

# **Soil quality — Assessment of human exposure from ingestion of soil and soil material — Guidance on the application and selection of physiologically based extraction methods for the estimation of the human bioaccessibility/ bioavailability of metals in soil**

ICS 13.080.30

# National foreword

This Draft for Development is the UK implementation of ISO/TS 17924:2007.

**This publication is not to be regarded as a British Standard.**

It is being issued in the Draft for Development series of publications and is of a provisional nature. It should be applied on this provisional basis, so that information and experience of its practical application can be obtained.

Comments arising from the use of this Draft for Development are requested so that UK experience can be reported to the international organization responsible for its conversion to an international standard. A review of this publication will be initiated not later than three years after its publication by the international organization so that a decision can be taken on its status. Notification of the start of the review period will be made in an announcement in the appropriate issue of *Update Standards*.

According to the replies received by the end of the review period, the responsible BSI Committee will decide whether to support the conversion into an international Standard, to extend the life of the Technical Specification or to withdraw it. Comments should be sent to the Secretary of the responsible BSI Technical Committee at British Standards House, 389 Chiswick High Road, London W4 4AL.

The UK participation in its preparation was entrusted to Technical Committee EH/4, Soil quality.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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# TECHNICAL SPECIFICATION

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## **Soil quality — Assessment of human exposure from ingestion of soil and soil material — Guidance on the application and selection of physiologically based extraction methods for the estimation of the human bioaccessibility/bioavailability of metals in soil**

*Qualité du sol — Évaluation de l'exposition humaine par ingestion de sol et de matériaux du sol — Lignes directrices pour l'application et la sélection de méthodes d'extraction fondées sur le point de vue physiologique pour l'estimation de la bioaccessibilité/biodisponibilité pour l'être humain de métaux dans le sol*



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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

In other circumstances, particularly when there is an urgent market requirement for such documents, a technical committee may decide to publish other types of document:

- an ISO Publicly Available Specification (ISO/PAS) represents an agreement between technical experts in an ISO working group and is accepted for publication if it is approved by more than 50 % of the members of the parent committee casting a vote;
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An ISO/PAS or ISO/TS is reviewed after three years in order to decide whether it will be confirmed for a further three years, revised to become an International Standard, or withdrawn. If the ISO/PAS or ISO/TS is confirmed, it is reviewed again after a further three years, at which time it must either be transformed into an International Standard or be withdrawn.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO/TS 17924 was prepared by Technical Committee ISO/TC 190, *Soil quality*, Subcommittee SC 7, *Soil and site assessment*.

## Introduction

When assessing soils contaminated with, for example, metals, soil ingestion, especially by children, is often considered to be the most important exposure pathway. Currently, this assessment is often carried out on the basis of the total content of the metals in question in the soil. However, several studies suggest that the availability of the metals in the gastrointestinal tract is dependent on the form of the metals present and the site-specific soil chemistry. Test methods based on *in vivo* tests with, for example, juvenile swine or mini-pigs are time consuming and expensive, and not very compatible with the decision processes connected with the assessment and clean-up of contaminated sites. At present, test methods are being developed and validated, which involve *in vitro* laboratory tests aimed at simulating *in vivo* results. This will reduce the cost and practicalities related to the use of such testing on contaminated land.

Due to the large expenditure necessary for both private landowners and public funds set aside for the remediation of contaminated land, International Standards on the assessment of contaminated soil, especially with regard to human health, are in great demand. International Standards in this complex field will support a common scientific basis for the exchange of data, development of knowledge and sound evaluation. Furthermore, International Standards will facilitate international recommendations and regulations. The aim of this Technical Specification is to describe the elements of such an *in vitro* test system, and give advice on the appropriate combination and use of these elements in the specific situation.

In human health-risk assessment, “bioavailability” is specifically used in reference to absorption into systemic circulation, consistent with the toxicological use of the term. This encompasses bioaccessibility, which again is a combined measure of the processes determining the interaction between the metal associated with the soil and the liquid in the human digestion system. Bioavailability furthermore includes the absorption of the contaminant through a physiological membrane and the metabolism in the liver. The bioavailable fraction is thus the fraction left after release into the human digestive liquid, transport across the intestinal epithelium and metabolism in the liver. A further description of these processes is given in Clause 4.

When considering bioavailability as the fraction of the chemical that is absorbed into systemic circulation, two operational definitions are important, *absolute* and *relative* bioavailability. Absolute bioavailability is the fraction of the applied dose that is absorbed and reaches the systemic circulation (and can never be greater than 100 %). Relative bioavailability represents a comparison of absorption under two different sets of conditions, for example, from a soil sample vs. food or another matrix used in a toxicity study, and can be greater than or less than 1. This factor can be used in exposure assessments for exposure by direct ingestion of soil, for instance, if the absolute bioavailability of the metal in the specific soil is suspected to differ significantly from the absolute bioavailability implicit in the toxicity value/quality criteria used.

