the abbreviation for nephelometric turbidity unit. A normal range for turbidity in river water has not been established. Turbidity in drinking water should be less than one NTU. Water treatment is required for drinking water when there is excessive turbidity. High turbidity water will appear to be murky or muddy. Turbidity in excess of five NTUs can be easily detected. Turbidity at that level may not affect health, but water treatment may be desirable. Excessive turbidity may interfere with disinfection processes and is measured by municipalities to monitor the efficiency of public water supply filtration systems used to remove parasites and viruses in water.

4. Alkalinity- Alkalinity is a measure of the quantity of compounds that shift the pH to the alkaline side of neutrality (above 7) or it is a measure of the capacity of water to neutralize acids. The pH of a normal stream usually falls between 6.5 and 8.5. In the carbonate-bearing rock of Monroe County, most alkalinity is due to the presence of the bicarbonate ion which is derived from the dissolution of carbonates by carbonic acid. Minor contributors to alkalinity in the county include carbonate and hydroxide ions. Alkalinity is important because it buffers pH changes that occur naturally during photosynthetic cycles, water exchanges and the addition of acids to water. Raising the alkalinity almost always raises the pH. Alkalinity is measured in parts per million (ppm) or milligrams per liter (mg/L). If the alkalinity of water is too high, the water can be cloudy, which inhibits the growth of underwater plants. Too high alkalinity raises the pH level, which in turn harms or kills fish and other river organisms.

5. pH- pH is a general measure of the acidity or alkalinity of a water sample. The symbol pH stands for potential for hydrogen. The pH of water, on a scale of 0 to 14, is a measure of the hydrogen ion concentration. Water contains both H ions and OH ions. Pure distilled water contains equal number of H and OH ions and is considered neutral (pH 7), neither basic or acidic. If water contains more H than OH ions the water is considered acidic with a pH less than 7. If water contains more OH ions than H ions, the water is considered basic with a pH greater than 7. The USEPA standard range is 6.5 to 8.5. Stream water usually ranges from pH 6.5 (slightly acidic) to a pH of 8.5, an optimal range for most organisms. Rain water by contrast is naturally acidic at about 5.6. The pH of a stream affects the organisms living there as can be seen from the scale below.

6. Electrical Conductivity - Conductivity is the ability of the water to conduct an electrical current, and is an indirect measure of the ion concentration. The more ions present, the more electricity can be conducted by the water. In many cases, there is a good correlation between electrical conductivity and the Sodium Chloride concentration in water This measurement is expressed in microsiemens per centimeter (uS/cm) at 25 degrees Celsius.

7. Chemical Oxygen Demand – this water quality parameter is a measure of the oxygen equivalent of the organic matter susceptible to oxidation by a strong chemical oxidant in water. The organic matter destroyed by the mixture of chromic and sulfuric acids is converted to carbon dioxide and water. Often termed COD, this parameter is expressed in MgO2/l and it is of paramount importance in water quality since if chemicals are present in excess in water, less oxygen will be available with time for marine life such as fish and aquatic plants.

2.6 Water quality standards
Below are the current standards of water quality parameters as used by the Swaziland Water Services Corporation (SWSC) and as defined by the Swaziland Water Act, 2003.

TABLE 1. Standards for drinking water quality

Determinant	Unit	SWSC Guide Level
Alkalinity (CaCO3)	mg/L	< 500
Chemical Oxygen Demand	mgO2/L	< 1800
Conductivity	uS/cm	< 7
Total dissolved solids	mg/L	< 1000
pH	pH Unit	6.5 - 8.5
Temperature	^{0}C	12.0 - 25.0
Turbidity	NTU	< 1 (only for treated water)

According to Nkambule (2004), the Swaziland Water Quality Standards although stating some of the values as WHO guidelines are essentially a legal document defining maximum admissible concentration (MAC) so that action can be taken against users or suppliers who do not conform with those standards,this is to achieve sensible equal water qualities and obligations throughout Swaziland.

Methodology

3.1 Location and background information
Ngwenya is one of the smallest but developing towns in Swaziland. Geographically, it is located in the highveld of Swaziland, about 15 kilometers from the capital city, Mbabane. It is also one of the major tourist attraction places since it comprises the Ngwenya Border Post, which connects to the Republic of South Africa. Ngwenya used to have an iron ore mine and it was one of the largest mines in the country but the mine was closed due to depletion of the mineral.

5 km from the border post on the way to Mbabane, there is the Ngwenya Industrial Sites on the right hand side, approximately a kilometer from the main highway. The industrial site has been sited at a stretch alongside a stream, which joins another small tributary from Ngwenya Village, before joining the Motshane River. Motshane River flows from Mbuluzi falls and pass the Ngwenya – Mbabane Highway at the junction road to Pigg's Peak. It flows behind Ngwenya Village, alongside a small hill before being joined by the stream from the industrial area.

Between the Industrial Sites and Ngwenya Village, the place is swampy, showing that it contains a lot of ground water which probably contribute to the catchment of the two small streams. The area is also characterized by diverse species of grasses, shrubs, aquatic plants water fleas, amphibians etc.
Adjacent the industrial area and across the stream are a group of homesteads. These homesteads use the water from the small stream for domestic purposes such as washing, drinking, cooking etc.

Description of study area
The research project was conducted at the Ngwenya Industrial Sites where Motshane River runs adjacent to the site. However there are some tributaries which run through the industrial site to later on join Motshane River, hence they bring with them all their distinct water qualities (Conto et al, 1996**).** Sampling points were identified at strategic points along the river course through physical inspection of Motshane

River and all the pertained tributaries, and also with consideration to different activities taking place in the surrounding area.

Sampling

Sampling entails selection and collection of a good representative sample of the subject being assessed. It is therefore very important that the best procedures are followed when carrying out sampling to ensure that the selection, collection, transportation, storage and analysis of the sample do not alter the true results of the selected parameters.

Research Design

The research design for this research is a purely experimental design. It entails identification of parameters, which was done by filtering out from the main list of parameters those which had a great bearing to industrial operations. It also entails collection of representative samples for those parameters and laboratory analysis for values of the stated parameters. Findings will be based upon the laboratory analysis (experiments) of the samples.

Sampling methods

1 liter plastic bottles were used for sample collection. Before that they were washed and rinsed with nitric acid and di-ionised water. This procedure was done to eliminate any concealed pollutants which might have affected the quality of the sample.

Sample Collection, Handling and Transportation

When collecting the sample it is necessary to ensure that there is no contamination of the sample resulting from hand contact with the inner sample container or from external interferences such as dust etc. Sample bottles were sealed immediately after sample collection. As suggested in the Swaziland Water Services Quality Inspection Manual (2003), samples were immediately taken to the laboratory for analysis within eight hours of collection. On arrival at the laboratory, they were analyzed on the same day. In extreme cases, samples may be stored in a refrigerator overnight at a temperature of 4ºC and analyzed the following day, first allowing the sample to reach room temperature. Sampling bottles for COD were rinsed with Elga since these samples were highly qualitative. Samples were labeled according to site, date of collection, weather conditions, etc.

Sampling points

Sampling points for the specified parameters were as identified on the map (Fig. 3.1). Seven sampling points were identified and this was done through a physical inspection of the tributaries and the main river to identify points which can be ideal for sampling. Below is the rationale for the sampling points selected:

TABLE 2. Selection of Sampling Points

Name of Sampling Point	Description of Sampling Point
Point 1	This is the source of a tributary (S1) which pass just through the industrial area. This was chosen as a control point for the tributary.
Point 2	This point is the source of a tributary (S2) which runs downside Ngwenya Village to join S1. It was also used as a control point for this tributary.
Point 3	This is where the two streams (S1 & S2) meet before flowing down as one tributary (S3) to join Motshane River. This site was sampled to determine joint water quality for both tributaries.
Point 4	This was the point just before the tributary (S3) joined Motshane River. Water quality might have changed from Point 3 due to the farming activities taking place between point 4 and point 3, hence sampling at this point was considered essential.
Point 5	This is where Motshane River crosses the Ngwenya – Mbabane Highway (at the bridge). This point was used as a control point because water from this point was not mixed with any effluents as it originates from Mbuluzi Falls.
Point 6	This point is just before Motshane River is joined by the tributary (S3). Water quality might not be the same as in point 5, (Control Point under the bridge) hence there was a need to sample before Motshane River is joined by the tributary.
Point 7	About 5 KM from where the tributary (S3) joins Motshane River. This point was used as a recovery sampling point. Sampling at this point was done because of the consideration that the river would have effectively mixed well with any pollutants from upstream.(Carol, 1993)

Sampling time and periods
The identified sampling points were sampled once a week for a period of four weeks, with each sampling session done every Friday. The sampling time was between 12 and 2 pm and this time was selected since it was possible to maintain it throughout the sampling period. Two samples were collected from each sampling point and this was done in case there were errors or mistakes in analysis in the laboratory. Hence each sample had a duplicate sample. Also, increasing the number of samples increase the accuracy of results, hence the repeated sampling. (Canter, 1995)

Laboratory Analysis
Physical parameters such as pH, and Temperature were analyzed on site and this was done because of the convenience offered by the sampling instruments for these parameters which were handy and can be carried on site. Chemical parameters and the rest of the physical parameters were analyzed at The Ministry of Energy and Natural Resources Laboratory. The analysis for all parameters was done using the "Standard Methods for the Examination of Water and Wastewater" (19th Edition, American Public Health Association, Washington).
Analysis was made for the following parameters and their methods of analysis are stated:

Table 3. METHODS FOR PHYSICAL ANALYSIS

PARAMETERS	UNITS	ANALYSIS METHOD
pH	pH Units	pH Meter (Model phm 62)
Temperature	^{o}C	Thermometer
Turbidity	NTU	Turbidity Meter Model 2100A)
Electrical Conductivity	Us/cm	Conductivity Meter (Model 163)

Source 1: Swaziland Water Services Laboratory Manual, 2003
Standard Methods for the examination of water and wastewater (APHA, 19th Ed. Washington.

Table 4. METHODS FOR CHEMICAL ANALYSIS

PARAMETERS	UNITS	ANALYSIS METHOD
Chemical Oxygen Demand	Mg/l	Spectrophotometer @ 620nm
Alkalinity	Mg/l	Titration
Total Dissolved Solids	Mg/l	Conductivity Meter (Model 163)

Source 1: Swaziland Water Services Laboratory Manual, 2003
2. Standard Methods for the examination of water and wastewater (APHA, 19th Ed. Washington.

Results and Discussion
This chapter focuses on presentation of both the Physical and Chemical water quality parameters analyzed in the assessment of the Motshane River water quality.

