

Pilot Study On International Information Exchange On Dioxins and Related Compounds

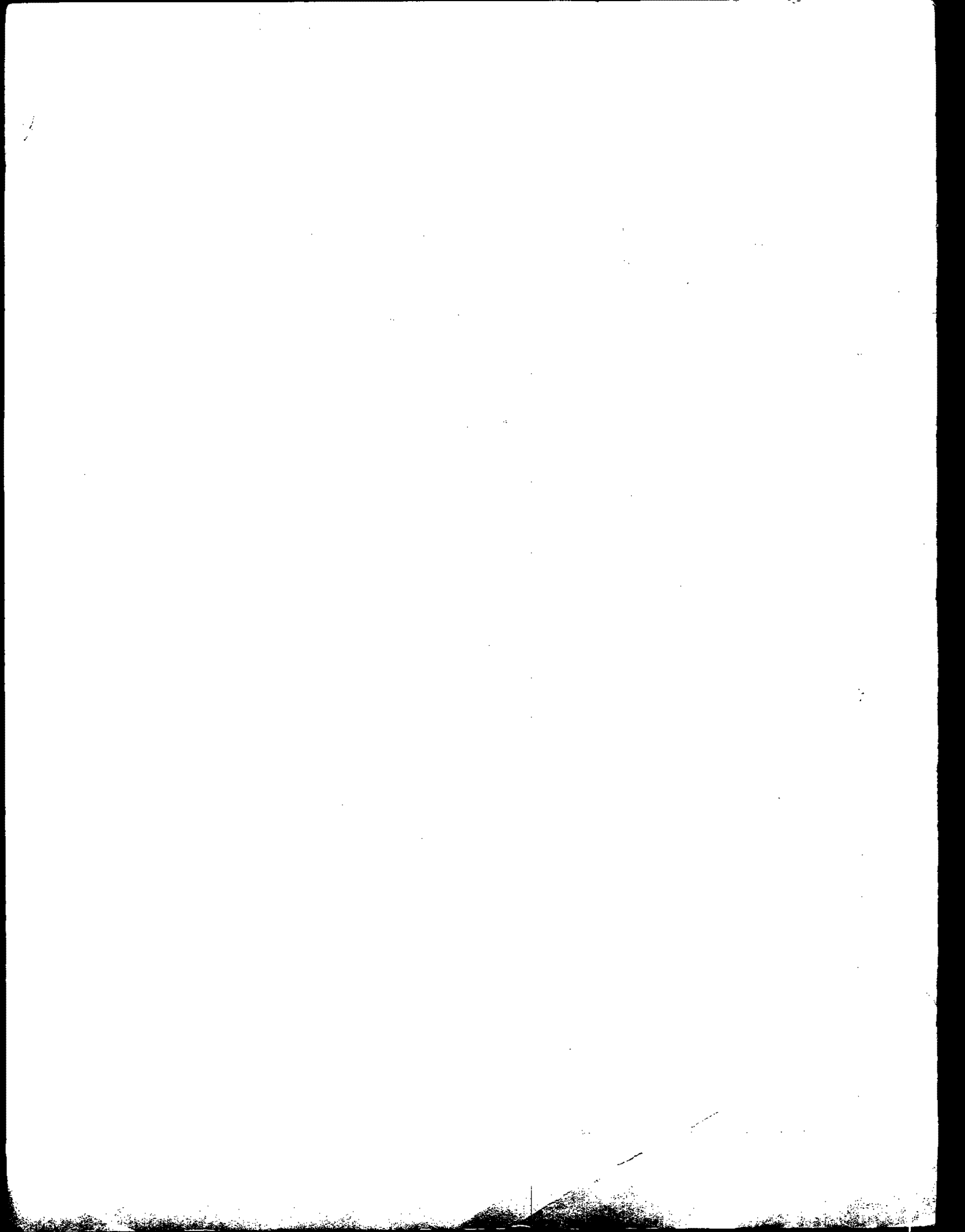


**Listing of Laboratories with
Expertise in the Analysis of Dioxins
and Related Compounds**

**Report Number 168
August 1988**

**North Atlantic Treaty Organization
Committee on the Challenges of Modern Society**

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TABLE OF CONTENTS

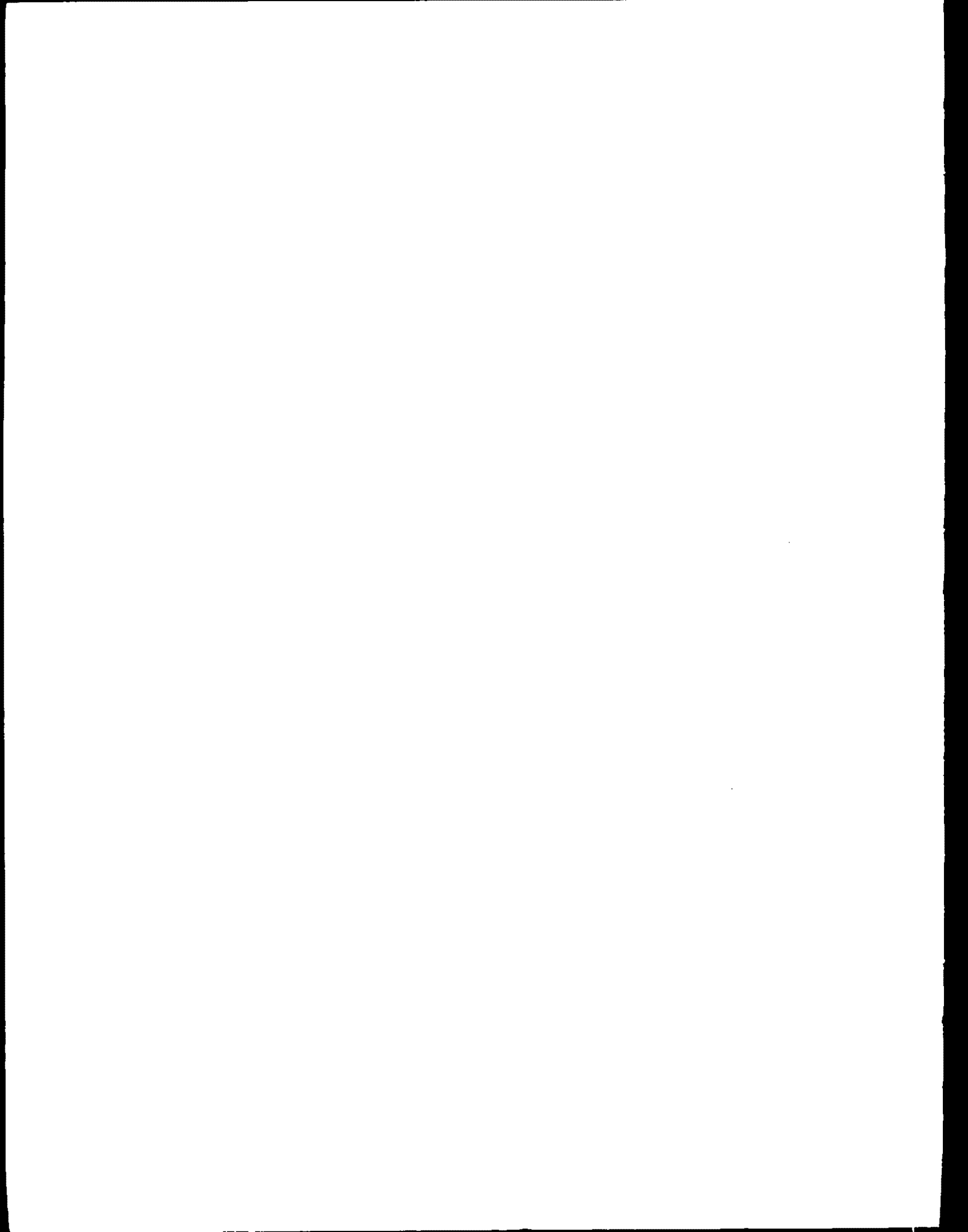
	<u>Page No.</u>
1. INTRODUCTION	1
1.1 Background	1
2. METHOD OF COMPILATION	4
3. DESCRIPTION OF LABORATORIES LISTED	7
3.1 Matrices Analyzed	7
3.2 Quality Assurance Schemes	8
3.2.1 Internal Quality Assurance	9
3.2.2 Externally Moderated Quality Assurance	10
(1) The Troika	11
(2) Contract Laboratory Program (CLP)	12
(3) Community Bureau of Reference (BCR)	13
(4) The WHO Interlaboratory Quality Control Protocol	13
4. ANALYSIS OF THE LISTING OF LABORATORIES	15
5. THE LISTING OF LABORATORIES WITH EXPERTISE IN THE ANALYSIS OF DIOXINS AND RELATED COMPOUNDS	22

