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Short Communication

EXAMINATION OF PIPE-BORNE WATER SUPPLY FROM OSHOGBO – EDE WATER TREATMENT-PLANT TO UNIVERSITY OF IFE AND NEIGHBOURING TOWNS FOR PRESENCE OF COLIFORMS.

BY

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INTRODUCTION

Perhaps the greatest danger associated with drinking water is contamination by human excrement (Bacteriological Examination of Water Supplies (BEWS), 1970). If such excrement contains pathogenic microorganisms, then consumers of the water may become infected by the diseases caused by the pathogens. The coliforms are generally present in large numbers in human exrement and can be detected in numbers as small as one in 100ml of water (Dutka and Tobin, 1976; Baker, 1979). They are therefore the most sensitive indicators at our disposal for demonstrating the excretal contamination of water. Thus the presence of faecal coliform bacteria in a water sample indicates that intestinal pathogens may likely be present, although perhaps in a much fewer number. Thus water is considered free of pollution when it contains less than one coliform bacteria per 100ml of water (WHO, 1971).

Studies were undertaken to examine the coliform density in the drinking water supplied from the Oshogbo-Ede water treatment plant to the University of Ife and the neighbouring towns and villages. The term 'coliform' as employed in this work refers to those aerobic and facultative anaerobic, gram-negative, rod shaped bacteria which ferment lactose with gas production within 48h at 35°C (Breed *et al.*, 1973).

MATERIALS AND METHODS

Sampling:

Water samples were collected from five sites over a three months period (Late September to early December, 1976): treated water at Oshogbo-Ede water works, Ede, Sekona, Edunabon and the University of Ife, Ile-Ife. Weekly samples were collected by filling 500ml sterile bottles, iced and processed within 12 hours of collection. Collection and examination of samples were as described in the standard methods for the examination of water and waste water (APHA, 1971).

Sample Analysis and Culture Media:

Residual chlorine was measured at each site by the orthoto-lidine method (hatch Methods Manual, 1976).

All samples were tested for total coliform population by the most probable number (MPN) technique (APHA, 1971) using MacConkey's broth (Baker, 1967) for the presumptive test and eosin methylene blue (EMB) agar plates for the confirmed test. Typical coliform colonies from the EMB plates were transfered to MacConkey's broth and nutrient agar slants. Production of

acid and gas in the MacConkey's broth, and the absence of spores and presence of gram-negative bacteria rods were interpreted as the presence of coliform organisms. Bacto-E C broth was employed for the faecal coliform test. Composition and preparation of all media were as previously described (APHA, 1971).

All coliform isolates were biochemically identified by the indole, methyl red, Voges-Proskaeur and citrate utilization (IMVIC) reactions and by the production of hydrogen sulphide and urease as previously described (APHA, 1971; Edwards & Ewing, 1972).

RESULTS AND DISCUSSION

Preliminary experiments indicated high total bacteria and coliform counts in the raw (untreated) water that is being treated at Oshogbo-Ede water treatment plant. After treatment, no coliforms were detected per 100ml water sample, and the maximum total bacteria obtained was fifteen bacteria per ml of treated water. Thus by international standards (WHO, 1971, the water sample at the treatment plant can be considered safe for drinking as it contains no coliform bacteria per ml of water. However, as we proceed from the treatment plant, there was a gradual rise in the total bacteria and coliform density and a gradual fall in the residual chlorine ne (Fig. 1). Among the sites sampled, University of Ife, (which was the farthest from the treatment plant) contained the highest number of total bacteria and coliform counts, and for most of the time, residual chlorine was not detectable.

Judging from the results of the coliform density, water collected from each site (except from the treatment plant) failed to meet the safe drinking water standards (WHO, 1971), or in other words, the water samples contained more than one coliform bacteria per 100ml water.

A number of factors could be responsible for contamination of the water samples among which are inadequate chlorination, regrowth of coliforms, effect of storage, effect of distance and contamination in distribution system.

It is ordinarily considered a good operational technique to have a residual chlorine in the amount of at least 1ppm in the water as it leaves the water treatment plant or storage tanks facility. In the present work the maximum concentration of chlorine was 0.5ppm which appears quite inadequate especially for sites like Edunabon and the University of Ife which are far removed from the water treatment plant. Also the regrowth of coliforms is a possible cause of the contamination. Although chlorine is a powerful germicide in respect of the bacteria of waterborne diseases, regrowth of bacteria in the presence of chlorine has been observed (Shuvel *et al.* 1973). Chlorine resistant strains of bacteria have also been isolated from water (Farakas-Himsley, 1964).

Water that is pumped to the consumer is stored in tanks at each sampling site. Such storage will lead to chlorine dissipation, resulting in more coliform regrowth (Shuvel *et al.* .1973).