The overall presentation of the results showed that most of the sampled parameters were within range of the water guidelines which are stipulated in the Swaziland Water Act (2003). Only Alkalinity values were above the maximum limits. The alkalinity limit was exceeded only by 7.5 mg/L which is a fairly small deviation from the set standard of 500 mg/L. Nevertheless it should be noted that Alkalinity is not a pollutant, but a total measure of the substances in water that have "acid-neutralizing" ability. The main sources of natural alkalinity are rocks, which contain carbonate, bicarbonate, and hydroxide compounds. Borates, silicates, and phosphates may also contribute to alkalinity (www.h2ou.com/h2wtrqual.htm, 2005).

Hence the results showed that the overall quality of Motshane River is within a recommended water quality range, hence by the time the Ngwenya Industrial Sites commence operation, this study would have established both warning and action limits for both the industries and pertained authority over the industrial operations which is the Swaziland Investment Promotion Authority (SIPA)

TABLE 5. AVERAGE VALUES FOR ALL PARAMETERS OVER FOUR WEEK SAMPLING

PARAMETERS	SAMPLING SITES						
	1	2	3	4	5	6	7
pH	7.2	7.08	7.08	7.3	7.1	7.18	7.18
Temperature	23.25	21.75	22.5	23.5	20.5	21.25	21.25
Turbidity	11.25	13.5	19.75	12	19	21.5	22.75
Electrical Conductivity	83.5	171.75	134.5	151	98.75	95.5	94.75
Alkalinity	184.75	507.5	393.5	483.75	307.5	280.5	304.12
COD	4.567	4.535	4.677	5.395	1.305	2.692	1.885
Total Dissolved Solids	34.5	76	80.25	75.25	53.25	39.25	48.75

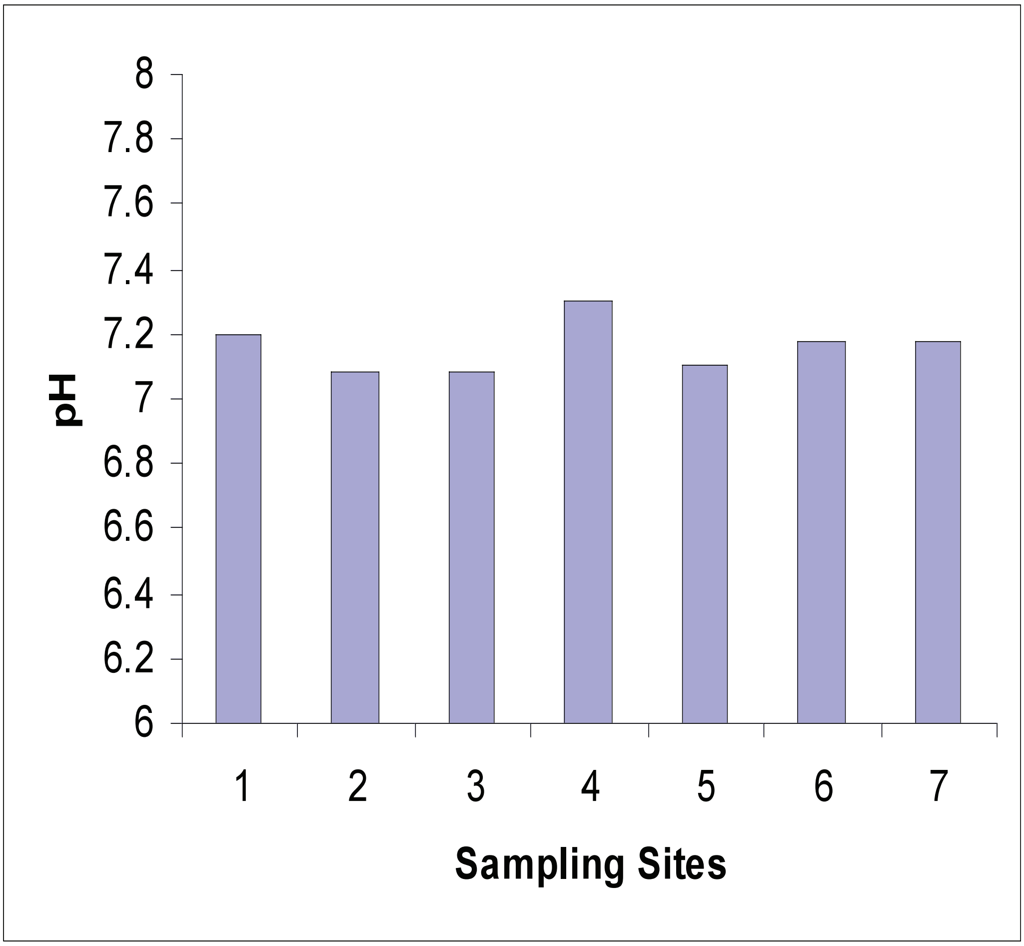


FIG.4.1. COMPARISON OF pH MEAN VALUES

Fig. 4.1 above shows the presentation of the mean pH values for all the sampled seven sites. The graph shows that the maximum pH was 7.3 from site 4 whilst the minimum pH was 7.1 from sampling sites 2 and 3. These pH values were within a constant range in all the sampling sites and this was expected since there were no intense activities along the river which would have contributed to major pH changes. According to Carol, 1993, pH is a basic water quality parameter of importance to virtually all biological and chemical processes hence it is important that its values are always within range.

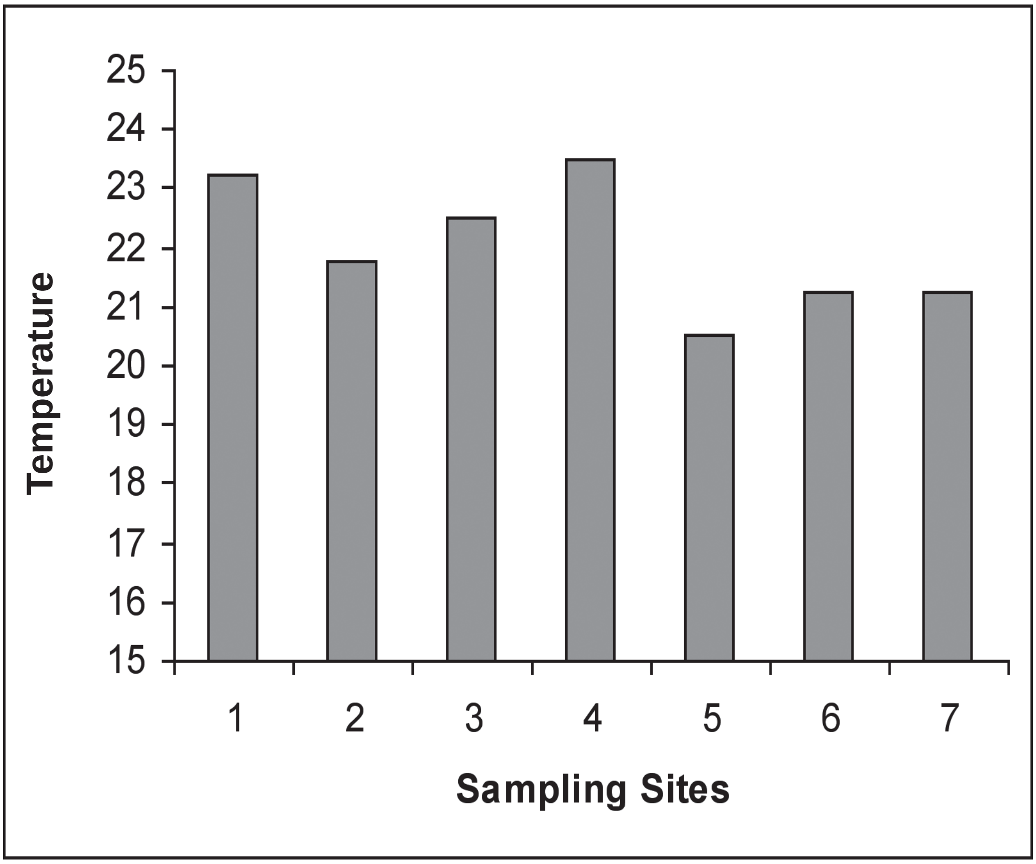


FIG.4.2 COMPARISON OF TEMPERATURE MEAN VALUES

FIG.4.2 shows the comparison of average temperatures which were taken from the sampling points over the four week period. The maximum temperature was 23.5ºC from site 4 whilst site 5 had the lowest temperature which was 20.5ºC. These temperature values were within the water quality standard values stipulated in the Swaziland Water Act (2003). The lower temperature from site 5 was probably attributed to the fact that at this sampling point, the river was narrow and deep, hence absorption of solar energy was not spread throughout the depth of the river, as compared to site 4 which was shallow and wider, hence enabling more heat spread to increase the temperature. (*www.h2ou.com/h2wtrqual.htm, 2005)*

FIG.4.3 COMPARISON OF TURBIDITY MEAN VALUES

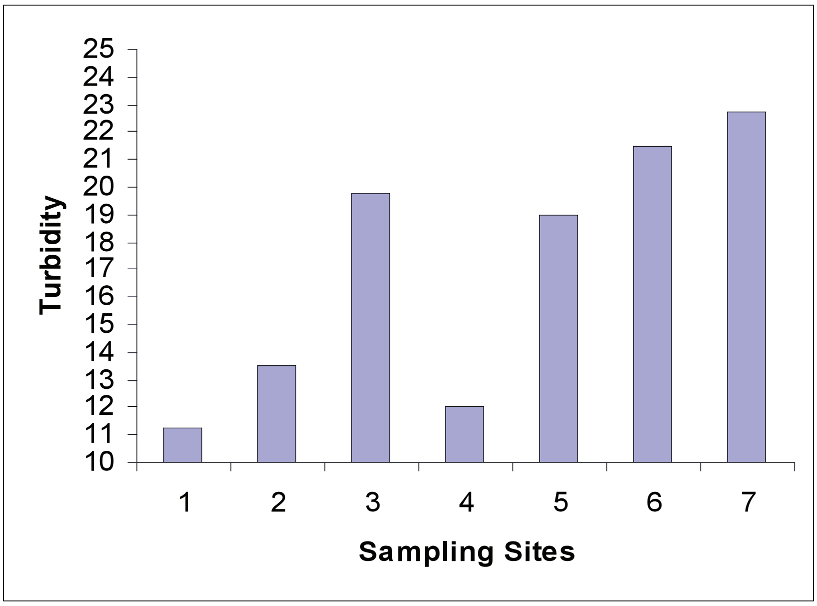


FIG.4.3 left indicates that the recovery point has the highest turbidity of 22.75 whilst 11.25 was the lowest turbidity from site 1. It is worth noting that the turbidity increased as one moved from point 5, (the reference point under the bridge) along the Motshane River up to point 7 (the recovery point). This was attributed to the variation of soil structure along the river banks as one moved down the river. Around point 5, the surrounding area was mostly composed of vegetation, hence less turbidity was contributed to the main river, but between point 6 and the recovery point, the surrounding soil structure changed to soft easily erodable particles, which increased turbidity as one moved down the river (Canter 1996).

