

## التقييم البكتريولوجى لمياه الشرب فى مزارع الحيوانات المختلفة

دكتور / ط.ح. مصطفى ، دكتور / ع.ا. اسماعيل ، دكتور / ع.ا. احمد ، دكتور / م.ى.م.

• كامل

### الملخص العربى

تم فحص ٥٠ عينة من المياه المستعملة فى مزارع الحيوانات المختلفة فى محافظة أسيوط ،

• المنيا

وأسفرت النتائج عن وجود بكتريا القولون بنسبة مرتفعة مما يؤكد تلوث المياه كما أن عزل  
الميكروبات المرضية المختلفة من المياه المستخدمة فى هذه المزارع يبين مدى عدم مطابقتها للمواصفات  
الصحية للمياه وخاصة ما يستعمل منها فى مزارع الحيوانات المنتجة للألبان .

• ويوصى الباحثون بضرورة غسل وتطهير أحواض الشرب بصفة دورية .

مجلسه مذاکره و تالیف در تاریخ ۱۳۰۲

در روز شنبه ۱۳۰۲

بسم الله الرحمن الرحیم

اینک که در این مجلسه مذاکره و تالیف

در روز شنبه ۱۳۰۲

توجه شد

Dept. of Animal Hygiene and Preventive Medicine, Faculty  
of Vet. Med., Assiut University.

Head of Dept.: Prof. Dr. S. Nasr.

## MICROBIOLOGICAL EVALUATION OF WATER SUPPLIES IN DIFFERENT ANIMAL ENCLOSURES

(with 3 Tables)

By

T.H. Moustafa, A.A. Ismail, A.A. Ahmed and Y.Y. Kamel

(Received at 29/3/1976)

### SUMMARY

Samples from 50 water troughs actually used for different species of farm animals were examined bacteriologically to evaluate their hygienic quality.

The results obtained revealed that Coliform organisms were found in considerable numbers in most of samples examined which indicate pollution.

It is epidemiologically significant that the abundance of the potentially pathogenic isolates demonstrate the unhygienic conditions existing in most farms investigated, especially in dairy farms which have a direct relation to public health.

Periodical cleaning and disinfection of water troughs in different farms is recommended.

### INTRODUCTION

Water is as vital to livestock as feed. The key to raising healthy livestock of high market values is the availability of sufficient quantity and good quality water at regular intervals.

Water supplies may become infected with micro-organisms derived either from man or animals, which may lead to serious out-breaks.

A widespread epidemic of *S. typhimurium* infection among sheep was reported by WATTS and WALL (1952). They found that their drinking water was contaminated with the droppings of infected birds.

The presence of typical *E. coli* in water was considered by the W.H.O. (1958) as the most reliable indicator of faecal pollution.

In 1964, LAFFOLAY described the role of polluted water in the transmission of bacterial diseases to man and animals.

KALICH *et al*, (1967) examined water samples collected from drinking water installations of cattle and horses for *E. coli*. They found that only the nipple type constantly yielded samples free from these organisms.

An outbreak of *Pseudomonas aeruginosa* in calves was described by PRASAD *et al.* (1968). Bacteriological examinations revealed that the causative agent was isolated only from their water supply.

As the quality of water provided to the animals must always be controlled, this work was carried out to determine the bacteriological quality of water actually used for animal consumption inside their enclosures, and to what extent it may spread infection among livestock population.

## MATERIAL AND METHODS

50 water samples actually used for drinking of different species of animals (Table 1), were aseptically collected in sterile colourless glass bottles (one liter capacity). Each sample was thoroughly mixed before being subjected to the following bacteriological examinations :

### 1. *Presumptive test for estimation of Coliform organisms :*

It was performed as described by CHALMERS (1955), using brilliant green bile broth medium.

