

# Safety of Potable Water in Ireland



Report to the Board of the  
Food Safety Authority of Ireland

# Safety of Potable Water in Ireland

Report to the Board of the  
Food Safety Authority of Ireland



Published by:  
**Food Safety Authority of Ireland**  
Abbey Court  
Lower Abbey Street  
Dublin 1

Tel: +353 1 817 1300  
Fax: +353 1 817 1301  
Email: [info@fsai.ie](mailto:info@fsai.ie)  
Website: [www.fsai.ie](http://www.fsai.ie)

©2006

*Applications for reproduction should be  
made to the FSAI Information Unit*



ISBN 1-904465-40-4

## CONTENTS

ABBREVIATIONS .....	3	9. GOOD PRACTICE FOR SUPPLY AND USE OF DRINKING WATER BY FOOD BUSINESSES .....	13
DISCLAIMER NOTICE .....	3	10. CURRENT CONCERNS WITH DRINKING WATER SAFETY .....	14
1. BACKGROUND AND PURPOSE OF THE REPORT .....	4	10.1 Microbiological Issues .....	14
2. SCOPE .....	4	10.1.1 Verotoxigenic <i>Escherichia coli</i> .....	15
3. INTRODUCTION .....	4	10.1.2 <i>Cryptosporidium</i> .....	16
4. ROLE AND RESPONSIBILITIES OF THE FOOD SAFETY AUTHORITY OF IRELAND .....	5	10.1.3 Norovirus .....	17
5. LEGISLATION GOVERNING DRINKING WATER .....	6	10.2 Chemical Issues .....	18
6. SUPPLY OF DRINKING WATER IN IRELAND .....	8	10.2.1 Fluoridation of the public water supply in Ireland .....	18
6.1 Introduction .....	8	10.2.2 Pesticides .....	19
6.2 Public Drinking Water Supplies .....	8	10.2.3 Nitrates .....	19
6.3 Group Water Schemes .....	8	10.2.4 Eutrophication .....	19
6.4 Private Drinking Water Supplies .....	8	10.2.5 Disinfectants and water treatment by-products .....	19
7. RESPONSIBILITIES OF GOVERNMENT AND AUTHORITIES FOR DRINKING WATER .....	9	10.2.6 Metals .....	19
7.1 Sanitary Authorities .....	9	10.2.7 Hormone residues .....	19
7.2 Private Drinking Water Supplies .....	10	10.2.8 Radioactivity .....	20
7.3 Environmental Protection Agency .....	11	11. HACCP AND WATER SAFETY .....	21
7.4 Department of the Environment, Heritage and Local Government .....	11	12. RELIANCE OF FOOD BUSINESSES ON DRINKING WATER SAFETY .....	22
8. RESPONSIBILITIES OF FOOD BUSINESSES FOR DRINKING WATER .....	12	13. CURRENT INITIATIVES TO IMPROVE WATER QUALITY IN IRELAND .....	23
		14. DISCUSSION .....	26
		BIBLIOGRAPHY .....	30

## ABBREVIATIONS

<b>Bq/l</b>	Becquerels per litre	<b>HPSC</b>	Health Protection Surveillance Centre
<b>DBO</b>	Design, Build and Operate	<b>S.I.</b>	Statutory Instrument
<b>DEHLG</b>	Department of the Environment, Heritage and Local Government	<b>µg/L</b>	Micrograms Per Litre
<b>DWNMP</b>	Drinking Water National Monitoring Programme	<b>mg/L</b>	Milligrams Per Litre
<b>EPA</b>	Environmental Protection Agency	<b>NDP</b>	National Development Plan
<b>EU</b>	European Union	<b>NFGWS</b>	National Federation of Group Water Schemes
<b>EC</b>	European Commission	<b>NRWMC</b>	National Rural Water Monitoring Committee
<b>EHO(s)</b>	Environmental Health Officer(s)	<b>PPB</b>	Parts Per Billion
<b>FÁS</b>	Irish Training and Employment Authority	<b>PPM</b>	Parts Per Million
<b>FBO(s)</b>	Food Business Operator(s)	<b>RPII</b>	Radiological Protection Institute of Ireland
<b>FSAI</b>	Food Safety Authority of Ireland	<b>RWP</b>	Rural Water Programme
<b>GWS(s)</b>	Group Water Scheme(s)	<b>VTEC</b>	Verotoxigenic <i>Escherichia coli</i>
<b>HSE</b>	Health Service Executive	<b>WHO</b>	World Health Organization
<b>HUS</b>	Haemolytic Uraemic Syndrome	<b>WSIP</b>	Water Services Infrastructure Programme

## DISCLAIMER

The information contained in this report has been provided by the Food Safety Authority of Ireland (FSAI) and by third parties, for general information purposes only. It does not constitute legal or other professional advice, nor is it intended to provide a detailed or exhaustive statement of the current law, or a definitive interpretation of any specific legal issues. Any person contemplating legal action in respect of matters set out in this report should obtain advice from a suitably qualified professional adviser.

## 1 BACKGROUND AND PURPOSE OF THE REPORT



This report was prepared for the FSAI Board in response to a request from the FSAI Board and the Food Safety Consultative Council.

## 2 SCOPE



This report concerns the safety of potable water (i.e. drinking water) supplied and used for human consumption in Ireland, excluding bottled water and water for medicinal products.

## 3 INTRODUCTION



**Drinking water should not represent a significant risk to human health through its consumption and use. It should be suitable for all commercial food production and domestic purposes, including personal hygiene.**

The quality of drinking water in food businesses is important with respect to product safety, reliability of production processes, cleaning and sanitation procedures and the safety of employees in the general workplace <sup>(1)</sup>.

The drinking water supplied to domestic residents and food businesses across Ireland comes from different sources. These sources include rivers, lakes, natural springs and wells (i.e. boreholes). Drinking water supplies (i.e. used for human consumption) must meet specific legislative requirements laid down by the European Union (EU) <sup>(2)</sup>.

In principle, drinking water must be free from microorganisms and substances that may endanger public health, such as chemical contaminants. Depending on the source of drinking water, the water may or may not go through some form of treatment to ensure its safety for human consumption.

## 4

## ROLE AND RESPONSIBILITIES OF THE FSAI



The principal function of the FSAI is to take all reasonable steps to ensure that food produced in Ireland (whether or not distributed or marketed in the State), meets the highest standards of food safety and hygiene <sup>(3)</sup>.

Food under the FSAI Act, 1998, includes <sup>(3)</sup>:

1. Any substance used, available to be used or intended to be used, for food or drink by human persons
2. Any substance which enters into or is used in the production, composition or preparation of these substances.

In addition, references to food include, as the context may require, reference to a particular food or class of food <sup>(3)</sup>.

The FSAI takes all reasonable steps to ensure that all food produced in Ireland complies with food legislation in respect of food safety and hygiene standards. This can also include the provisions of generally recognised standards or codes of good practice, aimed at ensuring the achievement of high standards of food hygiene and food safety <sup>(3)</sup>.

In discharging its obligations, the FSAI agrees service contracts with official agencies for food law enforcement and scientific support services. The FSAI also maintains informal contacts with industry through a number of industry forums which it hosts.

The FSAI has four principal responsibilities regarding the safety, quality and use of water by the food industry in Ireland:

1. Water used as a direct ingredient or as a solvent in foods
2. Water used as a cleaning agent at any point(s) in the food chain
3. Water used as a medium in which foods are grown, e.g. shellfish, vegetables
4. Water which is bottled <sup>(4)</sup>.

Therefore, any deterioration in water quality can have significant consequences for public health in general and food safety in particular. Beyond actual cases of human illness, this can also lead to:

1. Direct economic loss where food (both in processed and commodity form) is detained, seized and destroyed because of contamination rendering it unsafe
2. Consequential economic loss in the form of increased compliance costs for industry and increased legislative, enforcement and regulatory costs on the State and the State agencies associated with food law enforcement
3. Loss of reputation and opportunity costs as such events, particularly if they involve a high profile product recall, inevitably damage the reputation of not only the business concerned, but also the industry and the country.

The basic standards governing the quality of drinking water intended for human consumption are set out in EU Directive 98/83/EC, which is implemented in Ireland as S.I. No. 439 of 2000 <sup>(2)</sup>. The national legislation came into force in January 2004, when it revoked and replaced EC (Quality of Water intended for Human Consumption) Regulations, 1988 as amended <sup>(5)</sup>. The new legislation (S.I. No. 439 of 2000) <sup>(2)</sup> is substantially different from the previous 1988 legislation <sup>(2)</sup>.

In summary, the new legislation <sup>(2)</sup>:

1. Sets standards in relation to the quality of water intended for human consumption, e.g. drinking water, cooking, food preparation, other domestic purposes and food production
2. Provides for temporary departures from the standard where there is no threat to public health
3. Requires that information is made available to consumers in relation to matters on water quality, exempted supplies, departures granted, precautionary measures and remedial action in case of non-compliant supplies.

However, the new legislation does not cover <sup>(2)</sup>:

1. Natural mineral waters recognised as such by the competent national authorities, in accordance with Council Directive 80/777/EEC <sup>(6)</sup> such as bottled waters including natural mineral water, spring water <sup>(4)</sup>
2. Waters which are medicinal products within the meaning of Council Directive 2001/83/EC of 6 November 2001 on the Community code relating to medicinal products for human use <sup>(7)</sup>
3. Water intended exclusively for those purposes for which the competent authorities are satisfied that the quality of the water has no influence, either directly or indirectly, on the health of the consumers concerned
4. Drinking water from an individual supply, e.g. private well, which provides less than 10 m<sup>3</sup> a day on average or serves fewer than 50 people, unless the water is supplied as part of a commercial or public activity. However, Member States that have recourse to this exemption shall ensure that the population concerned is informed of any action that can be taken to protect human health from the adverse effects resulting from any contamination of the drinking water supply. In addition, when a potential danger to human health arising out of the quality of such water is apparent, the population concerned shall promptly be given appropriate advice <sup>(2)</sup>.

The legislation <sup>(2)</sup> specifies strict quality standards for drinking water in respect of 48 parametric values which are grouped into three categories:

1. Microbiological
2. Chemical
3. Indicator parameters.

The legislation outlines two monitoring categories. Check monitoring is used to provide information on the organoleptic and microbiological quality of the water supplied for human consumption as well as information on the effectiveness of drinking water treatment (especially of disinfection) where it is used <sup>(8)</sup>.

Audit monitoring is used to provide the information necessary to determine whether or not all the standards specified in Part I of the Schedule to the legislation <sup>(2)</sup> are being complied with <sup>(8)</sup>. All such parameters must be subject to audit monitoring unless it can be established by a sanitary authority, for a period of time to be determined by it, that a parameter is not likely to be present in a given supply in concentrations which could lead to the risk of a breach of the relevant parametric value <sup>(8)</sup>. A sanitary authority\* is one of the 34 City and County Councils in Ireland.

\* A sanitary authority is defined as a local authority for the purposes of the Local Government (Sanitary Services) Acts, 1878 to 1964 <sup>(10)</sup>.

Typically, a core group of eight to 15<sup>(8)</sup> of the parameters are monitored frequently as part of check monitoring while the remainder are required to be monitored on a less frequent basis as part of audit monitoring<sup>(2)</sup>. This core group forms a suitable basis on which the safety (i.e. potability) of drinking water may be generally assessed in the majority of cases<sup>(8)</sup>.

Minimum frequency for sampling and analyses for water intended for human consumption are given in the legislation under Annex II<sup>(2)</sup>. The Environmental Protection Agency (EPA) prepares and publishes annual reports on the results of the monitoring programmes carried out (Section 7.3)<sup>(8)</sup>. The most recent report on the quality of drinking water covers the year 2004<sup>(8)</sup>.

Under EU food law<sup>(9)</sup>, where there is a reference to drinking water, it is usually defined as water which meets the standards of the drinking water legislation<sup>(2)</sup>. Where the water quality does not meet the specified standards, remedial measures are outlined in legislation for public and private drinking water supplies<sup>(2)</sup>.