LIST OF TABLES

Table 1. Number of Laboratories by Geographic Location	17
--------------------------------------------------------------	----

LIST OF FIGURES

Figure 1. Laboratory Affiliations	18
Figure 2. Laboratory Affiliation in Each Country	19
Figure 3. Quality Assurance Schemes Employed	20
Figure 4. Matrices Analyzed	21



LISTING OF LABORATORIES WITH EXPERTISE
IN THE ANALYSIS OF DIOXINS AND RELATED COMPOUNDS

1. INTRODUCTION

This report presents a listing of laboratories with expertise in the analysis of dioxins and related compounds. The listing was compiled to facilitate the identification of analytical centers in the participating North Atlantic Treaty Organization (NATO) nations and their capabilities for such analyses. Also listed are laboratories located in participating countries, or as components of international organizations, active as observers in this project. In addition to the name and location of the laboratories, the matrices analyzed, principal analysts, and descriptions of the quality assurance schemes used are included. Finally, a series of graphical representations that summarize the information in the listing are presented.

The objective of this listing is to identify laboratories in participating countries having experience in the analysis of polychlorinated dibenzo-para-dioxins, dibenzofurans, and related compounds. This listing was compiled as a contribution toward international information exchange on the analysis of these important compounds. It should facilitate the exchange of information among those interested in this phase of dioxin research and promote the development of improved analytical methods and standards among the participating nations. The examination of this listing of 108 laboratories in nine nations also illuminates some of the trends with regard to laboratory affiliation, matrices analyzed, and quality assurance schemes used. Many of the laboratories listed have participated in externally moderated interlaboratory quality assurance programs to validate and compare analytical results.

1.1 Background

This Pilot Study on International Information Exchange on Dioxins and Related Compounds coordinated an international effort to address issues associated with polychlorinated dibenzo-p-dioxins (PCDDs), dibenzofurans (PCDFs), and related compounds. The 3-year project was conducted under

the auspices of the Committee on the Challenges of Modern Society (CCMS) of the North Atlantic Treaty Organization. The nations that participated included Canada, Denmark, Federal Republic of Germany, Italy, Netherlands, Norway, United Kingdom, and the United States. In addition to the major information exchange objective, secondary goals included the reduction of research program duplication and the identification of knowledge voids during the planning process. As a result, better informed decisions can be made concerning future research activities and resource allocations. When the project was initiated in 1985, it was divided into three areas of study: exposure and hazard assessment, technology assessment, and management of accidents.

The Exposure and Hazard Assessment Working Group, chaired by the United States, was charged with several tasks concerning research and risk assessment. Numerous information exchange activities were undertaken to promote interaction and to identify duplicative efforts and knowledge voids. Some of these activities included the compilation, analysis, and distribution of information on research projects, regulations and statutes, and methods of risk and exposure assessment in the participating nations. In addition, the working group desired to develop an international listing of laboratories with expertise in the analysis of dioxins and related compounds.

The accurate analysis of dioxins in environmental matrices at extremely low levels of sensitivity is fundamental to many areas of research and regulation pertaining to these compounds. The development of precise and repeatable methods for dioxin analysis is required for assessing the risk of these compounds at very low concentrations. For example, the effectiveness of destruction technologies is measured by the ability of treatment systems to reduce the concentration of these compounds to extremely low levels. In addition, the success of a remedial action or a human monitoring effects program depends heavily on the analytical capabilities available.

Ultimately, the control of these chemicals is directly based on our ability to analyze them in a variety of environmental matrices. As a result, the state of the art in dioxin analysis directly impacts many other forms of research. In recent years, there has been a greater emphasis on the risks involved with isomers other than 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD). Because of the need to analyze and quantify these compounds at very low concentrations (ppt or ppq) in various environmental matrices, special analytical methods and equipment have been developed. Currently, a limited number of laboratories have the capabilities to analyze these compounds at the detection limits necessary for research and regulation.

Section 2 presents the methodology used to collect and compile the information contained in the listing. It also outlines the organizations contacted for information and the criteria used to determine whether a lab should be listed.

Section 3 provides a description concerning the laboratories listed and the information contained in the listing. Specifically, the matrices analyzed and the quality assurance schemes used by the laboratories are presented. Extended discussions on the externally moderated interlaboratory quality assurance schemes used by the listed laboratories are also provided.

