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How Clean is the University Teaching Hospital Phase III Theatre Tap Water in Zambia for Use in the Orthopaedic Wound Irrigation

Dr Shadrick G Lungu

[BScHb. MB.ChB,Mmed[Orth] Cert[Spine]FFCSECSA
Senior Consultant Orthopaedic & Trauma Surgeon, Private Bag KCM (C) 2000, South Hospital, Chingola, Zambia
drshadrick.docgls.glungu525[at]gmail.com, shadrick.lungu[at]kcm.co.zm

Abstract: **Ethics committee:** **This was sought and approved prior to the study.** ***Objective: To evaluate how clean tap water from the Phase III was theatres of the University Teaching Hospital of Lusaka, Zambia to be used in orthopaedic wound irrigation.*** ***Rationale:*** ***Orthopaedic wound irrigation requires huge volumes of wound cleaning agents to abate or reduce wound/bone infection. And traditionally in orthopaedic wound irrigation, sterile normal saline was a liquid of choice. This of course would cost a lot of money. The rationale therefore was to see if tap water would be used instead of the normal saline but without compromising the outcome of orthopaedic wound care ultimately, while managing the cost of wound care. However, before the tap water could be used on the orthopaedic wounds, a bacteriological study of how clean the tap was in the Phase III theatres of the University Teaching Hospital was done.*** ***Methodology:*** ***The author engaged the personnel from the Foods and Drugs Laboratory, under the Ministry of Health, to go round the theatre rooms where orthopaedic operations were conducted to sample the tap water and later subject the samples to bacteriology tests. The theatre rooms sampled were theatres 3, 5 and 8 of the Phase III theatres at the UTH. The taps were labeled /marked UTH / PH3 / TH (number) Tap 1 to 12). So a total of twelve taps were sampled at different times and days. Not all the taps in one theatre room were sample on the same day. The sampling started from the 17th June 1998 to 2nd July 1998. Materials used before sampling were methylated spirit and a match stick (to light the spirit). The tap was turned on to allow the water run first, and then turned off; then the methylated spirit was sprinkle on the tap including the outlet and finally lit. After the methylated spirit burned itself off, then the tap was turned on again and the sample taken in sterile lab bottles. This procedure was repeated on every tap throughout the study period. Other materials used were Mac Conkey agar, Eosin Methylene Blue Agar, and plate and Count Agar. The samples so collected were then transported to the laboratory and were then subjected to the appropriate tests, after which a written report was produced. The reports were compiled and later submitted to the author.*** ***Results:*** ***All the samples analyzed for faecal coliforms and Escherichia Coli tested negative for the said micro organisms. Conclusion The tap water in the University Teaching Hospital Phase III theatres were safe to be used in the orthopaedic wound irrigation.***

Keywords: Tap water, orthopaedic wounds, wound irrigation, bacteriology

1. Introduction

Open fractures are a common orthopaedic surgical problem across the globe. One of the requirements in the treatment/management of this condition is wound irrigation. To decrease bacterial counts in traumatic wounds, debridement and irrigation with sterile saline is the normal treatment[1]. Recently investigators have found the antiseptic solutions of hydrogen peroxide, betadine (povidone iodine) solution and betadine scrub are toxic to osteoblasts in culture at concentrations used clinically, while bacitracin in normal saline solution had no similar toxic effects[1]. However, tap water is perfectly acceptable for this purpose, which is to wash away the gross contamination and so "dilute" the organisms in the wound to below dangerous levels. The University Teaching Hospital presents its yearly budget to the government. The government then approves how much it shall give the Institution (University Teaching Hospital). In the years 1996, 1997 and 1998, the government approved 43.1%, 39.9% and 20.7% respectively of the UTH budget[1]. Non expensive, yet effective, means of managing open tibial fractures had therefore become necessary. With such tight monetary funding, alternative yet effective means of treating fractures have to be sort. One such is the use of tap water in wound irrigation.

2. Methods

This work was done from 17th June 1998 to 2nd July 1998.The personnel from the Foods and Drugs Laboratory, under the Ministry of Health, were engaged to go round the theatre rooms where orthopaedic operations were conducted and sample the tap water and later subjected the samples to bacteriology tests. The theatre rooms sampled were theatres 3, 5 and 8 of the Phase 3 theatres at the UTH.

The taps were labeled /marked UTH / PH3 / TH (number) / Taps 1 to 12. So a total of twelve taps were sampled at different times and days. Not all the taps in one theatre room were sample on the same day.

Materials used before sampling were methylated spirit and match sticks (to light the spirit). The tap was turned on to allow the water run first, and then turned off; then the methylated spirit was sprinkle on the tap including the outlet and finally set alight. After the methylated spirit burned out, then the tap was turned on again and the sample taken in sterile laboratory bottles. This procedure was repeated on every tap throughout the study period.