### 6.1 Introduction

Most drinking water supplies in Ireland require treatment to bring them up to EU drinking water standards <sup>(2)</sup>. Based on data submitted to the EPA, the bulk of drinking water supplied in Ireland originates from surface water sources, e.g. rivers, lakes. This is particularly so for public drinking water supplies, whereas group water schemes (GWS) tend to be slightly more reliant on groundwater or spring water <sup>(8)</sup>.

Groundwater is typically of a very high quality in Ireland. However, surface waters, e.g. rivers, lakes etc., used for drinking water supplies nearly always require treatment. The general components of most water treatment in Ireland are chemical coagulation, settlement techniques, filtration and disinfection, e.g. decontamination techniques such as chlorination.

Disinfection techniques, e.g. chlorination, ultra violet, are used to counteract the potential problem of microbial contamination in drinking water supplies. However, many private GWS and private well (usually groundwater sources) supplies do not necessarily undergo any disinfection treatment prior to use <sup>(8)</sup>.

### 6.2 Public Drinking Water Supplies

Public drinking water supplies are administered and maintained by sanitary authorities across Ireland. From the 1st of January 2004, sanitary functions which were formerly the responsibility of Town or Borough Councils, became the responsibility of the relevant City or County Council.

In 2004, monitoring results were submitted to the EPA for 904 public drinking water supplies (or supply zones). Public drinking water supplies produce by far the greater quantity of drinking water in Ireland, although the number of GWSs far exceeds that of public water supplies <sup>(8)</sup>.

Public drinking water is supplied to food business operators (FBOs) and domestic customers in urban and some rural areas. The sanitary authority administers the building of approved water supply projects with stringent water testing carried out on all public waters by sanitary authorities and the Health Service Executive (HSE). The HSE assumed responsibility for the health service in the Republic of Ireland on January 1st, 2005. As part of the Irish Government's Health Service Reform Programme, the functions of health boards have transferred to the HSE.

### 6.3 Group Water Schemes

One in five households in Ireland is not connected to public mains water. This represents 150,000 to 200,000 rural households <sup>(11)</sup>. These households either receive piped drinking water supplies from GWSs or private wells <sup>(12)</sup>. The GWS sector in Ireland is represented by the National Federation of Group Water Schemes (NFGWS) <sup>(12)</sup>.

Group water schemes can be broken down into two distinct groups, those that obtain their drinking water from the sanitary authority (Section 6.2) and distribute it themselves (i.e. Public GWS) or those that source and distribute their drinking water from a well, lake or river (i.e. Private GWS). In 2004, the EPA received monitoring results from 794 public GWSs and 778 private GWSs. However, it is estimated that there are over 5,500 GWSs in Ireland, serving approximately 10% of the population <sup>(8)</sup>.

### 6.4 Private Drinking Water Supplies

If a public drinking water supply or public/private GWS is not available, a consumer or FBO may have to consider boring a private well and drawing out groundwater for supply needs. A private drinking water supply is any supply that is not provided by or regulated by a sanitary authority such as a private well <sup>(2)</sup>.

Estimates in 1999 put the number of private wells in Ireland at 200,000 or more <sup>(13)</sup>. The 2002 Census figures for private dwellings in permanent housing units indicates that 137,705 dwellings in Ireland have a private drinking water source while 4,478 have no piped water and 36,031 did not state their source <sup>(14)</sup>. In 2004, the EPA received monitoring results from only 123 private drinking water supplies <sup>(8)</sup>.

### 7.1 Sanitary Authorities

The generation, distribution and monitoring of drinking public water supplies is the responsibility of sanitary authorities (i.e. local authorities). In addition, irrespective of the water supply, e.g. public GWS or private well, sanitary authorities have responsibilities where drinking water sources such as rivers, lakes or groundwater become polluted. The Water Pollution Acts, 1977-1990 confer power on local authorities to prevent pollution and also to prosecute offenders, where pollution has occurred.

Where a sanitary authority considers that a supply of drinking water constitutes a danger to public health, the authority shall ensure that the supply of such water is prohibited or the use of such water is restricted, or action is taken to protect human health.

Consumers should also be promptly informed and given any necessary advice <sup>(2)</sup>.

Under Article 9 of S.I. No. 439 of 2000, the specific corrective actions that must be taken in the event of a failure to meet the specified microbiological, chemical or indicator parametric values, are outlined <sup>(2)</sup>. Priority shall be given to its enforcement action, having particular regard to the extent to which the relevant parametric value, e.g. faecal coliforms, has been exceeded and to the potential danger to public health <sup>(2)</sup>.

A sanitary authority shall decide what action should be taken with regard to the risks to public health which would be caused by an interruption of the supply or a restriction in the use of drinking water <sup>(2)</sup>. Extensive guidance for sanitary authorities in relation to investigation of breaches of parametric values <sup>(2)</sup> and the instigation of corrective actions has been published by the EPA <sup>(10)</sup>. However, the EPA has indicated what some of the most important requirements are: <sup>(8)</sup>

1. The primary requirement on the sanitary authority is to investigate all breaches of the listed parametric values in legislation <sup>(2)</sup> that are reported <sup>(8)</sup>
2. Where a failure to meet the indicator parametric values occurs <sup>(2)</sup>, the sanitary authority is required to determine whether the non-compliance poses a risk to human health. If such a risk exists, then the sanitary authority is required to follow the corrective action procedures outlined in the next two paragraphs
3. Where a breach in the microbiological or chemical parametric standard occurs <sup>(2)</sup> in a public supply, the sanitary authority is required to prepare an action programme within 60 days of receipt of the initial monitoring results. The measures proposed in the action programme must be in place within one year in relation to failures that present a risk to public health, and within two years for those breaches that do not present a risk to public health <sup>(8)</sup>
4. Sanitary authorities should ensure public or private GWSs, where microbiological quality problems were identified, has an action programme prepared to address the quality deficiency. Sanitary authorities should particularly focus on private GWSs that are not being upgraded as part of a planned Design Build Operate (DBO) bundle <sup>(8)</sup> (See Section 13). Where a GWS has not prepared a corrective action programme in accordance with the requirements of Article 9 of the drinking water regulations <sup>(2)</sup> and where there is little evidence of action taken to improve the quality of the water supply, the sanitary authority should use all the enforcement powers available to it to rectify the problems including, where necessary, prosecution <sup>(8)</sup>
5. Where a breach in the microbiological or chemical parametric standard occurs <sup>(2)</sup> in a public or private GWS, or is identified by the sanitary authority in a private supply the sanitary authority is required to serve a notice on the person(s) responsible for the particular supply within 14 days of receipt of the monitoring results. The notice must inform the persons responsible to prepare an action programme within 60 days of receipt of the notice. The action programme must ensure that the supply is brought back into compliance with the legislation within one year in relation to failures that present a risk to public health and within two years for those breaches that do not present a risk to public health <sup>(8)</sup>. The action programme must also be prepared in consultation with the sanitary authority and must comply with any strategic rural water plans which are in operation in the area <sup>(2)</sup>
6. Owners of small private supplies that supply water as part of a public or commercial activity must be identified by the sanitary authority and the owners made aware of their obligation to meet the requirements of the drinking water regulations <sup>(8)</sup>

There is one exception to the rules outlined previously and this arises where the sanitary authority has applied for and received authorisation from the EPA for a departure under Article 5 of S.I. No. 439 of 2000 <sup>(2,8)</sup>. A departure is a temporary authorisation given to a sanitary authority to exceed the limit for a specific chemical standard for a limited time period (not exceeding three years). Such a departure can only be granted by the EPA where no such departure constitutes a potential danger to human health. The EPA has the authority to refuse any such application where it is not satisfied that there is no potential danger to human health (8).

Where a notice is served on a person(s) under the drinking water regulations (i.e. Article 9(2)(c)) in relation to the preparation or implementation of an action programme in respect of water quality standards, regarding matters which present a risk to public health, and that person(s) fails to comply with the terms of the notice, that person(s) shall be guilty of an offence in respect of such failure and shall be liable on summary conviction to a fine not exceeding £1,500 (i.e. approximately €1,905) or to a term of imprisonment not exceeding six months or, at the discretion of the court, to both such fine and such imprisonment <sup>(2)</sup>. In addition, where a person(s), after conviction of an offence under the drinking water regulations (i.e. Article 9(2)(c)) sub-article (i)), continues to contravene the provision, that person shall be guilty of an offence on every day on which such contravention is continued and for each such offence that person shall be liable to a fine, on summary conviction, not exceeding £200 (i.e. approximately €254) <sup>(2)</sup>.

While sanitary authorities may test some GWS supplies for safety, they are not responsible for maintaining GWS pipes and filtration systems. However, increasingly, the maintenance of GWS is being administered by sanitary authorities. Sanitary authorities use their local HSE to test water safety and quality in most public GWS every year.

Unfortunately, the EPA has pointed out, that in 2004, many sanitary authorities did not fulfill their minimum monitoring requirements due to insufficient samples being analysed in some supplies, insufficient parameters being tested in some samples and the omission of some supplies from the monitoring programme entirely. No monitoring was carried out on 26% of public GWSs and on 10% of private GWSs <sup>(8)</sup>.

The EPA has recommended that: <sup>(8)</sup>

1. Operators of public GWSs should ensure that distribution networks under their control are regularly cleaned and maintained to ensure that the quality of the water supplied by the sanitary authority does not deteriorate in the GWSs distribution network <sup>(8)</sup>.
2. Operators of private GWSs that are in breach of the nitrate standard should investigate the cause of the breach and should take the necessary steps to reduce the levels of nitrate in the water supply so as to comply with the parametric value <sup>(2,8)</sup>. The first step to be taken should be the protection of the source of the supply <sup>(8)</sup>.

## 7.2 Small Private Drinking Water Supplies

If drinking water is taken from a private well, the individual consumer or FBO is responsible for monitoring the water safety and quality. The environmental health section of the local HSE should be contacted to organise regular sampling and testing of the supply. However, the consumer or FBO will have to pay the cost of any drinking water testing carried out.

All private supplies serving <50 persons or <10m<sup>3</sup>/day must comply with the requirements of the drinking water regulations where such supplies provide water as part of a public or commercial activity <sup>(8)</sup>.

Furthermore, if the private well supply does not meet the requirements of S.I. No. 439 of 2000, the consumer or FBO must organise and pay for any treatment that has to be carried out on the supply <sup>(2)</sup>. The EPA has indicated that there are FBOs using private wells and private GWS for drinking water supplies but the data on these are limited.

Under the current drinking water legislation, sanitary authorities are required to provide owners of private drinking water supplies (i.e. private well sources) with information about the risks of contamination and advice about what they can do to protect and keep their drinking water supplies safe (Section 7.1.1) <sup>(2)</sup>.

A leaflet produced by the Department of the Environment, Heritage and Local Government (DEHLG), provides information and advice on how to keep private water supplies safe <sup>(15)</sup>. The leaflet is available from the DEHLG and sanitary authorities across the country. This leaflet fulfils Ireland's obligation to provide owners of private drinking water supplies with information about the risks of contamination, and advice about what they can do to protect and keep their drinking water supplies safe <sup>(2,15)</sup>.

### 7.3 Environmental Protection Agency

The role and activities of the EPA are defined under Section 58 of the EPA Act, 1992 (No. 7 of 1992) <sup>(16)</sup>. In addition, the EPA has other functions assigned under S.I. No. 439 of 2000 <sup>(2)</sup>. In summary, the EPA is responsible for <sup>(6)</sup>:

1. The collation and verification of monitoring results from all drinking water supplies covered by S.I. No. 439 of 2000 and the preparation of a national annual report on the overall quality of drinking water in Ireland
2. The provision of advice and assistance to local authorities, both on a formal basis and on an ongoing basis
3. The authorisation of departures from the parametric values in respect of all drinking water supplies
4. Checking the analytical quality control systems that are in place in laboratories carrying out analysis of drinking water
5. Approval of microbiological methods of analysis other than those specified in Part 3 of the Schedule of S.I. No. 439 of 2000.