FIG.4.4 COMPARISON OF ELECTRICAL CONDUCTIVITY MEAN VALUES

The graph rught shows that the electrical conductivity values ranged between 83.5 and 171.75 *U*s/cm. Site 2 which is the reference point for tributary S2 had the largest capability for transferring or carrying metal ions whilst site 1 had the least capacity for carrying metal ions. By the time the recovery point was sampled, the electrical conductivity had reached a level of 94.75 *U*s/cm. This parameter was important since it measured the total ions present in the water and hence its levels work in correlation with the Sodium Chloride concentrations in water. The Water Guidelines from the Swaziland Water Act, 2003 show that conductivity values should be below 1800 and hence these values were within the stated range.

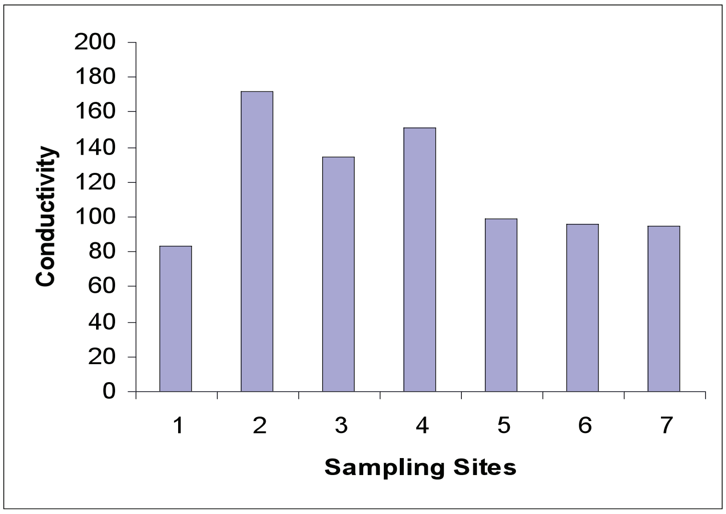


FIG.4.5 COMPARISON OF ALKALINITY MEAN VALUES

Fig.4.5 right shows that the alkalinity for site 2 was the highest and it had exceeded the maximum limit of 500mg/L stipulated in the drinking water quality guidelines from the Swaziland Water Act, 2003. The minimum alkalinity was 184.75 from site 1. As stated in the literature review, alkalinity represents the buffering capacity of the water with respect to acids and hydroxides additions. Alkalinity is important for fish and aquatic life because it protects or buffers against pH changes (keeps the pH fairly constant) and makes water less vulnerable to acid rain (www.h2ou.com/h2wtrqual.htm, 2005). The excess alkalinity values were probably as a result of the vast agricultural activities taking place along the river course. However it is also worth noting that by the time the water reached the recovery point (site 7), the water had mixed well to produce a within range alkalinity value of 304.125 mg/L

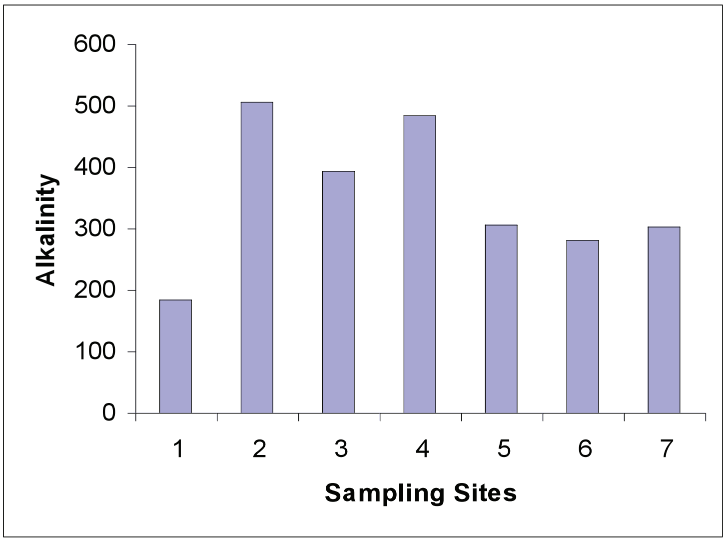


FIG.4.6 COMPARISON OF C.O.D MEAN VALUES

The Swaziland Water Act, 2003 water guidelines state that levels of chemical oxygen demand shall not exceed 10 mgO_2/L. from the above figure, this means that the chemical oxygen demand for Motshane river was still within range since the maximum value was 5.395 mgO_2/L from site 4 whilst the minimum value was obtained as 1.305 mgO_2/L from site 5. COD is a very sensitive measure since it determines the measure of the oxygen equivalent of the organic matter susceptible to oxidation by a strong chemical oxidant. This is important to (omit both) aquatic animals since they require adequate oxygen to successfully carry out their perspective life cycles such as reproduction.

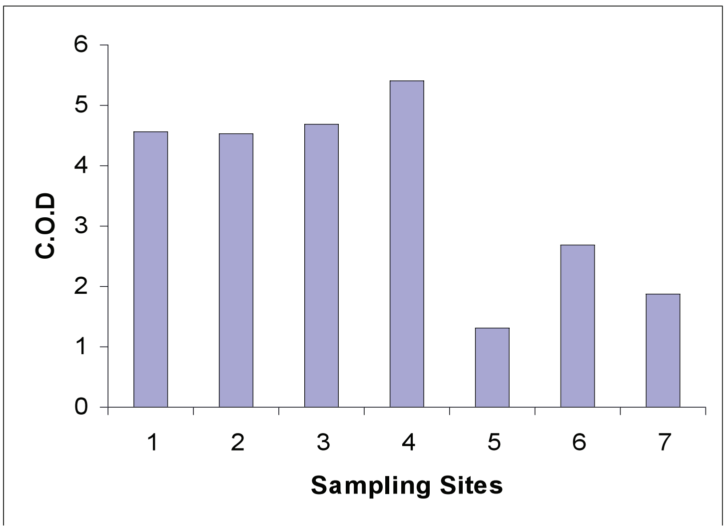


FIG.4.7 COMPARISON OF T.D.S MEAN VALUES

The Swaziland Water Act, 2003 requires total dissolved solids to be less than 1000 mg/L and from fig4.7 above, it was appreciable that the maximum TDS value was 80.25mg/L from site 3, with the minimum value being 34.5 from site 1. Though TDS can considerably increase during floods, the values from fig 4.7 show that even then, with only natural processes taking place along the river the values do not have a potential of exceeding the stated limit of 1000 mg/L.

Conclusion and Recommendations

The results showed that the overall water quality for Motshane River was within an acceptable range. This study has then created the necessary water quality reference database which was the main objective of the study. It is then upon the responsible local authority to implement measures which should safeguard Motshane River against industrial pollutants from the established industrial sites. River water quality deserves attention because of its implications for affecting the public health, the economy and the quality of ecosystems. This study was also able to meet the main objective which to develop a database for water quality of Motshane River for creating a reference point to safeguard the river from pollution by influx from industries in the area. In addition, the research also identified those parameters which are out of limits, evaluated the current water quality status and also recommended measures to safeguard Motshane river against industrial pollution.

Recommendations

Below is a list of recommendations which has been developed based on the research findings about the water quality characteristics of Motshane River:

The Swaziland Investment Promotion Authority (SIPA) should make these research findings known to all the industries at Ngwenya industrial sites before they start operating. This will work as the first monitoring step since polluters will have no excuse of not knowing the current water quality.

The Swaziland Environment Authority should on top of the above recommendations furnish all industries with copies of the reviewed Swaziland Water Act (2003), which stipulates guidelines and standards for industrial discharge into receiving waters. This is the second step which can help in furnishing information such as water guidelines and standards to industrial investors, who in most cases shift the blame to not knowing local standards and guidelines pertaining industrial discharge into water bodies.

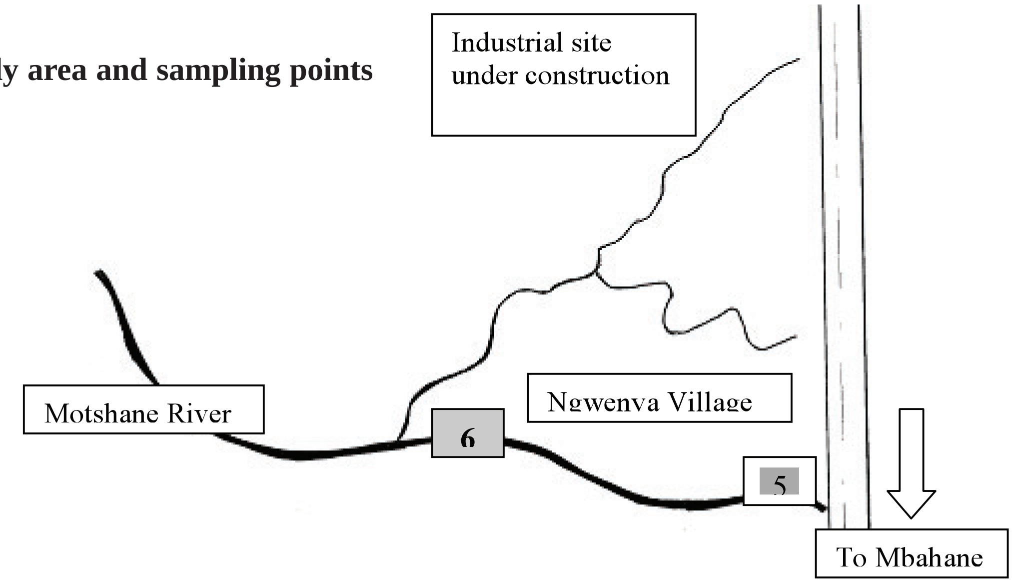
The local Environmental authority should also come up with a very compressive monitoring programme which should focus on preventing hazardous discharges into water bodies, in this case Motshane River. Monitoring programmes should encompass less on action after impact, but instead should have warning and action indicators in time.

The local water authority should shift from the ‘polluter pays’ approach and instead use more stringent measures like not renewing contracts for industries which pollute local rivers.

The Ministry of Enterprise and Employment should ensure that the local environmental authority embarks on intensive environmental impact assessment programmes before bringing in industrial investors. Those industries posing a threat to the environment should be turned away rather than compromising the environment.

The Swaziland government and the appropriate Ministry should facilitate a speedy formation of the water affairs department since the above recommendations can be effected more easily and faster with such a body in place.

Fig 3.2
A site map for study area and sampling points



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CIEH Campaign for a Smoking Ban in England and Wales

Ian Gray is a policy officer at the Chartered Institute of Environmental Health (CIEH). He has campaigned for a smoking ban in the workplace. In this article, Ian looks back on 20 years of campaigning for a ban on smoking in public places as the environmental health profession looks forward to their annual conference in September, where the practicalities of enforcing the regulations will be high on the agenda

1986

It all started 20 years ago in the pages of the Environmental Health magazine. The cover of the January 1986 issue of the institute magazine, Environmental Health, showed a woman smoking next to a man wearing breathing apparatus. It was the first time that passive smoking had been reported in a professional magazine and it was to herald a campaign that culminated with the surprise Valentine's Day (14/2/06) vote in Parliament this year in which MPs supported a ban on smoking in public places by 384 votes to 184.