Other materials used were Mac Conkey agar, Eosin Mathylene Blue Agar, and plate and Count Agar in the

laboratory. The samples so collected were then transported to the laboratory and were subjected to the appropriate tests, after which a written report was done. The reports were compiled and later submitted to the author of this work. The results were compiled as shown in Table 1below.

3. Discussion

Wound irrigation to remove debris and lessen bacterial contamination is an essential component of open fracture care[1]. Large volumes of irrigants in open fractures are required to improve on the outcome. Bewes divides wound irrigation into "social toilet" and "surgical toilet"[2]. During the "social toilet", this requires liters of water[2].He states that: "one might think that sterile saline would be the right solution for this but I have noticed that when people use sterile saline they consciously or unconsciously use less fluid than when using plain water, and it is volume that counts at this stage, not sterility"[2]. He states also that tap water is perfectly acceptable for this purpose, which is to wash away the gross contamination and so "dilute" the organisms in the wound to below dangerous levels[2].

While the use of a sterile, isotonic solution remains the gold standard and is recommended if the supplies exist, potable water irrigation removes an equal amount of bacteria from contaminated wounds and can be considered for use in situations with supply constraints[3]. The issue of low budgetary allocation to health institutions, especially in economically challenged countries, use of tap water for wound irrigations is a feasible alternative. This is supported by a study by Griffiths et al who concluded that drinkable tap water appears to provide a safe alternative to normal saline for wound cleansing and may be preferred by some patients[4].

The essence of testing the tap water in the University Teaching Hospital Phase III theatre was to establish whether or not this water was drinkable and the results show that the water was safe to consume orally.

Studies have shown that high pressure pulsatile wound irrigation has no superior outcomes compared to low pressure. These data suggest that use of a low-pressure device and saline solution to irrigate wounds is the best choice[1,5]. This again is suggestive that acquiring low pressure devices would call for low income input to procure the said devices. The low income health institution may easily acquire a hose pipe to provide low pressure irrigation connected directly to the tap in theatre. Approaches used to remove bacteria from wounds, such as irrigants other than saline solution or high-pressure devices, may not have the best clinical outcome[5]. This is a study which compared different irrigants such as castile soap, benzalkonium chloride, and bacitracinsolution[5]. These irrigants will cost much more that tap water for an equivalent volume. Another study compared the use of tap water and normal saline in paediatric patients. The conclusion in this study was as follows "there were no clinically important differences in infection rates between wounds irrigated with tap water or normal saline solution. Tap water might be an effective alternative to normal saline solution for wound irrigation in children"[6]. This however was a study in simple lacerations and not in immune compromised individual, complicated lacerations or current use of or need for antibiotics[6].In an animal model study "Comparison of normal saline with tap water for wound irrigation", the results showed that reduction in bacterial contamination of simple lacerations was not different comparing tap water with normal saline as an irrigant[7].

4. Conclusion

This study has demonstrated that the tap water examined from the University Teaching Hospital Phase III theatres did not grow any feacal coliform bacterial and E. coli. This shows that the tap water under study was safe for human consumption as drinkable. And following the literature review, there is justification to utilize this kind of tap water for surgical wound irrigation.

This paper, therefore, concludes that the tap water in the University Teaching Hospital Phase III theatres was safe to be used in the orthopaedic wound irrigation.