Section 4 presents some interpretation of the information contained in the listing and illuminates some of the trends with regard to laboratory affiliation, matrices analyzed, and quality assurance. The Listing of Laboratories with Expertise in the Analysis of Dioxins and Related Compounds is presented in Section 5.

2. METHOD OF COMPILATION

At the time at which the Committee on the Challenges of Modern Society adopted this project on International Information Exchange on Dioxins, each NATO-member nation interested in participating appointed a lead delegate to coordinate and administer the project for their country. The following NATO-member nations appointed lead delegates: Canada, Denmark, Federal Republic of Germany, Italy, Netherlands, Norway, United Kingdom, and the United States. Observing organizations were the Commission of European Communities (CEC), the Organization for Economic and Cooperative Development (OECD), the United Nations Environmental Programme, and the World Health Organization (WHO). In some countries, representatives of industrial trade organizations and non-governmental environmental public interest groups were invited to contribute as observers. For example, the Chemical Manufacturers Association represented the chemical industry from the United States, the Verband der Chemischen Industrie represented the chemical industry from the Federal Republic of Germany, and the Environmental Defense Fund represented the American public interest environmental groups. In addition, the governments of Austria and Sweden, although not members of NATO, requested to be kept informed of the progress of the project.

To compile this inventory, requests were sent to the lead delegates of participating nations and to representatives of observer organizations. These requests asked for information on analytical centers with expertise in dioxin analysis within their organizational or political areas of representation. Information requested included: (1) name and address of the laboratory, (2) name of the principal analysts, (3) matrices analyzed, and (4) a brief summary of the quality assurance schemes in use at each laboratory. Recommended criteria for inclusion on the list were (1) actual experience with the analyses for dioxins, furans, and related compounds; (2) procedures utilizing combined high resolution gas chromatography-mass spectrometry; and (3) demonstrated ability to perform analyses at the parts-per-trillion sensitivity level on environmental matrices.

Several of the laboratories listed have participated in studies sponsored by international organizations. The CEC Joint Research Centre, Ispra Establishment, has been the moderating laboratory for CEC sponsored studies and identified numerous laboratories included in this listing. The laboratories affiliated with the World Health Organization (WHO) study on levels of dioxins and related compounds in human milk were compiled from the report of their most recent meeting in February 1988. The report, "Summary of Consultation on Results on Analytical Field Studies on Levels of PCBs, PCDDs, and PCDFs in Human Milk," contained a listing of the participating laboratories and a description of the inter-laboratory quality assurance program used to provide consistent analytical results.

Laboratories in the United States were identified through several mechanisms. In addition to EPA's Contract Laboratory Program (CLP), the EPA has several laboratories that provide dioxin analyses. As part of the EPA's National Dioxin Study which was completed in 1986, the analytical methods development and quality assurance aspects of the project were provided by the Troika. The Troika consisted of three EPA laboratories and two supporting university laboratories and their function was to provide immediate and valid analysis for the National Dioxin Study and to serve as the nucleus for the development of the Contract Laboratory Program after private laboratories demonstrated their analytical capabilities. Information on the Troika laboratories and quality assurance was collected from "Analytical Procedures and Quality Assurance Plan for the Analysis of 2,3,7,8-TCDD in Tier 3-7 Samples of the U.S. EPA National Dioxin Study."

In the United States, in addition to listing laboratories involved in government programs, a survey of members of the American Council of Independent Laboratories was made. Laboratories that were members of this council and had combined gas chromatography-mass spectrometry capabilities as reported to the Council's headquarters in Washington, D.C., were contacted by telephone and asked if their capabilities matched the inclusion

criteria. This process added several laboratories to the list and confirmed the analytical capabilities of several laboratories already listed.

3.0 DESCRIPTION OF LABORATORIES LISTED

The listing contained herein presents the name and address of laboratories and the identification of principal analysts. In addition, the matrices analyzed and quality assurance schemes employed are also included as part of the listing. This information has been included as an integral part of the listing, which serves to indicate the type of analyses performed, and to promote interaction among labs in the participating nations. Increased awareness of the type of analyses being conducted, especially when dealing with difficult matrices, can result in greater cooperation among labs in the forms of sample exchanges and other activities in order to develop improved methods.

