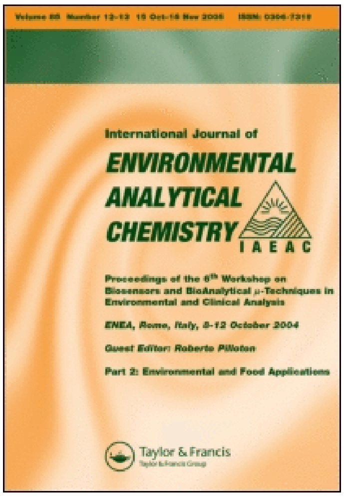

International Journal of Environmental Analytical Chemistry
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t713640455

identification and Determination of Harmful Substances in Libyan Water Samples

A. El Bayoumi[a]; A. El Shanawani[a]; M. Jaeda[a]
[a] Faculty of Pharmacy, Great Al-Fateh University, Tripoli, Libya

To cite this Article Bayoumi, A. El , Shanawani, A. El and Jaeda, M.(1991) 'identification and Determination of Harmful Substances in Libyan Water Samples', International Journal of Environmental Analytical Chemistry, 45: 3, 153 — 157
To link to this Article: DOI: 10.1080/03067319108026986
URL: http://dx.doi.org/10.1080/03067319108026986

Intern. J. Environ. Anal. Chem., Vol. 45, pp. 153–157
Reprints available directly from the publisher
Photocopying permitted by license only

IDENTIFICATION AND DETERMINATION OF HARMFUL SUBSTANCES IN LIBYAN WATER SAMPLES

A.EL BAYOUMI, A.EL SHANAWANI and M. JAEDA

Faculty of Pharmacy, Great Al-Fateh University, Tripoli, Libya

(Received 5 May 1991; in final form 10 May 1991)

INTRODUCTION

The object of the present study was to determine some physical and chemical characteristics of Libyan water samples to provide a background for the assessment of future priorities, planning, implementation and follow-up of programmes in the area of environmental health. Well-known analytical methods were applied for the determination of pH, nitrate, nitrite and inorganic trace components[1–12].

EXPERIMENTAL

Apparaus

A Shimadzu double-beam spectrophotometer UV-150-02, and a digital E 532 pH meter from Metrohm Herisau were used.

Materials and reagents

All chemical and reagents are of analytical-grade quality.

Procedures

Two-liter representative water samples were collected in amber-coloured borosilicate glass bottles kept at about 20°C; the physical characteristics were recorded immediately. To collect a sample of underground water, the pump was allowed to run for at least 30–60 min before actually taking the sample.

pH The pH of each sample was measured using a pH meter.

Chloride A 25 ml water sample was titrated with 0.01 M silver nitrate solution using potassium chromate as indicator.

Alkalinity The pH determination showed all samples to be slightly alkaline. Therefore, a 25 ml sample was titrated with 0.01 M hydrochloric acid using methyl orange as indicator.

Total hardness A 25 ml sample was taken, 2 ml of ammonia buffer (pH 10) were added and titration was done with 0.01 M EDTA using Eriochrome black T as indicator.

Calcium hardness The same procedure as above was applied, but at pH 12 (1 ml 8% sodium hydroxide solution) and a few drops of muroxide were added as indicator.

Lead A 50 ml sample was taken, 1–2 g of solid hexamine were added, and titration was done with 0.01 M EDTA using xylenol orange as indicator.

Iron A 25 ml sample was concentrated to about 10 ml, 2 drops of 50% nitric acid were added and, after heating and subsequent cooling, an ammonium thiocyanate solution was added; the volume was made up to 100 ml with water in a volumetric flask and the colour produced was measured at 470 nm.

Nitrite A 25 ml sample was transferred to a 100-ml volumetric flask, 1 ml of sulphanilic acid was added, the reaction was allowed to proceed for 2 min; 1 ml of α-naphthylamine acetate was added and the mixture was allowed to react for 10 min. The volume was made up to the mark with water and the colour produced was measured at 510 nm within 60 min.

Nitrate A 25 ml sample was evaporated to dryness, several drops of hydrogen peroxide were added, followed by 2 ml of phenoldisulphonic acid; the mixture was diluted with about 10 ml of water, 6 ml of 12 M potassium hydroxide were added, the whole solution was transferred quantitatively to a 100 ml volumetric flask, the volume was made up to the mark with water and the yellow colour obtained was measured at 390 nm.

RESULTS AND DISCUSSION

Water samples were collected from 16 different sources in Libya, in September and October 1989 (Table 1). The selected study areas represent the available sources of water in this land: underground, rain and treated sea water. The experimental results are presented in Tables 2 and 3.

The relatively high concentrations of calcium and magnesium compared with the international values for drinking water (Ca, 75 ppm; Mg, 50 ppm)[13]—in combination with the alkalinity of most samples, suggest their presence in the form of carbonate or bicarbonate salts. As for nitrate and nitrite, they were found to be present in concentrations exceeding the permissible level in Europe (50 ppm in both cases for drinking water[14]) for six and seven of the studied sources, respectively.

Table 1 Study area and source of water of Libyan water samples obtained in September and October 1989.

