Exposure to chemical contaminants in drinking water has been associated with an array of adverse health effects in human populations, including increased incidence of cancer (due to exposure to trichloroethylene and trihalomethanes), adverse effects on neurodevelopment (due to exposure to lead), and adverse effects on reproductive and birth outcomes (due to exposure to atrazine).

Current Regulations

The chemical quality of drinking water in Israel is regulated according to standards originally passed in 1974. The standards were revised in 1993, 2000, and most recently, in 2013. The 2013 standards include maximum contaminant levels for over 90 chemical contaminants, including metals, pesticides, radionuclides, and industrial organic pollutants. Compared to the 2000 drinking water standards, the 2013 standards require increased monitoring frequency, monitoring of 33 additional contaminants, and stricter permitted maximum contaminant levels for 28 chemicals (for examples see Table 1).

Chemicals with Lower Maximum Contaminant Levels and New Chemicals in the 2013 Standards

<table>
<thead>
<tr>
<th>Examples of Chemicals with Maximum Contaminant Levels Added in 2013 Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polychlorinated Biphenyls (industrial pollutant)</td>
</tr>
<tr>
<td>Ethylbenzene (industrial pollutant)</td>
</tr>
<tr>
<td>Carbofuran (pesticide)</td>
</tr>
<tr>
<td>Chlorpyrifos (pesticide)</td>
</tr>
<tr>
<td>Examples of Chemicals whose Maximum Contaminant Level was Lowered in 2013 Standards</td>
</tr>
<tr>
<td>Trichloroethylene (industrial pollutant)</td>
</tr>
<tr>
<td>Tetrachloroethylene (industrial pollutant)</td>
</tr>
<tr>
<td>Benzene (industrial pollutant)</td>
</tr>
<tr>
<td>Alachlor (pesticide)</td>
</tr>
</tbody>
</table>

Table 1
The 2013 standards stipulate that the sum of each parameter measured (within a contaminant group) in the drinking water source divided by the maximum contaminant level of that parameter is not allowed to exceed 1.5. This requirement is intended to minimize exposure to chemical mixtures in drinking water.

The 2013 standards also require the Ministry of Health (MoH) to establish a permanent advisory committee to continuously evaluate international drinking water standards, evaluate data on drinking water quality in Israel, and recommend changes to existing standards. The 2013 standards cancel the existing requirement to fluoridate drinking water (as of August 2014) and require the MoH to conduct a pilot study on the feasibility of adding magnesium to desalinated drinking water.

The quality of bottled water, much like other food products, is under the supervision of the National Food Service at the MoH. Regulations from 1986 establish maximum permissible concentrations of chemical parameters in drinking water sources of bottled water. The regulations require labeling if the mineral content in the water exceeds concentrations established by the regulations.

In 2013 the MoH launched a campaign to increase public consumption of tap water in order to decrease consumption of sweetened beverages and bottled water.

**Data on Chemical Parameters in Drinking Water**

The MoH publishes annual reports on microbial and chemical water quality in drinking water sources based on reported data from drinking water suppliers. Based on data from 2009–2010, four chemical contaminants (pesticides and industrial pollutants) were detected in over 5% of drinking water sources in Israel: trichloroethylene (9.5%), tetrachloroethylene (6.9%), atrazine (13.8%), and simazine (14.1%). Chloroform was detected in 4.9% of drinking water sources. These results are consistent with data from 2006–2008. Heavy metals such as arsenic, mercury, lead and cadmium occur naturally in the environment and are detected in 2–7% of drinking water sources, usually at levels below 30% of the drinking water standard.

The MoH publishes annual reports on water quality in municipal water supplies, including data on microbial quality, concentration of heavy metals, fluorides, and chlorination by-products (trihalomethanes). Heavy metals (chromium, lead, copper, iron and zinc) are generally below the drinking water standard in monitored municipal drinking water sources. However, it is important to point out that many municipalities do not meet the requirements for monitoring heavy metals in drinking water.

The first major survey on drinking water quality in households and institutions in Israel was conducted by the MoH in 2011 following four smaller surveys in the 1990s. Of approximately 800 samples, 16 samples (2%) had lead concentrations above the standard (10 µg/L), while
an additional 8% of samples had lead concentrations that were detectable, but below the standard (Figure 1). The major conclusion of the survey was that drinking water components, such as pipes and fittings, contribute to the presence of lead in drinking water in homes and institutions. In general, there are limited data in Israel on drinking water quality in households and in institutions, such as schools.