3.1 Matrices Analyzed

When the requests for information on laboratories with dioxin analysis capabilities were made, one of the data elements requested was the matrices analyzed. Because of the variety of environmental matrices analyzed and the varying detail of the available information reported on each analytical center, a summary grouping of matrices was developed. For example, surface waters, ground waters, and drinking waters were grouped together and presented in the listing as water. Other groupings, for which similarities were not as immediately obvious, were combined for the listing based on chemical/physical properties such as hazardous waste and chemicals. In contrast to many environmental samples where the matrices are generally different from the constituents of concern, hazardous wastes and chemicals may contain constituents very similar in structure and concentration. As a result, many of the extraction and cleanup steps may be similar.

In general, the matrix groupings were summarized for this listing with respect to the type and concentrations of potentially interfering constituents, the extraction and cleanup methods required, and the overall difficulty in analyzing these matrices. We recognize the potential differences in these matrices, and that, in some cases, they may require entirely different extraction or cleanup methods and/or may result in

varying detection limits achievable because of interferences from other constituents. If you have any questions related to a particular laboratory and the types of analyses carried out, we encourage you to contact that laboratory directly.

The groupings are generally as follows:

Water	= drinking water, surface water, ground water, etc.
Soil	= soils, sediments, sludges
Hazardous Waste/Chemicals	= industrial effluents, solid waste, chemical products, oil, pesticides
Combustion sources	= incinerator emissions, fly ash, air, stack gas, automobile emissions
Tissue	= animal and human tissue, blood, milk
Food	= food from animal sources
Vegetation	= vegetation, food from plant sources

3.2 Quality Assurance Schemes

At the time that this compilation was initiated, the lead delegates from each country were requested to determine and describe quality assurance schemes employed at each analytical center. The quality assurance schemes employed at the labs listed vary considerably. All labs provide elements of internal quality assurance; in addition, some reported participation in externally moderated programs. Internal quality assurance denotes that the analytical center uses procedures within the control of the individual laboratory. This is the usual case in research studies that are oriented toward analytical methods development. Externally moderated quality assurance denotes that the laboratory participates in a program under the technical direction of an independent organization outside the laboratory's direct control. This type of program is usually employed when a large number of samples are analyzed, as in organized exposure monitoring studies. It is usually resource intensive, with some type of technical assistance available from the moderating laboratory. In general, the interaction among labs in externally moderated quality assurance programs has improved the state of the art of dioxin analyses by validating methods and analytical results through interlaboratory sample exchanges. As a result, all labs, including those that use internally

developed quality assurance schemes, benefit from these activities. Many labs follow the quality assurance procedures developed from these externally moderated programs, including the frequency of instrument calibration, matrix spike analyses, and method blanks.

Both types of quality assurance programs are statistically based, and their goals are to provide data on the variability, accuracy, and precision of the analytical methodology. There are no value judgments placed by listing the internal/external quality assurance guidelines in terms of the accuracy of the analyses performed. In many cases, the internal quality assurance standards are as rigorous as those followed by the externally moderated laboratories. We have chosen to include this information to supplement the information exchange aspects of the project because the laboratories participating in externally moderated quality assurance programs are already utilizing information exchange to their benefit. Below are some descriptions of the types of quality assurance (both internal and external) being used by the laboratories.

3.2.1 Internal Quality Assurance

Laboratories reporting internal quality assurance schemes use procedures controlled within the management structure of the laboratory. Internal procedures comprise a discrete series of operations that vary from simple to complex and generally cover the entire analytical procedure. Operations include, but are not limited to, calibration of scales and measuring equipment, confirmation of the decontamination of glassware and other equipment, and more complex procedures such as recovery calculations and instrument calibration. The underlying objective is the determination of the accuracy, precision, and overall variability of the procedure. Samples are analyzed in specific sets with both positive and negative controls associated with each analytical series.

The exact procedures employed at each laboratory vary, but records are kept to document procedures. The proper evaluation of a laboratory always includes a review of the internal quality assurance data base.

3.2.2 Externally Moderated Quality Assurance

In the effort to develop accurate and reproducible analytical methods for dioxin analysis, several externally moderated quality assurance programs have been established. In general, the interaction among labs in the form of round-robin sample exchanges, blind QA samples, and cooperative development of methods, has improved the state of the art of dioxin analysis. Additionally, such externally moderated programs are structured to promote the development and use of precise analytical methods including instrument calibration procedures and multiple laboratory confirmation procedures to produce consistency among laboratories.