### 2. *Isolation of Enteric group :*

About 100 ml of each thoroughly mixed water sample were centrifuged at 3000 r.p.m. for 15 minutes. Loopfuls from the sediment were aseptically transferred to Selenite F broth tubes and incubated for 18 hours at 37°C. Mc Conkey's agar plates were inoculated from the broth tubes and similarly incubated for 24 hours. Suspected colonies were picked up and isolated in pure cultures to be identified according to KAUFFMANN (1954) and SMITH & CONANT (1962).

### 3. *Isolation of other bacterial contaminants :*

Loopfuls from the sediment were directly streaked on salt manitol and blood agar media and incubated at 37°C for 24 hours. Different growing colonies were isolated in pure culture for identification according to their cultural characters, staining reactions and biochemical activities (CRUICKSHANK *et al.*, 1969).

### 4. *Isolation of fungi :*

Sabouraud agar plates were inoculated from the sediment, and incubated at 37°C for 48 hours, then left at room temperature (15-20°C) for a week, before being examined. Aspergilli and Penicilli were identified according to the scheme of THOM and PAPER (1954). Other molds were identified according to their morphological appearance as well as the microscopical criteria (MERCHANT and PACKER, 1967).

5. Isolation of *Mycobacteria* :

The remaining sediment was treated with 4% sod. hydroxide solution and incubated at 37°C for 20 minutes, after which the suspension was similarly recentrifuged. The sediment was retreated with 5% oxalic acid, and incubated for 20 minutes at 37°C, then centrifuged once again for 15 minutes at 3000 r.p.m., after which it was evenly distributed on four slopes of modified LOWENSTEIN-JENSEN media. Inoculated slopes were left horizontally for 24 hours at room temperature, then incubated at 37 °C. in an upright position for 8 weeks. Each culture slope medium was examined daily for 3 days, and once a week thereafter for the presence of any suspected growth (acid fast bacilli.)

TABLE 1.—The number of water samples collected from the different animal enclosure investigated.

Farm	Locality	Cattle Byres			Buffaloe enclosures			Sheep Shelters	Horse Paddock	Total
		Dairy Cows	Bulls	Calves	Dairy cows	Bulls	Calves			
Faculty of Agriculture. . . . .	Assiut	5	1	12	1	1	1	1	—	22
Buffaloe breeding station . . . . .	Hawatka	—	—	—	6	1	3	—	—	10
Faculty of Agriculture. . . . .	Minia	3	—	4	—	—	—	3	2	12
Secondary Agricultural School . . . . .	Assiut	2	1	—	—	—	—	3	—	6
Total . . . . .		10	2	16	7	2	4	7	2	50

## RESULTS AND DISCUSSION

The results obtained are presented in Tables 2 and 3

Coliform bacteria were present in considerable numbers in the water samples examined. The results obtained revealed that the average *B. coli* titre ranged from  $10^{-1}$  to  $10^{-2}$ .

Since this group of organisms are commonly present in faecal matter and soil as well as on plants and grains, their presence in water is almost universally interpreted as an index of undesirable contamination and may signify that other potentially pathogenic organisms may also be present (W.H.O., 1958).

TABLE 2.—Bacterial contaminants isolated from drinking water troughs

Isolates	No.	Samples %	Isolates %
Staph. aureus . . . . .	3	6	4.28
Strept. pyogenes . . . . .	2	4	2.85
Strept. faecalis . . . . .	10	20	14.28
Arizona Spp. . . . .	1	2	1.42
Shigella flexneri . . . . .	2	4	2.85
Proteus vulgaris . . . . .	8	16	11.42
Proteus rettgeri . . . . .	10	20	14.28
Proteus morgani . . . . .	2	4	2.85
Proteus mirabilis . . . . .	2	4	2.85
E. coli . . . . .	7	14	10.00
Alcaligenes faecalis . . . . .	5	10	7.14
Alkales. dispar group . . . . .	3	6	4.28
Klebsiells Spp. . . . .	9	18	12.85
Pseudomonas Spp. . . . .	3	6	4.82
Aerobacter Spp. . . . .	1	2	1.42
Citrobacter Spp. . . . .	2	4	2.85
	70		

Water containing Coliform bacteria is looked upon with suspicion as it may be responsible, for a group of animal diseases including summer diarrhoea in calves, pyelonephritis and some cases of mastitis in cattle (THOMASON, 1956 and STABLEFORTH & GALLOWAY, 1959). Moreover, this group of organisms is of considerable importance in dairy farms, since the use of such water for washing the milkers' hands, udders or milk utensils, may be responsible for the development of objectionable taints and flavours in milk and milk products (FOSTER *et al.*, 1958).