The EPA and its predecessors, e.g. Water Resources Division of An Foras Forbartha, have published 15 reports on drinking water quality in Ireland. The most recent report, covering the year 2004 <sup>(8)</sup>, is the first under the new European Drinking Water Regulations, 2000 (S.I. No. 439 of 2000) <sup>(2)</sup> which came into force on the 1st January 2004 (Section 5).

The survey work undertaken by the EPA and by sanitary authorities is the principal source of data on which all the drinking water reports have been based. Additional data are also obtained from a number of other public bodies, in particular, the Marine Institute and the Central and Regional Fisheries Boards <sup>(6)</sup>.

### 7.4 Department of the Environment, Heritage and Local Government

The DEHLG has a major role in the provision and development of the country's physical infrastructure. A key element of this is drinking water supply and waste water (sewerage) services. While the provision of drinking water and waste water services is the responsibility of the sanitary authorities, DEHLG's role is to implement Government policy in this area. This is achieved by making sure that the necessary level of national and EU funding is secured to finance the services and monitoring physical and financial progress on schemes <sup>(17)</sup>.

Funding for the provision and upgrading of capital projects in water and waste water services is provided by the DEHLG out of its annual budget and also from EU Structural Funds. Other Government Departments and agencies with roles and responsibilities in the delivery and monitoring of safe drinking water include:

1. Department of Communications, Marine and Natural Resources
2. Department of Health and Children
3. Department of Agriculture and Food
4. Radiological Protection Institute of Ireland
5. Marine Institute
6. Central Fisheries Board.



The primary responsibility for food safety rests with a FBO throughout the food chain, starting with primary production <sup>(9)</sup>. General food law indicates that water ingested directly or indirectly like other foods contributes to the overall exposure of consumers to ingested substances, such as chemical and microbiological contaminants. Therefore, the definition of food includes water intentionally incorporated into food during its manufacture, preparation or treatment <sup>(19)</sup>.

However, water is only a food after the point of compliance as referred to in Article of 6 of Directive 98/83/EC <sup>(2)</sup>. Therefore, water becomes a food at the following points: <sup>(2)</sup>

1. Water supplied from a distribution network, at the point, within a premises or an establishment, at which it emerges from the tap or taps that are normally used for the provision of water for human consumption
2. Water supplied from a tanker, at the point at which it emerges from the tanker
3. Water used in a food-production undertaking, at the point where the water is used in the undertaking.

However, it is unclear at what point the water becomes a food in relation to FBOs storing water for further use in tanks.

In the case of public drinking water supplies, the sanitary authority is responsible for drinking water safety up to the point of compliance at which it becomes a food. A FBO can access data on the quality of all public supplies up to the point of compliance from the EPA. This can be used by the FBO to verify that their supply was meeting the requirements of legislation up to the point of compliance <sup>(2)</sup>.

However, if a problem arises with the drinking water safety and it can be established that the distribution system within the food business is the cause, the responsibility will lie with the FBO <sup>(2)</sup>. Therefore, it is prudent that FBOs ensure that the distribution system, e.g. pipes, within their premises/establishment is regularly checked and maintained. An exception to this will be if the sanitary authority supplies drinking water to consumers through public premises or establishments including schools, hospitals and food outlets. In these cases, the sanitary authority will be responsible for the drinking water safety due to the domestic distribution system in that premises and/or the maintenance of that system <sup>(2)</sup>.

In all cases, sanitary authorities supplying drinking water to both consumers and FBOs must take appropriate action(s) necessary to avoid consumption and use of unsafe drinking water. Appropriate action can include <sup>(2)</sup>:

1. Advertisement in local press of the safety issue and any remedial action consumers/FBOs should take, e.g. boil water before consumption
2. Implementation of treatment techniques prior to water being supplied.

Some FBOs will take their drinking water supplies from private GWS or private wells. These FBOs are directly responsible for the safety of the water they use. As private GWSs and private wells are the sectors of greatest concern in relation to drinking water safety in Ireland, FBOs should ensure the water they use meets all safety requirements and is appropriately treated if required <sup>(2)</sup>. Regular testing is strongly recommended.

There is a statutory requirement on FBOs to trace food (including ingredients such as water) and any other substance expected to be incorporated into a food at all stages of production, processing and distribution <sup>(19)</sup>. What this means for the FBO is that they must know where their water supply comes from and what product it is used for or in.

Traceability has been an area which has received much attention from the FSAI and the food industry in Ireland since the publication of General Food Law by the European Commission (EC) in 2002 <sup>(19)</sup>. Many industry representatives have indicated the difficulties in recording and tracing water supplies used in food processing. However, the difficulties are not generic and largely depend on the source of the water supply and the management of its use by the food business.

It is important that FBOs note that the benefits and importance of traceability typically only become apparent when a problem arises. Therefore, it is prudent that systems of traceability, e.g. water metering, recording times of use, designated taps/outlet for use etc., for drinking water supply and use are developed and implemented.

A FBO should take an overview of all the uses of water within the business. Typically, water used by food businesses will be either directly or indirectly related to its inclusion in the product or its use as utility water by the FBO for purposes such as cleaning and sanitation. In some cases, water may be used as a growth medium for foods such as shellfish, farmed fish and vegetables.

It is important for consumer safety that FBOs understand the risks associated with the application and use of drinking water. These risks will depend on the source of the water used, the treatment it receives, the distribution and storage of the water within the food business, the application of the water, where it is applied and the quality management system the FBO has developed and implemented.

Environmental issues in relation to drinking water supplies have also become increasingly important in recent years. In particular, water is being viewed by many countries as an increasingly diminishing resource. Many FBOs are incorporating systems of water recycling and re-use into their daily operations. These systems present unique challenges to FBOs in terms of water safety. However, these systems of water recycling and re-use are economically driven as the metering of all non-domestic users of drinking water by 2006 is a requirement of the Government's Water Services Pricing Framework <sup>(17)</sup>.

Therefore, it is apparent that a generic or simple overview of the risks associated with the use of drinking water by food businesses is difficult. However, the National Standards Authority of Ireland has published information in relation to good practice and drinking water safety. It is important that all Irish FBOs are familiar with this information and apply it to their normal daily operations <sup>(20)</sup>.



In December 2005, the Minister for the Environment, Heritage and Local Government, Mr Dick Roche, highlighted the measures being implemented by his Department and local authorities designed to assist in maintaining the continuing improvement in drinking water quality in Ireland, including <sup>(21)</sup>:

1. A €3.7 billion National Development Plan (NDP) investment in water services infrastructure up to the end of 2006
2. The publication of a new Water Services Investment Programme 2005 - 2007
3. Since 1997, increased drinking water treatment capacity completed equivalent to the needs of a population of 985,000, increased storage capacity increased equivalent to the requirements of a population of 1,575,000
4. Substantially increased investment in resolving GWS non-compliance with bacteriological standards
5. Anticipated expenditure of €125 million in 2005, up 45% on 2004 expenditure of €86 million.

The 2004 EPA report on drinking water quality in Ireland <sup>(8)</sup> details these continuing improvements in the quality of Ireland's drinking water. However, while the overall rate of compliance with the 48 standards for drinking water (Section 5) <sup>(2)</sup> in 2004 was 96.4% (up slightly from 96.1% in 2003) and the quality of drinking water provided to 84% of the population by the sanitary authorities in public water supplies and public GWSs was satisfactory, it also concluded that the quality of drinking water provided to less than 7% of the population by private GWSs was unsatisfactory.

It has been suggested that unsafe drinking water in Ireland, despite improvements, is a real threat to the public health <sup>(23)</sup>, a consequence not fully borne out unless details of drinking water compliance <sup>(8)</sup> are scrutinised carefully. The EPA has indicated that it is unacceptable that a significant proportion of the Irish population is still receiving drinking water that is unfit for human consumption <sup>(8)</sup>.

Microorganisms, metals, pesticides, naturally occurring and synthetic chemical compounds may occasionally be present in drinking water. These affect drinking water safety and are of particular danger to young children, older people, pregnant women and people whose immune systems have been compromised. The use of any contaminated drinking water for direct consumption, preparation of food or personal hygiene can result in infection or other ill health. In recent times, many sanitary authorities and Government agencies have highlighted that the increasing problems of illegal dumping and quarrying in Ireland may threaten the safety of drinking water supplies <sup>(22)</sup>.

### 10.1 Microbiological Issues

The main threat to the safety and the cause of the majority of drinking water related problems in Ireland is microbiological contamination (Table 1). Typically, this contamination originates from sewage, animal manures and organic wastes. The presence of faecal coliforms in a drinking water supply is a definite indication that faecal contamination (human or animal) of that supply has occurred <sup>(8)</sup>. However, it is important to note that not all coliforms are of faecal origin and to obtain a better indication of the quality of drinking water, tests are carried out to determine whether the coliforms detected are of faecal origin.

In 2004, the primary reason for the unsatisfactory status of many drinking water supplies from private GWSs was the relatively low percentage (78.1%) of samples complying with the *E. coli* parametric value <sup>(2,8)</sup>. In this regard, the quality of private GWSs was lower than that of the small private supplies (90.3% compliance), the public GWSs (96.2% compliance) and the public water supplies (98.9%). In private GWSs in 2004, four counties (i.e. Sligo, Donegal, Leitrim and Kerry) had less than 60% compliance with the *E. coli* parametric value while four counties (i.e. Meath, Westmeath, North Tipperary and Longford) had 100% compliance <sup>(8)</sup>.

The presence of faecal coliforms, e.g. *E. coli* in any drinking water supply at any time is unacceptable <sup>(8)</sup> and represents a public health risk if that supply is not treated. This is particularly pertinent to specific segments of the population (i.e. infants, young children, the elderly, pregnant women and immune compromised individuals) that are at greatest risk from disease and illness

due to microbiological contamination. Overall, just under 20% of drinking water supplies were contaminated with *E. coli* at least once during 2004. However, the majority of the supplies that were contaminated were private GWSs <sup>(6)</sup>.

In Ireland, there is increasing concern about the potential of drinking water as a possible transmission route for Verotoxigenic *Escherichia coli* (VTEC) and other water-linked diseases such as *Cryptosporidium* and viral related illness, e.g. Norovirus (Table 1). During 2004, a number of water linked outbreaks were reported in Ireland.

**Table 1 Waterborne Outbreaks in Ireland for 2004 <sup>1</sup>**

Type of Outbreak <sup>2</sup>	Location	Organism	Number ill	Number hospitalised
General outbreak	Community	<i>Cryptosporidium parvum</i>	6	1
General outbreak	Hospital	<i>Cryptosporidium spp.</i>	3	0
General outbreak	Community	<i>Cryptosporidium spp.</i>	9	2
General outbreak	Community	<i>Cryptosporidium spp.</i>	5	0
General outbreak	Sports club	<i>E. coli</i> O157	4	3
General outbreak <sup>3</sup>	Private house	<i>E. coli</i> O157	4	0
Family outbreak	Private house	<i>E. coli</i> O157	1	1
Family outbreak	Private house	<i>E. coli</i> O157	1	1
General outbreak <sup>4</sup>	School	Suspect viral organism	14	0

<sup>1</sup> Outbreak data may only include confirmed cases. There are often additional unconfirmed cases

<sup>2</sup> For three of the *Cryptosporidium* outbreaks, the suspect water supply was a public water supply and a GWS for one. For three of the VTEC outbreaks, the suspect water supply was a private well supply and a GWS for one

<sup>3</sup> Waterborne or animal contact

<sup>4</sup> Person-to-person and waterborne

Source of Data for Table 1: Private communication with Health Protection Surveillance Centre (HPSC) and references <sup>(23-24)</sup>

The current drinking water legislation requires that in the event of non-compliance with a parametric value, the supply shall be investigated to ensure that there is no potential danger to human health arising from the presence of pathogenic microorganisms <sup>(2)</sup>.

