



**A** compendium of  
**drinking-water**  
**quality standards**  
**in the Eastern**  
**Mediterranean**  
**Region**



World Health Organization  
Regional Office for the Eastern Mediterranean  
Regional Centre for Environmental Health Activities  
CEHA

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# Acronyms and abbreviations

APHA	American Public Health Association
Bq	Becquerel per litre
CEHA	Centre for Environmental Health Activities
EPA	Environmental Protection Agency in the United States
GV	Guideline value
MAV	Maximum admissible value
mg/l	Milligram per litre
MCPA	4-(2-methyl-4-chlorophenoxy) acetic acid
MPN	Most probable number
MX	3-chloro-4-dichloromethyl-5-hydroxy-2-(5H)-furanone
NTU	Nephelometric turbidity unit
TCC	Total coliform count
TCU	True colour unit
TFCC	Total faecal coliform count
TTCC	Total thermotolerant coliform bacteria

# 1. Introduction

This compendium presents an overview of drinking-water quality standards in countries of the Eastern Mediterranean Region. It aims at promoting the sharing of experience among countries in the adaptation and setting of appropriate drinking-water quality standards. It may also be used in devising local drinking-water quality standards in the short term. Standards of a more permanent nature should, nonetheless, be derived from conducting studies which take into account local prevailing conditions.

A survey was conducted to collate as much relevant information as possible from all countries of the Region. In addition, the Centre for Environmental Health Activities (CEHA) contacted countries in the Region requesting that respective ministries of health provide national standards and regulations for drinking-water quality standards. Collected standards are summarized in this compendium for Bahrain, Egypt, Iraq, Jordan, Kuwait, Lebanon, Morocco, Oman, Pakistan, Palestine, Sudan, the Syrian Arab Republic and Tunisia. A summary of obtainable information is shown in Table 1.

Tables 2 to 5 show promulgated standards for drinking-water quality standards as compared with World Health Organization *Guidelines for drinking-water quality, THIRD EDITION, Volume 1, 2004*. Chemicals excluded from guideline value derivation and those for which guideline values have not been established in WHO guidelines are shown in Tables 6 and 7. The rationale behind the exclusion and for not establishing a guideline in either case is explained for each chemical.

## 2. Annotations on available standards for drinking-water quality in the Region

1. Almost all countries in the Region lack a clear strategy for the setting, promulgation and review of drinking-water quality standards. Issued standards have been adapted from WHO and international standards but have not been adapted to suit local conditions. Epidemiological studies that may help realize a more rational adaptation and determination of standards are virtually nonexistent.
2. Issued standards do not include explanatory notes to facilitate interpretation, implementation and enforcement. Frequency of sampling is not adequately addressed in most issued standards. Furthermore, standards address drinking-water quality in general, and do not specify requirements, for instance, in the distribution system, in tankers, and during times of emergency.
3. Health and aesthetic classifications do not always follow WHO recommendations. In certain cases standards are well above these guidelines, and in others, below them. No rationale is cited for these deviations.
4. There is a tendency in some countries to adopt an approach of setting limits to suit the actual prevailing characteristics of available water resources rather than setting limits to protect public health. This is unacceptable and will discourage long-term system improvement.
5. The presence of specialized institutes which can devise, set and promulgate appropriate standards appears to be absent from the majority of countries in the Region. Ministries of health and environment are usually entrusted with the issuance of such standards.
6. It is strongly recommended that countries conduct a comprehensive review of existing national drinking-water quality standards to take advantage of the recently issued *WHO Guidelines for drinking-water quality, THIRD EDITION, Volume 1, Recommendations, 2004*. In so doing it is also advisable that the following points be considered in the setting and issuance of national standards:
  - a. The ability of local laboratories to analyse results should be taken into account when standards are set. This includes the detection limits of

available equipment and whether all necessary equipment is available. It would be prudent to include all health parameters even if national testing laboratories are incapable of meeting these at the time of issuing the standards. At present, regulations in most countries of the Region exclude standards for organics, pesticides and disinfectant by-products.

- b. Pursuing a policy of allowing two limits, whenever that is deemed necessary, can provide greater flexibility in using available water resources in the absence of a better water source. Under this provision the second set of limits needs to be made clear.
- c. It is essential that the type, number and frequency of sample requirements be appropriately addressed in the promulgated standards. This is particularly necessary for a reliable evaluation of the quality of water and accrued decisions on the extent of compliance.
- d. National standards should clearly state the cases under which water becomes potentially unsafe and the notice to boil water should be issued, and when this notice may be removed.
- e. Affordability needs to be accounted for in setting standards. It may be impossible in certain cases that such standards can ever be realized due to economic hardship.
- f. Stakeholders' participation in the setting and issuance of standards needs to be ensured.
- g. The rationale for the selection of values other than WHO or other international guidelines should be explained in the promulgated standards.
- h. Promulgated standards should be subject to revision every 3–5 years or as often as the need arises. This is to account for new scientific developments in the field, and also to reflect on the experience gained in their implementation.



### 3. A summary of the collected information on drinking-water standards in the Region

**Table 1. A summary of the collected information on drinking-water standards in the Region**

Country	Name of national regulation	Issuing agency	Year of issuance	Quality standards for	Remarks
Bahrain	Decree No.(10) for Environmental Standards (water and air)	Ministry of Housing Municipalities and Environment	1999	Water and air	Table 5 for water standards Annex 2 is missing
Egypt	Decree of Minister of Health No (108) and (301)/1995	Ministry of Health	1995	Drinking-water Source protection	
Iraq	IQS 417/2001, ICS: 13.060.20 First update–drinking-water	Council of Ministers – Central Agency for Meteorology and Quality Control	2001	Drinking-water	
Jordan	Drinking-water Standards; JS 286:2001	Standards and Meteorology Corporation	2001	Drinking-water	
Kuwait	WHO guidelines for drinking-water quality	Environmental Public Authority	1999	Drinking-water	WHO guidelines are applied without modification
Lebanon	Ministry of Environment Decree No. 52/1–Standards for the Minimization of Pollution of Air, Water and Soil	Ministry of Environment	1996	Drinking-water Surface water used as a source for drinking after treatment	
Morocco	Quality Standard of Water for Human Consumption Homologation Decree No. 359–91	Moroccan Industrial Standards Office (SNIMA)	1991	Water for human consumption	
Oman	Omani Standards No.(8) (OS 8/1978)	Ministry of Commerce and Industry/Directorate General for Specifications and Measurement	1978	Drinking-water	

Country	Name of national regulation	Issuing agency	Year of issuance	Quality standards for	Remarks
Pakistan	WHO guidelines for drinking-water quality	Ministry of Health	2001	Drinking-water	WHO guidelines for drinking-water quality were adopted
Palestine	Palestine Standard 41	Palestine Standards Institution	1997	Drinking-water	Adopted from WHO and Jordanian Standard JS:286/1997
Sudan	Drinking-water Standard ICS 13.060.00	Sudanese Standards and Metrology Organization	2002	Drinking-water	
Syrian Arab Republic	Syrian Arab Republic Drinking-water Quality Standards	Ministry of Environment/Higher Council for Environment Safety	1994	Drinking-water	
Tunisia	Project of Tunisian Standard PTS 14.09 (1993)	National Institute of Standardization and Industrial Property	1991	Drinking-water	This is a project document and cannot be considered a Standard as such

## 4. Drinking-water quality standards in the Region compared with WHO guidelines

### 4.1 Bacteriological quality

**Table 2. Bacteriological drinking-water quality standards in the Region compared with WHO guidelines**

Country/ Organization	Name of standard	All water intended for drinking <sup>a</sup>	Treated water entering the distribution system		Treated water in the distribution system	
			Organisms			
		<i>E. coli</i> or thermotolerant coliform bacteria <sup>b,c</sup>	<i>E. coli</i> or thermotolerant coliform bacteria <sup>b</sup>	Total coliform bacteria	<i>E. coli</i> or thermotolerant coliform bacteria <sup>b</sup>	Total coliform bacteria
WHO	Guidelines for drinking-water quality, THIRD EDITION, Volume 1, Recommendations. WHO, Geneva, 2004.	Must not be detectable in any 100 mL sample.	Must not be detectable in any 100 mL sample.	Must not be detectable in any 100 mL sample.	Must not be detectable in any 100 mL sample.	Must not be detectable in any 100 mL sample. In the case of large supplies, where sufficient samples are examined, must not be present in 95% of samples taken throughout any 12-month period.
Bahrain	Decree No.(10) for Environmental Standards (water and air).				<i>E. coli</i> must not be detectable in any 100 mL sample.	TCC must not be detectable in 100 mL sample.

