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INFLUENCE OF WATER POLLUTION ON GENERAL HEALTH AND MILK PRODUCTION OF EGYPTIAN BUFFALOES

(With 4 Tables)

By

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تأثير تلوث المياه الجوفية على الصحة العامة وإنتاج اللـــــبن
فى الجاموس المصـــــــــرى

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تم فى هذا البحث دراسة تأثير تلوث المياه الجوفية على إنتاج اللبن والصورة الإكلينيكية وكذا بعض التغيرات الدموية والبيوكيميائية فى خمسون من الجاموس المدر للبن بالمقارنـــة بعشرة من الحيوانات السليمة ظاهرياً والتى تشرب ماء نقى أخذت ككنترول · هذا وقد لوحظ إنحدار شديد فى مستوى إنتاج اللبن فى جميع الحيوانات · أما الصورة الإكلينيكية فكانـــت مكونة فى خمول ونقص فى نشاط الحيوانات مع ضعف عام وزيادة فى معدل مرات التنفس ومعـدل ضربات القلب وكبح للشهية · كما أن الصورة الدموية أثبتت زيادة واضحة فى عدد خلايـــــا النيوتروفيل مع آننميا غير معنوية · كيميائياً كان هناك زيادة معنوية فى قيم جميع الانزيمات المقاسة مع زيادة غير معنوية فى الكرباتينن ، واليليروبين واليوريا نتروجين ، أما البروتـــين الكلى والجلوكوز فقد إنخفض انخفاضاً واضحاً بالمقارنة بالمجموعة السليمة ظاهرياً ·

SUMMARY

The present study was conducted to determine the influence of water pollution upon milk production, clinical behavior as well as some haematological and biochemical parameters of fifty dairy buffaloes in comparison to other ten control group. A highly significant drop in the levels of daily milk production of all animals under experimentation was recorded and tabulated. Clinical observations included dull apearance, reduced activities, apathy, polyponea and tachycardia. The obtained heamatological results showed a marked neutrophilia with a non significant anaemia.

Biochemical data revealed a highly significant increase in all measured enzymes together with a non significant elevation in the levels of creatinine, bilirubin and urea nitrogen. Total protein and blood glucose were markedly droped, in comparison with the autocontrol group.

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INTRODUCTION

Modern aspects in veterinary practice are now directed towards increasing milk and meat productions by improvement of growth rate, efficiency of food utilization and productive efficiency with a minimal and cheapest cost of food intake.

Although drop in milk production occurs sporadically in all dairy buffaloes.

Many diseases of buffaloes are incriminated as the main cause of the interference with general health, food intake and concquently milk production. So milk can be considered as a mirror of general health condition of dairy animals which reflects the various changes closely associated with affections of many organs (KELLY, 1974). Water is considered as vital to livestock as feed. Raising healthy livestock of a high market value requires the availability of sufficient quantity and good quality water and is a very important factor in the production of milk. Chemical charactersitics of water are important parameters of its quality and its potetial health impact.

LEITCH and THOMSON (1944) reviewed on the effect on animals consuming water which has a high saline and mineral content and reported that excesses of nitrates, sulphates, sulphides, florine and magnesium caused certain disorders and even death when consumed by some animals. On the other hand, LARSEN and BAIELY (1913) stated that no deverse effects were observed when polluted water was consumed by dairy cows.

The mineral salts of sodium, potasium, magnesium and calcium are a major factor contributing to diminishing water quality, MCKEE and WOLF (1963) and DUTT and MCCREARY (1970). The U.S. Public Health Service (1962) recommends that domestic drinking water should contain less than 500 ppm total dissolved salts.

Water containing 5000 ppm dissolved salts have been classified as satisfactory for lactating cows (National research concil 1974) while concentrtion approaching 7000 ppm gnerally are not recommended (ANON, 1950 and EMBRY et al., 1959).

Concerning the haematological and biochemical changes associating water pollurion, little had been recorded. BLOOD et al. (1979) concluded that the polluted water may be considered as essential factor in the alteration of Liver and Kidney functions.

Moreover, animals were found mostly to be due to environmental pollution including water (DOXEY, 1971). Furthermore, IBRAHIM (1983) attributed the drop levels of milk production generally to the anaemic condition resulting from errors in food and water intake.

Our study aimed to compensate the deficient data concerning the effect of water pollution on general health, milk production and some blood constituents including Kidney and Liver functions to put it in consideration during treatment and control of such problem.