### 10.1.1 Verotoxigenic *Escherichia coli*

Verotoxigenic *E. coli* (VTEC), e.g. *E. coli* O157, can cause a wide range of illnesses, from mild diarrhoea to haemorrhagic colitis with severe abdominal pain and bloody diarrhoea to death in some cases. Historically, 9% of symptomatic Irish cases have developed haemolytic uraemic syndrome (HUS), a form of renal failure <sup>(23)</sup>. VTEC is an important cause of gastroenteric illness in Ireland with between 42 and 88 cases of VTEC O157 reported annually between 1999 and 2004 <sup>(23)</sup>.

A variety of sources and transmission routes have been demonstrated worldwide for VTEC, including food, water, environmental, and direct animal (i.e. cattle, sheep, horses, goats and wild birds) contact as well as person-to-person transmission. Person-to-person spread is important in households, crèches and institutions <sup>(23)</sup>.

In 2004, in Ireland, two outbreaks, one general and one family, were linked epidemiologically and/or microbiologically with drinking water from private wells, demonstrating the potential of this type of water supply in the transmission of VTEC infection (Table 1) <sup>(23)</sup>. A private well was also suspected as the route of transmission for a further family outbreak. The general outbreak illustrates the danger that even a small private water supply can pose, if it provides water to a large number of people in a short period of time, exposing them to infection if the water is contaminated <sup>(23)</sup>.



In 2004, the North Eastern Health Board (NEHB) (now under the auspices of the HSE - North Eastern Area) reported a cross-health board outbreak of VTEC O157 linked to a sports club. Four confirmed cases were reported, three of whom were admitted to hospital (Table 1). Drinking water used at the venue, and supplied from an untreated private well, was found positive for the outbreak strain. Epidemiological evidence was also obtained linking infection with water consumption at the venue <sup>(23)</sup>.

Two family outbreaks in the NEHB were also reported as waterborne. Definitive microbiological evidence was obtained linking water from a private well to two confirmed cases in one of these outbreaks (Table 1). For the second, water from a private well was found positive for *E. coli* and coliforms but no VTEC were isolated <sup>(23)</sup>.

A third family outbreak in the Western Health Board (now under the auspices of the HSE - Western Area) was reported as being transmitted either by water or by animal contact (Table 1). Both the water from a small GWS used by the family, and samples taken subsequently from sheep on the family farm, tested positive for VTEC O157 that were indistinguishable from those isolated from the human cases <sup>(23)</sup>. While the precise route of transmission is unclear, the GWS had experienced problems over a protracted period of time, and was poorly maintained, with the schemes chlorinator non-functional and the water source unprotected. For the four remaining family/household outbreaks, two were suspected to be due to contact with livestock on family farms, one to person-to-person transmission, and for the remaining outbreak the mode of transmission was unknown <sup>(23)</sup>.

An important point in relation to all these outbreaks is the fact that the numbers of people ill and/or hospitalised (Table 1) really only touches on the problems associated with waterborne outbreaks in Ireland. The issue of numbers of people exposed to contamination and/or directly or indirectly affected would further emphasise the problem. In addition, the causes of waterborne outbreaks, e.g. animal waste run off from land, would be useful in assessing the problem of water contamination, e.g. private well, GWSs etc. by the competent authority.

### 10.1.2 *Cryptosporidium*

*Cryptosporidium* is a microscopic parasite found in humans and animals. *Cryptosporidium parvum* and *C. hominis* are the main species associated with human infection, although a minority of infections has been linked with other species such as *C. felis* and *C. meleagridis* <sup>(24)</sup>. *Cryptosporidium* causes an unpleasant disease called cryptosporidiosis, typically characterised by severe watery diarrhoea with abdominal pain, accompanied by nausea, vomiting, weight loss and fever <sup>(25)</sup>.

The primary reservoir for *C. hominis* is humans while both livestock (calves and lambs in particular) and humans serve as reservoirs for *C. parvum*. Thus, speciation can be used to indicate a likely source of infection for individual cases <sup>(24)</sup>. Water and food can be a source of the organism as can contact with infected humans and animals, particularly cattle.

With both humans and animals serving as potential reservoirs, multiple routes of transmission are possible. The consumption of contaminated water is regarded as being an important transmission route, but infection can also occur as a result of recreational bathing, consumption of contaminated foods, animal-to-person and person-to-person transmission. However, the transmission route for sporadic cases remains unconfirmed. It is likely that transmission from animal reservoirs is of primary importance for sporadic cases, with perhaps animal contact and water source contamination by livestock being central <sup>(24)</sup>.

On January 1st 2004, human cryptosporidiosis became a notifiable disease in Ireland. Over 400 cases of cryptosporidiosis were notified in 2004 making cryptosporidiosis the most common protozoan gastrointestinal pathogen notified in Ireland during 2004 <sup>(24)</sup>.

Four outbreaks of cryptosporidiosis were reported in Ireland in 2004 where the suspected mode of transmission was waterborne (Table 1) <sup>(24)</sup>. In one general outbreak, epidemiological evidence linked the outbreak to the consumption of drinking water from a public water supply that serviced approximately 25,000 people <sup>(24,26)</sup>. This supply had also been the source of an outbreak of cryptosporidiosis in April/May 2002. As a result of this 2002 outbreak, a filtration system was installed in December 2003. However, due to a high demand on the water supply and an inability of the system to deal with the high turbidity of the water, the local authority added unfiltered water to the filtered water at a ratio of 1:4. The local authority carried out testing for *Cryptosporidium* on a daily basis when they started using the unfiltered water. The water supply had also been tested for *Clostridium perfringens*, an indicator organism for *Cryptosporidium* <sup>(26)</sup>.

*Cryptosporidium* was not isolated from the water source during the incubation period for this outbreak which indicates that testing a water supply is not always sufficient to determine the risk of a *Cryptosporidium* outbreak. Active surveillance of cases is required to identify an outbreak in a timely manner thus allowing prompt control measures to be implemented <sup>(26)</sup>. The potential for significant numbers of people including vulnerable populations to be affected in these waterborne outbreaks reinforces the need for stringent early control measures with *Cryptosporidium* to be implemented. In addition, a primary public health concern regarding *Cryptosporidium* is its relative resistance to chlorination <sup>(24)</sup>.

The current drinking water legislation has an indirect requirement for monitoring of *Cryptosporidium* <sup>(2)</sup>. However, no numerical standard for *Cryptosporidium* is set in the current drinking water legislation <sup>(2)</sup>. The United Kingdom Water Supply (Water Quality) Amendment Regulations, 1999 (S.I. No. 1524), have defined as a treatment standard, a level of less than one *Cryptosporidium* oocyst\* per/10 litres water when sampled over a 24 hour period <sup>(26)</sup>. Outbreaks of cryptosporidiosis associated with drinking water have occurred where oocysts counts have been below the UK statutory limit (i.e. <1/10L) <sup>(26)</sup>. In 1998, the DEHLG stated that where monitoring for *C. parvum* indicates levels above the parametric value of 0/100ml, a sanitary authority should monitor the raw and treated water for *Cryptosporidium* <sup>(2,8)</sup>.

In 2004, the HPSC (i.e. formally the National Disease Surveillance Centre) published a report on waterborne cryptosporidiosis. This report recommended that all providers of water for human consumption should be required to apply risk assessment techniques for *Cryptosporidium* to their supplies <sup>(27)</sup>.

The EPA has reported that risk assessments were carried out on 331 individual public water supplies by sanitary authorities to determine the vulnerability of public water supplies to *Cryptosporidium* in 2004. Fifty nine percent of the total population is served by a public water supply which has had a risk assessment carried out. Of the 363 risk assessments carried out (i.e. some supplies have more than one source) 21% were identified as being in the high-risk or very high-risk categories <sup>(8)</sup>. There was little evidence of the implementation of source protection measures at the majority of plants visited in 2004 although the implementation of *Cryptosporidium* risk assessments at many of the plants visited was welcomed by the EPA as a step in the right direction <sup>(8)</sup>.

A Safefood (i.e. Food Safety Promotion Board) *Cryptosporidium* Research Network has been set up to enhance communication and research collaboration between those concerned with medical, veterinary and environmental aspects of this protozoan parasite on the island of Ireland. The Research Network will run from 2004 to 2009 and it is hoped that greater co-operation and communication will result in improved detection of contamination and more effective prevention and control programmes on the island of Ireland.

### 10.1.3 Norovirus

Norovirus (previously described as Norwalk virus or Small Round Structured Viruses) causes gastroenteritis, which is typically characterised by nausea, vomiting, and/or diarrhoea, accompanied by abdominal cramps and sometimes headache, fever, chills and muscle aches.

Live bivalve molluscs, e.g. oysters, are shellfish products extensively produced in Ireland for export. Shellfish which are filter feeders, essentially trap and concentrate whatever materials are present in the water. This can include pathogenic microorganisms and viruses such as Norovirus.

Current legislative standards for shelled and shucked products of cooked crustaceans and molluscan shellfish are based on monitoring levels of *E.coli* and coagulase positive *Staphylococcus* at the end of the manufacturing process <sup>(28)</sup>. The rationale behind testing for *E.coli* is the same as with drinking water where the presence of faecal coliforms is usually inferred as indicating the possible presence of pathogens. However, the more persistent and prevalent threat is presented when shellfish are polluted by human sewage leading to contamination by viruses, particularly Norovirus.

In 2002, contaminated Irish oysters were shipped to Hong Kong, causing an outbreak of viral food poisoning <sup>(29)</sup>. Subsequent investigations showed Norovirus as the causative agent. As Norovirus is typically only found in humans it was confirmed that human sewage discharge into the water in which the shellfish were grown in Ireland caused the contamination. This led to the

\* An oocyst is the thick walled resistant outer shell that encases *Cryptosporidium* when it is excreted by humans and animals <sup>(8)</sup>.

authorities in Hong Kong prohibiting all imports of Irish shellfish, a halting of Irish exports to other major markets and the closure of the production area affecting the two shellfish farms <sup>(29)</sup>.

## 10.2 Chemical Issues

The current drinking water legislation lays down maximum levels for a number of chemical parameters in drinking water, namely acrylamide, antimony, arsenic, benzene, benzo(a)pyrene, boron, bromate, cadmium, chromium, copper, cyanide, 1,2-dichloroethane, epichlorohydrin, fluoride, lead, mercury, nickel, nitrate, nitrite, pesticides, polycyclic aromatic hydrocarbons, selenium, tetrachloroethene and trichloroethene, trihalomethanes and vinyl chloride <sup>(2)</sup>. These substances are stringently regulated because of concerns about their effect on human health, for example, a number of them are cancer-causing chemicals.

In addition, a number of chemical parameters are monitored in drinking water as so called "indicator" parameters, reflecting water quality. These include odour, aluminium, ammonium, chloride, iron and manganese, and also certain parameters influenced by chemical content including taste, pH, colour and odour <sup>(2)</sup>.

The EPA has reported that the level of monitoring for a number of chemical parameters in drinking water in 2004 was insufficient. Many local authorities did not carry out any monitoring for some of these chemical parameters <sup>(6)</sup>. The main reason for this was the difficulty in sourcing laboratories capable of carrying out the required analysis. In addition, for some parameters there is no laboratory in Ireland capable of doing the analysis and thus requiring outsourcing to laboratories in the United Kingdom.

However, notwithstanding this difficulty, the EPA noted that sanitary authorities were aware of the requirements to monitor these parameters from the date of publication of the current drinking water legislation <sup>(2)</sup> in 2000 and should have put the necessary arrangements in place prior to the Regulations taking effect in 2004 <sup>(8)</sup>.

### 10.2.1 Fluoridation of the public water supply in Ireland

Fluoridation of the public drinking water supply in Ireland commenced in 1964 and continues to the present day. In Europe, the maximum level of fluoride currently allowed in drinking water is 1.5 parts per million (ppm) <sup>(2)</sup>. However, in Ireland, the 1960 Health (Fluoridation of Water Supplies) Act restricts the maximum level of fluoride to only 1ppm and this supersedes the European maximum limit.

The Government's Forum on Fluoridation Report 2002 <sup>(30)</sup> listed 271 fluoridated public water supplies in the 26 counties of the Republic of Ireland. Northern Ireland does not add fluoride to its water supplies. Fluoride is not added to water from private wells or private GWSs.