Mike Squirrell, the senior scientific officer for Leeds City Council, first alerted the profession to the presence of about 3,000 different chemicals in cigarette smoke that placed the passive smoker at risk from cancer and heart disease. His article condemned smoking in public places, saying that it was an environmental hazard that should be no more acceptable than a spittoon or an open sewer. But it would take a lot more persuasion, hard graft and campaigning before the public health community won the argument against the hospitality industry and the tobacco companies, both fearful of lost earnings.

By describing environmental tobacco smoke as an indoor air pollutant from the start, the environmental health profession sowed the seeds for the ban. But at this early stage an outright ban in public places seemed too ambitious. Legislation requiring ventilation and designated smoking areas were the most anyone then hoped to achieve.

All campaigns take time for opinion to coalesce around a cause and the public places smoking ban was no exception. It would take another five years before the debate over the need for a smoking ban was to take another step forward.

1988

A report by the consumer magazine "Which" finds that no-smoking rooms top the list of changes that people would most like to see in public houses. It beats the introduction of longer and more flexible opening hours.

1991

The campaign is given a fillip as the cancer charities weigh in, providing evidence for the first time of a direct link between passive tobacco smoke and cancer. With their endorsement the CIEH (then the IEHO) and Action on Smoking and Health (ASH) are able to shift up a gear. David Pollock, director of Ash, and IEHO president John Tiffney declare the debate is moving from whether passive tobacco smoke is harmful to how to protect the non-smoker.

In a joint statement the IEHO and Ash put local authorities at the heart of the debate by calling on them to provide information for workers, members of the public and employers and providers of public services about the dangers of passive smoking.

In the same year a joint document is published by Ash and the IEHO providing local authorities with a checklist for reducing passive smoking. Protecting the health of children proves an unambiguous objective. Schools are asked to become smoke-free within the year while Councils are asked to ban smoking in all of their sports halls, youth clubs and community centres. In fact bans are to be implemented in all areas controlled by local authorities where children are likely to be exposed to tobacco smoke.

The workplace proves a more complicated issue. Industrial tribunal rulings state action on smoking can only be taken once there has been full consultation with all staff. The needs of smokers must be taken into consideration and employees require 12 weeks' notice if there is going to be any change to their contract.

A poll in "The Evening Standard", a London newspaper reveals that 89 per cent of smokers think restaurants should have non-smoking areas; 49 per cent of smokers think there should be no smoking on public transport. Fifty per cent claim they would be more likely to visit a pub if there was a total ban.

Environmental Health Officers (EHOs) are asked to visit local pubs and recommend no-smoking areas, starting with pubs where food is being served. It is suggested that the Heartbeat Eating Award promotes no-smoking areas in restaurants. In the same year another EHO, Paul Hooper, and myself work with the Health Education Authority (HEA) to find out what councils are doing to cut passive smoking.

We discover most Councils have policies in place but allow workplace smoking. So the IEHO and HEA join forces and produce guidelines for local authorities. As the biggest employers in the country, employing 2.5 million people in England alone, it would be a significant start to a workplace ban if they could be made smoke-free. The HEA report recommends a model local authority is needed to show the way.

1993

Hackney council produces Towards a Smoke-Free Environment. Its model policy attracts an award from Ash and the British Heart Foundation. All the advice at this stage is that if the Health and Safety at Work Act (H&SAWA) is used to protect workers from passive smoking it would be open to a major challenge. EHOs argue for tobacco smoke to be included in Control of Substances Hazardous to Health Regulations (CoSHH) and that the Local Authority Associations should share the legal costs in the case of a prosecution testing the H&SAWA.

At this stage all campaigners can rely on is persuading local authorities to follow good practice. The local authority response is patchy. Even when it comes to prosecuting shopkeepers for selling tobacco to minors 58 per cent of Councils admit to not having taken any prosecutions; the rest claim not to know or fail to answer. Only a handful have taken action.

1998

Between 1993 and 1998 councils increasingly adopt smoking policies in line with the model guidelines. There is also a lot of international activity, especially in the US, but the UK government does little to progress things until the Department of Health publishes the report of the Scientific Committee on Tobacco and Health, know as the Scoth report.

This is a milestone because it states there is no safe level of exposure and that exposure to environmental tobacco smoke increases the chances of lung and breast cancer by 20 to 30 per cent. It recommends that "smoking in public places should be restricted on the grounds of public health". It also states: "Wherever possible, smoking should not be allowed in the workplace."

Following the Scoth report Health Minister Frank Dobson brings out the aptly named white paper Smoking Kills with the stark statistic that smoking kills 13 people an hour in the UK. It sets out the government plans on under-age sales, advertising, taxation, smoking cessation, and environmental tobacco smoke.

At last it looks like the government is going to give EHOs power by recommending that the Health and Safety Commission (HSC) should consult on a new code of practice to protect workers from tobacco smoke. The code would state that the H&SAWA will apply and smoking will not be permitted in the workplace.

However, the white paper shies away from a ban in pubs and restaurants, claiming it would be too difficult to implement. Instead it introduces the idea of a voluntary charter with the hospitality industry to encourage smoke-free areas and the use of ventilation.

The CIEH comes out in favour of the Approved Code of Practice (Acop) but dismisses the idea of a charter

as unworkable. The Acop is to have a rocky history, being passed backwards and forwards between the HSC and ministers with the hospitality sector lobbying hard to water it down. In the end it comes to nothing as ministers bow to pressure from the pub and restaurant trade.
On cue, the hospitality trade introduces the Public Places Charter, launched by public health minister Tessa Jowell. Mike Garton, the then CIEH health and safety policy officer, opposes the charter. Pubs and restaurants can comply with the charter just by putting up signage saying that smoking is allowed. The charter is eventually to become totally discredited due to lack of compliance with the smoke-free standards.

1999
The consultation on the Acop is published by the HSC. It refers to tobacco smoke as an irritant and a cause of physical discomfort. The CIEH consults its members and robustly responds, arguing that tobacco smoke is far more than just an irritant.
A joint seminar is held with the CIEH, Ash and the TUC, Don’t Choke on the Smoke. This becomes a landmark event as it firms up the alliance between the profession, campaigners and trades unions.
At the conference Ash launches its research paper, A Killer on the Loose, revealing that 900 office workers, 165 bar workers and 145 manufacturing workers die each year from passive smoke, three times as many as die from industrial accidents.
The Acop is now seen as dead in the water and there is solidarity in the renewed call for effective legislation. The CIEH publishes new guidelines for local authorities, Towards Tobacco-free Environments. Now more than 90 per cent of councils have smoking policies, most require smoke-free areas rather than voluntary restrictions.
The CIEH General Council formally adopts a policy stating that all workers should be free from environmental tobacco smoke and that ventilation is no alternative to a no-smoking policy. Medical research is being published throughout this time, repeatedly confirming the risk to health of environmental tobacco smoke.

2003
Micheál Martin, Ireland’s Minister for Health and Children, stands up in Wagamama’s restaurant in Dublin and announces a nationwide ban on smoking in public places. The Environmental Health Officers’ Association of Ireland works to ensure the ban is effective.
Ash and the CIEH begin campaigning for smoke-free legislation despite being told by ministers and civil servants there is no chance of success. The CIEH joins a smoke-free coalition of trades unions, politicians, Ash and other campaigners.

2004
The smoking in public places ban comes into force in Ireland to overwhelming acclaim. Predictions of the collapse of the hospitality industry prove unfounded and there is almost 100 per cent compliance.
The Achieving Smoke Freedom Tool Kit is launched jointly by the CIEH and Ash. It calls on local authorities to be at the heart of local smoke-free initiatives and for local politicians to provide leadership ahead of the primary care trusts. Low-cost training is provided across the country to help EHPs use the tool kit. The CIEH reveals that more than 2 million people are employed in workplaces where smoking is allowed and again calls for national legislation to ban smoking in all workplaces.
In this time a number of local authorities and primary care trusts go smoke-free. Chains such as Weatherspoons and Greene King launch a rolling programme to make their pubs smoke-free. The CIEH endorses the National Clean Air Award by the Roy Castle Lung Cancer Foundation aimed at supporting smoke-free pubs.

2005
There is increasing talk of pubs and clubs that do not serve food being exempt from a ban. The CIEH argues that this is unworkable, among growing confusion over what constitutes food. There is also talk of a patchwork ban being brought in by individual local authorities, led by Liverpool City Council. Again, the CIEH argues strongly in support of national legislation.
The move splits the opposition. The hospitality industry does not want local bans while the tobacco industry would prefer it to be an outright national ban. Meanwhile John Reid, the health minister, comes out against a total smoking ban.

2006
The CIEH is lobbying behind the scenes before the Valentine’s Day vote. To many people’s surprise ministers vote in favour of a public places ban by 384 votes to 184. In April Scotland goes smoke-free.
In July the Smokefree Action coalition, of which the CIEH is a core member, is honoured with a Global Smoke-Free Partnership inaugural award for outstanding campaigning at the 13th World Conference on Tobacco and Health in Washington, US.
Also in July the publication of the draft regulations for the Health Act ensure that most enclosed pubic places and work places will become smoke-free by 2007.

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The Influence of Knowledge, Attitudes and Practices of Food Handlers on Food Kiosk Hygiene - Eldoret, Kenya

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ABSTRACT
The study was conducted from October to December 2003 in Eldoret Municipality, Kenya to assess the influence of knowledge, attitudes and practices of food handlers in food kiosks in relation to food hygiene. The data collection tools were questionnaires for food handlers(n=61) working in food kiosks and consumers(n=63) of kiosk food, sanitary evaluation of premises(n=30) as well as bacteriological tests of water, food contact surfaces, food handlers hands and throat swabs of food handlers. Results showed that the majority of food handlers did not receive any form of food hygiene training and therefore do not have a high level of general food hygiene knowledge hence their behavioral practices were not conforming to minimum health standards. Most of the foods did not meet the sanitary standards presented by the Kenyan legislation. With the exception of water samples analysed, all other samples tested positive for total microbial count, *Escherichia coli, Staphylococcus aureus* and *Salmonella*. Food handlers tested positive for *Staphylococcus aureus* in their throats, while with 75% of food handlers, this organism was found on their hands. A further finding that should be of great concern to law enforcing bodies is the fact that all of the kiosks owners and food handlers had a fear of being removed or victimized and therefore this directly impacted on the attitude and subsequent translation into negative practices by food handlers.

