Impact of glyphosate on water supply abstractions

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European Glyphosate Environmental Information Source

Important Notes to users:
This document is part of a toolbox which provides independent information on the sustainable use of glyphosate. It cannot however be definitive and users must ensure that they assess local factors and particularly take account of any national or regional legislative requirements. At the end of the document reference sources used in its preparation and links to other relevant documents are provided.

Summary
This note summarises available information on the effectiveness of different water treatment processes in removing glyphosate and its principal metabolite (AMPA), which is produced readily under environmental conditions. Chlorination which is a widely used treatment process provides a very effective barrier against these substances. Ozonation which is also used in some supplies provides an even more effective barrier. However other commonly used treatment processes provide very little, if any, effective removal of glyphosate. The implications for managing drinking water quality using a Water Safety Plan (WSP) risk assessment approach as recommended by WHO is assessed. .

Detailed information

Water supply sources
Public water suppliers across Europe abstract raw water from a range of different sources depending on local availability. In some countries supplies are taken almost entirely from groundwater, in other countries surface water (rivers, canals, lakes or reservoirs) are the predominant source of drinking water.

Typical water treatment processes
The type of treatment necessary before water can safely be distributed to consumers will vary considerably between waterworks. This depends particularly on the quality of the raw water and the potential levels of both natural and man made pollutants, but in general groundwater requires less treatment than surface water. The minimum treatment is normally disinfection to kill harmful microorganisms, but in some countries where groundwater sources are highly protected from faecal contamination, water can be safely distributed without any form of disinfection. Equally for many works, particularly those abstracting surface water, a number of linked sequential treatment processes are used to ensure that water fully meets the necessary potable standards.

Treated water quality standards
All EU countries must as a minimum comply with water quality standards laid down in the EU drinking water directive (98/83/EC). These requirements must be transposed into the legislation of each Member State (MS) although MS may impose stricter or additional requirements if it believes these are necessary. Glyphosate is covered by the pesticides standard which requires that drinking water must not at any time have levels of individual pesticides or their relevant metabolites in excess of 0.1 micrograms per litre ($\mu g\ l^{-1}$ or parts per billion) or 0.5 $\mu g\ l^{-1}$ of all pesticides. This standard is based on a highly precautionary value which is close to zero and is not related to actual toxicity of the pesticides involved. Thus in the vast majority of cases the standard is considerably lower than the level at which any health impact might occur. For example the World Health Organisation has identified a health based guideline value of 0.9mg/l for AMPA alone or in combination with glyphosate.

Removal of glyphosate by different water treatment processes
The Water Research Centre (WRc) based in the UK has carried out a detailed literature review to identify the effectiveness of different types of water treatment in removing glyphosate. It also assessed the treatment effectiveness for the principal metabolite of glyphosate, AMPA (amino methyl phosphonic acid).

The main conclusions of the report were:

- Chlorine, which is one of the most common disinfectants (oxidants) used in water treatment in Europe, can provide a high degree of removal (>95%) for glyphosate and AMPA under typical conditions used in water treatment.
- Ozonation, another oxidant commonly used for pesticide removal, can also provide more than 95% removal of glyphosate and AMPA.
- Bankside or dune infiltration, coagulation/clarification/filtration and slow sand filtration, commonly used in water treatment, would each contribute some removal, but alone would not provide a secure barrier in relation to meeting a 0.1 $\mu g\ l^{-1}$ standard.
- Depending on the treatment processes used, waterworks which include chlorine could deal with between 1 and 4 $\mu g\ l^{-1}$ (glyphosate + AMPA) in the raw water to maintain less than 0.1 $\mu g\ l^{-1}$ in the treated water, but if the works also includes ozonation total concentrations of above 30 $\mu g\ l^{-1}$ could be treated.
- Other disinfection processes used in some parts of Europe, such as UV or chlorine dioxide, are much less likely to remove glyphosate, although experimental data is limited.
- The most common water treatment process installed for removal of pesticides worldwide is adsorption using granular activated carbon (GAC). However, this does not provide an effective barrier to glyphosate or AMPA.

Risk management for water abstractions

Water suppliers are increasingly adopting a Water Safety Plan (WSP) source to tap risk management approach to provide improved management of drinking water quality as recommended by the World Health Organisation (WHO). In assessing compliance risks from the possible presence of glyphosate in the raw water the above information will be of value. Water suppliers should liaise with catchment managers and glyphosate users in the catchment to ensure that raw water levels and particularly peak values are kept as low as possible. Where the waterworks employs chlorination or ozonation this will however provide a very effective barrier against glyphosate and AMPA entering supply above the standard. By contrast where such processes are not used then the effectiveness of treatment against these substances is much reduced and catchment protection will need to be correspondingly higher.

Private water supply sources

Most of the information in this document relates to public water supplies. However, in many parts of Europe, particularly in rural areas, the water supply for individual properties or scattered very small communities is the direct responsibility of the property owner or other local organisations. In such cases the level of treatment provided is often very low or non existent and the technical knowledge of the operators is often also very low. In such circumstances the risks from local use of all pesticides including glyphosate could be correspondingly higher.

Glyphosate detection in treated water

WRc has also conducted a review of the detection of glyphosate and AMPA in drinking water in nine European countries. In most cases no exceedances of the 0.1 $\mu g\ l^{-1}$ pesticides standard were reported, although a small number of sporadic results >0.1 $\mu g\ l^{-1}$ have been reported. In some cases the exceedances were attributed to analytical problems, in others they related to small private wells (untreated water) from shallow aquifers, which may have been due to localised short-term well contamination. Only three countries have reported some results for AMPA. However there was not always adequate information to fully assess the reliability of the monitoring results.

Reference for further detailed information:

- WRc report UC 7374 dated July 2007 (Click here)
- WRc report UC 7729.04 dated September 2008 (Click here)

See also:

- Environmental fate and behaviour of glyphosate and its main metabolite
- Monitoring results for glyphosate and AMPA in surface and groundwater
- EU drinking water legislation

Document status:

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