Sample number	*Study area*	*Source*
1	Sobratha	Underground
2	Zuara, Soulthan house	Underground
3	Hoon	Tap water
4	Zuara (Welldoon)	Underground
5	Abukamhash Chemical Comp.	Tap water
6	Zawiat El-Dahmany	Tap water
7	Faculty of Pharmacy-Tripoli	Tap water
8	Abukamhash	Sea water
9	Zuara	Rain water collected in aluminium container
10	Zuara (Port)	Sea water
11	Grian	Tap water
12	Wenziek Al-Shati	Underground
13	Temssan	Underground
14	Zuara	Underground
15	Zuara (Zrimegge)	Underground
16	Gergarish (Tripoli)	Tap water

Chloride was present in high concentrations, exceeding the permissible international values for drinking water (200 ppm)[13] in samples 1–8, 10–12 and 16. However, the water can be used for other purposes provided other harmful organic substances are absent.

In all but three cases (samples 5, 9 and 14), lead was also present in concentrations above the level permissible for drinking water, which is 0.1 ppm[15]. Iron was found

Table 2 Physical characteristics, pH amd alkalinity of 16 Libyan water samples.

*Sample no.**	*Colour*	*Taste*	*Odour*	*pH*	*Alkalinity (ppm $CaCO_3$)*
1	Colourless	tasteless	Odourless	7.27	364
2	Colourless	Bitter	Offensive	7.21	360
3	Colourless	Tasteless	Odourless	7.84	380
4	Colourless	Salty	Odourless	8.22	492
5	Colourless	Sweaty	Odourless	7.85	385
6	Colourless	Salty	Odourless	8.61	390
7	Colourless	Astringent	Offensive	8.91	500
8	Yellowish	Salty	Faint	10.00	580
9	Colourless	Sweaty	Odourless	8.00	395
10	Colourless	Salty	Odourless	9.97	480
11	Colourless	Tasteless	Odourless	8.90	465
12	Yellowish	Astringent	Odourless	8.10	420
13	Yellowish	Sandy	Odourless	7.90	370
14	Colourless	Bitter	H_2S odour	7.30	350
15	Faint pink	Astringent	Faint	7.90	380
16	Colourless	Tasteless	Odourless	7.60	350

* See Table 1.

Table 3 Inorganic substances in Libyan water samples.

*Sample no.**	*Chloride*	*Total hardness***		*Lead*	*Iron*	*Nitrate*	*Nitrite*
		Calcium & magnesium	*Calcium*				
1	400	490	200	0.40	0.81	346	ND
2	600	825	450	0.36	ND***	104	ND
3	250	240	20	0.32	0.66	5.8	ND
4	700	1820	400	0.68	ND	ND	ND
5	250	60	12	0.02	0.64	2.9	6070
6	350	455	360	0.60	0.68	11.5	1720
7	500	450	410	0.48	0.96	5.8	ND
8	4000	3920	460	0.62	ND	ND	245
9	100	40	35	0.03	ND	1.2	245
10	4500	3730	480	0.57	ND	ND	ND
11	250	250	200	0.22	0.92	231	ND
12	350	120	60	0.42	1.20	577	ND
13	200	140	120	0.44	0.82	577	ND
14	200	11560	2120	ND	0.89	ND	490
15	200	230	210	0.24	0.46	ND	615
16	350	200	170	0.18	0.97	230	1280

* See Table 1.
** All values calculated as μm $CaCO_3$ (Ref. 16).
*** ND, not detected under our experimental conditions.

to be present in concentration exceeding the permissible level[15] which is 0.3–1 ppm for drinking water, in sample 12.

CONCLUSION

The above results on the presence of harmful substances in Libyan water samples indicate that, according to European standards, none of them can be used as drinking water. Treatment of the water—taken from sources representative for Libya—according to known procedures obviously is highly necessary.

References

1. W. Wang and J. M. Williams, *Water, Air and Soil Pollution*, 44, (1989) 363–373.
2. R. J. Martin and W. J. Ng, *Water Res.*, 19, (1985) 1527.
3. F. Yaurana, P. Fernanda, R. Enrico, M. Rosanna and O. Giovanni, *Aqua Aria*, 4, (1986) 381-386.
4. A. James, *Mathematical Models in Water Pollution Control*, J. Wiley & Sons: New York, 1978.
5. H. Brauer and Y. B. G. Varma, *Air Pollution Control Equipment*, Springer-Verlag, Heidelberg. 1981.
6. Block, Roche, Soine, Wilson, Lea and Febiger; *Inorganic Medicinal and Pharmaceutical Chemistry*, Philadelphia, 1974.
7. D. R. Marmorek, D. P. Bernard, C. H. R. Wedeles and G. Sutherland, *Water, Air and Soil Pollution*, 44, (1989) 235–257.
8. T. Okutani, C. Tanaka and Y. Yamaguchi, *Talanta*, 36, (1989) 973–976.
9. J. O. Kempo, *Water Sci. Technol.*, 15, (1983) 27–28.
10. A. I. M. Aly, M. A. Mohamed and E. Hallabu, *Anal. Chem. Symp. Ser.*, 11, (1982) 475–81.

11. F. I. Khattab and A. El-Bayoumi, *Egypt. J. Pharm. Sci.*, 23, (1982) 337–353.
12. P. R. Loconto and A. K. Gaind, *J. Chromatogr. Sci.*, 27, (1989) 569–73.
13. B. R. Swistock, D. R. D. Dewalla and W. Sharpe, *J. Water Resources Res.*, 25, (1989) 2139.
14. F. Sulton, *Systematic Hand Book of Volumetric Analysis*, Butterworths, London, 1955.
15. W. Barbarak, *J. Heavy Metals Environ.*, 1, (1983) 183.
16. U.S. Environmental Protection Agency, *Methods of Chemical Analysis of Water and Wastes*, Cincinnti, 1979.