The HSE is responsible for the fluoridation of drinking water and monitoring the levels of fluoride at the point of consumption. However, the addition of fluoride is carried out on its behalf by the sanitary authorities, who also monitor levels of fluoride at the treatment works.

In 2002, the FSAI Scientific Committee conducted a risk assessment on the use of fluoridated drinking water used in the reconstitution of infant formula <sup>(31)</sup>. The Committee suggested that all tap water in Ireland should be brought into line with the statutory fluoride limits for drinking water and that the limit should be re-examined with the aim of reducing it to the lowest necessary level to achieve the desired level of protection against dental caries. On foot of this recommendation, the Government's Forum on Fluoridation recommended the amendment of Irish legislation to reflect an optimum level of fluoridation of between 0.6 and 0.8ppm.

In 2004, the Government created the Fluoride Expert Group to oversee the implementation of the recommendations in the Forum on Fluoridation report 2002. This group is in the process, as its highest priority, of assisting the Department of Health and Children to amend the Irish Statutory Instruments enacting fluoridation of the public drinking water supply.

One of the key recommendations of the 2004 EPA report on drinking water is that sanitary authorities should ensure that fluoridation is carried out in accordance with the requirements of the Fluoridation Act and that levels in the final waters do not exceed 1ppm <sup>(6)</sup>.

### 10.2.2 Pesticides

Pesticides and other chemical residues in drinking water are a source of public concern in relation to drinking water safety. Drinking water legislation restricts the total level of pesticides (i.e. the sum of all individual pesticides detected and quantified in the monitoring procedure) in drinking water to 0.5 micrograms per litre ( $\mu\text{g/L}$ ) or 0.5 parts per billion (ppb) and to 0.1  $\mu\text{g/L}$  or 0.1ppb for any individual pesticide <sup>(2)</sup>. However, the actual levels recorded in drinking waters in Ireland are low and within legislative requirements. The development and significant progress in the use of pesticides particularly by the agricultural sector, has contributed to a lowering of pesticide levels in all waters <sup>(8, 18)</sup>.

Some local authorities use treatments such as activated charcoal to remove pesticides as well as other chemical residues in drinking water, and generally, levels of such residues in drinking water in Ireland are not identified as a significant problem <sup>(8)</sup>.

### 10.2.3 Nitrates

Nitrate levels in drinking water may also, like pesticides, be linked to agricultural practice. High usage of nitrogenous fertilisers and application of slurry to agricultural land may result in run-off into rivers and lakes adjacent to farmland, which in turn, may be a source of drinking water. Maximum levels of nitrate and the related nitrite in drinking water are 50 milligrams per litre (mg/L) and 0.5mg/L respectively or 50 and 0.5ppm. The Nitrates Directive is a further piece of EU legislation intended to reduce water pollution caused or induced by nitrates from agricultural sources (See Section 13) <sup>(32)</sup>.

### 10.2.4 Eutrophication

Eutrophication is a term used to describe the process of over-enrichment of lakes and rivers with nutrients, usually phosphorus but also nitrate. Eutrophication can lead to excessive growth of algae and other aquatic plants. This is not usually a major issue for the quality of drinking water, except in so far as such waters and lakes may be used as the source of drinking water supplies, requiring extensive clean-up procedures on the part of sanitary authorities. The problem is being successfully addressed by phosphorus reduction treatment at sewage treatment plants and by controls on nitrate application to agricultural land.

### 10.2.5 Disinfectants and water treatment by-products

Drinking water frequently goes through a treatment process, usually chlorination, in order to ensure its safety for the general public. This reduces the microbiological load to a safe level, but may result in formation of certain disinfection by-products including bromate and trihalomethanes which are formed due to a reaction of chlorine with organic material in the raw water.

The EPA has indicated that while there are insufficient data on disinfection by-products in drinking water supplies in Ireland, the available data may point towards a potential issue.

Acrylamide is another potential by-product of water treatment, due to the use of polyacrylamide as a flocculating agent in sewage treatment plants. Due to concerns about its potential cancer-causing properties, a maximum level for free acrylamide in drinking water is 0.1  $\mu\text{g/L}$  (0.1ppb) <sup>(2)</sup>.

### 10.2.6 Metals

A number of metals including lead, cadmium, chromium, nickel and arsenic are also regulated under the current drinking water legislation <sup>(2)</sup>. High levels of these metals in water are linked to intensive industrial activity, and given that Ireland has not had a great deal of heavy manufacturing industry in the past, the levels of such contaminants, in particular, aquifers are often an indication of illegal dumping of industrial waste.

### 10.2.7 Hormone residues

The issue of drinking water contamination with human hormones, e.g. residues, arising from use of oral contraceptives, which could have an endocrine-disrupting effect has been controversial in recent times. However, this is not currently seen by the EPA as a major issue in Ireland. Primarily, this is because most waste water in Ireland (with some exceptions), e.g. Leixlip Water Treatment Plant, is discharged into sea estuaries rather than directly into river systems. However, the EPA has indicated that while the problem is unlikely, it does warrant further research <sup>(33)</sup>.

### 10.2.8 Radioactivity

Another issue that has arisen recently has been the discovery of high levels of naturally occurring radioactivity in drinking water from ground sources in certain parts of the country.

The EPA discovered levels of uranium in drinking water in samples taken from certain private wells which were between three and ten times the World Health Organization (WHO) recommended level of 15mg/L for uranium <sup>(34)</sup>. The uranium is believed to have entered private water supplies, e.g. wells, through dissolution processes in rock.

The presence of low levels of radionuclides in water can arise through natural processes as for uranium, but can also arise as a result of a nuclear or radiological accident or releases from industrial or medical facilities. Since 2004, levels of radionuclides in drinking water have been subject to national regulations based on the Drinking Water Directive <sup>(2)</sup>. The RPII has, for more than 20 years, routinely monitored levels of radioactivity in Irish drinking water from public supplies. Results for 2003 indicate that the levels of radioactivity in these supplies comply with international guidelines and are of no cause for concern <sup>(33)</sup>.

However, during 2003, the RPII published the results of a 2002 pilot study on radon in drinking water from private ground water supplies in Co. Wicklow. The survey found that 2.4% of the supplies tested had radon concentrations above the EC recommended action level of 1000 Becquerel's per litre (Bq/l) <sup>(36)</sup>. The becquerel (Bq) is the SI unit (i.e. International System of Units) of radioactivity, defined as the activity of a quantity of radioactive material in which one nucleus decays per second ( $s^{-1}$ ).

The RPII advised remedial action to reduce the radon levels in these supplies. In addition, on foot of the study, an advice document was issued to sanitary authorities. The document advised that sanitary authorities identify and survey those water supplies likely to have elevated concentrations of both radon and other naturally occurring radionuclides <sup>(37)</sup>.

Dose estimates based on the measurements made by the RPII in the 2002 pilot study, demonstrate that radon in drinking water may pose a significant additional health risk, in the longer term, to some consumers who depend on these supplies as their primary source of water <sup>(35-36)</sup>.



The Irish food industry operates in a highly regulated and tightly controlled environment. While there have been and continue to be food safety incidents, the safety of food produced in Ireland is now among the highest in the world.

Water is a vital ingredient and medium used for many different purposes in the food industry. Under EU law, water used in processing or directly as an ingredient in a product is considered a food <sup>(19)</sup>. Therefore, water used in the food industry, at a minimum must be equal to or exceed the EU requirements for drinking water <sup>(2)</sup>.

The food industry has been legally obliged to apply the principles of Hazard Analysis and Critical Control Point (HACCP) for over ten years. This involves identifying likely hazards, implementing control procedures to minimise or eliminate these hazards and employing regular checks to ensure that control is maintained. This approach has improved the way in which the Irish food industry operates by helping businesses to focus resources on steps which are critical to food safety.

A similar risk based approach to controlling the safety of drinking water is neither a legal requirement, nor is it widely employed on a voluntary basis by those responsible for the supply of drinking water in Ireland. This is despite the fact that drinking water used in processing or directly as an ingredient in a product is regarded as a food and therefore critical in maintaining public health. When a drinking water supply enters a food business it becomes the responsibility of the FBO and therefore, it should be included in its HACCP system.

In addition, where a food business is part of a private GWS or has its own private well supply, it is expected that the water supply is included within the scope of its HACCP system. However, the application of HACCP principles to the supply of public drinking water by sanitary authorities and public GWSs, is not a legal requirement.

Accidental and natural discharges, e.g. run-off from land, waste water etc., into drinking water supplies can happen suddenly when conditions change, such as during heavy periods of rainfall. Drinking water can become polluted or contaminated while in supply to consumers. Therefore, precautionary and pre-emptive strategies of prevention such as HACCP could be especially useful.

In the absence of data, the net benefits of employing HACCP to ensure drinking water safety are difficult to quantify. However, based on the experience of the food industry, its widespread application to the supply of drinking water could increase the understanding of water safety/quality issues, streamline work procedures, increase consumer confidence, and improve the ability of authorities to react to drinking water safety incidents.

Adoption of the principles of HACCP in the field of drinking water supply has begun in Australia, Switzerland, and France.

The WHO has also expanded the application of the HACCP principles to drinking water and has developed water safety plans <sup>(38)</sup>.

The Irish Government's Fluoride Expert Group is conducting work to produce a code of practice for the safe fluoridation of drinking water supplies that is based on HACCP principles.

The National Federation of Group Water Schemes (NFGWS) has developed a voluntary quality assurance scheme for its members. This scheme applies the principles of HACCP for the delivery of safe drinking water supplies from GWSs <sup>(12)</sup>. Currently, there are three private GWSs implementing the quality assurance scheme. A further 58 GWSs (4 part private GWSs) have completed training in the quality assurance scheme which is an integral part of the NFGWS Management Training Course. Implementation of the quality assurance scheme will commence in the very near future with these GWSs <sup>(48)</sup>. The EPA has recommended that GWSs should obtain certification under the HACCP system adopted by the NFGWS. Where the quality model adopted by the NFGWS is not in place, those responsible for the GWS should prepare a protocol in order to reduce the risk of an unsafe drinking water supply <sup>(8)</sup>.

While the NFGWS quality assurance scheme is a welcome development, it lacks the additional credibility of an independent third party auditor as the scheme is operated by the NFGWS itself and the scheme is voluntary rather than mandatory for members of the NFGWS <sup>(39)</sup>.

The EPA carried out a series of audits during 2004 and found that management by sanitary authorities in the area of drinking water has improved compared to previous years. More sanitary authorities have adopted a documented management systems approach and all sanitary authorities audited had developed a documented protocol for dealing with breaches of the drinking water legislation <sup>(2)</sup>, in accordance with EPA recommendations <sup>(8)</sup>.

The level of reliance a FBO should put on the safety of drinking water it uses and is supplied with, largely depends on the individual business practices and the nature of the water supply it receives and uses.

Food business operators should be aware of the nature of the supply of drinking water they receive and use (i.e. public, GWS or private well). In general, FBOs can put high reliance on the quality of public drinking water supplies<sup>(6)</sup>. However, complacency about the quality of public drinking water supplies is not recommended.

Every FBO has a responsibility for the safety of the products it produces and reliance on water supplies, like all other raw materials and ingredients, should not be taken for granted no matter what the source of the supply is. In particular, where a FBO receives their drinking water supply from a private GWS or private well, the safety of the water should be verified before use.

Under the current drinking water legislation, there is no legal obligation on the EPA to monitor and collect data on private well sources<sup>(2)</sup>. As a result, there can be no guarantees on the quality of the water provided from these sources. The 2002 EPA report on drinking water quality in Ireland<sup>(40)</sup> indicated varying levels of faecal contamination in drinking water supplies around the country. In early 2004, the FSAI issued an alert notification on the implications for FBOs based on the findings of this EPA report<sup>(41)</sup>.