Country/ Organization	Name of standard	All water intended for drinking <sup>a</sup>		Treated water entering the distribution system		Treated water in the distribution system	
		Organisms					
		<i>E. coli</i> or thermotolerant coliform bacteria <sup>b,c</sup>	<i>E. coli</i> or thermotolerant coliform bacteria <sup>b</sup>	Total coliform bacteria	<i>E. coli</i> or thermotolerant coliform bacteria <sup>b</sup>	Total coliform bacteria	
Egypt	Decree of Minister of Health and Population No.(108)/1995.	1. TCC (per 100 cm <sup>3</sup> ): 95% of samples taken in 1 year should be free. No sample should contain more than three cells/100 cm <sup>3</sup> in two consecutive samples of the same source. 2. TFCC: Must not be detectable in any sample. 3. <i>Streptococcus fecalis</i> : Must not be detectable in any sample. 4. Protozoa, pathogenic nematodes of all phases and blue-green algae must not be detectable when microscopic analysis of samples is conducted.				It is generally accepted if one organism is detected in 5% of 100 samples analysed in one year.	

Country/ Organization	Name of standard	All water intended for drinking <sup>a</sup>			Treated water entering the distribution system		Treated water in the distribution system	
		Organisms						
		<i>E. coli</i> or thermotolerant coliform bacteria <sup>b,c</sup>	<i>E. coli</i> or thermotolerant coliform bacteria <sup>b</sup>	Total coliform bacteria	<i>E. coli</i> or thermotolerant coliform bacteria <sup>b</sup>	Total coliform bacteria		
		Implementation:						
		1. Standard enforcement must start immediately after its issuance for all microbiological and biological tests for all samples on a routine basis.						
		2. All new drinking-water treatment works should be designed to comply with the requirements of this standard. Laboratory facilities should be equipped to conduct the required tests. Existing treatment plants should be upgraded gradually to ensure compliance.						

Country/ Organization	Name of standard	All water intended for drinking <sup>a</sup>		Treated water entering the distribution system		Treated water in the distribution system	
		Organisms					
		<i>E. coli</i> or thermotolerant coliform bacteria <sup>b,c</sup>	<i>E. coli</i> or thermotolerant coliform bacteria <sup>b</sup>	Total coliform bacteria	<i>E. coli</i> or thermotolerant coliform bacteria <sup>b</sup>	Total coliform bacteria	
		<p>3. Testing procedures should be conducted in accordance with the latest edition of <i>Standard methods for the examination of water and wastewater</i> (American Public Health Association (APHA) and Environmental Protection Agency in the United States (EPA)). It is the responsibility of the management of the central laboratories of the Ministry of Health and Population to select, reprint and distribute the most appropriate methods in the aforementioned reference. The Ministry of Health and Population should also furnish training to personnel and provide equipment, chemicals and supplies necessary to enforce the Standard. The Ministry of Health and Population should also apply quality control measures in all of its laboratories.</p>					

Country/ Organization	Name of standard	All water intended for drinking <sup>a</sup>	Treated water entering the distribution system		Treated water in the distribution system	
		Organisms				
		<i>E. coli</i> or thermotolerant coliform bacteria <sup>b,c</sup>	<i>E. coli</i> or thermotolerant coliform bacteria <sup>b</sup>	Total coliform bacteria	<i>E. coli</i> or thermotolerant coliform bacteria <sup>b</sup>	Total coliform bacteria
Iraq	Drinking-water Standard IQS: 417/2001.	Health aspects: Should comply with microbiological limits stated in the Guidelines for Food Products No. 365.				
Jordan	Drinking-water Standards; JS 286:2001.	<p>1. Bacteria:</p> <p>a. TCC: Must be &lt; 1.1 MPN/100 mL and must not be detectable in 100 mL when filtration method (or any internationally recognized method is used).</p> <p>b. TTCC or <i>E.coli</i>: Must be &lt; 1.1 MPN/100 mL and must not be detectable when filtration method is used (or any internationally recognized method is used).</p> <p>2. Parasites: The following must not be detectable:</p> <p>a. Pathogenic intestinal protozoa in all of their phases.</p> <p>b. Pathogenic intestinal</p>				

Country/ Organization	Name of standard	All water intended for drinking <sup>a</sup>				Treated water entering the distribution system		Treated water in the distribution system	
		Organisms							
		<i>E. coli</i> or thermotolerant coliform bacteria <sup>b,c</sup>	<i>E. coli</i> or thermotolerant coliform bacteria <sup>b</sup>	Total coliform bacteria	<i>E. coli</i> or thermotolerant coliform bacteria <sup>b</sup>	Total coliform bacteria			
		nematodes in all of their phases							
		<p>3. Free living organisms (nematodes): Should not exceed one living organism (in any phase of its life-cycle) per litre.</p> <p>Detection for TCC, TTCC and <i>E. coli</i> should be conducted as follows:</p> <p>a. Once a month for protected groundwater sources.</p> <p>b. Daily for unprotected groundwater and surface water (five samples/week).</p> <p>c. Distribution network:</p> <p>i. For 5000 people: once per month.</p> <p>ii. From 5000 to 50 000: one sample per 5000 people.</p> <p>iii. More than 50 000 people: one sample per 10 000 plus 10 samples.</p>							



Country/ Organization	Name of standard	All water intended for drinking <sup>a</sup>		Treated water entering the distribution system		Treated water in the distribution system	
		Organisms					
		<i>E. coli</i> or thermotolerant coliform bacteria <sup>b,c</sup>	<i>E. coli</i> or thermotolerant coliform bacteria <sup>b</sup>	Total coliform bacteria	<i>E. coli</i> or thermotolerant coliform bacteria <sup>b</sup>	Total coliform bacteria	
Kuwait	WHO Guidelines for drinking-water quality.	WHO guidelines are applied.					
Lebanon	Ministry of Environment Decree No. 52/1 – Standards for the minimization of pollution of air, water and soil–1996.	<ol style="list-style-type: none"> <li>1. TCC (number/100 mL): guideline value (GV) = 0, maximum admissible value (MAV) = 0.</li> <li>2. <i>Streptococcus fecalis</i>: (number/100 mL): GV = 0; MAV = 0.</li> <li>3. TFCC (number/100 mL): GV = 0; MAV = 0.</li> <li>4. Sulfite-reducing bacteria (number/20 mL): MAV = 1.</li> <li>5. TTCC (number/100 mL): GV = 0; MAV = 0.</li> <li>6. <i>Salmonella</i> (number/5 L): GV = 0; MAV = 0.</li> <li>7. Pathogenic <i>Staphylococcus</i> (number/100 mL): GV = 0; MAV = 0.</li> </ol>					