The demonstration of pathogenic bacteria, would obviously constitute the most direct proof of a dangerous impurity (Table 2).

Although the presence of *Proteus* species does not constitute an animal health hazard, yet they may be associated with other organisms, as secondary invaders, in wound-infections and diseases of mucous membranes. Moreover, they have been isolated from cases of cystitis and pyelitis in man (SOLTYS, 1963).

*Shigella flexneri* could be isolated only from water troughs intended for buffaloes (Table 2). Although the natural habitat of dysentery bacilli is the human intestines, yet it has been isolated from rabbits, calves and dogs in Egypt (FLOYD, 1955). The organisms were excreted in the faeces of infected man and animals for a few weeks, and some may become persistent carriers (SZTURM-RUBINSTEN & PIECHAUD, 1965). Contamination of water troughs may occur either directly through faecal matter from diseased or carrier man and animals or indirectly through insects, particularly flies, which are of importance in the spread of the diseases (HUTCHINSON, 1956). Moreover, in dairy farms, contamination of milk may therefore arise from the use of contaminated water supply. (CHALMERS, 1955).

TABLE 3.—Types of isolated fungi from water troughs

Isolates	No.	Sample %	Isolates %
Dematiaceae . . . . .	3	6	15.78
Mucor Spp. . . . .	5	10	26.31
Rhizopus Spp . . . . .	1	2	5.26
Aspergillus Spp. . . . .	6	12	31.57
Penicillium Spp. . . . .	1	2	5.26
Candida Spp. . . . .	1	2	5.26
Botrytis Spp. . . . .	2	4	10.52
	19		

Arizona species were incriminated in diseases of man, fowls, dogs and cats (EDWARDS and associates, 1952). They produce similar clinical syndroms as *Salmonellae*, and are regarded as very similar from the epidemiological point of view (CRUICKSHANK *et al.*, 1969).

*Klebsiella*, *Citrobacter* and *Aerobacter* species have been associated with cases of enteritis and frequently in urinary tract infections in man and animals (BAILY and SCOTT, 1974). They are not considered as truly pathogenic but may possibly be opportunists.

*Strept. faecalis* have been found to be associated with specific disease conditions such as pneumonia in sheep, endocarditis and arthritis in lambs and occasionally mastitis, urinary and other infections in cattle (STABLEFORTH and GALLOWAY, 1959).

*Strept. pyogenes* and *Staph. aureus* were responsible for a number of diseases in man and animals. They are associated with tonsillitis, septic sore

throat and various suppurative inflammatory conditions in man. The organisms may be transmitted from an infected worker during the milking process invading the bovine mammary gland producing mastitis (MERCHANT and PACKER, 1967).

Mycobacteria failed detection in all samples examined.

The pathogenic fungi presented in Table 3 can produce various pathological conditions in man and animals (AINSWORTH and AUSTWICK, 1958). Moreover, they can infect the udder tissues causing mastitis in dairy animals, when such contaminated water is used for washing the udder or milker's hands. Therefore, their presence in water constitutes a possible hazard for human and animals.

From the results achieved in this study, it is epidemiologically significant that the abundance of isolates demonstrates the unhygienic conditions existing in most farms investigated.

In dairy farms, soiled water used for washing the udders, milker's hands or milk utensils is a notorious means in spreading infections among man and animals.

The bacteriological quality of water should approximate to that of high purity for the development and survival of our contemporary civilization.