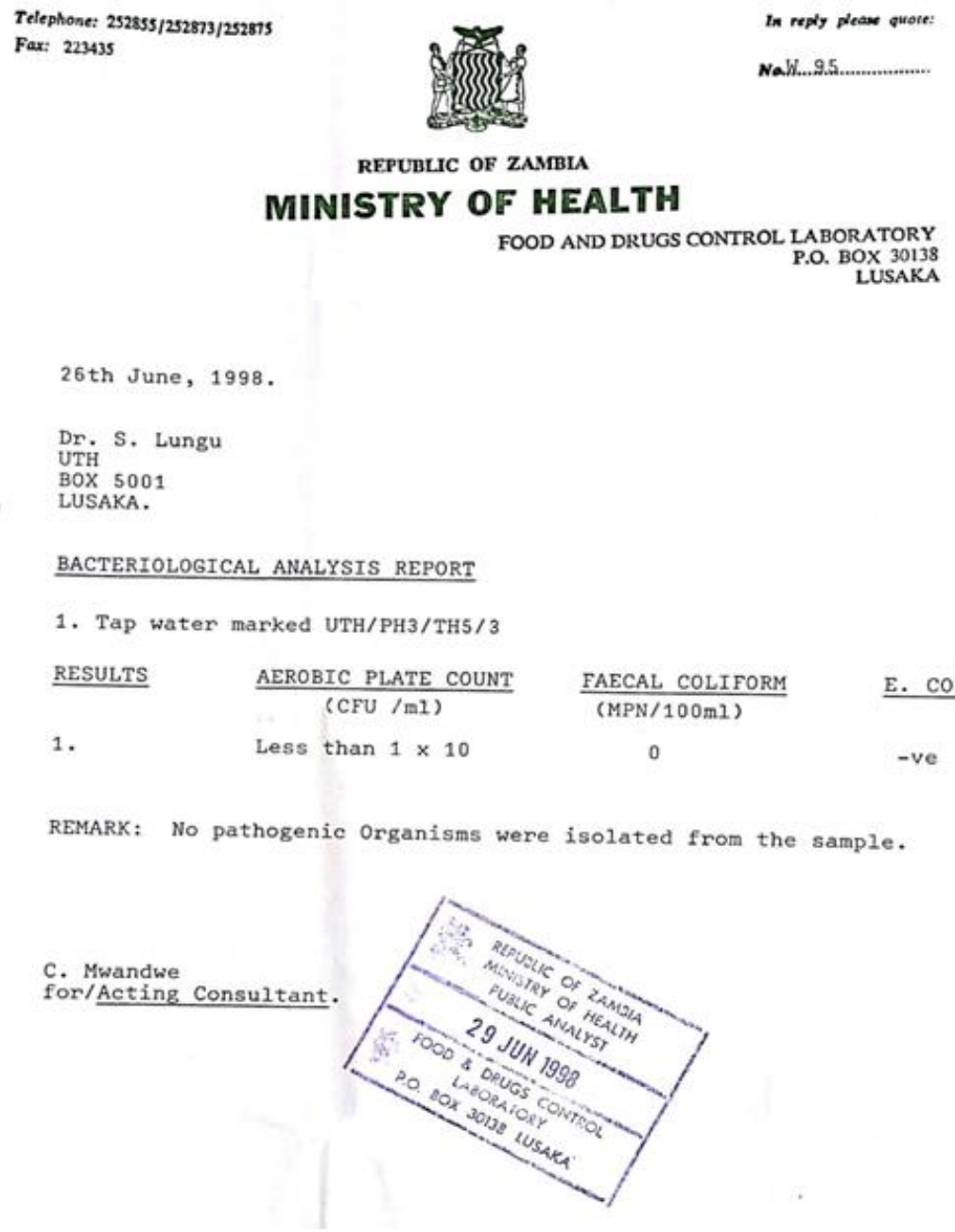
5. Results

Table 1

Date	Theatre	Tap No.	Faecal Coliform MPN/100ml	APC – CFU/ml	E. Coli
17/06/98	5	1	< 1 x 10	0	Negative
17/06/98	5	2	<1 x 10	0	Negative
26/06/98	5	3	<1 x 10	0	Negative
29/06/98	8	5	< 1 x 10	0	Negative
29/06/98	8	6	< 1 x 10	0	Negative
29/06/98	3	4	< 1 x 10	0	Negative
02/07/98	5	11	< 1 x 10	0	Negative
02/07/98	5	12	< 1 x 10	0	Negative
02/07/98	5	7	< 1 x 10	0	Negative
02/07/98	5	8	< 1 x 10	0	Negative
02/07/98	8	9	< 1 x 10	0	Negative
02/07/98	8	10	< 1 x 10	0	Negative

Note that the remark for all the samples was "No pathogenic organisms were isolated from the samples." See appendix I below.

Appendix



Telephone: 252855/252873/252875
Fax: 223435

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REPUBLIC OF ZAMBIA
MINISTRY OF HEALTH
FOOD AND DRUGS CONTROL LABORATORY
P.O. BOX 30138
LUSAKA

26th June, 1998.

Dr. S. Lungu
UTH
BOX 5001
LUSAKA.

BACTERIOLOGICAL ANALYSIS REPORT

1. Tap water marked UTH/PH3/TH5/3

RESULTS	AEROBIC PLATE COUNT (CFU /ml)	FAECAL COLIFORM (MPN/100ml)	E. COLI
1.	Less than 1 x 10	0	-ve

REMARK: No pathogenic Organisms were isolated from the sample.

REPUBLIC OF ZAMBIA MINISTRY OF HEALTH PUBLIC ANALYST 29 JUN 1998 FOOD & DRUGS CONTROL LABORATORY P.O. BOX 30138 LUSAKA

C. Mwandwe
for/Acting Consultant.

See attachment (example of a report per theatre room and tap)

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