Country/ Organization	Name of standard	All water intended for drinking <sup>a</sup>		Treated water entering the distribution system		Treated water in the distribution system	
		Organisms					
		<i>E. coli</i> or thermotolerant coliform bacteria <sup>b,c</sup>	<i>E. coli</i> or thermotolerant coliform bacteria <sup>b</sup>	Total coliform bacteria	<i>E. coli</i> or thermotolerant coliform bacteria <sup>b</sup>	Total coliform bacteria	
		8. Bacteriophages (number/50 mL): GV = 0; MAV = 0.					
		9. Enteroviruses (number/10 L): GV = 0; MAV = 0.					
Morocco	Quality Standard of Water for Human Consumption Homologation Decree No. 359-91.	Comment: Turbidity, preferably inferior to 1 nephelometric unit (NTU), for disinfected with chlorine, pH preferably inferior to 8.0, free chlorine residual 0.2-0.5 mg/L following (minimum) contact time of 30 minutes.  For un piped supplies, bottled drinking-water and emergency water supplies; "maximum recommended value of faecal coliform is 0. Failure to achieve this value in case of "emergency water supplies" the public should be advised to boil water.	Minimum value of residual free chlorine should be between 0.1 and 1.0 mg Cl/L.	Minimum value of residual free chlorine should be between 0.1 and 1.0 mg Cl/L.  Untreated water: 0 in 98% of samples examined throughout the year.  3 (number/100 mL) occasionally but not in two consecutive samples from the same spot.	Chlorine residual between 0.1 and 1.0 mg/L at any time.	0 in 95% of samples examined throughout the year.  3 in an occasional sample examined throughout the year.	

Country/ Organization	Name of standard	All water intended for drinking <sup>a</sup>		Treated water entering the distribution system		Treated water in the distribution system		
		Organisms						
		<i>E. coli</i> or thermotolerant coliform bacteria <sup>b,c</sup>	<i>E. coli</i> or thermotolerant coliform bacteria <sup>b</sup>	Total coliform bacteria	<i>E. coli</i> or thermotolerant coliform bacteria <sup>b</sup>	Total coliform bacteria		
Oman	Omani Standard No.8, 1978.	<p>For unpiped supplies, 10 (number/100 mL) of total coliform is the maximum value recommended but "if this occurrence is 'repeated' twice at least and if sanitary protection cannot be improved an alternative source must be found if possible".</p> <p>1. Treated water:</p> <p>a. No sample should contain <i>E. coli</i> in 100 mL.</p> <p>b. No sample should contain more than 10 coliform organisms in 100 mL.</p> <p>c. Throughout any year, 95% of the sample examined should not contain any coliform organisms in 100 mL.</p>						

Country/ Organization	Name of standard	All water intended for drinking <sup>a</sup>				Treated water entering the distribution system		Treated water in the distribution system	
		Organisms							
		<i>E. coli</i> or thermotolerant coliform bacteria <sup>b,c</sup>	<i>E. coli</i> or thermotolerant coliform bacteria <sup>b</sup>	Total coliform bacteria	<i>E. coli</i> or thermotolerant coliform bacteria <sup>b</sup>	Total coliform bacteria			
Pakistan	WHO Guidelines for drinking-water quality.	2. Untreated water:							
		a. No sample should contain <i>E. coli</i> in 100 mL.							
		b. No sample should contain more than 10 coliform organisms in 100 mL.							
			TFCC (number/100 mL): GV = 0.	TCC (number/100 mL): GV = 0.	TFCC (number/100 mL): GV = 0.	TCC (number/100 mL): GV = 0.			
			1. Turbidity < 1 NTU.				1. In 95% of samples examined throughout the year—in the case of large supplies when sufficient samples are examined.		
			2. If chlorine is used for disinfection, pH preferably < 8 and free chlorine residual 0.2–0.5 mg/L following 30 minute (minimum) contact.				2. TCC (number/100 mL): GV = 3 in an occasional sample but not in consecutive samples.		
			3. If untreated water entering the distribution system: In 98% of samples examined throughout the year—in the case of large supplies when sufficient samples are examined. TCC (number/100 mL): GV = 3 in an occasional sample but not in consecutive samples.				3. For bottled water: source should be free from faecal contamination.		
							4. For emergency water supplies: Advise public to boil water in case of failure to meet guideline value.		

Country/ Organization	Name of standard	All water intended for drinking <sup>a</sup>		Treated water entering the distribution system		Treated water in the distribution system	
		Organisms					
		<i>E. coli</i> or thermotolerant coliform bacteria <sup>b,c</sup>	<i>E. coli</i> or thermotolerant coliform bacteria <sup>b</sup>	Total coliform bacteria	<i>E. coli</i> or thermotolerant coliform bacteria <sup>b</sup>	Total coliform bacteria	
Palestine	Palestine Standard 41–1997.	Biological characteristics*: <ol style="list-style-type: none"> <li>1. TCC: Must not exceed 1 most probable number (MPN)/100 mL and 0 when membrane filtration testing is used.</li> <li>2. TFCC: Must not be detectable.</li> <li>3. When TCC is found; further tests should be performed for other indicators, such as <i>Streptococcus fecalis</i> and sulfite-reducing clostridia.</li> <li>4. Focus should be made on sampling points where total bacterial counts are found to exceed 1000 per mL.</li> <li>5. Additionally, drinking-water should be devoid of the following:               <ol style="list-style-type: none"> <li>a. Pathogenic protozoa.</li> <li>b. Pathogenic nematodes of all phases.</li> </ol> </li> </ol>					

Country/ Organization	Name of standard	All water intended for drinking <sup>a</sup>		Treated water entering the distribution system		Treated water in the distribution system	
		Organisms					
		<i>E. coli</i> or thermotolerant coliform bacteria <sup>b,c</sup>	<i>E. coli</i> or thermotolerant coliform bacteria <sup>b</sup>	Total coliform bacteria	<i>E. coli</i> or thermotolerant coliform bacteria <sup>b</sup>	Total coliform bacteria	
		<p>c. Free living organisms including fungi and algae species of health significance or which may produce toxins that may affect human health.</p> <p>d. Enteroviruses.</p> <p>6. Drinking-water should be disinfected ensuring sufficient dosage and contact time to satisfy the above-mentioned requirements. Whenever chlorine is employed as the disinfectant the following are required:</p> <p>a. Mixing and reaction time should be between 15 to 30 minutes.</p> <p>b. Free residual chlorine should not be less than 0.2 mg/L and is preferably not more than 0.8 mg/L at the consumers' premises.</p>					

Country/ Organization	Name of standard	All water intended for drinking <sup>a</sup>		Treated water entering the distribution system		Treated water in the distribution system	
		Organisms					
		<i>E. coli</i> or thermotolerant coliform bacteria <sup>b,c</sup>	<i>E. coli</i> or thermotolerant coliform bacteria <sup>b</sup>	Total coliform bacteria	<i>E. coli</i> or thermotolerant coliform bacteria <sup>b</sup>	Total coliform bacteria	
Sudan	Drinking-water Standard ICS 13.060.00.	<ol style="list-style-type: none"> <li>1. <i>E. coli</i> or thermotolerant coliform bacteria: Must not be detectable in any 100 mL sample.</li> <li>2. Pathogenic intestinal protozoa: Must not be detectable in any 100 mL sample.</li> </ol>	<p><i>E. coli</i> or thermotolerant coliform bacteria: Must not be detectable in any 100 mL sample.</p> <p>Pathogenic intestinal protozoa: Must not be detectable in any 100 mL sample.</p>	TCC: Must not be detectable in any 100 mL sample.	<p><i>E. coli</i> or thermotolerant coliform bacteria: Must not be detectable in any 100 mL sample.</p> <p>Pathogenic intestinal protozoa: Must not be detectable in any 100 mL sample.</p>	TCC: Must not be detectable in any 100 mL sample.	
Syrian Arab Republic	S.N.S: 45/1994– Drinking-water (First Amendment)– 1994.	<p>Under normal conditions:</p> <ol style="list-style-type: none"> <li>1. TCC (colony/100 mL): 0 at 37 °C after 24, 48 hours.</li> <li>2. <i>Streptococcus fecalis</i> (colony/100 mL): 0 at 37 °C after 24, 48 hours.</li> <li>3. TFCC (colony/100 mL): 0 at 44 °C after 24, 48 hours.</li> <li>4. Total counts of other organisms (colony/100 mL): 200 at 37 °C after 24 hours or 2000 at 22 °C after 72 hours.</li> </ol>					