The FSAI stated:

*"Faecal coliforms found in water are a direct indication that the water has been contaminated with animal or human effluent. Pathogenic microorganisms are associated with such faecal material and hence raised faecal coliform levels are indicative of an increased potential risk of pathogenic micro-organisms being present in the water supply. This could give rise to serious foodborne illness in consumers. Any level of faecal coliforms in a water supply is a breach of the drinking water regulations."*

*"The rules of hygiene include the requirement that there must be an adequate supply of 'drinking' water in food premises i.e. water which is suitable for drinking. The safety of water supplies directly affects the safety of food in contact with water provided by those supplies. It is clear from the EPA drinking water report that despite improvements, water represents a real and serious hazard to consumers served by food businesses in Ireland."*

Based on the 2002 EPA report, the FSAI was of the opinion that it was not sufficient for food businesses to assume that the water entering their premises was free from pathogenic microorganisms. The alert notification outlined the implications for FBOs on public water supplies and group water schemes and private supplies.

Implications for food businesses on public water supplies:

1. Food businesses should consider potential faecal coliform contamination as a hazard requiring control under the arrangements of their HACCP plans. As a minimum, they should seek written confirmation of the quality of the public water supply on a yearly basis and take appropriate action based on the monitoring results received.

Implications for food businesses on group water schemes and private supplies:

1. Food businesses served by group water supplies and their own private supplies are particularly at risk and the FSAI advises that they should urgently strengthen their HACCP systems as above
2. Periodic monitoring of the microbiological quality of the water entering the food premises by the FBO may also be required where no monitoring by an external body, e.g. sanitary authority, group scheme operator, takes place
3. As a control measure, a food business may have to install water treatment equipment if there is not a subsequent critical control point for the control of pathogenic microorganisms in their production process. This is a particular consideration for cold serve ready-to-eat foods like salads, which may be washed in contaminated water
4. Food businesses requiring further details on the safety of their water supply should contact their water supplier and request the water monitoring results for their supply. If the water supplier cannot provide evidence confirming the safety of the water they supply, then food businesses should adopt the precautionary principle, assume that their water is contaminated and take appropriate control action.

The FSAI also stated that enforcement officers should be aware of the implications of the EPA report<sup>(40)</sup> and should be ensuring that adequate checks are carried out in premises most likely to be at risk<sup>(41)</sup>.



The overall level of compliance in Ireland with the legislative requirements for drinking water from all supplies in 2004 was 96.4% <sup>(8)</sup>. While this overall figure shows a slight improvement in the level of compliance for drinking water in Ireland with 2003 (i.e. 96.1% in 2003), further improvements are required.

In 2004, only 78.1% and 90.3% of private GWS and small private supplies respectively, showed compliance with the *E. coli* parametric value <sup>(2)</sup> which indicates faecal contamination. This is in comparison to 98.9% and 96.2% compliance in public water supplies and public GWSs respectively <sup>(8)</sup>.

Improvement in the quality of all water supplies in Ireland is being tackled on a number of fronts, including new infrastructure, under the Water Services Investment Programme (WSIP) and the Rural Water Programme (RWP) <sup>(17)</sup>.

The WSIP is coordinated and funded by the DEHLG. In recent years it has also been substantially co-funded by the EU <sup>(17)</sup>. One of the key environmental and economic objectives of the WSIP is to bring the quality of all public and GWS supplies up to the legislative standards for drinking water by 2005 <sup>(17)</sup>.

In December 2005, the DEHLG published plans to invest €5.1bn on new water and sewerage infrastructure throughout the country. The Water Services Investment Programme 2005-2007 includes 899 individual schemes of which 193 are scheduled to begin construction in 2006. A further 191 schemes will start in 2007. At the end of June 2005, a total of 321 water and wastewater schemes had been provided since the start of 2000. It was also announced that there would be an increase in the Exchequer grant available to local authorities for replacing leaky water-mains from the present 75% to 90% <sup>(21)</sup>.

The RWP is an initiative set-up in 1998 by the DEHLG and administered by sanitary authorities. The RWP includes a package of measures aimed at establishing a framework for the upgrading and development of rural water supplies. It addresses deficiencies in GWSs, small public water and sewerage systems in rural villages and private individual supplies where alternative group or public supplies are not available <sup>(17)</sup>. In addition, the RWP includes substantial capital provision for the improvement of rural water supply systems, with resources focused on compliance with drinking water legislation and protecting public health <sup>(2)</sup>. A total of €644 million will be spent on measures to improve rural water supplies under the NDP 2000-2006 <sup>(17)</sup>.

The EPA has indicated that the poor microbiological quality of private GWSs and small private supplies are the most challenging issue facing the authorities charged with responsibility for drinking water in Ireland <sup>(8)</sup>. Under a new national strategy, private GWSs are now eligible for increased subsidy claims and grants where water disinfection and/or treatment is provided under a Design, Build, Operate (DBO) contract or where the water disinfection/treatment plant is operated and maintained by way of a bona fide Operational and Maintenance Contract. A number of individual GWSs may also be bundled together under a single contract. These increased subsidy claims and grants are designed to support the provision of GWSs in rural areas. A procurement guidance document has also been published by the DEHLG to assist local authorities and GWS committees in progressing DBO contracts <sup>(21)</sup>.

In addition to grant aiding new schemes, funding will be available to improve sub-standard supplies to existing schemes, by providing links for such schemes to the public regional water network. Where this is not practicable, suitable filtration and disinfection will be provided in order to ensure compliance with drinking water standards and to protect public health. However, to avail of full grant support under the RWP, GWSs are required to participate in the NFGWS Quality Assurance Scheme <sup>(12)</sup> which is based on HACCP <sup>(8)</sup>.

The Irish Training and Employment Authority (FÁS) provides a three day modular training programme aimed at GWS personnel. The training programme addresses the requirements of drinking water legislation <sup>(2)</sup>. The development of the programme was a collaborative process by FÁS, in conjunction with the NFGWS with the support of the DEHLG, the EPA and the sanitary authorities.

The problems with private GWSs and small private supplies can be mainly put down to poor filtration and disinfection systems (or lack of) and the use of damaged and/or inadequate supply pipes and equipment. Leaking pipes not only allow water to seep out, they allow contaminants to seep into the water supply. Contamination of these supplies is often caused by run-off from poorly constructed or damaged septic tanks, poor agricultural practices, e.g. spreading raw human/animal sewage on land, leaking slurry pits,



and landfill sites. With the introduction of the RWP, the Government has taken a number of actions aimed at improving the quality of water in GWSs and private wells. Under this programme, a sanitary authority has responsibility for:

1. Small public water and sewerage schemes programme
2. Administration of GWSs and sewerage grants and subsidy schemes
3. Grants for provision or improvement of individual water supplies to a house
4. The development of a Strategic Rural Water Plan.

The National Rural Water Monitoring Committee (NRWMC) was established in 1998. The main objectives of the NRWMC are to ensure compliance with drinking water legislation and to establish uniformity in the sampling, testing and entry of data for drinking water supplies and reporting procedures. The NRWMC also advises on policy and oversees the implementation, by local authorities, of the annual RWP. The NRWMC acts under an independent chairperson, and has representation from DEHLG, the Department of Arts, Culture, Gaeltacht and the Islands, NFGWS, sanitary authorities, farming and rural organisations.

Consultants were appointed by DEHLG to assist with the planning and implementation of a Drinking Water National Monitoring Programme (DWMNP). They have reviewed drinking water monitoring techniques from source to tap, along with laboratory capacity. Their report was presented to the Department in December 2004. The report will provide the basis for mapping public and private drinking water supplies and the development of a monitoring strategy, preparation of training manuals and the training of operatives. It also examined existing laboratory practices and will make recommendations on quality control, capacity and accreditation <sup>(17)</sup>.

The Water Services Bill, 2003 incorporates a comprehensive review, update and consolidation of all existing water services legislation, and facilitates the establishment of a comprehensive supervisory regime to ensure compliance with specified performance standards. Some of the innovations this bill has proposed include <sup>(42)</sup>:

1. Accelerated water conservation programmes to reduce wastage and leakage
2. The introduction of a licensing system for all GWSs
3. The operation and maintenance of larger schemes under contract, with funding thereby committed to operation and management and to capital replacement
4. Performance management of all schemes to ensure quality assured standards are met
5. Rigorous assessment of all costs involved in operating and maintaining water and wastewater schemes
6. The metering of all non-domestic consumers so that non-domestic water supplied and wastewater treated is paid for on a usage basis.

As part of a restructuring of EU water policy and legislation, Directive 2000/60/EC which is transposed in Ireland by S.I. No. 722 of 2003, has established a new framework for Community action in the field of water policy <sup>(18)</sup>. The overall objective of this framework Directive is to achieve at least good status for all waters by 2015 <sup>(8, 18)</sup>. The definition of good water status encompasses the chemical composition of water and the ecological elements. The ecological status is defined as an expression of the condition of water bodies as regard their capacity to support natural life, biodiversity and legitimate water uses <sup>(18)</sup>.

This Directive rationalises and updates existing water legislation and provides for water management on the basis of river basin districts, which will be led by local authorities. The DEHLG is promoting the establishment by local authorities of such projects to address all inland and coastal waters <sup>(8)</sup>.

The Directive is very broad in its scope and relates to water quality in rivers, lakes, canals, groundwater, transitional (estuarine) waters and coastal waters extending out a distance of at least one nautical mile from the shoreline <sup>(18)</sup>. However, the key concept of the Directive is integration including the following <sup>(18)</sup>:

1. The Directive is founded on the sustainable development principle

2. The Directive calls for an integrated river basin management of water resources
3. The Directive, links and co-ordinates all previous water policies, such as the directives on urban waste water treatment, nitrates, bathing or drinking water into a common framework
4. The integration of other major EU policies, e.g. agriculture, hydropower or navigation, and water policy is a prerequisite for successful protection of the aquatic environment.

The EU Water Framework Directive <sup>(16)</sup> is being implemented through a range of measures arising from its transposition into national law, including an allocation of some €55 million under the NDP to establish River Basin District Projects for the management of all waters. Extensive co-operation is also ongoing with Northern Ireland authorities for the management of cross-border waters <sup>(43)</sup>.

The Nitrates Directive aims to protect waters against pollution from agricultural sources, with the primary emphasis being on the better management of livestock manures and other fertilisers <sup>(32)</sup>. However, the European Court of Justice delivered a judgment in March 2004 that Ireland was non-compliant with the Nitrates Directive mainly by reason of failing to establish and implement an action programme to protect water quality against pollution by farming.

Ireland's revised Nitrates Action Programme was submitted to the EC on July 29th, 2005 <sup>(44)</sup>. The submission of the action programme is an important step towards protecting general water quality in Ireland. The action programme represents best practice in relation to managing agricultural activities so that they do not pose a risk to water quality.

The European Communities (Good Agricultural Practice for Protection of Waters) Regulations, 2005 came into effect in Ireland on a phased basis on February 1st, 2006 extending to December 31st, 2008 <sup>(32)</sup>. These Regulations give legal effect to the Nitrates Action Programme <sup>(44)</sup>. The establishment of an action programme required the preparation of a programme of measures to be taken and the enactment of appropriate legislation to give legal effect to the programme. The action programme provides for a range of measures to strengthen the application of good agricultural practice countrywide.



### Current Situation

The rules of food safety and hygiene include the requirement that there must be an adequate supply of safe drinking water in food premises<sup>(9,19)</sup>. The safety of water supplies directly affects the safety of food in contact with water provided by those supplies.

It is clear from the EPA that the overall level of compliance for drinking water in Ireland continues to improve<sup>(8,40)</sup>. The most recent EPA report on drinking water quality in 2004 noted that the overall rate of compliance with drinking water standards was 96.4 %<sup>(8)</sup>. The best result to date. However, despite these improvements, drinking water still represents a real and serious hazard to public health in Ireland<sup>(41)</sup>. Furthermore, it appears that many of the problems in relation to the safety of Irish drinking water supplies are exacerbated by lack of finance.