Key words: Food handler, Food kiosk, hygiene, knowledge, attitudes, practices

INTRODUCTION

For a long time in Kenya, food kiosks have been an important part of the food industry which contributes significantly to the national economy. A food kiosk can be defined as a temporary structure within which food is prepared, handled, stored and sold for the purpose of generating income (Tinker, 1997; Canet and N`Diaye, 1996:4-13, World Health Organization, 1996a), and depends on the local eating habits and trends in lifestyles as well as the economic and legal systems (Chauliac and Gerbouin, 1994:5). Kiosk food refers to food and beverages prepared and sold taken away to be eaten elsewhere (Kidiku, 2001; Khubheka, Mosupye and Von Holy, 2000).

The rise in the demand for kiosk food by consumers with the subsequent expansion of food kiosks globally is increasingly offering challenges to both the local authorities and health of consumers. One of the challenges is a lack of proper control in this informal sector. Kiosk foods are often prepared in an unsanitary environment and stored for long periods in unsuitable conditions before selling (Department of Health, 2000:4). Further, due to a lack of resources the Municipality of Eldoret (Kenya) finds it difficult to control and ensure the safety and quality of kiosk food efficiently and effectively. This lack of resources (Nangalama, 2003), hence poses potential health risks to food consumers. The World Health Organisation regards illnesses due to contaminated food as one of the most widespread health problems in the modern world (Mukhola, 2000:1). According to Marriott (1999:3), poor hygiene practices can contribute to outbreaks of food-borne illnesses such as *samonellosis, typhoid and shigellosis*. According to Van der Heijden et al. (1999:15), food-borne diseases cause economic and social problems, such as a loss of income, loss of human resources and medical care costs. In 1985 for instance, *salmonellosis* was estimated to have costed the United States $1613 to $5053 million (Van der Heijden et al., 1999:15).

Informal commerce has experienced a dramatic expansion in the central areas of most Third World cities (Crypol, 2002:78; Acho-chi, 2002:65). This is a result of urbanisation, the high rate of unemployment, low salaries, limited work opportunities and limited social programmes. Many historic city centres in the Third World, for example Nairobi and Eldoret in Kenya (Eldoret Municipal Report, 1986a:16) as well as Delhi in India, retain a thriving and expanding informal commerce sector because of the demand from their low-income inhabitants and due their strategic positions (Khopkar,1994:22). As trade in food kiosks expands internationally, food safety can no longer be considered a domestic issue. Furthermore, food security is an integral facet of food hygiene and nutrition (WHO, 1996b:1).

Although some data is available, little or nothing is known about the level of knowledge of food handlers and the effect thereof on their attitudes towards practicing food hygiene and the sanitation of the environment in which the food is prepared. Further, the level of knowledge and the subsequent perception of consumers regarding food hygiene and food-borne diseases are unknown, hence the need to conduct this research. The research on which this article is based attempted to determine the level of knowledge, of knowledge and perceptions of consumers on food hygiene. The results of the research could assist the municipality of Eldoret or other municipalities with similar situations to bring this industry under the control of health authorities and to take remedial action, as well as to encourage and empower the community with knowledge so as to take charge of their own health.

This article explains the method that was used to generate data regarding the knowledge, attitudes and practices of food handlers and the knowledge and perceptions of kiosk food consumers. Furthermore, the results of the questionnaire survey, an evaluation of the environment, samples of (food, water, food preparation surfaces and the throat of food handlers) are presented. In addition, the article reports on the data that was analysed and interpreted in order to reach the conclusion and to make recommendations.

MATERIAL AND METHODS

This research was conducted from September to December 2003 in the Central Business District of Eldoret Municipality, Uasin Gishu District, Rift Valley Province, Kenya. The research was confined randomly at selected food kiosks (n=30) that prepared, cooked and sold cooked beef, cooked chicken cooked fish and raw milk. The research included evaluation of food kiosks; administering of questionnaires to food handlers and kiosk food consumers; samples of raw milk ,water; cooked chicken; red meat; fish ;food contact surfaces; food handlers hands and throat swabs.

Hygiene evaluation was carried out using an evaluation form (n=30) to determine the hygiene status of both the food kiosks and the surrounding environment. The evaluation involved observations and identification of food hygiene status and interviews with food handlers on factors that may have had a negative impact on food hygiene. Factors considered covered physical structure of food kiosks, food preparation, equipment/furniture, pest infestation and control, basic services, personal hygiene including medical status and the environment.

Separate questionnaires were administered to both food handlers (n=61) and kiosk food consumers (n=63).Two food handlers and two kiosk food consumers per each kiosk were randomly selected to participate. However, one extra food handler and three extra kiosk food consumers volunteered to participate. The purpose of administering questionnaire to food handlers was to determine their knowledge, attitudes and practices with regard to food hygiene, while the purpose of administering questionnaire to kiosk food consumers was to determine their knowledge, and perceptions with regard to food hygiene. The questionnaires duly completed by the support staff were handed back to the researcher on a daily basis for processing.

Samples of raw milk (n=13); water (n=20); cooked chicken (n=33);cooked red meat (n=32);cooked fish (n=12);food contact surfaces (n=32);food handlers hands (n=60); and throat swabs (n=20) were collected according to the standard method prescribed by (Bekker,2003a: 83; Harrigan, 1998:147; Greenberg,clescent, and Eaton,1992:1.8-2.2 ; and Food Agricultural Organisation,1988:2) and taken for microbiological analysis. All equipment and utensils were pre-sterilized (121°C for 15 minutes) in laboratory. Aseptic techniques were followed during the sampling and analysis to prevent contamination. Samples were transported chilled (below 10°C) in cooler boxes to laboratory within an hour. A thermometer was placed in the cooler box and the temperatures were noted on receipt of the samples at the laboratory (Harrigan,1998:155).Sample details were also recorded in order to identify the origin (kiosk, date sample was taken, the sample number),nature (type, cooked, raw, contact surface, food handlers hands and throat) and sampler(name and designation).For water samples, wide mouthed (schott) bottles (100ml) were prepared by adding 0.1ml of a 30 % solution of sodium thiosulphate ($Na_2S_2O_3$) to neutralize chlorine in water (Bekker,2003a:84;De Zuane,1990:394) therefore allowing the live organisms in the check to grow. The number of samples were determined by the availability of a particular sample type at the time of study.

The reasons for selecting the abovementioned food types included: they are the most sensitive foods that can easily get spoiled due to their high protein and water content; further, they are classified as high risk foods (Bekker,2003 a) and also form a good medium for pathogenic microorganisms; these foods are classified as perishable(Bekker,2003b:178;Kenya Food, Drugs and Substances Act, Cap 254 of 1992:South African Foodstuffs, Cosmetics and Disinfectants Act of 1972); they are the most popular foods with food consumers and common on market. The purpose for sampling food was to determine the absence and presence of bacteria capable to grow at 37°C in food and on food contact surfaces.

Samples were analyzed to determine microbiological status and hygiene status of the food kiosks. Aseptic techniques were used to prevent contamination and to get accurate results. Microbiological analysis included aerobic total count, coli form organisms, *Escherichia coli*, *Staphylococcus aureus* and *salmonella.*

Interviews were conducted in addition to the questionnaire and evaluation form, so as to compare the response of the self /staff administered questionnaire and to check if there was discrepancies in the evaluation. The interviews were conducted by trained Environmental Health Officers from Eldoret Municipality. The interviewers were trained/ briefed prior to conducting interviews by the researcher. The briefing included: How to conduct interviews and how to make objective observations regarding food practices.

Data was analyzed using social scientist statistical package (S S S P version) and other computer software package. Analyzed data was presented on charts, graphs and tables.

RESULTS

Demographics of food handlers and consumers.

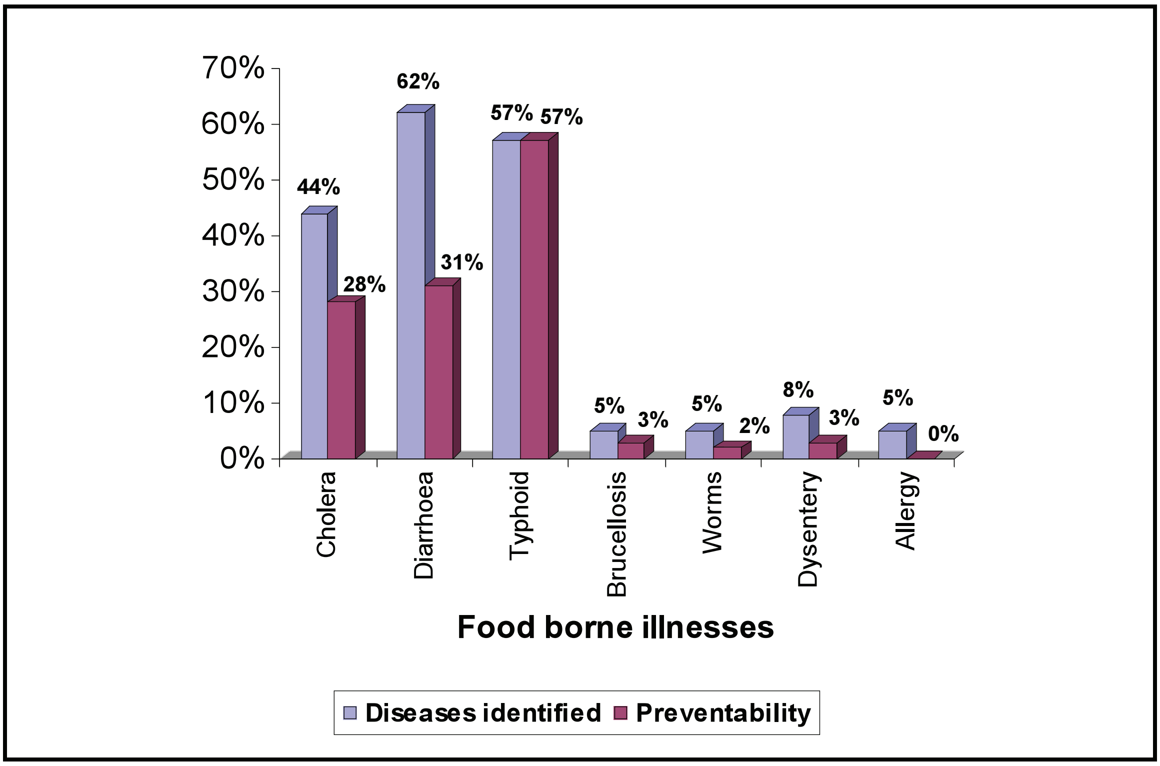
Of the 61 food handlers working in the food kiosks, that the questionnaire was administered to, 56.8% were female and 43.2% were male with a mean age of 25 years and a range of 10-45 years. In terms of education, 60.6% had primary school education, while only 39 4% had received education at secondary school level. The food handlers had an average of nine (9) month experience working at the food kiosk during the time of research. However, 60% had some previous experience working in other food establishments that included hotels, school kitchens and eating houses. Few of the food handlers indicated that they had received training in food preparation, either at college (6.6%),through on the job training (4.9%) by a co-worker or a supervisor and attendance of seminars (3.28%).However, none of the food handlers (n=61) had received any form of food hygiene training and 95% indicated that they require training.

