

EPTIS: The new European database of proficiency testing schemes for analytical laboratories

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Quality represents a cornerstone in the credibility of analytical laboratories. Their performance must be systematically checked through participation in proficiency testing schemes, co-ordinated by independent providers. These establish the organisational arrangements and the interpretation of results for evaluating the technical competence of the laboratories. The EPTIS database (European Proficiency Testing Information System) aims to establish an important link between all potentially participating laboratories and proficiency testing scheme organisers, as well as the systematisation of all relevant European information. This article describes the promotion of this new database and how the proficiency testing schemes operate in Portugal. ©2001 Elsevier Science B.V. All rights reserved.

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1. Introduction

In the search for quality, any analytical laboratory claiming accreditation has to perform regular checks of its operational performance, leading to a higher credibility and competitiveness. Thus, laboratories carrying out routine analyses must rely on

careful survey of the traceability of methods, as well as on the competence of the analysts involved. For quality assurance purposes, laboratories have to use certified reference materials or in-house standards as well as establish control charts in order to monitor the quality of measurements performed and to highlight any problems as soon as they arise.

A suitable way of evaluating the performance of an analytical laboratory is through participation in interlaboratory studies. Nevertheless, despite the usefulness of these studies, if the number of participants involved is too low, it may not be representative, leading to difficulties in the evaluation of the results.

According to ISO guide 43 (EA-2/03) [1], proficiency testing schemes (PTS) are interlaboratory comparisons that are organised regularly to assess the performance of analytical laboratories and the competence of the analytical personnel. Many PTS are operating, mainly in the field of analytical chemistry – particularly in environmental and food testing, but also in several fields of physical and technological testing. They are usually designed, operated and evaluated by private organisers or by governmental institutes.

The PTS are assumed to run continuously and consist of a systematic distribution of samples to participating laboratories for the analysis of one or more parameters, using the method of their choice or one prescribed by the organiser. There are basically two main types of PTS – those set up to evaluate the competence of a group of laboratories for a very specific analysis (e.g., lead in air) and those

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where there is a need to judge the competence of laboratories across a certain field or type of analysis (e.g., trace metal analysis by AAS) [2]. PTS are organised as sequences of well-established steps, with rules for the interpretation of the results obtained – where the *z*-score is the most used classification system [3,4].

Taking these aspects into consideration, a new database was developed to gather information on all types of PTS operating in Europe, with the aim of providing any analytical laboratory with the possibility of participating in appropriate circuits. This should lead to a more consistent evaluation of the respective competences at reduced costs.

The main goal of this article is to describe and promote the EPTIS database, and to provide information on the PTS operating in Portugal.

2. The EPTIS database

Through the Standards, Measurements and Testing Programme, SMT (1994–1998), the European Commission has funded series of research and development (R&D) projects related, for example, to the implementation of the certification of reference materials and the development of new measurement methods [5], as well as studies concerning the survey on PTS in some EU member states [6]. The main conclusions of on-going discussions on PTS highlighted the lack of sufficient information for existing needs, the utilisation of different assessments in various countries, as well as the limited

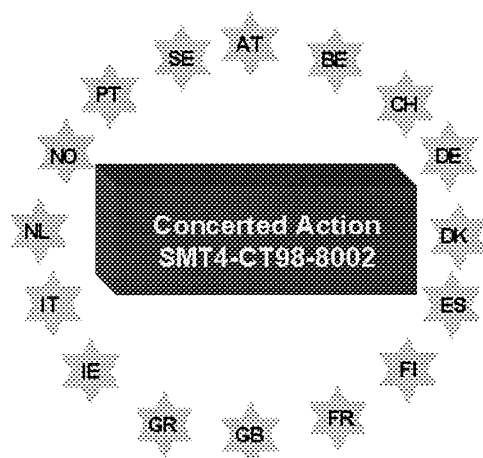


Fig. 1. Countries involved in the EPTIS database concerted action.

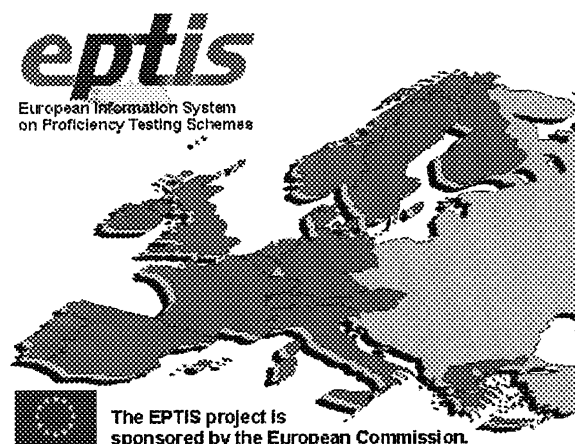


Fig. 2. Logo for EPTIS database promotion.

international PTS participation. In this context, the response to these deficiencies led to the concept of the development of a new database via the Internet, which would be capable of systematising all the PTS European data and give access to any potential users.