### In Perspective

Over a four month period between July and October 2005, three separate incidents of VTEC and cryptosporidiosis contamination resulted in the HSE deeming the public drinking water supply in Ennis County Clare as unfit for human consumption. The HSE and the local council imposed boil notices in all cases which affected approximately 30,000 residents in the Ennis area. A new treatment plant is currently being constructed to serve the public drinking water supply in Ennis. However, the construction of this new plant is not expected to be completed until July 2007.

Between the 15th of October and 30th of November 2005, 18 cases of VTEC (i.e. *E. coli* O157) were identified in a small rural area of West Limerick. This is the largest outbreak of VTEC infection ever recorded in Ireland, and it is unusual because half the cases detected were asymptomatic (i.e. having a disease without signs or symptoms of disease). Two children were hospitalised with HUS and one child required peritoneal dialysis. Nine of the 18 cases of VTEC were in pre-school children attending two local crèches<sup>(45)</sup>. Epidemiological investigations indicated exposure of those affected by VTEC to a private GWS in West Limerick. Preliminary results from the investigation supported the hypothesis that crèche attendance and drinking water from the private GWS were risk exposures. Transmission appeared to be confined to childcare and household settings, and there was significant person-to-person transmission<sup>(45)</sup>. The private GWS implicated in this VTEC outbreak took water from an agricultural hinterland with close proximity to cattle and slurry spreading. Data from veterinary sources showed the presence of *E. coli* O157 organisms in one herd in the area<sup>(45)</sup>. Control measures included the voluntary closure of the two crèches where cases were identified, exclusion of all cases in at-risk groups, hygiene advice to all close contacts and family contacts of cases, and placement of a boil-water notice by the HSE and Limerick County Council to over 250 households supplied by the private GWS. Guidance on protecting children in care was also issued by the FSAI in 2006<sup>(49)</sup>.

This outbreak highlighted the importance of maintaining water quality standards in private GWSs, and the need for parents to be aware of how childcare facilities are regulated. Registered crèches are subject to basic minimum hygiene requirements, and are regularly inspected by local authorities, who give hygiene advice. The outbreak also demonstrates the potential that vulnerable water supplies in agricultural communities have for producing a large scale VTEC outbreak with significant morbidity<sup>(45)</sup>.

This outbreak and others are also set against a backdrop of Ireland having the highest number of VTEC cases in any year to date in 2005. This is largely due to the normal summer peak continuing far into the autumn of 2005.

### Legislation

Currently the EPA does not have the statutory power to take action against a sanitary authority for breaches of the drinking water legislation in the aforementioned cases and others, as legislation (i.e. Environmental Protection Agency Act, 1992) does not permit the EPA to ensure safe drinking water<sup>(2)</sup>. Currently, Ireland does not have a statutory body, e.g. like the Drinking Water Inspectorate which regulates public water supplies in England and Wales<sup>(50)</sup> which can prosecute sanitary authorities for breaches of the drinking water regulations. Rather, the EPA can issue advice and recommendations to sanitary authorities in relation to problems which may arise with a drinking water supply.

In addition, the EPA carries out audits of sanitary authorities in relation to drinking water. These audits are used to verify information which is submitted to the agency as part of annual returns and also to provide advice and assistance to the sanitary authorities in the implementation of the Regulations <sup>(6)</sup>. However, the EPA can prosecute local authorities and individuals for pollution offences and waste management breaches.

The EPA <sup>(6)</sup> has recommended that consideration should be given to the introduction of legislation to provide for the overseeing and enforcing of sanitary authorities implementation of drinking water legislation <sup>(2)</sup>. The legislation should include the provision of powers to an appropriate body such as the EPA <sup>(6)</sup>, to direct sanitary authorities to carry out specified actions where the need arises and to prosecute sanitary authorities if they fail to carry out directions or continually fail to provide drinking water that meets the requirements of drinking water legislation <sup>(2)</sup>. Amending the Water Services Bill <sup>(42)</sup> to allow for the EPA to prosecute or initiate criminal proceedings against local authorities, councils, individuals or others, responsible for breaches of drinking water legislation could help in dealing with this issue.

### **Infrastructure and Funding**

While substantial progress has been made in improving the drinking water infrastructure in Ireland, there is still a real hazard to public health from contaminated drinking water supplies. Further increases in Government funding to update and improve water services, particularly private GWSs and small private supplies, will continue to help minimise the risks of outbreaks occurring. However, there remain many issues in relation to GWSs, small private supplies and some public supplies which may affect the safety of drinking water.

The pipework in many GWSs and private wells and indeed some older public supplies may not be up to modern standards. Lead pipes in older supply networks and properties are still an issue as regards water safety. The EPA has recommended that sanitary authorities should carry out lead surveys to determine the extent of lead piping in their distribution networks and in the population served <sup>(6)</sup>.

1. In all drinking water supplies, continuous, routine maintenance is required to keep the supply and the distribution systems up to modern standards. Many users of GWSs are not aware of the GWS they receive their drinking water supplies from. Many users of GWSs are also not aware of who exactly is responsible (i.e. trustees) for the drinking water supply they receive <sup>(6)</sup>.
2. In many cases where problem(s) arise with a GWS, the responsibility to rectify the problem falls to the trustee(s) of the GWS. Unfortunately, in a lot of cases, the trustees may not have the necessary expertise or resources to deal effectively with the problem. This also appears to be the case in relation to the provision of continuous, routine maintenance of the supply and its distribution network <sup>(6)</sup>.
3. Where decontamination treatments, e.g. ultra violet, are applied to the drinking water supplied by a GWS or small private supply, the treatment is typically administered by the individual or trustees of the GWS. It appears that there is a poor understanding of these treatments and their limitations of use by those responsible for their operation <sup>(6)</sup>.

In some regions of Ireland there are FBOs which are supplied with unfit drinking water from GWS or small private supplies. Unfortunately, individual FBOs on small private supplies cannot avail of local authority grants and subsidies which are available to domestic customers (See Section 13). These grants are designed to bring quality deficient GWSs and private wells up to the satisfactory standard <sup>(2)</sup>. Grants are only available for the provision or improvement of individual supplies in houses, more than seven years old, which are not connected to a public water supply. Extension of grants to FBOs could help to reduce the risk from water in these businesses.

Many public drinking water supplies can also be borderline or have marginal results in terms of compliance with legislation, or have a poor water quality history <sup>(2)</sup>. With these supplies there can be a significant risk that the drinking water can quickly become non-compliant if ideal conditions of supply are not maintained.

An imperative for clean water in which to grow shellfish and farmed fish is also required in Ireland. This can only be achieved by proper controls on point and non-point sources of pollution, both microbiological and chemical, in catchments areas feeding the rivers that empty into the bays where the shellfish are cultivated or harvested from. This is a point previously articulated by the EU Commission's Standing Committee on Veterinary Measures relating to Public Health who concluded that it was widely accepted that the most effective way to tackle shellfish transmitted viral disease is to prevent or reduce sewage pollution of shellfish harvesting areas <sup>(46)</sup>.

### Communication

Discussions with the EPA and the HSE suggest that, in general, with drinking water supplies there may be issues in relation to communication between competent authorities and/or responsible individuals. During the 1970s the then health boards split from the local authorities. Since that split, in matters related to drinking water safety communication between representatives of the health boards (i.e. HSE) and local authorities in some cases has been unsatisfactory.

In all cases, not communicating information to consumers in relation to matters on water quality, exempted supplies, departures granted, precautionary measures and remedial action in case of non-compliant supplies, may prevent rapid resolution of problems with drinking water supplies.

### Cooperation

An open policy should be promoted between the HSE and local authorities to exchange results and communicate better the implications of these results on drinking water safety to the public. There should be encouragement given to local authorities to also publish water results and act more proactively in communicating the results. Drinking water safety would also benefit from clear communication between local authorities and trustees of GWSs about responsibilities to FBOs and the public and the dangers of unsafe drinking water.

### Food Industry

Within the Irish food industry there is a continuous need for improvement in the quality and the safety of food. The same situation should prevail for the supply of drinking water in Ireland. The drinking water legislation clearly indicates a binding responsibility for the preparation and implementation of corrective action programs on the sanitary authorities and GWSs supplying drinking water.

The food industry has, through its own initiatives and legislative requirements, been moving towards greater use of risk assessment and management techniques. The use of end-product testing by the food industry can be used to verify the safety of products. However, end-product testing is expensive and often comes too late to ensure the safety of foods. The same situation applies to drinking water supplies. Consequently, the food industry has moved away from the use of product sampling and monitoring as a basis for preventative risk management decisions and actions. Preventative management using HACCP is the mandatory approach to food safety in Ireland and the EU <sup>(9)</sup> and product sampling is used to verify that the HACCP system is working.

The FSAI is of the opinion that it is not sufficient for a FBO to assume that the drinking water entering their premises is free from pathogenic microorganisms and chemical contaminants <sup>(41)</sup>. They should identify hazards in their drinking water supply and put controls in place. These same principles should apply to all drinking water supplies. Therefore, similar initiatives using the principles of HACCP should prevail for the supply of drinking water in Ireland.

Currently, food businesses using public drinking water supplies should consider potential faecal coliform contamination as a hazard requiring control under the arrangements of their HACCP plans. At a minimum, they should seek written confirmation of the quality of the public water supply on a yearly basis and take appropriate action based on the monitoring results received <sup>(41)</sup>.

While levels of chemical contaminants are unlikely to present a direct risk to health, food businesses should be aware of possible contaminants in their drinking water supply. Again, the results of annual monitoring of the public water supply will indicate any potential problem with chemical contaminants.

Food business operators on GWSs and private supplies are particularly at risk and the FSAI advises that they should urgently strengthen their HACCP systems as outlined above. Periodic monitoring of the microbiological and chemical quality of the water entering a food premises by the FBO may also be required where no monitoring by a competent authority takes place.

As a control measure, a FBO may have to install water treatment equipment as a critical control point in their production process if a hazard is identified in their drinking water supply. This is of particular concern to FBOs producing cold serve ready-to-eat foods like salads which may be washed in contaminated water.

Food business operators requiring further details on the safety of their water supply should contact their water supplier and request the water monitoring results for their supply. If the water supplier cannot provide evidence confirming the safety of the water they supply, the FBO should adopt the precautionary principle, assume that their drinking water is contaminated and take appropriate control action.

### Conclusions

Although the safety of drinking water in Ireland is improving<sup>(6)</sup> some deficiencies are still apparent. Therefore, it is essential that collaborative approaches are adopted. Communication between relevant agencies, organisations, individuals and FBOs with clear designation of responsibility for specific areas of the drinking water supply will improve drinking water safety. All interested parties should be involved in the umbrella management of drinking water safety and quality in Ireland.

The HPSC has indicated that the potential for a substantial number of people in Ireland to be exposed to waterborne infection is high. This potential for exposure to infection requires a concerted effort on behalf of the regulatory authorities and service providers to inform the public that untreated water supplies, particularly from private wells, may pose a significant risk to public health<sup>(47)</sup>.

Improvements already underway in the country's water services infrastructure have begun to show improvements in drinking water supplies<sup>(6)</sup>. However, to develop, implement and support good practice in drinking water supply in Ireland, the entire water system must be managed. Inter-agency consultation will be required for monitoring and reporting requirements (monitoring and assessment of water sources, treatment efficiency, quality of drinking water leaving treatment facilities and in the distribution systems), emergency response plans, communication strategies and strategies to deal with day-to-day management of water quality, including safety failures<sup>(34)</sup>.

Major stakeholders, e.g. sanitary authority, GWSs, FBOs etc., who could affect or be affected by decisions or activities of drinking water suppliers should be encouraged to coordinate their planning and management activities where appropriate. These could include, for example, health and resource management agencies, consumers and industry. Appropriate mechanisms and documentation should be established for stakeholder commitment and involvement.

Unless safe drinking water is available, Ireland's reputation as a supplier of safe, wholesome foods could be damaged. This could lead to direct economic losses and unquantifiable lost opportunity costs not to mention the effects on public health. If consumers perceive a greater probability of ill-health from a particular food and/or a food from a particular supplier, demand for that food will inevitably fall.