In the NATO member nations participating in this project, four formal externally moderated QA programs were identified: (1) the Troika, (2) the Contract Laboratory Program (CLP), (3) the Community Bureau of Reference (BCR), and (4) the WHO Interlaboratory Quality Control Protocol. Each of these programs are described below. In addition, some comparative laboratory measurements and sample exchanges have been used in the Federal Republic of Germany and the United States as a means to provide data with greater consistency and validity. Working groups were established by the Association of German Engineers and the Federal Environmental Agency for analysis of emissions of PCDD/PCDF from waste incineration facilities in the Federal Republic of Germany.

A Lake Ontario TCDD bioaccumulation study conducted by the U.S. EPA, New York State Department of Health, and Occidental Chemical Corporation, utilized interlaboratory comparisons using well documented analytical protocols. Although it was not developed as a formal externally moderated quality assurance program, the study utilized the analytical expertise of the EPA-Duluth, the New York State Department of Health, and the Ontario (Canada) Ministry of the Environment Laboratories, in round-robin comparisons to confirm analytical results for the use in bioaccumulation studies of TCDD in fish and sediment from the Hyde Park landfill to Lake Ontario.

Included below are descriptions of the four formal externally moderated quality assurance schemes.

(1) The Troika

The Troika program was initiated in 1983 to provide a consistent standard for dioxin analysis in the United States. The quantification of 2,3,7,8-TCDD and related compounds was performed by a limited number of labs in the U.S. In order to satisfy the demand for sensitive analyses at the parts-per-trillion level of detection, the United States Environmental Protection Agency (EPA) delineated special measures to validate the accuracy of analytical procedures for 2,3,7,8-TCDD to be used in the conduct of analysis for the National Dioxin Study. Because the analytical portion of the National Dioxin Study was completed, the Troika program was terminated at the end of 1986.

The four basic principles of the program were: (1) studies to validate methods; (2) "blind" QA samples; (3) multiple laboratory participation; and (4) defining analytical criteria for confirmation of 2,3,7,8-TCDD. The Troika consisted of the Environmental Research Laboratory-Duluth (ERL-D), the Environmental Monitoring Systems Laboratory-Research Triangle Park (EMSL-RTP), and the Environmental Chemistry Laboratory-Bay St. Louis (ECL). Also working with the Troika under cooperative agreements were Dr. Mike Gross of the University of Nebraska, Lincoln, and Dr. Thomas Tiernan of Wright State University.

The Troika program was structured to facilitate the exchange of QA samples, test samples, and analytical results. The validation capabilities inherent in these sample exchanges and "blind" QA samples, along with detailed sample preparation and analytical methods, provided the means for the generation of scientifically sound data. The interaction among labs not only verified the accuracy of analysis, but also enabled the labs to develop new methods or make modifications required to analyze troublesome samples. Overall, the Troika program established reference standards for analytical procedures to provide accurate and reproducible methods, enhanced credibility, and validity for the data from participating labs.

(2) Contract Laboratory Program (CLP)

The Contract Laboratory Program (CLP) was established by the U.S. Environmental Protection Agency (EPA) to provide analytical services in support of EPA's Superfund program for remediating hazardous waste sites. Because of the concern for dioxins in such contaminated sites and the need for accurate analytical data for these compounds, the Agency established detailed quality assurance criteria and validation procedures for a network of commercial analytical laboratories with capabilities for dioxin analysis. The CLP provides the Agency with consistent and accurate analytical services and is closely controlled by the use of specific methods, procedures, and reporting requirements.

The QA/QC program associated with dioxin analysis conducted under the CLP includes:

- Detailed requirements for initial and periodic calibration and instrument performance checks, and specified actions that must be taken when the specified criteria are not met;
- Specifics on frequency of and criteria for method blank and matrix spike analyses;
- Field blanks with every batch of samples;
- A blind performance evaluation sample with every batch of samples - the acceptability of the analytical results depends on the performance evaluation sample results.

In addition, the EPA performs complete and detailed data audits of approximately 20 percent of the results submitted by the contract laboratories. A large and increasing data base is maintained by the EPA, which facilitates establishing realistic requirements for QA/QC and for precision and accuracy. The EPA also maintains a standards repository for use by the laboratories participating in the CLP.

These QA/QC measures are complemented by periodic onsite laboratory evaluations conducted by EPA teams of qualified scientists.