MATERIAL and METHODS

The present work was carried out on 50 Egyptian dairy buffaloes 5-7 years old, drinking water from a driven well, in addition to other ten apparently healthy animals obtaining a fresh tap water supply, served as control. These animals were belonged to inhabitants of farm ofFac. of Vet. Med. at Esmaeileia. Animals fed cotton seed cakes, barly and barseem at therate of 3, 2 and 5 K.g/H./day, respectively, together with adequate amount of tibn.

They showed signs of dull appearance, reduced activity, apathy, polyponea and tachycardia. All of examined animals passed clinical and laboratory examination, and were free from both external and internal parasites.

A total of 10 water samples were collected from the source of water supply of the driven well ofexamined dairy farm. This farm was visited periodically at different occasions.

Two glass bottles each of one liter capacity were used for each sample. The water of well was pumped mechanically for five minuts, then the sample was collected. Each sample was labeled, and indentified. the pH of samples were taken atcollection time. The same procedure was adopted on the fresh tap water supplied to the control group.

Standard methods were used for chemical examination of water (A.P.H.A., 1971) including Ammonia using the direct Nesslerization, Nitrite by diazotization method, Chloride by Argetometric method, sulphate by Gravimetric method with ignition of residue, and hardness by using E.D.T.A. Titrimetric method.

Later on Nitrates by Bruccing method according to A.P.H.A. (1960).

Blood and serum samples were collected from examined animals for haematological and biochemical studies. Total erythrocytic count, total and differential leucocytic count and haemoglobin concentration were determined according to SONNERWIRTH and JASTER (1980).

Serum analysis including Transaminases, Alkaline phosphatase, Creatinine, glocose, total protein, Bilirubin and Urea nitrogen, were determined after REITMAN and FRANKEL (1957), KIND and KING (1954), COLES (1967), HYVARINEN and NIKKILA (1962), WEIELUSELL (1956), EL-AMROUSI et al. (1965) and CAMPBELL and WATTS (1970), respectively.

RESULTS and DISCUSSION

The source of water supply in the examined dairy farm from driven well. The depth of te well is about 40-60 meter and the distance between the well and yard for about 50 meter. The water pumped mechanically and distributed to water through. The area of El-Esmaeileia is near drains for about 50 Kilometers and the surrounding area is sandy soil which may indicate high amount of some chemical pollutants.

Regarding the chemical content of examined water samples (table 4) it is evident that the mean value of pH was 6.98 with a maximum of 7.1 and minimum of 6.8. The concentration of Ammonia ranged from 2.75 to 3.53 with a mean value of 2.99 mg/L.

The concentration of Nitrites varied from 0.01 to 0.03 with a mean value of 0.02 mg/L, while Nitrates lies between 33.73 and 37.15 with an average of 35.44 mg/L. On the same time, the mean value of Chlorides, sulphate and Hardness in collected water samples were (1930), 624.88 and 960 mg/L, respectively.

The obtained results show that Ammonia, Choloride, Sulphate and Hardness were found in concentration exceeded the highest desirable limit (0.5, 250, 200 and 100 mg/L, respectively) recommended by W.H.O. (1971).

From the hyginic point of view, high concentration of Choloride in water may render itunpalatable for livestock and may cause toxic effect for all classes of animals especially dairy cows which are more suceptible than beef cattle (BLOOD and HANDERSON, 1974). On the other hand, the Sulphate ions water may adversely affect the health of cattle by causing methaemoglobinaemia, Sulphhaemoglobinaemia, decreased appetite and loss of body weight (WEETH and HUNTER, 1971).

Generally, it can be concluded that the examined water unfit for consumption and affect the health of such animals.

Close observation concerning clinical data revealed dull appearance, reduced activities, apathy, polyponea and tachycardia of all animals supplied with polluted water. Similar findings were recorded by KELLY (1974) and BLOOD et al. (1979).

The obtained data concerning levels of milk production revealed a market reduction withen the period of 3 months, in comparison with the auto control group. Similar data were reported by GRAF and WOLDAWAY (1952) and JASTER et al. (1978) who noticed a considerable drop of daily milk yeld of cows drinking mineralized water.

Regarding haematological data (Table 1), there was a non significant reduction in haemoglobin concentration and total erythrocytic count together with leucocytosis and neutrophilia.

Doxey (1971) concluded that drinking meineralized water is usually accompained by lowered percentage of haemoglobin, erythrocytic count togheter with leucocytosis.

In addition IBRAHIM (1983) attributed the drop levels of milk production generally to the anaemic condition resulting from errors in food and water intake. The present results are in a partial agreement with the previous studies.

(Table 2) presents the normal and subnormal levels of total protein in healthy and affected bufaloes, respectively.