Country/ Organization	Name of standard	All water intended for drinking <sup>a</sup>				
		Treated water entering the distribution system		Treated water in the distribution system		
		Organisms				
		<i>E. coli</i> or thermotolerant coliform bacteria <sup>b,c</sup>	<i>E. coli</i> or thermotolerant coliform bacteria <sup>b</sup>	Total coliform bacteria	<i>E. coli</i> or thermotolerant coliform bacteria <sup>b</sup>	Total coliform bacteria
		5. Free chlorine residual (mg/l): 0.4 at beginning of the network and 0.2 at the end. Contact time must not be less than 30 minutes. During emergencies: 1. TCC (colony/100 mL): 10 at 37 °C after 24–48 hours. 2. <i>Streptococcus fecalis</i> (colony/100 mL): 0 at 37 °C after 24, 48 hours. 3. TFCC (colony/100 mL): 0 at 44 °C after 24, 48 hours 4. Total counts of other organisms (colony/100 mL): 200 at 37 °C after 24 hours. 5. Pathogenic <i>Staphylococcus</i> (colony/100 mL): 0. 7. Free chlorine residual (mg/L): 0.5 at the end of the network. Drinking-water must be free from viruses (0/10 L). Drinking-water should be				



Country/ Organization	Name of standard	All water intended for drinking <sup>a</sup>		Treated water entering the distribution system		Treated water in the distribution system	
		Organisms					
		<i>E. coli</i> or thermotolerant coliform bacteria <sup>b,c</sup>	<i>E. coli</i> or thermotolerant coliform bacteria <sup>b</sup>	Total coliform bacteria	<i>E. coli</i> or thermotolerant coliform bacteria <sup>b</sup>	Total coliform bacteria	
		devoid of the following:					
		a. Protozoa.					
		b. Nematodes of all phases.					
		c. Free living organisms including algae, fungi, etc.					
Tunisia	Tunisian Standards PTS 14.09 (1993) quality of drinking-water.		Must not be detectable in any 100 mL sample.				

<sup>a</sup> Immediate investigative action must be taken if either *E. coli* or total coliform bacteria are detected. The minimal action in the case of total coliform bacteria is repeat sampling; if these bacteria are detected in the repeat sample, the cause must be determined by immediate further investigation.

<sup>b</sup> Although *E. coli* is the more precise indicator of faecal pollution, the count of thermotolerant coliform bacteria is an acceptable alternative. If necessary, proper confirmatory tests must be carried out. Total coliform bacteria are not acceptable indicators of the sanitary quality of rural water supplies, particularly in tropical areas where many bacteria of no sanitary significance occur in almost all untreated supplies.

<sup>c</sup> It is recognized that, in the great majority of rural water supplies in developing countries, faecal contamination is widespread. Under these conditions, the national surveillance agency should set medium-term targets for the progressive improvement of water supplies, as recommended in Volume 3 of WHO *Guidelines for drinking-water quality*.

## 4.2 Standards for chemicals of health significance

**Table 3. Standards for chemicals of health significance in the Region compared with WHO guidelines**

Chemical	WHO guideline value <sup>a</sup> (mg/L)	Remarks	Egypt	Iraq	Jordan	Lebanon	Morocco	Oman	Palestine	Sudan	Syrian Arab Republic	Tunisia
Acrylamide	0.0005 <sup>b</sup>	–	–	0.0005	–	–	–	–	–	0.0004	–	–
Alachlor	0.02 <sup>b</sup>	–	0.02	–	–	–	–	–	–	0.15	–	–
Aldicarb	0.01	Applies to aldicarb sulfoxide and aldicarb sulfone	0.01	–	–	–	–	–	–	0.0075	–	–
Aldrin and dieldrin	0.00003	For combined aldrin plus dieldrin	0.00003	–	0.00003	0.00003	–	–	–	0.00002	0.00003	–
Ammonium	–	–	–	–	–	–	–	–	–	–	0.05 <sup>c</sup>	–
Antimony	0.02	–	–	–	0.005	0.01	–	–	0.005	0.004	0.005	0.02
Arsenic	0.01 (P)	–	0.05	0.01	0.01	0.05	0.05	0.05	0.05	0.007	0.01	0.05
Atrazine	0.002	–	0.002	–	–	0.002	–	–	–	0.0015	–	–
Barium	0.7	–	–	0.7	1.5	–	1.0	–	–	0.5	0.1	–
Benzene	0.01 <sup>b</sup>	–	0.01	–	0.01	–	–	–	–	0.007	0.01	–
Benzo[a]pyrene	0.0007 <sup>b</sup>	–	0.0007	–	–	–	–	–	–	0.0005	–	–
Boron	0.5 (T)	–	–	–	2.0	–	–	–	–	0.2	0.3	–
Bromate	0.01 <sup>b</sup> (A, T)	–	0.025	–	–	–	–	–	–	0.017	–	–

Chemical	WHO guideline value <sup>a</sup> (mg/L)	Remarks	Egypt	Iraq	Jordan	Lebanon	Morocco	Oman	Palestine	Sudan	Syrian Arab Republic	Tunisia
Bromodichloromethane	0.06 <sup>b</sup>	–	–	–	–	–	–	–	–	0.04	–	–
Bromoform	0.1	–	–	–	–	–	–	–	–	0.075	–	–
Cadmium	0.003	–	0.005	0.003	0.003	0.005	0.005	0.01	0.005	0.003	0.005	0.005
Carbofuran	0.007	–	0.005	–	–	–	–	–	0.0035	–	–	–
Carbon tetrachloride	0.004	–	0.002	–	–	–	–	–	–	–	0.0013	0.002
Chemical oxygen demand	–	–	–	–	–	–	–	–	–	–	2.0	–
Chloral hydrate (trichloroacetaldehyde)	0.01 (P)	–	0.01	–	–	–	–	–	–	–	0.07	–
Chlorate	0.7 (D)	–	–	–	–	–	–	–	–	–	–	–
Chlordane	0.0002	–	0.0002	–	–	–	–	–	–	0.00015	0.0002	–
Chlorine	5 (C)	For effective disinfection, there should be a residual concentration of free chlorine of $\geq 0.5$ mg/L after at least 30 minutes contact time at pH < 8.0	–	–	Water in the distribution network should contain a residual concentration of free chlorine of $\geq 0.2$ mg/L after at least 15 minutes contact time	–	Residual in the distribution system (0.1–1.0) mg cl/L	–	–	3.4	Residual 0.2 to 0.4 0.5 in emergency Contact time not less than 30 minutes	–

