JMPR agreed that it is unlikely that atrazine is genotoxic and concluded that atrazine is not likely to pose a carcinogenic risk to humans, as the mode of carcinogenic action in certain susceptible rat strains is not relevant for human risk assessment. The weight of evidence from the epidemiological studies also did not support a causal association between exposure to atrazine and the occurrence of cancer in humans.

In special studies of reproductive toxicity, exposure of rats during early pregnancy (i.e. the luteinizing hormone–dependent period) caused increased pre-implantation or post-implantation losses, including full-litter resorptions. Attenuation of the luteinizing hormone surge and subsequent disruption of the estrous cycle (characterized by an increase in days in estrus) were observed at and above 3.65 mg/kg body weight per day, with a NOAEL of 1.8 mg/kg body weight per day. The effects on the luteinizing hormone surge and disruption of the estrous cycle were further supported by a number of short-term mechanistic studies. Additional experiments suggested that the effects of atrazine on luteinizing hormone and prolactin secretion are mediated via a hypothalamic site of action. JMPR concluded that atrazine was not teratogenic.

Studies using a variety of test systems in vitro and in vivo indicated that modulation of the immune system occurs after exposure to atrazine. However, effects suggestive of impaired function of the immune system were observed only at doses greater than those shown to affect neuroendocrine function, leading to disruption of the estrous cycle or developmental effects.

The toxicity profiles and mode of action of the chloro-*s*-triazine metabolites are similar to those of atrazine; the potency of these metabolites with regard to their neuroendocrine-disrupting properties appeared to be similar to that of the parent compound.

The metabolite hydroxyatrazine does not have the same mode of action or toxicity profile as atrazine and its chloro-*s*-triazine metabolites. The main effect of hydroxyatrazine was kidney toxicity (owing to its low solubility in water, resulting in crystal formation and a subsequent inflammatory response), and there was no evidence that hydroxyatrazine has neuroendocrine-disrupting properties. There was no evidence of carcinogenicity, and hydroxyatrazine did not show genotoxicity in an adequate range of tests in vitro and in vivo.

Barium

Barium compounds are present in nature as ore deposits and in igneous and sedimentary rocks, and are used in a variety of industrial applications. Barium in water comes primarily from natural sources, although barium also enters the environment from industrial emissions and anthropogenic uses. Food is the primary source of intake for the non-occupationally exposed population. However, where barium concentrations in water are high, drinking-water may contribute significantly to total intake.

Guideline value	1.3 mg/l (1300 µg/l)
Occurrence	Concentrations in drinking-water are generally below 100 µg/l, although concentrations above 1 mg/l have been measured in drinking-water derived from groundwater

TDI	0.21 mg/kg bw per day, derived by applying an uncertainty factor of 300 to account for intraspecies variation (10), interspecies variation (10) and database deficiencies (3 for the lack of a developmental toxicity study) to a $BMDL_{05}$ of 63 mg/kg bw per day for nephropathy in mice in a 2-year study
Limit of detection	0.004–0.8 µg/l by ICP-MS; 1.0 µg/l by ICP-AES
Treatment performance	Ion exchange, lime softening or direct filtration with chemical precipitation may be able to remove barium to below 1 mg/l
Guideline value derivation	
• allocation to water	20% of TDI
• weight	60 kg adult
• consumption	2 litres/day
Additional comments	As rounding can have significant practical implications at milligram per litre levels, it was concluded that a guideline value with two significant figures was reasonable in this case.
	The guideline value derived based on the long-term mouse study is not inconsistent with health-based values that could be derived from limited human studies.
Assessment date	2016
Principal references	IPCS (2001). *Barium and barium compounds* USEPA (2005). Toxicological review of barium and compounds. In support of summary information on the Integrated Risk Information System (IRIS). WHO (2016). *Barium in drinking-water*

There is no evidence that barium is carcinogenic or genotoxic. Acute hypertension has been observed in case reports, but the effects may be secondary to hypokalaemia. The critical study that had been identified previously for deriving the guideline value has several limitations (e.g. no effect observed at the single dose evaluated, limitations in the exposure methodology and design, no control for important risk factors for hypertension). Another human study that reported no effects on hypertension at 10 mg/l is limited by the small study size and short exposure duration. Barium has been shown to cause nephropathy in laboratory animals, and this was selected as the toxicological end-point of concern for the current guideline.

Bentazone

Bentazone (CAS No. 25057-89-0) is a post-emergence herbicide used for selective control of broadleaf weeds and sedges occurring among a variety of crops. It is highly soluble in water and very resistant to hydrolysis; it is also very mobile in soil. However, photodegradation occurs in both soil and water. Bentazone may leach from soil into groundwater, particularly during heavy rainfall, and may contaminate surface water through effluents from production plants, drainage waters and actual use in the water (rice fields). Exposure from food is likely to be low.