(3) Community Bureau of Reference (BCR)

The Commission of European Communities (CEC) formed a group to improve the analytical methodologies for the determination of chlorinated dibenzodioxins and furans. Specifically, the various isomers in addition to 2,3,7,8-TCDD have been chosen as the subjects of the study. The analysis of dioxins is being studied in a series of collaborative exercises to improve and standardize the analytical methods used. The participants have evaluated several analytical steps for the study including sample preparation, extraction, clean-up, GC-injection and separation, and MS-quantification and identification.

Identification and quantification at parts-per-trillion levels have been studied using solutions of pure dioxin-congeners that are labelled with C^{13} isotopes. By using statistical techniques for collaborative tests and examining the experimental conditions, the sources of error in the various steps of the entire analytical procedure can be determined. As a result, the entire methodology can be improved, and through such collaborative efforts the sources of error can be minimized. After having improved their methodology, the participants disseminate their information in the form of certified materials.

This Community Bureau of Reference (BCR) program is being conducted with numerous analytical laboratories in several CEC-member nations. The overall program is being moderated through the CEC Joint Research Centre, Ispra. Of the 22 analytical centers participating in the BCR in addition to the Ispra establishment, 17 are located in NATO nations which participated in the CCMS project. (Four are located in France and one is in Belgium). These analytical centers have also been included in this listing.

(4) The WHO Interlaboratory Quality Control Protocol

In order to provide consistent analytical results for a World Health Organization (WHO) study on dioxins in human milk, a group of 18 laboratories participated in an interlaboratory quality assurance program. This study was initiated in 1985 to produce more data on the levels of, and

routes of exposure to, dioxins and related compounds in various countries and geographic areas. Samples of milk were collected according to a well defined scheme and analyses for PCDDs, PCDFs, and PCBs were completed at 18 selected laboratories, 16 of which participated in the CCMS Pilot Study (and 5 of these also participated in the BCR).

The interlaboratory analytical quality assurance program was implemented to ensure the validity and comparability of the analytical results in order to produce reliable data for subsequent risk assessments. The analytical protocol was developed and moderated by Dr. Rappe of the University of Umea, Sweden. Two separate pools of human milk were distributed from the moderating laboratory along with the ^{13}C -labelled standards to the participating laboratories. Analyses for PCDDs and PCDFs were received from 12 labs and PCB results from six labs. In general, high resolution GC/MS was used for PCDD/PCDF analysis while PCB analysis was performed using gas chromatography equipped with EC detection or a similar technique.

Additional interlaboratory studies are planned to take place as an ongoing process with additional laboratories tentatively invited to participate.

4. ANALYSIS OF THE LISTING OF LABORATORIES

The following tables and figures illustrate the information contained in the listing. These graphical representations are intended to illuminate some of the more notable trends pertaining to the laboratory affiliation, type of analysis performed, and the quality assurance schemes used. Table 1 presents the number of laboratories in each of the nations that participated in this project. There are 108 laboratories listed from 9 nations. Figure 1 presents the breakdown of laboratory affiliation (government, university, or commercial) for all the labs listed. Of the 108 laboratories listed, 40 percent are commercial labs, 37 percent are affiliated with government agencies, and 23 percent are university laboratories.

Figure 2 displays the affiliation of the laboratories in each nation. In Canada, Italy, and the United Kingdom, the majority of the labs are affiliated with government agencies while in the United States and the Federal Republic of Germany, more labs are commercially operated than in the government agencies. It should be noted, however, that a considerable portion of the dioxin analysis performed by commercial labs is in support of government programs.

Figure 3 presents the quality assurance schemes employed at the laboratories listed, while Figure 4 displays the types of sample matrices analyzed at the laboratories providing this information. Over 30 percent of the laboratories listed reported that they participate in externally moderated quality assurance programs. Specifically, 18 laboratories belong to the CEC Community Bureau of Reference, 16 participated in the WHO interlaboratory quality control program, 12 participated in the U.S. EPA Contract Laboratory Program, while five laboratories listed were part of the Troika. Although the information on matrices analyzed is incomplete (only 75 of the 108 labs listed reported the matrices analyzed), most of these laboratories have expertise in the analysis of soil, water, and tissue. The analysis of combustion sources, chemicals, and hazardous wastes are generally common practices at these laboratories. The analysis