Chemical	WHO guideline value <sup>a</sup> (mg/L)	Remarks	Egypt	Iraq	Jordan	Lebanon	Morocco	Oman	Palestine	Sudan	Syrian Arab Republic	Tunisia
					In any case a 15-minute period should be allowed between chlorination and the first consumer							
Chlorite	0.7 (D)	–	0.2	–	0.2	–	–	–	–	0.15	–	–
Chloroform	0.2	–	–	–	–	–	–	–	–	0.15	0.03	–
Chlorotoluron	0.03	–	0.03	–	–	–	–	–	–	0.02	–	–
Chlorpyrifos	0.03	–	–	–	–	–	–	–	–	–	–	–
Chromium	0.05 (P)	For total chromium	0.05	0.05	0.05	0.05	0.05	–	0.05	0.04	0.05	–
Copper	2.0	Staining of laundry and sanitary ware may occur below guideline value	–	1.0	Listed as aesthetic: 1.0 <sup>d</sup> 1.5 <sup>e</sup>	–	1.0	0.05 <sup>f</sup> 1.5 <sup>dg</sup>	Listed as aesthetic: 1.0 <sup>d</sup> 1.5 <sup>e</sup>	1.5	1.0	0.05 <sup>f</sup> 1.0 <sup>d</sup>
Cyanazine	0.0006	–	–	–	–	–	–	–	–	–	–	–
Cyanide	0.07	–	0.05	0.02	0.07	0.05	0.1	0.05	0.05	0.05	0.05	0.05
Cyanogen chloride	0.07	For cyanide as total cyanogenic compounds	0.07	–	–	–	–	–	–	0.05	–	–

Chemical	WHO guideline value <sup>a</sup> (mg/L)	Remarks	Egypt	Iraq	Jordan	Lebanon	Morocco	Oman	Palestine	Sudan	Syrian Arab Republic	Tunisia
2,4-D (2,4-dichlorophenoxyacetic acid)	0.03	Applies to free acid	0.03	–	0.09	–	WHO GV	–	0.01	0.02	0.03	–
2,4-DB	0.09	–	0.09	–	–	–	–	–	–	0.067	–	–
DDT and metabolites	0.001	–	0.002	–	0.002	–	–	–	–	0.015	0.001	–
Di(2-ethylhexyl)phthalate	0.008	–	0.008	–	–	–	–	–	–	0.0054	–	–
Dibromoacetonitrile	0.07	–	0.01	–	–	–	–	–	–	0.075	–	–
Dibromochloromethane	0.1	–	–	–	–	–	–	–	–	0.075	–	–
1,2-Dibromo-3-chloropropane	0.001 <sup>b</sup>	–	0.001	–	–	–	–	–	–	0.007	–	–
1,2-Dibromoethane	0.0004 <sup>b</sup> (P)	–	–	–	–	–	–	–	–	–	–	–
Dichloroacetate	0.05 (T, D)	–	–	–	–	–	–	–	–	–	–	–
Dichloroacetonitrile	0.02 (P)	–	0.09	–	–	–	–	–	–	0.06	–	–
Dichlorobenzene, 1,2-	1 (C)	–	1.0	–	–	–	–	–	–	0.7	–	–
Dichlorobenzene, 1,4-	0.3 (C)	–	0.3	–	–	–	–	–	–	–	–	–
Dichloroethane, 1,2-	0.03b	–	0.03	–	–	–	–	–	–	0.02	–	–
Dichloroethene, 1,1-	0.03	–	0.03	–	–	–	–	–	–	0.02	0.03	–
Dichloroethene, 1,2-	0.05	–	0.05	–	–	–	–	–	–	0.035	0.05	–
Dichloromethane	0.02	–	0.02	–	–	–	–	–	–	0.014	–	–
1,2-Dichloropropane (1,2-DCP)	0.04 (P)	–	0.02	–	–	–	–	–	–	0.015	–	–
1,3-Dichloropropene	0.02b	–	–	–	–	–	–	–	–	0.015	–	–

Chemical	WHO guideline value <sup>a</sup> (mg/L)	Remarks	Egypt	Iraq	Jordan	Lebanon	Morocco	Oman	Palestine	Sudan	Syrian Arab Republic	Tunisia
Dichlorprop	0.1	–	0.1	–	–	–	–	–	–	0.075	–	–
Dimethoate	0.006	–	–	–	–	–	–	–	–	–	–	–
Edetic acid (EDTA)	0.6	Applies to free acid	0.2	–	–	–	–	–	–	0.15	–	–
Endrin	0.0006	–	–	–	–	–	–	–	–	–	–	–
Epichlorohydrin	0.0004 (P)	–	0.0004	–	–	–	–	–	–	0.0003	–	–
Ethylbenzene	0.3 (C)	–	–	–	0.5	–	–	–	–	0.2	–	–
Fenoprop	0.009	–	0.009	–	–	–	–	–	–	0.006	–	–

Chemical	WHO guideline value <sup>a</sup> (mg/L)	Remarks	Egypt	Iraq	Jordan	Lebanon	Morocco	Oman	Palestine	Sudan	Syrian Arab Republic	Tunisia
Flouride	1.5	Volume of water consumed and intake from other sources should be considered when setting national standards	0.8	1.0	2.0	1.5 (at 8–12 °C), 0.7 (at 25–30 °C) <sup>h</sup>	1.5 <sup>f</sup> 0.7 <sup>d</sup>	0.8	Allowable range (0.6–1.0) 1.5 <sup>e</sup>	–	1.5 (at 8–12 °C), 0.7 (at 25–30°C)	1.7 (at 10.0–12.0 °C), 1.5 (at 12.1–14.6 °C), 1.3 (at 14.7–17.6), 1.2 (at 17.7–21.4 °C), 1.0 (at 21.5–26.1 °C), 0.8 (at 26.2–32.6 °C)
Formaldehyde	0.9	–	–	–	–	–	–	–	–	0.6	–	–
Hexachlorobutadiene	0.0006	–	0.0006	–	–	–	–	–	–	0.0004	–	–
Iodine	GVNE <sup>d</sup>	–	–	–	–	–	–	–	–	0.004	Still under consideration	0.02
Isoproturon	0.009	–	0.009	–	–	–	–	–	–	0.007	–	–
Lead	0.01	–	0.05	0.01	0.01	0.05 (in flowing water)	0.05	0.1	0.01	0.007	0.01	0.05
Lindane	0.002	–	0.002	–	0.004	–	–	–	0.004	0.0015	0.002	–

Chemical	WHO guideline value <sup>a</sup> (mg/L)	Remarks	Egypt	Iraq	Jordan	Lebanon	Morocco	Oman	Palestine	Sudan	Syrian Arab Republic	Tunisia
Manganese	0.4 (C)	–	–	–	Listed as aesthetic; 0.1 <sup>d</sup> 0.2 <sup>e</sup>	–	0.1	0.05 0.5 <sup>g</sup>	Listed as aesthetic: 0.1 <sup>d</sup> 0.5 <sup>e</sup>	0.5	Listed as aesthetic: 0.1	0.05 0.5
MCPA	0.002	–	0.002	–	–	–	–	–	–	0.015	–	–
Mecoprop	0.01	–	0.01	–	–	–	–	–	–	0.007	–	–
Mercury	0.001	For total mercury (inorganic plus organic)	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.0007	0.001	–
Methoxychlor	0.02	–	0.02	–	–	–	–	–	0.1	0.015	0.02	–
Metolachlor	0.01	–	0.01	–	–	–	–	–	–	0.007	–	–
Microcystin-LR	0.001 (P)	For total microcystin-LR (free plus cell-bound)	–	–	–	–	–	–	–	–	–	–
Molinate	0.006	–	0.006	–	–	–	–	–	–	0.004	–	–
Molybdenum	0.07	–	–	–	–	–	–	–	–	0.05	0.07	–
Monochloramine	3.0	–	3.0	–	–	–	–	–	–	2.0	–	–
Monochloroacetate	0.02	–	–	–	–	–	–	–	–	–	–	–
Nickel	0.02 (P)	–	–	0.02	0.07	0.05	–	–	0.05	0.014	0.02	–
Nitrate (as NO <sub>3</sub> <sup>-</sup> )	50	Short-term exposure	44	50	50 (70 <sup>e</sup> )	50 <sup>h</sup>	50	45	50 70 <sup>e</sup>	50	44	45
Nitritotriacetic acid (NTA)	0.2	–	0.2	–	–	–	–	–	–	0.15	–	–