The different alterations concerning haematological picture and total protein pointed out that, there is a direct relationship between red blood count, haemoglobin percentage and total protein in which the resulting anaemia was usually accompained by lowered

protein production. The most important basic cause might be due to the failure of bone marrow to produce enough erythrocytes due to the damage marrow cells or deficiency of the raw materials need for cell production.

Moreover, the declined values of total protein might be due to the state of inapitance or due to the inability of the Liver to synthesize protein, and the later was proved by the Liver function tests, in which the obtained data reveled a highly significant elevation of all measured enzymes including Transaminases and Alkaline Phosphatase.

The observed alteration in serum enzymes may be referred to the degenerativer changes accompained the anaemic condition, our findings coincide with those obtained by DOXEY (1971) and BLOOD et al. (1979).

Furthermore, the lowered values of blood glucose might be attributed to the lowered food intake and the different alterations in the Liver function which is responsible for carbohydrate metabolism.

Serum bilirubin was non significantly increased. In fact this elevation is not diagnostic for Liver disfunction. Similar data were obtained by DOXEY (1971). While elevated values of serum creatinine can be considered as an indicator of renal damage or mild kidney damage, so, there is a direct relationship between the mineralized water and Kidney function and concequently general health and milk production. Our findings were in agreement with those reported by HOE and O'SHEA (1965).

Blood urea nitrogen was found to be slightly elevated indicating a renal damage, because the later is responsible for the retention of urea in blood. General speaking the degree of damage can be considered as a mild or slowly progressive chronic nephritis in which the later may have normal blood urea values if enough nephrons are still functioning adequently. Similar findings were recorded by CAMPBELL and WATTS (1970).

The present work is an attempt for finding out the relation between polluted water and levels of milk production later on with some haematological and biochemical changes. This may be shed light upon the control and diagnostic procedure of such problem.

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Table (1): Blood picture in both clinically healthy and disturbed buffaloes.

Variable Unit		R.B.Cs. Millions	Hb. Gm%	W.B.Cs. Thousands	Neutrophils %	Esinophils %	Basophils %	Monocytes %	Lymphocyes %
Control animals	Max	10.5	13	11	42	18	2	9	73
	Min	6	9	5	17	3	0	2	40
	Mean	8.41 ±0.21	11.1 ±0.2	7.22 ±0.32	29.3 ±1.45	9.1 ±1.2	0.5 ±1.15	0.3 ±0.4	58.05 ±1.95
Affected animals	Max	9.5	11	12	85	16	2	10	80
	Min	4	8	6.5	30	0	0	4	45
	Mean	6.78* ±0.41	10.2 ±0.1	8.45 ±0.12	58.2** ±0.43	6.25* ±1.6	0.75* ±0.32	6.9* ±0.4	62.3 ±1.2

* : Significant (P/__ 0.05).   ** : Highly significant (P/__ 0.05)

Table (2): Changes in some biochemical parameters in serum of normal and disturbed buffaloes.

Aspects	Examination animals	
	Control	Disturbed
G.O.T. (IU)	23.12 ± 1.02	70.2 ± 2.4***
G.P.T. (IU)	11.3* ± 0.6	22 ± 3.1**
Alk.Ph. (IU/1)	58.4 ± 2.1	73.4 ±**
Cretinine. (mg/1001)	1.8 ± 0.4	2.1 ± 0.05
Bilirubin. (mg/100 ml)	0.22 ± 0.1	0.9 ± 0.1
Urea nitrogen. (mg/100 ml)	15.4 ± 1.6	18.6 ± 0.3
T.protein. (mg/100 ml)	7.65 ± 0.04	5.1 ± 0.3*
Blood glucose. (mg/1001)	41.1 ± 1.6	33.6 ± 2.7*

Table (3): Levels of milk production in normal and disturbed animals.

	Control group	Disturbed group
Unit	K.gm/day	K.gm/day
Max	12	8
Min	6	0.0
Mean	8.21	4.109
	±0.13	±0.25

Table (4): The range and mean of chemical contents of polluted and tap water samples.

Variable Unit		pH.value	Ammonia mg/L	Nitrite mg/L	Nitrate mg/L	Chloride mg/L	Sulphate mg/L	Hardness mg/L
Polluted water	Max	7.1	3.53	1.01	37.15	1960	649.26	980
	Min	6.8	2.75	0.03	33.73	1900	600.5	949
	Mean	6.98	2.99	0.02	35.44	1930	624.88	960
Tap water	Max	7.5	0.0	0.0	0.456	150.18	100	85.13
	Min	7	0.0	0.0	0.0	95.18	85	41.11
	Mean	7.2	0.0	0.0	0.278	122.718	92.6	53.586