Of the consumers who ate in the food kiosks (n=30) that the questionnaire was administered to 84.1% were males and 15.9% were females with a mean age of 30 years and a range of 10-45 years. In terms of education, 31.8%of food consumers had received primary education, 39.7% had received secondary education and 26.9%had received tertiary education while 1.6% had received no education at all. Seventy six (76%) of the consumers were working and 89% indicated that they ate regularly in food kiosks.

Knowledge, attitudes and practices

All food handlers (n=61) were aware that consumers could be become ill by eating contaminated food. Eighty two percent (82%) and thirty six (36%) associated passing loose stools and vomiting respectively with food-borne illness. Figure 1 shows the food-borne illnesses as identified (%) by the food handlers in relation to the knowledge and their prevention.

Figure 1
Food borne illness (%) as identified by food handlers in relation to their prevention (%) (n=61)



Only 27% 0f food handlers knew that *diarrhoea,* cholera *and typhoid* are prevented by treating water. No other preventive methods could be identified for any of the other food-borne illnesses. Figure 1 shows that knowledge of food-borne diseases was higher than knowledge on the disease prevention. The respondents described treatments of diseases instead of their prevention. This indicated that the concept of prevention was confused with the concept of treatment. Prevention was an unknown concept and could be linked to the low level of awareness of the causes of diseases.

They too knew that it was essential for them to have a good personal hygiene. However they did not know that putting on a uniform was for safer food kiosks. Ninety three (93%) were aware that it was necessary for them to wash hands before handling food (57%) after visiting toilet,(48%) during handling of different foods. Seventy two percent said they wash their hands using cold water, soap and then dry them with a towel. However from observation 95% food handlers never washed their hands as claimed. The high level of knowledge in hand washing and its lack in translation to practice of the studied food handlers might be attributed to lack of hand washing facilities, toilets and negative attitude. These are in correlation with improper food handling practices of food handlers.

Forty percent (40%) of food handlers were able to identify sources of hand contamination such as hand greeting of people, touching dirty surfaces, handling of raw and cooked food. However, none could relate dirty hands and their practices with food-borne disease transmission, despite the fact that 50% identified ways of food becoming unfit for human consumption as shown in table 2 below. This clearly indicated that there was a lack of knowledge regarding food-borne illnesses and prevention thereof.

Table 2: Sources of food contamination (%) as identified by food handlers (n=61)

SOURCES OF CONTAMINATION	FREQUENCY
Dirty equipment/utensils	32 (52.45%)
Poorly cooked food	30 (49.18%)
Foreign matter	25 (40.98%)
Stale food	20 (32.78%)
Food handlers	17 (27.86%)
Poor storage/uncovered	9 (14.75%)
Food ingredients	8 (13.11%)
Contaminated water	4 (6.56%)
Raw food	3 (4.92%)
Don’t know	1 (1.64%)

All food handlers were aware that they should be medically examined and issued with health certificates (Kenya Public Health Act, Cap242 of 1986). However, only one knew the purpose and importance thereof.

Consumers

Forty six percent (46%) of consumers admitted having suffered from a disease after eating food. Forty one percent (41%) and 17% of the respondents indicated malaria and scabies respectively as food-borne diseases. These responses indicated that consumer knowledge regarding food-borne was inadequate and poor. The researcher was of the opinion that allergies were mistakenly to be scabies. Typhoid was the most commonly food-borne disease (62%).This might be due the frequent incidences of typhoid in Uasin Gishu district and the bordering districts. Consumers identified vomiting (35%),diarrhoea (54%) and loss of weight (14%) as associated symptoms of food-borne illnesses.

Water

The respondents stated the methods used in water safety as: boiling (61%);use of clean equipment (72%);covering during storage (53%);kept safely/treated by addition of chemicals(23%) and by filtration (21%).Observation revealed that this was contrary to what they practiced. Seventy percent (70%) stored their water in plastic jerry cans and that 86% of them were uncovered.30% stored water in buckets and cooking pots that were uncovered. This had a negative impact on the quality of drinking/cooking/washing water as the opportunity for contamination was increased.

Sound food supply

All food kiosks (n = 30) procured their food supply locally from the open air markets (mostly live chicken, vegetables and fruits), butcheries, fish vendors and directly from farmers (live chicken, milk, vegetables and fruits). On receiving the food supply, no inspection is carried out to determine the suitability and hygiene status thereof. The food supplies are deemed to be fit for human consumption.

Food preparation
The study established that all the foods were prepared, handled, cooked and stored in the food kiosks, with the exception of soft drinks, cakes and bread that required no further preparation. All the food kiosks (n = 30) prepared their foods in the morning with the exception of beans which was left on a stove (*Jiko*) to cook overnight.

Washing
Observation revealed that 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; therefore increasing the chance of cross-contamination (Marriott, 1999:55-65; Davies and Board, 1998:158; Lawrie, 1998: 121), including allergens from e.g. fish, fruits and vegetables (McSwane, Rue and Linton, 2000:71; Van der Heijden *et al*., 2000:454-457). In general the washing was done unsatisfactorily and without regard to consumers with food allergic reactions (anaphylaxis).

Cutting and chopping
Cutting and chopping was done using the same boards or tables for both raw and cooked food. This practice increases the chance of cross contamination (Marriott, 1999:55-65; Davies and Board, 1998:158; Lawrie, 1998: 121).

Cooking and holding
All of the food kiosks cooked their foods on charcoal stoves (*Jikos*) at high temperatures and included frying (meat, fish, chicken and chips), using re-used oil (100% of food kiosks) and boiling (milk, fish, meat, vegetables). For the purpose of this study the levels of dioxins and acrylamides which may form during high temperatures and re-using oil were not measured.

Tasting of food during cooking is a common practice during food preparation. This practice may however serve as a source of cross contamination (Marriott, 1999:55-65; Davies and Board, 1998:158; Lawrie, 1998: 121). Table 3 shows methods of tasting food as indicated by food handlers.

Table 3: Methods of tasting food (5) indicated by food handlers (n = 61)

METHODS OF TASTING FOOD	FREQUENCY (%)
Putting portion on plate and tasting it	80.60%
Putting portion on palm and licking it	16.10%
Licking the cooking spoon and washing it	1.64%
Licking the cooking stick/spoon	0%
By dipping finger in food and licking it	0%
No response	1.64%

Observations however 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 result in cross contamination of food
The Kenya Food, Drugs and Chemical Substances Act, (Cap 254 of 1992) requires that storage (hot and cold) of food shall be under such conditions as to prevent contamination, including development of pathogenic or toxigenic micro organisms or both. Thirty seven percent (37%) of the food kiosks kept food on stoves (*Jikos*).

The cooked foods in the kiosks were found to be kept at the temperatures as indicated in Table 4.

Table 4: Holding temperatures (ºC) of cooked food in food kiosks (n = 30)

FOODSTUFF	HOLDING TYPE	LOWEST (ºC)	HIGHEST (ºC)	MEAN (ºC)
Beef	Hot	56.6	93.1	74.9
	Cold	24.2	43.1	33.7
Chicken	Hot	52.4	92.6	72.5
	Cold	25.3	46.1	35.7
Fish	Hot	56.2	83.4	69.8
	Cold	39.6	40.0	39.8
Milk	Hot	64.5	75.1	69.8
	Cold	22.5	37.6	30.1

From the above it was clear that the cooked food that was kept hot was kept at a temperature (above 63ºC) that prohibited the growth of micro-organisms (McSwane and Linton, 2000), and therefore complied with the Kenyan legal requirements. However, food that was kept cold was kept at temperatures that ranged within the "danger zone" (between 7ºC and 63ºC) and therefore ideal for the support of microbial growth.

Storage

From observation, 93.3% of the food kiosks (n = 30) did not have proper storage facilities (dry, cold and hot) for both raw and cooked foods. Both raw and cooked foods were stored together in display counters, on tables or in pots on the floors in the kitchen None of the food kiosks covered the cooked foods properly, hence exposed them to contamination from the environmental pollutants like heavy metals from industrial activities (automobile workshops/garages), aerosols, soils, insects, micro organisms, dust and automobile exhaust (Marriott, 1999:55-65; Davies & Board, 1998:158; Lawrie, 1998: 121).

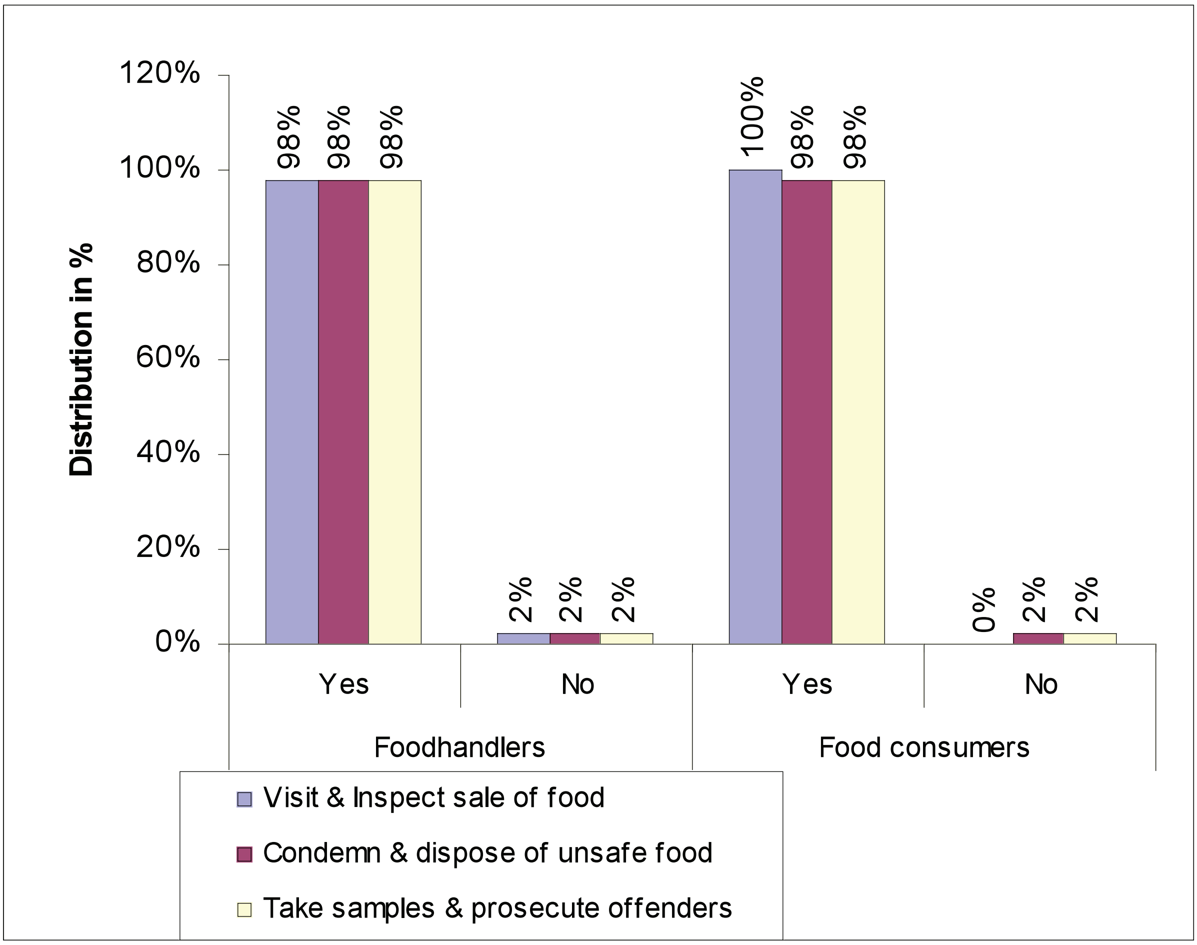
Serving

None of the food kiosks allowed customers to serve themselves. Only 5% used utensils (forks and tongs) to serve the food while the remaining ones served food by bare hands. This practice increased the chance of cross-contamination of food (Marriott, 1999:55-65; Davies & Board, 1998:158; Lawrie, 1998: 121).