Chemical	WHO guideline value <sup>a</sup> (mg/L)	Remarks	Egypt	Iraq	Jordan	Lebanon	Morocco	Oman	Palestine	Sudan	Syrian Arab Republic	Tunisia
Nitrite (as NO <sub>2</sub> <sup>-</sup> )	3.0 0.2 (P)	Short-term exposure Long-term exposure	0.02	3.0	2.0	0 <sup>h</sup>	0.1	–	–	2.0	0.04	–
Pendimethalin	0.02	–	0.02	–	–	–	–	–	–	0.015	–	–
Pentachlorophenol	0.009 <sup>b</sup> (P)	–	0.009	–	–	–	–	–	–	0.007	–	–
Phosphate	–	–	–	–	–	–	–	–	–	–	0.5	–
Pyriproxyfen	0.3	–	–	–	–	–	–	–	–	–	–	–
Selenium	0.01	–	0.01	0.01	0.05	0.01	0.01	0.01	0.01	0.007	0.01	0.01
Silver	Available data not adequate to permit derivation of health-based guideline value	–	–	–	0.1	0.01 <sup>h</sup>	–	–	0.01 0.05 <sup>e</sup>	–	–	0.02
Simazine	0.002	–	0.002	–	–	–	–	–	–	0.0015	–	–
Styrene	0.02 (C)	–	–	–	–	–	–	–	–	0.015	–	–
2,4,5-T	0.009	–	0.009	–	0.009	–	–	–	0.01	0.006	–	–
Terbutylazine	0.007	–	–	–	–	–	–	–	–	–	–	–
Tetrachloroethene	0.04	–	0.04	–	0.05	–	–	–	–	0.03	0.01	–
Toluene	0.7 (C)	–	–	–	0.3	–	–	–	–	0.5	–	–
Trichloroacetate	0.2	–	–	–	–	–	–	–	–	–	–	–
Trichloroethene	0.07 (P)	–	0.07	–	–	–	–	–	–	0.05	0.03	–
Trichlorophenol, 2,4,6-	0.2b (C)	–	0.2	–	–	–	–	–	–	0.15	0.01	–

Chemical	WHO guideline value <sup>a</sup> (mg/L)	Remarks	Egypt	Iraq	Jordan	Lebanon	Morocco	Oman	Palestine	Sudan	Syrian Arab Republic	Tunisia
Trifluralin	0.02	–	–	–	–	–	–	–	–	–	–	–
Trihalomethanes	–	The sum of the ratio of the concentration of each to its respective guideline value should not exceed 1.0	0.1	–	0.15	–	–	–	–	–	–	–
Uranium	0.015 (P, T)	Only chemical aspects of uranium addressed	–	–	–	–	–	–	–	–	–	–
Vinyl chloride	0.0003 <sup>b</sup>	–	0.0005	–	–	–	–	–	–	0.00035	0.0005	–
Xylenes	0.5 (C)	–	–	–	0.7	–	–	–	–	0.35	–	–

<sup>a</sup> (P) = provisional guideline value, as there is evidence of a hazard, but the available information on health effects is limited.

(T) = provisional guideline value because calculated guideline value is below the level that can be achieved through practical treatment methods, source protection, etc.

(A) = provisional guideline value because calculated guideline value is below the achievable quantification level.

(D) = provisional guideline value because disinfection is likely to result in the guideline value being exceeded.

(C) = concentrations of the substance at or below the health-based guideline value may affect the appearance, taste or odour of the water, leading to consumer complaints.

<sup>b</sup> For substances that are considered to be carcinogenic, the guideline value is the concentration in drinking-water associated with an upper-bound excess lifetime cancer risk of 10<sup>-5</sup> (one additional cancer per 100 000 of the population ingesting drinking-water containing the substance at the guideline value for 70 years).

Concentrations associated with upper-bound estimated excess lifetime cancer risks of 10<sup>-4</sup> and 10<sup>-6</sup> can be calculated by multiplying and dividing, respectively, the guideline value by 10.

<sup>c</sup> Provided bacteriologically safe.

<sup>d</sup> Maximum allowable.

<sup>e</sup> Maximum allowable in the absence of a better source.

<sup>f</sup> Highest desirable.

<sup>g</sup> Classified as affecting suitability

<sup>h</sup> Categorized as undesirable.

N.B. Bahrain, Kuwait and Pakistan apply WHO guideline values without any modifications.

### 4.3 Radionuclides screening levels

**Table 4. Standards for radionuclides screening levels in drinking-water in the Region compared with WHO guidelines**

Parameter	WHO GV screening level (Bq/l)	Egypt	Iraq	Jordan	Lebanon	Morocco	Sudan	Palestine	Syrian Arab Republic	Tunisia
gross alpha activity	0.5 <sup>a</sup>	0.1	0.1	0.5 (excluding radon)	–	–	0.07	0.1	0.1	0.1
gross beta activity	1.0 <sup>a</sup>	1.0	1.0	1.0 (excluding tritium and carbon 14)	–	–	0.7	1.0	1.0	1.0

<sup>a</sup> Screening level below which no further action is required.

N.B. Bahrain, Kuwait and Pakistan apply WHO guideline values without any modifications.

#### 4.4 Parameters and substances of aesthetic significance

**Table 5. Standards for parameters in drinking-water that may give rise to complaints in the Region compared with WHO guidelines**

Parameter	WHO guidelines <sup>a</sup>	Reasons for consumer complaint	Egypt	Iraq	Jordan	Oman	Lebanon	Morocco	Palestine	Sudan	Syrian Arab Republic	Tunisia
Colour	15 TCU <sup>b</sup>	appearance	20–30	10	10 <sup>b</sup> 15 <sup>c</sup>	–	15	–	10	15	15	5 <sup>b</sup> 50 <sup>c</sup>
Taste and odour	Cause should be investigated	Should be acceptable	Taste: acceptable odour: absent	Should be acceptable	Palatable to most people	–	2 at 12 °C For a dilution ratio: 2 3 at 25 °C For a dilution ratio: 3	–	Palatable to most people	Acceptable	Palatable to most people	Palatable to most people
Temperature	–	–	–	–	–	–	25	–	8–25 °C	Acceptable	8–25 °C	–

Parameter	WHO guidelines <sup>a</sup>	Reasons for consumer complaint	Egypt	Iraq	Jordan	Oman	Lebanon	Morocco	Palestine	Sudan	Syrian Arab Republic	Tunisia
Turbidity	< 5 NTU <sup>c</sup> acceptable to consumers  < 0.1 for effective disinfection	Taste, odour and appearance	5 (for filtered water)  10 (for ground- or mixed water)	5	1 <sup>b</sup> 5 <sup>c</sup>	–	4	1 <sup>b</sup> 5 <sup>c</sup>	5	5	5 (If exceeded then a special study should be conducted to suggest a new value to issuing agency)	5 <sup>b</sup> 25 <sup>c</sup>
Aluminum	GVNE <sup>d</sup>	Depositions discoloration	0.2	0.2	0.1 <sup>b</sup> 0.2 <sup>c</sup>	–	0.2	0.05 <sup>b</sup>	0.2 <sup>b</sup> 0.3 <sup>c</sup> (Health-related as well)	0.2	0.2	–
Ammonia	GVNE <sup>d</sup>	Odour and taste	–	–	0.5 <sup>b</sup> (NH <sub>4</sub> )	–	0.5 (NH <sub>4</sub> )	–	–	1.5	–	–
Chloride	GVNE <sup>d</sup>	Taste, corrosion	500	250	200 <sup>b</sup> 500 <sup>c</sup>	200 <sup>d</sup> 600 <sup>e</sup>	200	300 <sup>b</sup> 750 <sup>c</sup>	250 <sup>b</sup> 600 <sup>c</sup>	250	250	200 <sup>b</sup> 600 <sup>c</sup>
Copper	2.0 mg/L (of health significance)	Staining of laundry and sanitary ware may occur below guideline value	1.0	1.0	1.0 <sup>b</sup> 1.5 <sup>c</sup>	0.05 <sup>d</sup> 1.5 <sup>c</sup>	–	1.0 <sup>c</sup>	1.0 1.5 <sup>c</sup>	–	1.0	0.05 <sup>b</sup> 1.0 <sup>c</sup>

