relatively higher or lower selenium dietary intake, the guideline value may have to be modified accordingly. The 1993 Guidelines proposed a health-based guideline value of 0.01 mg/litre on the basis of human studies.

Assessment date
The risk assessment was originally conducted in 1993. The Final Task Force Meeting in 2003 agreed that this risk assessment be brought forward to this edition of the Guidelines for Drinking-water Quality.

Principal reference

12.106 Silver
Silver occurs naturally mainly in the form of its very insoluble and immobile oxides, sulfides and some salts. It has occasionally been found in groundwater, surface water and drinking-water at concentrations above 5 mg/litre. Levels in drinking-water treated with silver for disinfection may be above 50 mg/litre. Recent estimates of daily intake are about 7 mg per person.

Only a small percentage of silver is absorbed. Retention rates in humans and laboratory animals range between 0 and 10%.

The only obvious sign of silver overload is argyria, a condition in which skin and hair are heavily discoloured by silver in the tissues. An oral NOAEL for argyria in humans for a total lifetime intake of 10 g of silver was estimated on the basis of human case reports and long-term animal experiments.

The low levels of silver in drinking-water, generally below 5 mg/litre, are not relevant to human health with respect to argyria. On the other hand, special situations exist where silver salts may be used to maintain the bacteriological quality of drinking-water. Higher levels of silver, up to 0.1 mg/litre (this concentration gives a total dose over 70 years of half the human NOAEL of 10 g), could be tolerated in such cases without risk to health.

There are no adequate data with which to derive a health-based guideline value for silver in drinking-water.

History of guideline development
The 1958, 1963 and 1971 WHO International Standards for Drinking-water did not refer to silver. In the first edition of the Guidelines for Drinking-water Quality, published in 1984, it was not considered necessary to establish a guideline value for silver in drinking-water. No health-based guideline value for silver was proposed in the 1993 Guidelines. Where silver salts are used to maintain the bacteriological quality of
drinking-water, levels of silver up to 0.1 mg/litre can be tolerated without risk to health.

**Assessment date**
The risk assessment was originally conducted in 1993. The Final Task Force Meeting in 2003 agreed that this risk assessment be brought forward to this edition of the *Guidelines for Drinking-water Quality*.

**Principal reference**

### 12.107 Simazine
Simazine (CAS No. 122-34-9) is a pre-emergence herbicide used on a number of crops as well as in non-crop areas. It is fairly resistant to physical and chemical dissipation processes in the soil. It is persistent and mobile in the environment.

<table>
<thead>
<tr>
<th>Guideline value</th>
<th>0.002 mg/litre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occurrence</td>
<td>Frequently detected in groundwater and surface water at concentrations of up to a few micrograms per litre</td>
</tr>
<tr>
<td>TDI</td>
<td>0.52 µg/kg of body weight, based on a NOAEL of 0.52 mg/kg of body weight from a long-term study in the rat (based on weight changes, effects on haematological parameters and an increase in mammary tumours) and an uncertainty factor of 1000 (100 for inter- and intraspecies variation and 10 for possible non-genotoxic carcinogenicity)</td>
</tr>
<tr>
<td>Limit of detection</td>
<td>0.01 µg/litre by GC/MS; 0.1–0.2 µg/litre by GC with flame thermionic detection</td>
</tr>
<tr>
<td>Treatment achievability</td>
<td>0.1 µg/litre should be achievable using GAC</td>
</tr>
</tbody>
</table>

**Guideline derivation**
- allocation to water 10% of TDI
- weight 60-kg adult
- consumption 2 litres/day

**Toxicological review**
Simazine does not appear to be genotoxic in mammalian systems. Recent studies have shown an increase in mammary tumours in the female rat but no effects in the mouse. IARC has classified simazine in Group 3.

**History of guideline development**
The 1958 and 1963 WHO *International Standards for Drinking-water* did not refer to simazine, but the 1971 International Standards suggested that pesticide residues that