The use of a general water trough in stables for large animals is almost the only choice, however, precautions to reduce the likelihood of water contamination should be undertaken. For newly born animals, separate troughs should be constructed whenever possible. In addition, these water troughs should be periodically cleaned and disinfected.

#### References

- Ainsworth, G.C. and Austwick, P.K.C. (1958). "Fungal diseases of animals." Commonwealth Agricultural Bureaux.
- Baily, W.R. and Scott, E.G. (1974). "Diagnostic microbiology." 4th Ed., The C.V. Mosby Co., St. Louis.
- Chalmers, C.H. (1955). "Bacteria in relation to milk supply." 4th Ed. Edwards Arnold Limited.
- Cruickshank, R.; Duguid, J.P. and Swain, R.H.A. (1969). "Medical Microbiology." 11th E. & S. Livingstone Limited. Edinburgh & London.
- Edwards, P.R.; Kauffmann, F. and Van Oye, M. (1952). "A new diphasic Arizona type." Acta Path. Microbiol. Scand. 31, 5.
- Floyd, T.M. (1955). "Isolation of Shigella from dogs in Egypt". J. Bact., 70 621.
- Foster, E.M.; Nelson, F.E.; Speck, M.L.; Doetsch, R.N. and Olsen, J.C. (1958). "Dairy Microbiology." MacMillan & Co. Ltd., London.
- Hutchison, R.I. (1956). "Some observations on method of spread of sonne dysentery." Month. Bull. Hlth., 15, 110.



- Kalich, J. ; El-Bahay, G. and Maier, E.** (1967). "Hygienic and economic significance of drinking water installations". *Tierarztl. Umsch.*, 22, 134.
- Kauffmann, F.** (1954). "Enterobacteriaceae." Einar Munksgaard 2nd Ed., Copenhagen.
- Loffolay, B.** (1964). "Drinking water and animal diseases." *Revue. Path. Comp.* 64, 561.
- Merchant, I.A. and Packer, R.A.** (1967). "Veterinary bacteriology and Virology." 7th Ed. The Iowa State University Press. Ames., Iowa, U.S.A.
- Prasad, B.M. ; Srivastava, C.P. ; Narayan, K.G. and Prasad, A.K.** (1968). "Source of Pseudomonas infection in calves." *Indian J. Anim. Hlth*, 7 51.
- Smith, D.T. and Conant, N.F.** (1960). "Zinsser Microbiology". 12th Ed. Appleton-Century-Croft. Inc. New York.
- Soltys, M.A.** (1963). "Bacteria and Fungi pathogenic to man and animals." Bailliere Tindall & Cox, London.
- Stableforth, A.W. and Galloway, I.A.** (1959). "Infectious diseases of animals. Diseases due to bacteria". Vol. I. Butterworths Scientific publications, London.
- Szturm-Roubinson, S. and Pichaud, D.** (1965). "Shigella isolated from the faeces of animals." *Annls Inst. Pasteur Paris*, 108, 257.
- Thom, C. and Paper, K.D.** (1945). "A manual of the Aspergilli." Baltimor, Williams & Wilkins Comp.
- Tomason, S.** (1956). "Is infantile gastro-enteritis fundamentally a milk-borne infection?" *J. Hyg. (Lond.)*, 54, 311.
- Watts, P.S. and Wall, M.** (1952). "Salmonella typhimurium epidemic in sheep in South Australia." *Aust. Vet. J.*, 28, 165.
- World Health Organization** (1958). "International Standards for drinking water". Palais de Nations Geneva.
- Authors address :** Dr. T.H. Moustafa., Dept. of hygiene. Fac. of vet. Med. Assiut.

MEMORANDUM OF THE BOARD OF TRUSTEES

Resolved, That the Board of Trustees do hereby certify that the following is a true and correct copy of the minutes of the meeting of the Board of Trustees held on the 15th day of June, 1900, at the City of New York, New York.

Attest: Secretary of the Board of Trustees

Secretary of the Board of Trustees