![Lead Concentration in Drinking Water in Households and Institutions, 2011](image)

One of the emerging positive trends in the quality of drinking water in Israel is the significant decrease in trihalomethane concentrations over the past 15 years, mostly as a result of the increase in supplied desalinated water in southern Israel and the subsequent decrease in staying time of water in drinking water systems. In 2005, average monthly trihalomethane concentrations measured at different points along the National Water Carrier were as high as 132.6 µg/L (compared to the drinking water standard of 100 µg/L). In 2012, average monthly trihalomethane concentrations measured at different points along the National Water Carrier were below 60 µg/L.

The Water Authority’s Water Quality Division regularly monitors groundwater affected by contamination sources, such as industry, gas stations, waste sites, and agricultural sites. The Division monitors contaminants which are not included in the drinking water standards. The Division has detected widespread gasoline contamination in the Mountain Aquifer and has detected chlorinated solvents and heavy metals in groundwater around selected industrial areas. The Division has recently begun to monitor endocrine disrupting chemicals, pharmaceuticals, and hormones in groundwater.

In 2010–2011 the MoH conducted a pilot survey on bisphenol A (BPA) in bottled water in polycarbonate containers. Water samples were collected from new and used polycarbonate containers. BPA was not detected in any of the samples.
Research on the Chemical Quality of Drinking Water in Israel

There have been very few published studies on the chemical quality of drinking water in Israel. In 2010, researchers from the Hebrew University of Jerusalem, the Water Authority, and Mekorot – Israel National Water Company, published findings showing that the organic drug carbamazepine can be used to accurately estimate the probability that a drinking water well has been contaminated by wastewater.

Progress and Challenges

• As a result of the 2013 Drinking Water Standards, there has been major progress in increasing transparency and timely reporting of data on drinking water quality. The MoH website includes quarterly results on the microbial and chemical quality of drinking water in water sources and in municipal water supplies. The website also includes a database with information on health effects of drinking water contaminants currently regulated in Israel.
• The new Drinking Water Standards partially address the issue of chemical mixtures by requiring that total chemical parameters within a contaminant group (pesticides, metals, or industrial organic pollutants) relative to each maximum contaminant concentration not exceed 1.5. This is an important precedent for environmental health policy in Israel.
• By 2015, 30% of the drinking water in Israel is expected to be desalinated. Reductions in intake of magnesium due to the introduction of desalinated water could potentially increase risks for various adverse health effects, for example cardiac abnormalities and hypertension. Given the increasing dependence on desalinated water in Israel, further research is needed to monitor the impact of desalination on calcium and magnesium intake and on public health in general.
• As of August 2014, fluoridation will not be required by law. The impact of discontinued fluoridation on dental health, especially in children from lower socioeconomic groups, will be evaluated.
• To date in Israel, there are no regulations or standards which limit the content of lead and other metals in pipes, faucets, and other materials that come in contact with drinking water. This is in contrast to US legislation and a voluntary program in selected European countries (Germany, France, England, the Netherlands). According to current regulations, materials in contact with drinking water are tested according to Israeli standard 5452, which tests migration of metals from new products. The MoH is currently working with representatives from the Standards Institution of Israel and with industry representatives to develop a standard that will limit the lead content of materials in contact with drinking water.
• The herbicides atrazine and simazine are present in approximately 14% of drinking water sources in Israel, albeit in concentrations that are far below the current standard. Despite decisions by the Ministry of Agriculture and Rural Development to reduce agricultural and municipal use of atrazine and to ban agricultural use of simazine, these chemicals and their breakdown products are expected to persist in drinking water sources in Israel for decades.
Atrazine is a suspected endocrine disrupting chemical which has been associated with pre-term delivery and intrauterine growth retardation; however, the health effects of widespread exposure to this chemical in drinking water in Israel have not been studied.

- There is no central database in Israel on emerging drinking water contaminants, such as unregulated chlorination by-products, and pharmaceuticals in drinking water, such as carbamazepine.

References