Parameter	WHO guidelines <sup>a</sup>	Reasons for consumer complaint	Egypt	Iraq	Jordan	Oman	Lebanon	Morocco	Palestine	Sudan	Syrian Arab Republic	Tunisia
Hardness	GVNE <sup>d</sup>	High hardness: scale deposition, scum formation Low hardness: possible corrosion	500 (as CaCO <sub>3</sub> )	500	300 <sup>b</sup> 500 <sup>c</sup>	100 <sup>d</sup> 500 <sup>e</sup>	–	200 <sup>f</sup> 600 <sup>b</sup>	500	–	500	100 (as CaCO <sub>3</sub> <sup>b</sup> ) 1000 (as CaCO <sub>3</sub> <sup>c</sup> )
Hydrogen sulfide	GVNE <sup>d</sup>	Odour and taste	–	–	–	–	Not detectable	–	–	0.05	–	–
Iron	GVNE <sup>d</sup>	Staining of laundry and sanitary ware may occur below guideline value	0.3 (for filtered water) 1.0 (for ground- and mixed water)	0.3	0.3 <sup>b</sup> 1.0 <sup>c</sup>	0.1 <sup>d</sup> 1.0 <sup>e</sup>	0.2	0.3 <sup>c</sup>	0.3 <sup>b</sup> 1.0 <sup>c</sup>	0.3	0.3	0.1 <sup>b</sup> 0.5–1.0 <sup>c</sup>
Manganese	0.4 mg/L (of health significance)	Staining of laundry and sanitary ware may occur below guideline value	0.1 (for filtered) 0.5 (for ground- and mixed water)	0.1	0.1 <sup>b</sup> 0.2 <sup>c</sup>	0.05 <sup>d</sup> 0.5 <sup>e</sup>	0.5	0.1 <sup>c</sup>	0.1 <sup>b</sup> 0.5 <sup>c</sup>	–	0.1	0.05 <sup>b</sup> 0.5 <sup>c</sup>
Dissolved oxygen	GVNE <sup>d</sup>	Indirect effects	–	–	–	–	–	> 5.0 < 8.0 <sup>b</sup>	–	–	–	–

Parameter	WHO guidelines <sup>a</sup>	Reasons for consumer complaint	Egypt	Iraq	Jordan	Oman	Lebanon	Morocco	Palestine	Sudan	Syrian Arab Republic	Tunisia
pH	GVNE <sup>d</sup> (operational significance)	Low pH: corrosion High pH: taste, soapy feel preferably < 8.0 for effective disinfection with chlorine	6.5–9.2	6.5–8.5	6.5–8.5 <sup>b</sup>	7.0–8.5 <sup>d</sup> 6.5–9.2 <sup>e</sup>	9.0	6.0 <sup>f</sup> 9.2 <sup>b</sup> >6.5 <8.5 <sup>c</sup>	6.5–8.5 <sup>b</sup> 9.5 <sup>c</sup>	6.5–8.5	6.5–8.5 (Should be < 8 when using chlorine as the disinfectant)	7–8 <sup>b</sup> 6.5–8.5 <sup>c</sup>
Sodium	GVNE <sup>d</sup>	Taste	200	200	200 <sup>b</sup> 400 <sup>c</sup>	–	150	–	200 <sup>b</sup> 400 <sup>c</sup> (Health-related as well)	200	200	–
Sulfate	GVNE <sup>d</sup>	Taste, corrosion	400	250	200 <sup>b</sup> 500 <sup>c</sup>	200 <sup>d</sup> 400 <sup>e</sup>	250	200 <sup>b</sup>	200 <sup>b</sup> 400 <sup>c</sup>	250	250	200 <sup>b</sup> 600 <sup>c</sup>
Total dissolved solids	GVNE <sup>d</sup>	Taste	1200 (at 120 °C)	1000	500 <sup>b</sup> 1500 <sup>c</sup>	500 <sup>d</sup> 1500 <sup>e</sup>	1500	–	1000 <sup>b</sup> 1500 <sup>c</sup>	1000	1000	500 <sup>b</sup> 2000–2500 <sup>c</sup>
Zinc	GVNE <sup>d</sup>	Appearance, taste	5.0	3.0	3.0 <sup>b</sup> 5.0 <sup>c</sup>	5.0 <sup>d</sup> 15 <sup>e</sup>	5.0	5.0 <sup>c</sup>	5.0 <sup>b</sup> 10 <sup>c</sup>	3.0	3.0	1.0 <sup>b</sup> 5.0 <sup>c</sup>
Calcium	–	–	200	50	–	75 <sup>d</sup> 200 <sup>e</sup>	–	–	100 <sup>b</sup> 200 <sup>c</sup>	–	–	75 <sup>b</sup> 300 <sup>c</sup>

Parameter	WHO guidelines <sup>a</sup>	Reasons for consumer complaint	Egypt	Iraq	Jordan	Oman	Lebanon	Morocco	Palestine	Sudan	Syrian Arab Republic	Tunisia
Magnesium	–	–	150	50	–	Not more than 30 if there are 250 mg/L of sulphate. If less than up to 150 may be allowed	50	100 <sup>b</sup>	50 <sup>b</sup> 120 <sup>c</sup>	–	–	30 <sup>b</sup> 150 <sup>c</sup>
Toluene	700 µg/l (of health significance)	Odour, taste may occur below guideline value	–	–	300 <sup>b</sup>	–	–	–	WHO GV	–	–	–
Xylene	500 µg/l (of health significance)	Odour, taste may occur below guideline value	–	–	700 <sup>b</sup>	–	–	–	WHO GV	–	–	–
Ethylbenzene	200 µg/l (of health significance)	Odour, taste may occur below guideline value	–	–	500 <sup>b</sup>	–	–	–	WHO GV	–	–	–



Parameter	WHO guidelines <sup>a</sup>	Reasons for consumer complaint	Egypt	Iraq	Jordan	Oman	Lebanon	Morocco	Palestine	Sudan	Syrian Arab Republic	Tunisia
Synthetic detergents	The presence of any detergent may indicate sanitary contamination of source water	Foaming, taste, odour	–	–	0.2 <sup>b</sup> 0.5 <sup>c</sup> LAS (MBAS) <sup>b</sup>	–	0.2	–	WHO GV	–	0.2	0.2 <sup>b</sup> 0.3 <sup>c</sup>
Chlorophenol 2-	GVNE <sup>d</sup>	Taste, odour	–	–	–	–	–	–	–	5	–	–
Dichlorophenol, 2,4-	GVNE <sup>d</sup>	Taste, odour	–	–	–	–	–	–	–	2	–	–
Trichlorophenol, 2,4,6-	GVNE <sup>d</sup>	Taste, odour	–	–	–	–	–	–	–	–	10 (Listed as health related)	–

<sup>a</sup> The levels indicated are not precise numbers. Problems may occur at lower or higher values according to local circumstances. A range of taste and odour threshold concentrations is given for organic constituents.