The development and implementation of a HACCP approach to the supply of drinking water in Ireland is required. The approach should entail a systematic assessment of risks throughout drinking water supplies right from the source through distribution, treatment and the final user. Enforcement officers should be aware of the implications of EPA reports on drinking water quality in Ireland<sup>(6)</sup> and should ensure that adequate checks are being carried out in premises most likely to be at risk<sup>(41)</sup>.

The reliability of methodologies to determine drinking water safety and the competency of agencies carrying out the testing, e.g. in the case of *Cryptosporidium*, must also be examined. It has been observed that routine testing for *E. coli* in drinking water sometimes does not isolate or identify VTEC which is then later identified as a causative agent in an outbreak<sup>(23)</sup>.

## BIBLIOGRAPHY

1. **European Hygienic Engineering & Design Group** (2005) Safe storage and distribution of water in food factories. *Trends Food Sci. Technol.*, **16**, 162-165
2. Council Directive 98/83/EC (OJ L330, p32, 5/12/1998) of 3 November 1998 on the quality of water intended for human consumption. European Communities (Drinking Water) Regulations, 2000 (S.I. No. 439 of 2000)
3. Food Safety Authority of Ireland Act, 1998 (S.I. No. 540 of 1998)
4. European Communities (Natural Mineral Waters, Spring Waters and Other Waters in Bottles or Containers) Regulations, 2005 (S.I. No. 79 of 2005)
5. Council Directive 80/778/EEC of 15 July 1980 on the quality of water intended for human consumption. European Communities (Drinking Water) Regulations, 1988 (S.I. No. 88 of 1988)
6. Council Directive 80/777/EEC of 15 July 1980 on the approximation of the laws of the Member States relating to the exploitation and marketing of natural mineral waters. European Communities (Quality of Water Intended for Human Consumption) Regulations, 1988 (S.I. No. 81 of 1988)
7. Council Directive 2001/83/EC of 6 November 2001 on the Community code relating to medicinal products for human use
8. **Environmental Protection Agency** (2005) The Quality of Drinking Water in Ireland - A Report for the Year 2004
9. **European Union** (2004) Corrigendum to Regulation (EC) No 852/2004 of the European Parliament and of the Council of 29 April 2004 on the hygiene of foodstuffs, Official Journal, L series 226, p3, 25/06/2004, Brussels
10. **Environmental Protection Agency** (2004) European Communities (Drinking Water) Regulations, 2000 (S. I. No. 439 of 2000): A Handbook on Implementation for Sanitary Authorities  
<http://www.epa.ie/OfficeofEnvironmentalEnforcement/PublicAuthorityEnforcement/DrinkingWater/DrinkingWaterDownloads/FileUpload,5404,en.pdf>
11. Water Supply in Ireland [http://www.oasis.gov.ie/public\\_utilities/water\\_services/water\\_supply.html](http://www.oasis.gov.ie/public_utilities/water_services/water_supply.html)
12. **National Federation of Group Water Schemes** <http://www.nfgws.ie/>
13. **Wright, G.** (1999) How many wells are there in Ireland? The Geological Survey of Ireland (GSI) Newsletter, **35**  
<http://www.gsi.ie/workgsi/groundwater/newslet/35/35-01.htm>
14. Census 2002 - Housing. <http://www.cso.ie/census/vol13.htm>
15. **Department of the Environment, Heritage and Local Government** (2005) Keeping your unregulated private water supply safe.  
<http://www.louthcoco.ie/louthcoco/downloads/SansServices/Small%20schemes%20leaflet%20Jan%202005.pdf>
16. **Environmental Protection Agency Act** (1992) (No. 7 of 1992) <http://www.irishstatutebook.ie/front.html>
17. **Department of the Environment Heritage and Local Government**  
<http://www.environ.ie/DOEI/DOEIPol.nsf/wvNavView/wvdWaterServices?OpenDocument&Lang=en>
18. Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy. European Communities (Water Policy) Regulations, 2003 (S.I. No. 722 of 2003)
19. **European Commission** (2002) Regulation No 178/2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety, Official Journal, L Series 031, p1, 01/02/2002, Brussels
20. **National Standards Authority of Ireland** (1997) Guide to good hygiene practice for the food processing industry in accordance with the council directive 93/43/EEC on the Hygiene of Foodstuffs. Irish Standard (I.S.) 342: 1997

21. **Department of the Environment, Heritage and Local Government** (2005) Press Releases  
<http://www.environ.ie/DOEI/DOEIPub.nsf/wvNavView/PressReleases?OpenDocument&Start=1&Count=1000&Collapse=1&LatNews=2&Lang=en&LatNews=2&Lang=en&LatNews=2&Lang=en>
22. **Humphreys, J.** (2005) EPA says Wicklow dump now polluting local water. *The Irish Times*, 20th of July 2005
23. **Garvey, P., Mc Keown, P., Carroll, A. and McNamara, E.** (2005) Epidemiology of Verotoxigenic *E. coli* O157 in Ireland, 2004. *EPI-Insight*, 6(12), 2-3. Health Protection Surveillance Centre, Dublin Ireland. <http://www.ndsc.ie/EPI-Insight/Volume62005/File,1413,en.PDF>
24. **Garvey, P. and Mc Keown, P.** (2005) Epidemiology of Cryptosporidiosis in Ireland, 2004. *EPI-Insight*, 6(11), 2-3. Health Protection Surveillance Centre, Dublin Ireland. <http://www.ndsc.ie/EPI-nsight/Volume62005/File,1387,en.PDF>
25. **Glberman, S. et al.** (2002) Three drinking water associated cryptosporidiosis outbreaks, Northern Ireland. *Emerging Infectious Diseases*, 8, (6). <http://www.cdc.gov/ncidod/EID/vol8no6/01-0368.htm>
26. **O'Toole, C.E., Jennings, P., Meagher, G. and Kelly, I.** (2004) Cryptosporidium Outbreak in a Continuously Tested Public Water Supply. *EPI-Insight*, 5(10), 1. Health Protection Surveillance Centre, Dublin Ireland. <http://www.ndsc.ie/EPI-Insight/Volume52004/File,906,en.pdf>
27. **National Disease Surveillance Centre** (2004) Report of Waterborne Cryptosporidiosis Subcommittee of the Scientific Advisory Committee. <http://www.ndsc.ie/Publications/Cryptosporidiosis/d1073.PDF>
28. **European Commission** (2005) Regulation 2073/2005 of 15 November 2005 on Microbiological Criteria for Foodstuffs, Official Journal L Series 338, p.0001, 22/12/2005, Brussels
29. **Food Safety Authority of Ireland** (2003) Annual Report 2002
30. **Government of Ireland** (2002) Forum on Fluoridation-Ireland. Dublin, Stationary Office, Government Publications
31. **Anderson WA, Pratt I, Ryan MR, Flynn A** (2004) A probabilistic estimation of fluoride intake by infants up to the age of 4 months from infant formula reconstituted with tap water in the fluoridated regions of Ireland. *Caries Research*; **38**, 421-429
32. Council Directive 91/676/EEC (*OJ L 375, P. 0001 - 0008 31/12/1991*) of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources. European Communities (Good Agricultural Practice for Protection of Waters) Regulations 2005 (S.I. No. 788 of 2005)
33. **O'Brien, T.** (2005) Disruptive hormonal effect of chemicals on fish in Liffey revealed. *The Irish Times*, 14th of June 2005
34. **World Health Organisation** (2004) Guidelines for Drinking Water Quality, (*3rd Edition*), Volume 1 - Recommendations [http://www.who.int/water\\_sanitation\\_health/dwq/GDWQ2004web.pdf](http://www.who.int/water_sanitation_health/dwq/GDWQ2004web.pdf)
35. **Radiological Protection Institute of Ireland** (2003) Annual Report and Accounts <http://www.rpii.ie/download/RPII%20ann%20report%2003.pdf>
36. **Ryan, T.P., Sequeira, S., McKittrick, L. and Colgan, P.A.** (2003) Radon in Drinking Water in Co. Wicklow - a Pilot Study. Radiological Protection Institute of Ireland (RPII -03/1). <http://www.rpii.ie/download/Radonindrinkingwaterwicklow.pdf>
37. **Radiological Protection Institute of Ireland** (2002) Annual Report and Accounts. <http://www.rpii.ie/reports/2003/RPII2002Annualreport.pdf>
38. **World Health Organisation** (2005) Managing water in the home: accelerated health gains from improved water supply WHO/SDE/WSH/02.07 [http://www.who.int/water\\_sanitation\\_health/dwq/wsh0207/en/print.html](http://www.who.int/water_sanitation_health/dwq/wsh0207/en/print.html)
39. **National Federation of Group Water Schemes** (2003) The NFGWS Quality Assurance Scheme <http://www.nfgws.ie/images/pdf/QA%20Training%20booklet%20o.pdf>
40. **Environmental Protection Agency** (2003) The Quality of Drinking Water in Ireland - A report for the year 2002 with a review of the period 2000 - 2002. <http://www.epa.ie/NewsCentre/ReportsPublications/Water/FileUpload,388,en.pdf>



41. **Food Safety Authority of Ireland (2004)** EPA report on water supplies in Ireland: Implications for food businesses. Alert Notification: 2004.04. <http://www.fsai.ie/alerts/archive/fa20040216.asp>
42. Water Services Bill, 2003 [http://www.environ.ie/DOEI/DOEIPol.nsf/0/36b8a967e7badcd980256f0f003bc80a/\\$FILE/b5703s.PDF](http://www.environ.ie/DOEI/DOEIPol.nsf/0/36b8a967e7badcd980256f0f003bc80a/$FILE/b5703s.PDF)
43. **Department of the Environment, Heritage and Local Government (2005)** Statement of Strategy 2005-2007. The Department of the Environment, Heritage and Local Government, Custom House, Dublin 1  
[http://www.environ.ie/DOEI/DOEIHome.nsf/0/16a229a3c01649b980256f0f0039b7dd/\\$FILE/Statement%20Strategy%2005%20Eng.pdf](http://www.environ.ie/DOEI/DOEIHome.nsf/0/16a229a3c01649b980256f0f0039b7dd/$FILE/Statement%20Strategy%2005%20Eng.pdf)
44. **Department of the Environment and Local Government & Department of Agriculture and Food (2005)** National Action Programme under the Nitrates Directive  
[http://www.environ.ie/DOEI/doeipub.nsf/0/7d411c497cb4fbd80256f88003b0961/\\$FILE/NAP%20July%2005%20final.doc](http://www.environ.ie/DOEI/doeipub.nsf/0/7d411c497cb4fbd80256f88003b0961/$FILE/NAP%20July%2005%20final.doc)
45. **Mannix, M., (2005)** Large *E. coli* O157 outbreak in Ireland, October-November 2005. Eurosurveillance Weekly Release, 10(12).  
<http://www.eurosurveillance.org/ew/2005/051222.asp#3>
46. **European Commission Health and Consumer Protection Directorate General (2002)** Opinion of the Scientific Committee on Veterinary Measures relating to Public Health on Norwalk-like viruses. [http://europa.eu.int/comm/food/fs/sc/scv/out49\\_en.pdf](http://europa.eu.int/comm/food/fs/sc/scv/out49_en.pdf)
47. **Health Protection Surveillance Centre (2005)** Annual Report 2004  
<http://www.ndsc.ie/AboutHPSC/AnnualReports/File,1438,en.pdf>
48. **National Federation of Group Water Schemes (2005)** Personnel Communication
49. **Food Safety Authority of Ireland (2006)** *E. coli* O157:H7 Protecting the Children in Your Care.  
<http://www.fsai.ie/publications/index.asp>
50. **Drinking Water Inspectorate (2004)** Drinking Water in England 2004: A Report by the Chief Inspector.  
<http://dwi.gov.uk/pubs/annrep04/contents.shtml>



Published by:

**Food Safety Authority of Ireland**

Abbey Court

Lower Abbey Street

Dublin 1

Tel: +353 1 817 1300

Fax: +353 1 817 1301

Email: [info@fsai.ie](mailto:info@fsai.ie)

Website: [www.fsai.ie](http://www.fsai.ie)