The EPTIS database (European Proficiency Testing Information System) is available in English and was developed as a concerted action of national PTS co-ordinators from 16 European countries: Austria, Belgium, Denmark, Finland, France, Germany, Great Britain, Greece, Ireland, Italy, The Netherlands, Norway, Portugal, Spain, Sweden and Switzerland. This initiative was funded by the SMT programme (contract SMT4-CT98-8002) [7] as shown in Fig. 1, and supported by the European co-operation for Accreditation (EA), the European Federation of National Associations of Measurement, Testing and Analytical Laboratories (EUROLAB) and Analytical Chemistry in Europe (EURACHEM).

The implementation of EPTIS (ORACLE Database – EURING), whose promotional logo is reproduced in Fig. 2, aims to include all the information concerning the PTS which regularly operate in the European Union in several testing fields, namely analytical chemistry, physics, and general technology. It was co-ordinated and managed by the BAM (Federal Institute for Materials Research and Testing – Germany) between 1998 and 2000. Since 1 March 2000, all information related to European PTS in the EPTIS database is accessible via the Internet (<http://www.eptis.bam.de>) and is free of charge to users. The structure of EPTIS makes it possible to carry out inquiries regarding the Euro-

pean PTS, in which all collected data are based on an uniform questionnaire developed on the basis of ISO/IEC Guide 43-1 [8], made available and completed by the correspondent providers.

The access to the database is user-friendly, allowing one to make the search on the basis of countries, products, and /or testing fields. For example, if one selects as country *Germany*, a product *water* and the testing field *analytical chemistry*, a listing will be provided on all water-analysis-related PTS organised by German providers, including the name of the provider (e.g., AQS-Leitstelle Bayern), the designation (e.g. 'Intercomparison No. 3 – Herbicides'), the test items (e.g., drinking water), the tested properties (e.g., atrazine), the testing methods (e.g., HPLC) and the standard series or guidelines accepted (e.g., DIN 38407). In this context, the basic information related to each PTS is a powerful and useful consulting tool for analytical laboratories.

Fig. 3 shows the number of PTS provided from each European partner involved in the development of the EPTIS database. At present, the 670 available PTS are organised by 248 providers from 16 countries, covering different types of laboratories, public and private institutions, organisations, or accreditation bodies. The existing 520 test items belong to 52 sets of products, where the top five are food and drink (210), water (134), soil, sludge and contaminated sites (66), agriculture (58) and building materials, accessory agents and building and construction products (54). They are distributed among 25 testing fields, of which the top five are analytical chemistry (444), environmental protec-

tion/conditions (207), microbiology (85), materials evaluation (80), and physics (30). Thus, the overall data sets from EPTIS include 1120 tested properties, 334 testing methods and 552 standard series/guidelines [7].

Complementary information, concerning specific quality characteristics observed in the PTS organised in Europe, is also available on the EPTIS home-page, basically relating to the *conditions for participation, documentation and quality management system, characterisation of test items, evaluation of test results and assessment of the laboratories, communication between the provider and participants*, as well as access to the organisers for additional explanations. A proposal for *Quality Characteristics for PTS in Testing*, including 21 topics and resulting from the analysis of all European data, was presented according to the requirements of ISO/IEC Guide 43-1, and may also be consulted on the EPTIS home-page. It was with this aim that the EPTIS database was developed, having been published in 2000 on the CORDIS database of the European Union – R&D information. The systematic updating by the EPTIS consortium, as well as the possible expansion to other countries outside the European Union and other fields of testing, is also expected in the future.

The EPTIS database also represents a powerful tool to investigate and achieve comparability of testing results in Europe, which forms the basis of the fundamental harmonisation concept of the European Commission, and also promotes trade agreements in the European market and between Europe and the rest of the world.