Role of Environmental Health Officer.

Both the handlers and the consumers were aware that the environmental health officers, employed by the municipality of Eldoret were responsible for food control, including inspection of premises, sampling of food for analysis and condemnation of food unfit for human consumption. Ninety eight percent (98%) of the food handlers indicated that they recognized and appreciated the services of environmental health officers. All consumers reacted positively on being advocates for healthy kiosk foods and indicated that environmental health officers should be vigilant in enforcing the laws and regulation that govern sale of food.

Figure 2 Duties of the environmental health officer



ENVIRONMENTAL SANITATION OF FOOD KIOSKS

The general environmental sanitation in which food kiosks operate was found to be poor and not in compliance with the general hygiene standards (Kenya Food, Drugs and Chemical Substances Act, Cap 254 of 1992; Kenya Public Health Act, Cap 242 of 1986) and therefore does not support food hygiene principles.

Location

The food kiosks (n = 30) were located in areas that had high density activities such as automobile workshops/garages, petrol stations, welding, patch and painting units, motor parks, railway stations, market places, construction sites and government institutions (hospitals, courts, schools etc.). The surrounding areas were found to be unpaved, leading to uncontrolled dust during the dry season and stagnant water and muddy conditions. This circumstance made maintenance of hygiene in food kiosks very difficult and hence created a source of food contamination (Alli, 2004:94; Bekker, 2003b:19; South African Bureau of Standards, 2001:8; Food and Agricultural Organization, 1997:12; Kenyan Public Health Act, Cap 242 of 1986; South African Act 63 of 1977).

Physical structure-hygiene aspects

Seventeen of the thirty (56.67%) of the food kiosks were found to be crude temporary structures whose walls and roofs are constructed of corrugated iron sheets and structural timber members and did not comply to the legal requirements (Kenya Public Health Act, Cap 242 of 1986). The remaining 13 (43.33%) consisted of a dining area that was of a permanent nature complying with the legal requirements and a semi-detached kitchen constructed in the same manner as with the mentioned seventeen kiosks. Forty percent (40%) of food kiosks (including the permanent structures) had worn out floors especially in the kitchen which were mostly wet. This created potential sources of food contamination.

Waste handling

In general the handling of waste was poorly managed.

Solid waste

None of the food kiosks were in possession of proper waste receptacles (dust bins) with lids. However, solid waste was collected and stored in gunny bags, plastic bags, cartons, boxes and uncovered jerry cans (plastic or tin) in the kitchen or outside immediately outside the door. No proper storage facilities were provided and therefore this encouraged solid waste to be thrown into the nearby bush, streets, sidewalks, gutters, open manholes, service ducts, streams or rivers. With the majority of the food kiosks (n = 30), it was evident that this waste handling practices attracted pests such as flies, rodents, dogs, cats (National Board of Experts-HACCP, The Netherlands, 2002:31-32; McSwane, Rue and Linton, 2000:300). Further, wastes improperly disposed of may be detrimental to the environmemt (Umoh and Odoba, 1999).

Liquid waste

Observation during the study period revealed that 79.2% of food kiosks (n = 30) disposed of waste water around the open yard and 10.8% disposed of it in the sewer line and 10% directed into the nearby stream. Liquid waste disposed of in this manner made the yards unsightly, wet and resulted in the attraction of pests such as flies and cockroaches (National Board of Experts-HACCP, The Netherlands, 2002:31-32; McSwane, Rue and Linton, 2000:300).

Sanitary facilities

Fifty (82%) of the food handlers (n = 61) indicated that they did not have toilets while 11 (18%) indicated that they had. Observation however revealed that 93.3% of the food kiosks (n = 30) had no form of toilet dedicated to the food kiosk, while only 6.7% had some form (limited structure) of a toilet in the yard. Food handlers indicated that they used the neighbourhood toilets such as the municipal public toilet or the railway station toilets. A small number (1.64%) indicated that they do not use the toilet at all while on duty.

The general reasons given for not having the toilet included:

- The temporary nature of the kiosk;
- The land tenure-ship;
- The municipal bye-laws do not allow the provision of pit latrines in areas that are serviced by a sewer line;
- Financial constraints, and
- Regular harassment and demolitions by the local authorities.

It was clear from observations made by participating Environmental Health Officers that none of the few toilets were well maintained and cleaned. Lack of sanitary facilities like toilets are correlative with improper food handling

Hand washing facilities

Improvised hand washing facilities without hot water were provided for use by both food handlers and consumers by 90% of the food kiosks (n = 30), while the remaining 10% did not have any hand washing facilities. Most (66.7%) of the hand washing facilities were not supplied with soap but only provided it on request. Reasons given for not providing soap at the facility included rampant theft and abuse of soap by consumers. However, when provided it ranged from powdered washing soap to bars of soap which were not of food grade (Bekker; 2003b:114). The fact that an improvised hot water hand washing facility was provided indicated that food handlers knew that it was necessary to provide such facilities in the food establishments. Lack of hot water in these hand washing facilities might be attributed to their ignorance, lack of adequate knowledge on sources of food contaminants and money driven attitude. Less than half (48%) of those food kiosks that had hand wash facilities provided hand towels (fabric) for drying of hands but in all instances were found to be dirty and wet. This was a potential source of food contamination.

Equipment and utensils

In general most of the equipment, utensils and surfaces that came in direct contact with the food were found to be worn out (cracked, chipped, dented, rusty). Observation by participating Environmental Health Officers revealed that equipment; utensils and work surfaces were washed without any soap in cold water that had already been used several times. The rinsing water was also re-used several times. Washing utensils/crockery with soap reduced the level of bacteria. However some gram negative bacilli such as salmonella typhi are resistant to soap made from unsaturated fatty acids while staphylococcus aureus survive for 20 minutes.

Pest control

None of the food kiosks had pest control programs. Rodents were observed in 13.3% of the food kiosks, while flies were seen in all the food kiosks. The presence of pests was as a result of food leftovers and increased the chances of food contamination.

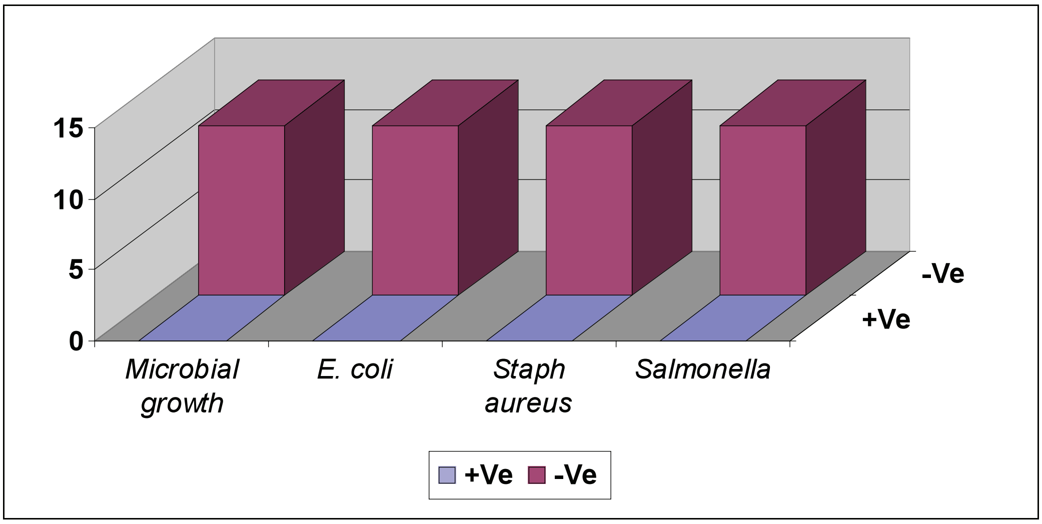
MICROBIOLOGICAL ANALYSIS

Samples of water (n = 12), cooked beef (n=32), cooked chicken (n=33), cooked fish (n=12), raw milk (n=13), food contact surfaces (n=32), food handlers hands (n=60) and throat swabs (n=20) were taken for microbiological analysis.

Water

As previously discussed the water is mainly (85%) obtained form communal municipal taps, while the remaining 15% is purchased from water vendors, the origin of the water is unknown. Figure 3 shows the results obtained for the water samples taken.

Figure 3 Microbial growth (+ve versus -ve) at 37∞ C (n=12)



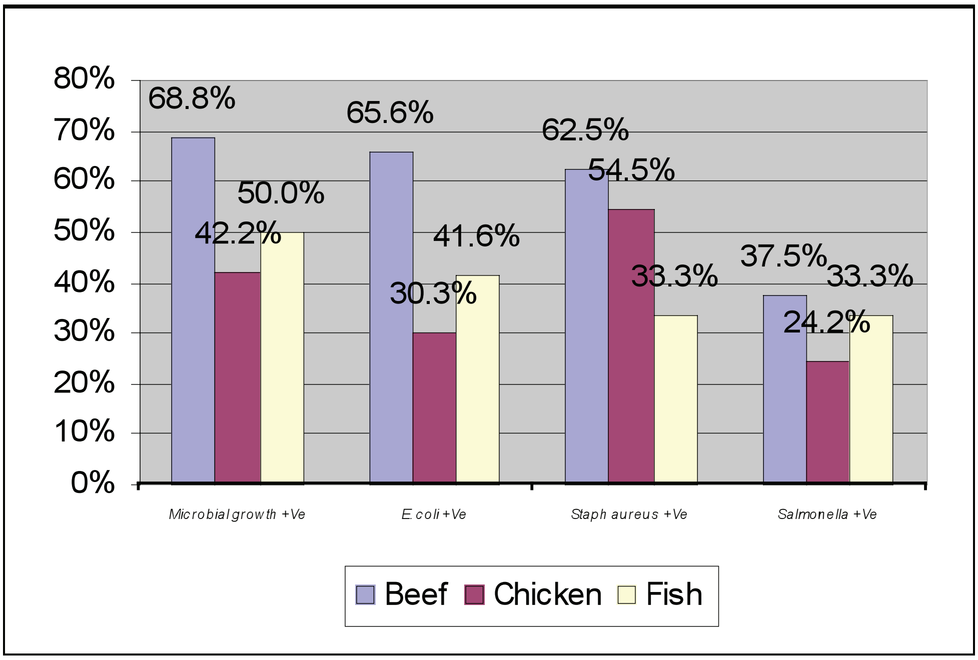
Water obtained from the municipal taps was found to be of a good standard and no microbial growth could be obtained. This mainly is due to the effective treatment of the water. However, the water is then put into containers as previously indicated where contamination may take place. The negative results indicate that the municipal water treatment works were effective.

