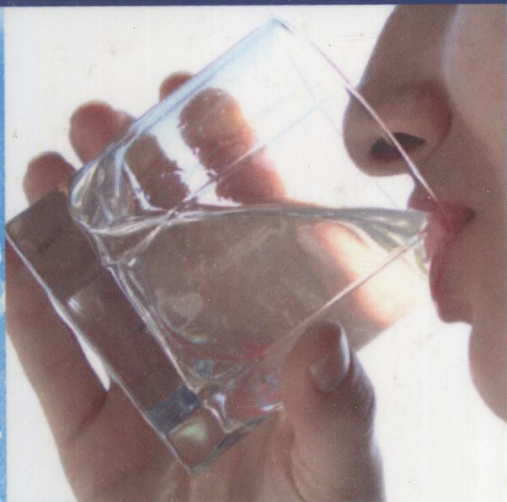


WATER QUALITY MEASUREMENTS SERIES



Analytical Methods for Drinking Water

Advances in Sampling and Analysis

Editors

Philippe Quevauviller | K. Clive Thompson

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Analytical Methods for Drinking Water

Advances in Sampling and Analysis

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Analytical Methods for Drinking Water

Advances in Sampling and Analysis

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Dedication

This book is dedicated to the memory of A. L. Wilson (1929–1985).

Antony Leslie (Tony) Wilson was born in Brighton in 1929 and educated at Vardean Grammar School and Kings College, London, where he took an honours degree in chemistry. He worked for eighteen years at the Atomic Energy Research Establishment, Salwick and the Central Electricity Research Laboratories, Leatherhead, before joining the Water Research Association at Medmenham—later to become a constituent laboratory of the Water Research Centre—in 1968. He remained with the Centre until his retirement in 1980, when he held the position of Manager of the Analysis and Instrumentation Division.

His considerable reputation as an analytical chemist was the product of a prodigious capacity for work and the painstaking application of his considerable intellect, not only to the development of a wide range of methods, but also to the fundamental principles of analysis quality control. His work on the latter was especially pioneering and its importance has become very widely recognised.

His approach to the specification and assessment of analytical performance and to the control of analytical errors formed the basis of the standard practices of both the electricity generating and water industries in the U.K. Over the years the former Department of the Environment, in its Harmonised Monitoring Scheme, and the World Health Organization, in its Global Environment's Standing Committee of Analysts have incorporated his ideas on performance characterisation in their published methods.

In 1975 he was awarded the Louis Gordon Memorial Prize for the best paper of the year in the journal *Talanta* (one of a series in which he drew together in a coherent manner the important factors to be considered in characterising the performance of analytical methods).

It is considered very fitting that this book dealing with various aspects of water quality should be dedicated to such an illustrious and dedicated individual.

Series Preface

Water is a fundamental constituent of life and is essential to a wide range of economic activities. It is also a limited resource, as we are frequently reminded by the tragic effects of drought in certain parts of the world. Even in areas with high precipitation, and in major river basins, overuse and mismanagement of water have created severe constraints on availability. Such problems are widespread and will be made more acute by the accelerating demand on freshwater arising from trends in economic development.

Despite of the fact that water-resource management is essentially a local, river-basin based activity, there are a number of areas of action relevant to all or significant parts of the European Union and for which it is advisable to pool efforts for the purpose of understanding relevant phenomena (e.g. pollution, geochemical studies), developing technical solutions and/or defining management procedures. One of the keys for successful cooperation aimed at studying hydrology, water monitoring, biological activities, etc., is to achieve and ensure good water quality measurements.

Quality measurements are essential for demonstrating the comparability of data obtained worldwide and they form the basis for correct decisions related to management of water resources, monitoring issues, biological quality, etc. Besides the necessary quality control tools developed for various types of physical, chemical and biological measurements, there is a strong need for education and training related to water quality measurements. This need has been recognized by the European Commission, which has funded a series of training courses on this topic that cover aspects such as monitoring and measurement of lake recipients, measurement of heavy metals and organic compounds in drinking and surface water, use of biotic indexes, and methods of analysing algae, protozoa and helminths. In addition, a series of research and development projects have been or are being developed.

This book series will ensure a wide coverage of issues related to water quality measurements, including the topics of the above mentioned courses and the outcome of recent scientific advances. In addition, other aspects related to quality control tools (e.g. certified reference materials for the quality control of water analysis) and monitoring of various types of waters (river, wastewater, groundwater) will also be considered.

This book, *Analytical Methods for Drinking Water: Advances in Sampling and Analysis* is the fourth in the series; it has been written by policymakers and scientific experts in drinking water analytical science and offers the reader an overview of drinking water policies and examples of analytical research directly supporting these policies.

The Series Editor – Philippe Quevauviller

Preface

Drinking water policies and research are intimately linked. It is thanks to the scientific progress made over the last 25 years in identifying and controlling toxic products in drinking water that regulations have developed in such a way that the protection of public health from waterborne diseases has drastically improved. The integration of research outputs into the policy-making progress requires close cooperation among the scientific and policy communities, which is not always straightforward. In the US, drinking water research is an integral part of the US Environmental Protection Agency's base research programme, meaning that research is directly feeding the policy process. In Europe, links have also been established among research and policy development, albeit in a less integrated way. Exchanges between scientific and policy-making communities certainly represent key elements of progress for better environmental protection. In this respect, analytical developments linked to drinking water are at the core of the science-policy debate.

This book reflects this awareness by joining recent analytical developments with policy considerations. The first chapter gives an overview of EU and US drinking water policies, as well as on standardization. Analytical developments are described in depth in Chapter 2, focusing on bromate in drinking water. The third chapter deals with the development of a sampling protocol for determining lead in drinking water, thus mixing analytical development with standardization needs. Finally, Chapter 4 focuses on standardization aspects (pre-normative research) related to materials in contact with drinking water.

This book has been written by experts in the field of drinking water policy and analysis. It does not pretend to give an exhaustive view of drinking water analytical developments, but rather illustrates recent scientific advances in this field, which have contributed to policy development. The gathered information will be of direct use to policymakers, water scientists, researchers and analytical laboratories.

Philippe Quevauviller and K. Clive Thompson

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Disclaimer: The views expressed herein are those of the authors and do not necessarily represent the views of the European Commission nor of the US Environmental Protection Agency policy.

1.1 EU DIRECTIVE ON DRINKING WATER – PAST, PRESENT AND FUTURE

1.1.1 EU Water Legislation

Water is one of the most comprehensively regulated areas of EU environmental legislation. Early European water policy began in the 1970s with the adoption of political programmes as well as legally binding legislation. As regards programmes, the First Environmental Action Programme covered the period 1973–76. Parallel with political programmes, a first wave of legislation was adopted, starting with the 1975 Surface Water Directive and culminating in the 1980 Drinking Water Directive 80/778/EEC. This initial directive was based upon the scientific and technical state of the art of 25 years ago. Since then both scientific and technological knowledge and the approach to EU legislation has changed. It was therefore necessary not only to adapt the original directive to bring it in line with the current scientific and technical progress, but also to bring it into accordance with the principle of subsidiarity by reducing the number of parameters that member states were obliged to monitor and by focusing on compliance with essential quality and health parameters.

1.1.2 The Drinking Water Directives – Revision Processes

In 1993 the commission organized a European drinking water conference in Brussels to consult all stakeholders in the supply of drinking water about the revision of the