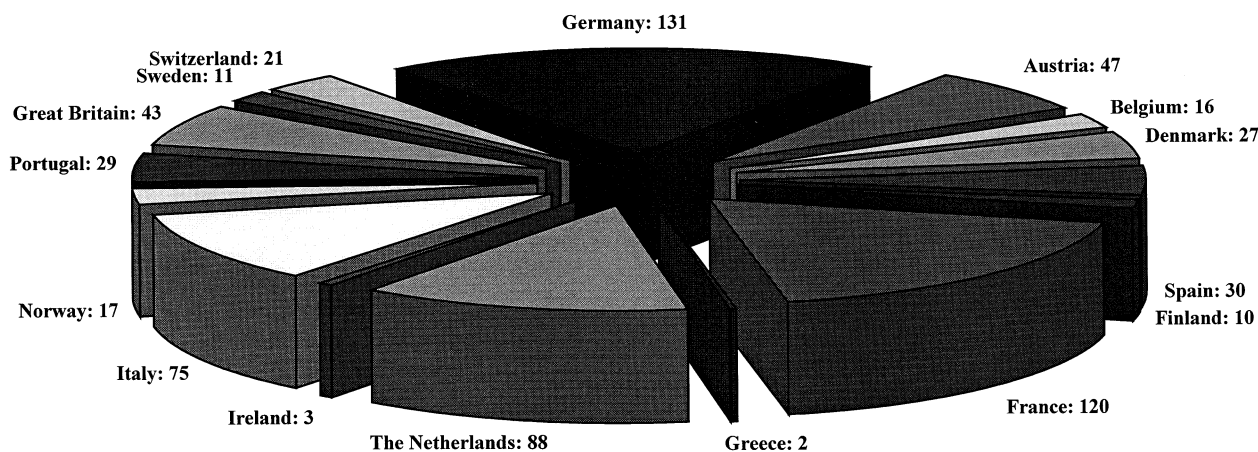


Fig. 3. Number of PTS provided by each European partner involved in the EPTIS database development.

3. The Portuguese situation

Portugal participated in the EPTIS database development, through the Chemistry and Biochemistry Department of the Faculty of Sciences of the University of Lisbon (national PTS co-ordinator). The Portuguese data indicated the existence of four PTS providers, namely the Portuguese Institute for Quality (IPQ), the Portuguese Accredited Laboratories Association (RELACRE), the Portuguese Pulp and Paper Industry Association (CELPA) and the Portuguese National Health Institute Dr. Ricardo Jorge (INSRJ) [9].

Within the EPTIS database, 29 Portuguese data sets are available, of which 22 belong to IPQ (76.0%), five to RELACRE (17.0%), one to CELPA (3.5%) and one to INSJ (3.5%). The 'Accreditation Service' from IPQ provides a set of products distributed in the following areas: building materials, accessory agents and construction products, coatings and surface treatment, electrical/electronic components, fluid engineering, food and drink, gas, laboratory and scientific equipment, measuring instruments, soil, sludge, contaminated sites and water. The 'Interlaboratory Comparison Tests' from RELACRE makes available a set of products distributed in the electrical/electronic components, food and drink, measuring instruments, pulp and paper, soil, sludge, contaminated sites, textiles and clothing, and water. The 'CELPA Protocol' from CELPA obviously provides PTS related to pulp and paper, while the 'Medical Analysis' from INSJ takes part in the health-care technology testing.

Thus, the PTS presently organised in Portugal are distributed among testing fields in the following sectors: acoustics, analytical chemistry, electro-technics/electronics, emission from gases and vapours, environmental protection, fluid dynamics, geology, materials evaluation, mechanics, medical analysis, non-destructive materials testing, physics, sampling, and thermodynamics. The overall Portuguese data sets from EPTIS include 29 test items, 53 tested properties, more than seven testing methods and 18 standard series/guidelines.

The Portuguese PTS generally use standard series/guidelines, some of them aiming to validate testing methods. The frequency of PTS exercises used to be every half-year or yearly, and some of them were first performed in the 1980s. Only national participants are involved in the tests, which are in some cases mandatory, and are liable

to pay the PTS-related costs. The quality management systems of the Portuguese PTS are based on ISO/IEC Guide 43 and an advisory/steering group for the supervision of each PTS is nominated and the confidentiality of the results always guaranteed.

From the questionnaires collected for Portuguese PTS, the reference values of the determined testing quantities are, in general, assigned by the preparation process (e.g., weighing value), by measurements of one selected laboratory traceable to stated references, by the results of several selected laboratories, as well as from the results of the participants in the PTS. The uncertainty of the reference values is determined according to the ISO GUM [10], EA-4/02 [11], or calculated through the standard deviation of the results (i.e., type A uncertainty). A star, chain, and/or simultaneous scheme [1,12] usually manages the distribution of the test items (e.g., reference materials, calibrating solutions and transfer standards) and the stability and homogeneity are always studied. The statistical analysis of the testing results obtained is generally carried out according to procedures described in the literature [1,12] or in standards [13], and in some cases robust procedures are applied [14–16] in order to minimise the influence of outliers.

The statistical criterion or ranking used for laboratory evaluation is the *z*-score and the performance is assessed as being satisfactory if values of $-3 \leq z\text{-score} \leq 3$ are obtained [8]. The period for exchange of information between the PTS provider and the participants is generally around 2–16 weeks, and an evaluation report from the provider is generally available after 1–3 months. A more detailed search of the EPTIS database is recommended to obtain a complete view of all data related to PTS organised in Portugal and Europe in a given testing sector. A sufficiently widespread dissemination of this new database to all potential users is also important, especially to accreditation bodies and/or all authorities which assess the competence of analytical laboratories, as well as all PTS providers, in order to lead to an increased participation and overall improvement of measurement data in Europe.

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