Food

Microbiological comparison (%) between cooked beef, cooked chicken and fried fish

Figure 4 compares (%) the microbiological growth (+Ve) (37 °C) between cooked beef, cooked chicken and fried fish.

Figure 4
Comparison (%) of the microbial growth (+ve) (37ºC) between cooked beef, chicken and fried fish

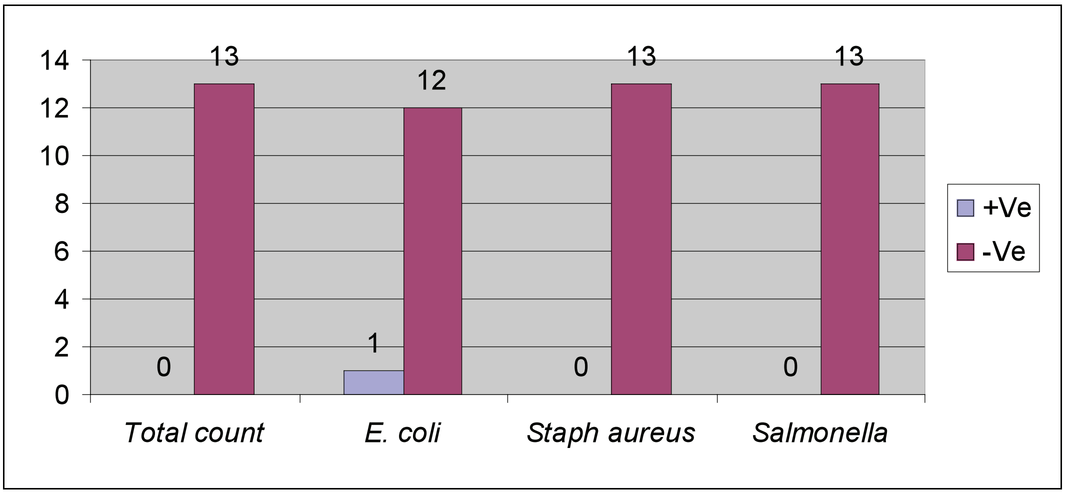


There were 70% cooked beef, 52% cooked chicken, 75% cooked fish, 8% milk and 0% water positive samples. This might be attributed to: abuse of temperature, handling of food at ground level, washing utensils/hands using dirty water, preparation, cooking, storage of food using dirty utensils; cooling and reheating of food resulting into the proliferation of bacteria; poor hygiene practice of food handlers; poor cooking methods; possible cross contamination between raw and cooked foods. For nil negative fried food samples meant that high temperatures used in frying are capable of destroying micro organisms.

Raw milk

Figure 5 illustrates the microbiological growth (+Ve versus –Ve) (37 °C) obtained for raw milk.

Figure 5
Microbiological growth (+ve versus -ve) at 37ºC for raw milk (n=13)



For 8% milk, positive samples might mean obtaining milk from reliable supplies and boiling it to the correct temperature, or due to (what was alleged) formalin and hydrogen peroxide being used in enhancing the keeping quality of milk.

Contact surfaces

Contacts surface samples were analyzed to determine the hygiene status of food contact surfaces, food handlers hands and the effectiveness of cleaning thereof. All of these surfaces were analyzed for Total count and Staphylococcus aureus. Table 5 shows the results obtained for the different surfaces.

Table 5:
Microbial growth (+Ve versus –Ve at 37°C) on food contact surfaces and food handler's hands

Surfaces	Microbial growth		Staphylococcus aureus	
	+ve	-ve	+ve	-ve
Tables (n=12)	12 (100%)	0	12 (100%)	0
Pots (n=4)	4 (100%)	0	3 (75%)	1 (25%)
Chopping boards (n=16)	16 (100%)	0	16 (100%)	0
Hands (n=60)	42 (100%)	0	42 (70%)	18 (30%)

The general microbial growth obtained was too numerous too count (TNTC). The test for Staphylococcus aureus was a qualitative test hence no enumeration was done. Staphylococcus aureus is associated with food handlers and was found to be present on all the working surfaces, thus a clear indication of cross contamination. From this it is clear that the hygiene status of all the food contact surfaces and hand hygiene are unsatisfactory and that the cleaning is not effective at all. As previously indicated, cleaning is done with re-used water, without proper soap and hand washing facilities are not adequate.

Throat swabs

As Staphylococcus aureus normally is present in the nose and throats of human beings and therefore associated with food handlers, throat swabs were taken to determine the presence thereof in the throats of the food handlers. Table 4.9 indicates the results obtained from the food handlers that gave permission for the samples to be taken.

Table 6
Results of the presence of Staphylococcus aureus (+Ve versus –Ve) (37°C) in the throats of food handlers (n = 20)

S. aureus (+ve)	S. aureus (–ve)
12	8

This is a clear indication that two thirds of the food handlers were tested positive for Staphylococcus aureus, therefore increasing the chance for contamination of the food from the food handlers.

CONCLUSION AND RECOMMENDATIONS

Conclusions

There was significant breach between food hygiene and safety and the translation of a wide knowledge of food handlers to actual practices. This was primarily attributed to financial considerations being more of a priority than food safety (Kotcheval and Terryl,1985:7).Most food handlers and their families are totally reliant for their financial support on food kiosk enterprises (Khubeka et al.,2001:127; Mosupye and Von Holy,1999:1278-1284). It is quite restrictive for them to put food safety considerations before the economic needs (Kotcheval and Terryl,1985:7).

The food kiosks enterprise involves very important elements of sustainable urban development (Gnamnon-Adiko, 1996:11 – 14; Winarno and Allain, 1991), including the convenient location of service points and low input technology and offers job opportunities for both males and females (Tinker, 1997; Canet and N'Diaye, 1996). Food handlers in these food kiosks depend largely upon local business conditions and provide essential low cost, nutritionally wholesome food (Winarno and Allain, 1991); hence the question of its abolition cannot arise. Consequently there is a critical consideration in economic planning and development in Eldoret as well as in other areas in Kenya.

Recommendations

Although the improvement of the kiosk food industry is complex in nature, 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 this 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 on the need for upholding sanitary standards as well-informed politicians can better influence food kiosk operators in their wards and constituents (Pfannhauser and Reinhart, 2000:5; Venatesh and Davis, 2000:187)

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 program, 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 proper provision for 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 and Linton, 1998:3). Adequate training strategies should be established, implemented and maintained to improve the knowledge and resulting attitude and practices of food handlers and food consumers

The Eldoret Municipality's Environmental Health Department should intensify health education regarding food hygiene to both food handlers and consumers (Venatesh and Davis, 2000:187)

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

Although not the objective of this study, it was observed that cooking oil is re-used for food preparation at high temperatures. It is therefore recommended that the effect thereof on the cooking oils and subsequent health hazards be researched (Uwalaka and Matsuo, 2002:1-2)

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Networking Patterned on the Environment

Networking Patterned on the Environment

By Fred O'Brien, Honorary Vice President (Ireland) of IFEH

Some years back the National Association of Adult Education of Ireland held a workshop at the Lakeside Hotel, Killaloe. Some 45 people from different backgrounds, principally in the fields of adult education and environmental science, came together and outlined and discussed their approaches to developing a course in adult education on "Caring for the Environment".

At the Killaloe workshop before very long it became apparent that the great variety of perspectives and attitudes present could result in much disagreement. The variety of viewpoints and the depth of feeling on issues discussed had the potential to create a significant barrier to communication and cooperation. In addition to the differences of opinion on what has been termed "soft science" there was a variety of scientific disciplines present with different concerns, approaches and priorities.

At an early stage it appeared to me that the differences in approach presented insurmountable obstacles. But I was wrong. On the afternoon of the second day we were taken on a guided tour of North Clare, and visited the area known as the Burren, a unique environment where Arctic and Mediterranean plants and other life forms thrive. As we walked the road and the land of the area the backgrounds of the different participants came into play in interpreting the environment that we were observing. Agriculturalists, botanists, geologists, ecologists, those familiar with the local history and culture and others completed a picture of what we were looking at.

Finally I found myself with a small group looking down on a patchwork of ground about the size of a tabletop. It contained perhaps a hundred or more types of plants with all variety of beautiful flowers, and, within these, a mix of living creatures, including insects, spiders and worms.

Having experienced this patch of the environment in terms of its great diversity and overall unity, in which interconnections, interrelationships and interdependencies revealed the importance of each element and the significance of the overall pattern, I was struck by the fact that a group of people could form a network, the model of which was the environment itself. Each member of this diverse group had an important contribution to make and our networking was of a pattern of nature.

The environment itself is a unifying force and the environmental health global stewardship challenge is an opportunity to establish a form of networking locally and internationally to the significant benefit of the world community. Human beings are distinguished by a special and complementary capacity for service, which, when properly exercised, can renew the quality of the environment and promote the well being of all peoples. It is necessary to break down the barriers between the social partners influencing environmental health, and to promote a science of the heart where the complementary capacity for service in each individual is recognized, appreciated and encouraged.

The foregoing was a personal story that the author experienced and contributed in part to the 'Healing Cycle' and 'Pattern in Nature' flowcharts set out below.

Healing Cycle

Bone Break	**Earthquake**
↓	↓
Blood Flow	**Tsunami**
↓	↓
Communication	**Communication**
↓	↓
Damage/Response	**Damage/Response**
↓	↓
Cells with Genetic Code Act	**Humans with Caring Imprint Act**

Healing Process

Environmental Health Stewardship

develop pattern of
human relationships

- informed by -

pattern disclosed in nature

relationships between

individuals, families, representative bodies and states	and the community of the whole family of humankind

based on

environmental health 'science' and
international principles of human justice

Presentation to REHIS by Malta Association – Bernard Forteath, John Stirling, Hadrian Bonello (Malta) and Mike Halls

Kia Regner, Honorary P.R.O., and outgoing President, Jerry Chaka

The Australians take over Dublin

Jerry Chaka, Mary Harney, Ireland's Minister for Health & Children and Colm Smythe