Another possible cause of contamination in the distribution system could be cross connections, calking materials used in the joints, leather washer of pumps, faulty plumbing and back siphonage. Frequent interruption of the water supply is also a possible cause. This is a common feature of the water supply to the various sites especially University of Ife. During such periods, low pressure can be created in the pipeline and contaminants might find their way into the pipe lines through possible existing holes and leaks (APHA 1971).

Our best control over the final quality of water is chemical treatment involving chlorine administered as a gas. However, as pointed out earlier, routine tests made for chlorine during the sampling period failed to show any evidence of a significant amount of chlorine in our water. One possibility is to request the Oyo State Water Corporation to install chlorinators at each site. We would then have the application and the control of the chlorination process administered locally and not be subject to the many vicissitudes that might occur at the Oshogbo-Ede plant or along the distribution systems and reservours.

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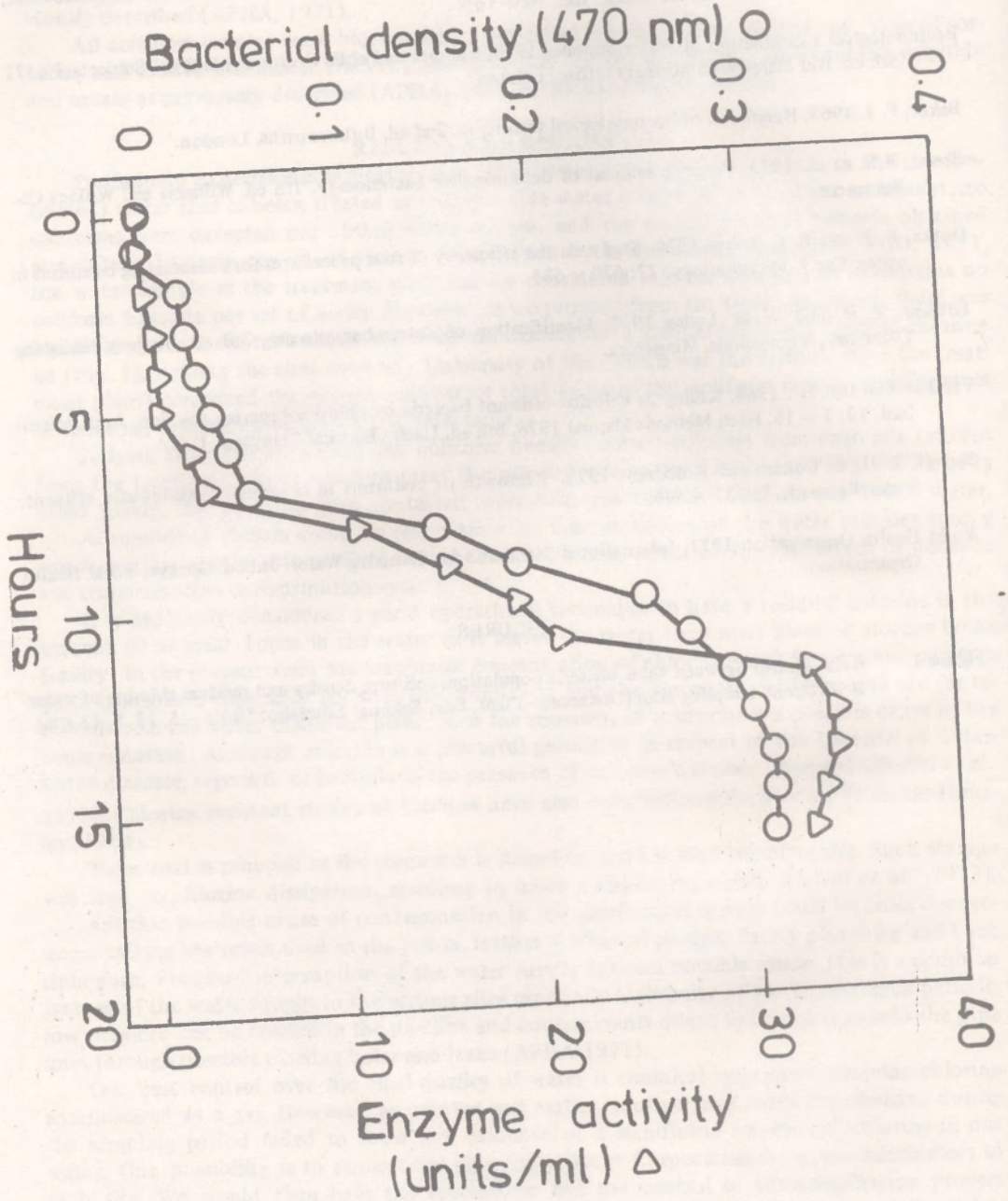
FIGURES

Figure 1. Relationship between total bacteria population, coliform density and residual chlorine of water at different sampling sites (Distances:- Plant, Ede, Sekona: Edunabo: Unife – 5, 13, 8, 13 Km).


Bacterial density (470 nm) ○
0
0.1
0.2
0.3
0.4
Hours
0
5
10
15
20
Enzyme activity
(units/ml) △
0
10
20
30
40