<sup>b</sup> TCU: true colour unit.

<sup>c</sup> NTU: nephelometric turbidity unit is not established.

<sup>d</sup> GVNE: guideline value

N.B. Bahrain, Kuwait and Pakistan, apply relevant WHO guideline values without any modifications.

## 5. Chemicals for which no WHO guideline value is derived

**Table 6. Chemicals excluded from guideline value derivation in WHO guidelines**

Chemical	Reason for exclusion
Amitraz	Degrades rapidly in the environment and is not expected to occur at measurable concentrations in drinking-water supplies
Beryllium	Unlikely to occur in drinking-water
Chlorobenzilate	Unlikely to occur in drinking-water
Chlorothalonil	Unlikely to occur in drinking-water
Cypermethrin	Unlikely to occur in drinking-water
Diazinon	Unlikely to occur in drinking-water
Dinoseb	Unlikely to occur in drinking-water
Ethylene thiourea	Unlikely to occur in drinking-water
Fenamiphos	Unlikely to occur in drinking-water
Formothion	Unlikely to occur in drinking-water
Hexachlorocyclohexanes (mixed isomers)	Unlikely to occur in drinking-water
MCPB	Unlikely to occur in drinking-water
Methamidophos	Unlikely to occur in drinking-water
Methomyl	Unlikely to occur in drinking-water
Mirex	Unlikely to occur in drinking-water
Monocrotophos	Has been withdrawn from use in many countries and is unlikely to occur in drinking-water
Oxamyl	Unlikely to occur in drinking-water
Phorate	Unlikely to occur in drinking-water
Propoxur	Unlikely to occur in drinking-water
Pyridate	Not persistent and only rarely found in drinking-water
Quintozene	Unlikely to occur in drinking-water
Toxaphene	Unlikely to occur in drinking-water
Triazophos	Unlikely to occur in drinking-water
Tributyltin oxide	Unlikely to occur in drinking-water
Trichlorfon	Unlikely to occur in drinking-water

Source: *Guidelines for drinking-water quality, THIRD EDITION, Volume 1, Recommendations*. WHO, Geneva, 2004.

## 6. Chemicals for which no WHO guideline value is established

**Table 7. Chemicals for which guideline values have not been established in WHO guidelines**

Chemical	Reason for not establishing a guideline value
Aluminium	Owing to limitations in the animal data as a model for humans and the uncertainty surrounding the human data, a health-based guideline value cannot be derived; however, practicable levels based on optimization of the coagulation process in drinking-water plants using aluminium-based coagulants are derived: 0.1 mg/L or less in large water treatment facilities, and 0.2 mg/L or less in small facilities.
Ammonia	Occurs in drinking-water at concentrations well below those at which toxic effects may occur
Asbestos	No consistent evidence that ingested asbestos is hazardous to health
Bentazone	Occurs in drinking-water at concentrations well below those at which toxic effects may occur
Bromochloroacetate	Available data inadequate to permit derivation of health-based guideline value
Bromochloroacetonitrile	Available data inadequate to permit derivation of health-based guideline value
Chloride	Not of health concern at levels found in drinking-water <sup>a</sup>
Chlorine dioxide	Guideline value not established because of the rapid breakdown of chlorine dioxide and because the chlorite provisional guideline value is adequately protective for potential toxicity from chlorine dioxide
Chloroacetones	Available data inadequate to permit derivation of health-based guideline values for any of the chloroacetones
Chlorophenol, 2-	Available data inadequate to permit derivation of health-based guideline value
Chloropicrin	Available data inadequate to permit derivation of health-based guideline value
Dialkyltins	Available data inadequate to permit derivation of health-based guideline values for any of the dialkyltins
Dibromoacetate	Available data inadequate to permit derivation of health-based guideline value
Dichloramine	Available data inadequate to permit derivation of health-based guideline value
Dichlorobenzene, 1,3-	Toxicological data are insufficient to permit derivation of health-based guideline value
Dichloroethane, 1,1-	Very limited database on toxicity and carcinogenicity
Dichlorophenol, 2,4-	Available data inadequate to permit derivation of health-based guideline value
Dichloropropane, 1,3-	Data insufficient to permit derivation of health-based guideline value
Di(2-ethylhexyl)adipate	Occurs in drinking-water at concentrations well below those at which toxic effects may occur
Diquat	Rarely found in drinking-water, but may be used as an aquatic herbicide for the control of free-floating and submerged aquatic weeds in ponds, lakes and irrigation ditches
Endosulfan	Occurs in drinking-water at concentrations well below those at which toxic effects may occur
Fenitrothion	Occurs in drinking-water at concentrations well below those at which toxic effects may occur
Fluoranthene	Occurs in drinking-water at concentrations well below those at which toxic effects may occur
Glyphosate and AMPA	Occurs in drinking-water at concentrations well below those at which toxic effects may occur

Chemical	Reason for not establishing a guideline value
Hardness	Not of health concern at levels found in drinking-water <sup>a</sup>
Heptachlor and heptachlor epoxide	Occurs in drinking-water at concentrations well below those at which toxic effects may occur
Hexachlorobenzene	Occurs in drinking-water at concentrations well below those at which toxic effects may occur
Hydrogen sulfide	Not of health concern at levels found in drinking-water <sup>a</sup>
Inorganic tin	Occurs in drinking-water at concentrations well below those at which toxic effects may occur
Iodine	Available data inadequate to permit derivation of health-based guideline value, and lifetime exposure to iodine through water disinfection is unlikely
Iron	Not of health concern at concentrations normally observed in drinking-water, and taste and appearance of water are affected below the health-based value
Malathion	Occurs in drinking-water at concentrations well below those at which toxic effects may occur
Methyl parathion	Occurs in drinking-water at concentrations well below those at which toxic effects may occur
Monobromoacetate	Available data inadequate to permit derivation of health-based guideline value
Monochlorobenzene	Occurs in drinking-water at concentrations well below those at which toxic effects may occur, and health-based value would far exceed lowest reported taste and odour threshold
MX	Occurs in drinking-water at concentrations well below those at which toxic effects may occur
Parathion	Occurs in drinking-water at concentrations well below those at which toxic effects may occur
Permethrin	Occurs in drinking-water at concentrations well below those at which toxic effects may occur
pH	Not of health concern at levels found in drinking-water <sup>b</sup>
Phenylphenol, 2- and its sodium salt	Occurs in drinking-water at concentrations well below those at which toxic effects may occur
Propanil	Readily transformed into metabolites that are more toxic; a guideline value for the parent compound is considered inappropriate, and there are inadequate data to enable the derivation of guideline values for the metabolites
Silver	Available data inadequate to permit derivation of health-based guideline value
Sodium	Not of health concern at levels found in drinking-water <sup>a</sup>
Sulfate	Not of health concern at levels found in drinking-water <sup>a</sup>
Total dissolved solids (TDS)	Not of health concern at levels found in drinking-water <sup>a</sup>
Trichloramine	Available data inadequate to permit derivation of health-based guideline value
Trichloroacetonitrile	Available data inadequate to permit derivation of health-based guideline value
Trichlorobenzenes (total)	Occurs in drinking-water at concentrations well below those at which toxic effects may occur
Trichloroethane, 1,1,1-	Occurs in drinking-water at concentrations well below those at which toxic effects may occur
Zinc	Not of health concern at levels found in drinking-water <sup>a</sup>

<sup>a</sup> May affect acceptability of drinking-water.

<sup>b</sup> An important operational water quality parameter.

Source: *Guidelines for drinking-water quality, THIRD EDITION, Volume 1, Recommendations*. WHO, Geneva, 2004.