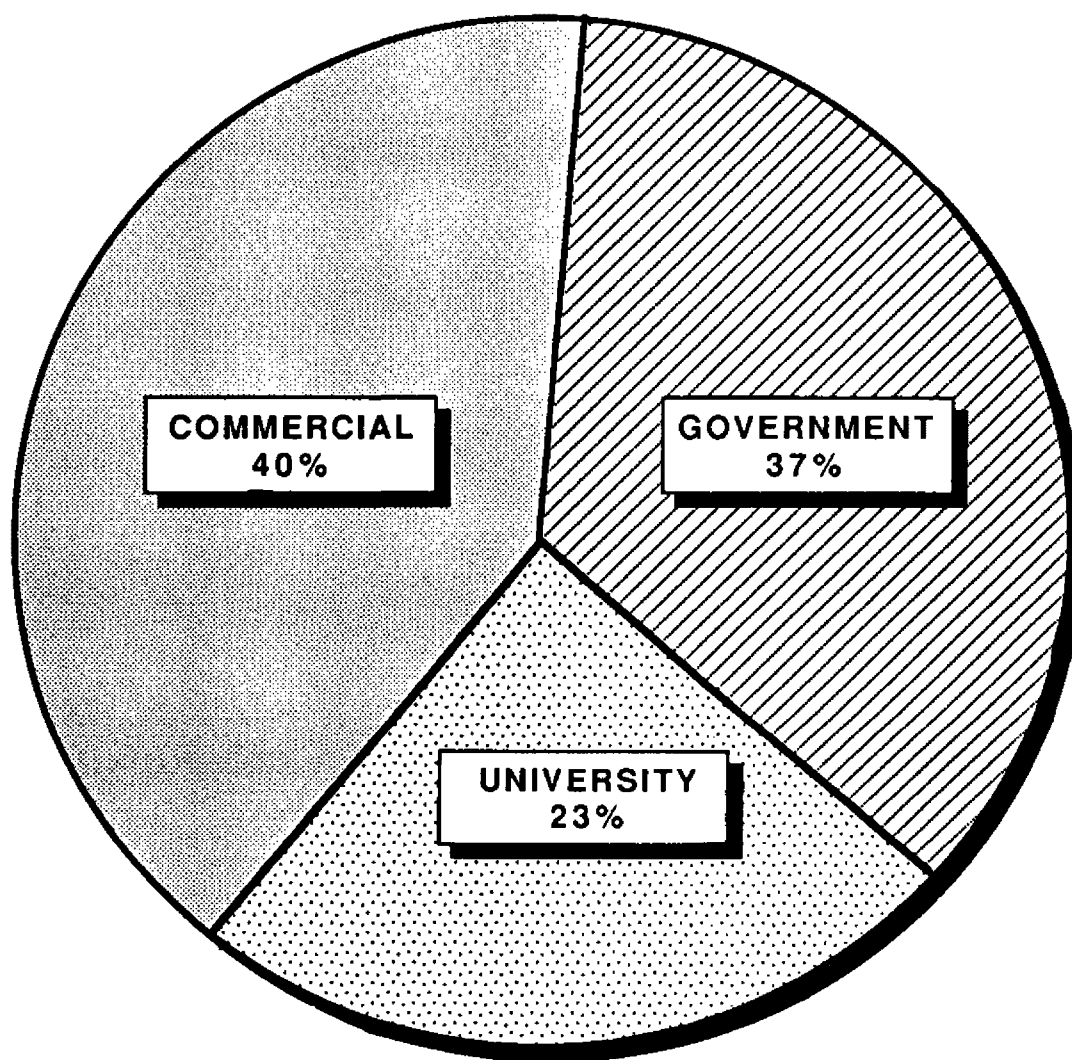
of dioxins in food and vegetation is relatively scarce and only a few selected laboratories reported these capabilities.

**TABLE 1. NUMBER OF LABORATORIES LISTED
BY GEOGRAPHIC LOCATION**

Country	Number of Laboratories Listed
Canada	13
Denmark	1
Federal Republic of Germany	23
Italy ¹	9
Netherlands	5
Norway	1
Sweden ²	1
United Kingdom	7
United States	<u>48</u>
Total	108

¹ Includes the Commission of European Communities, Joint Research Center, Ispra Establishment, Italy.

² Observer Nation.



TOTAL NUMBER OF LABORATORIES LISTED = 108

FIGURE 1. LABORATORY AFFILIATIONS

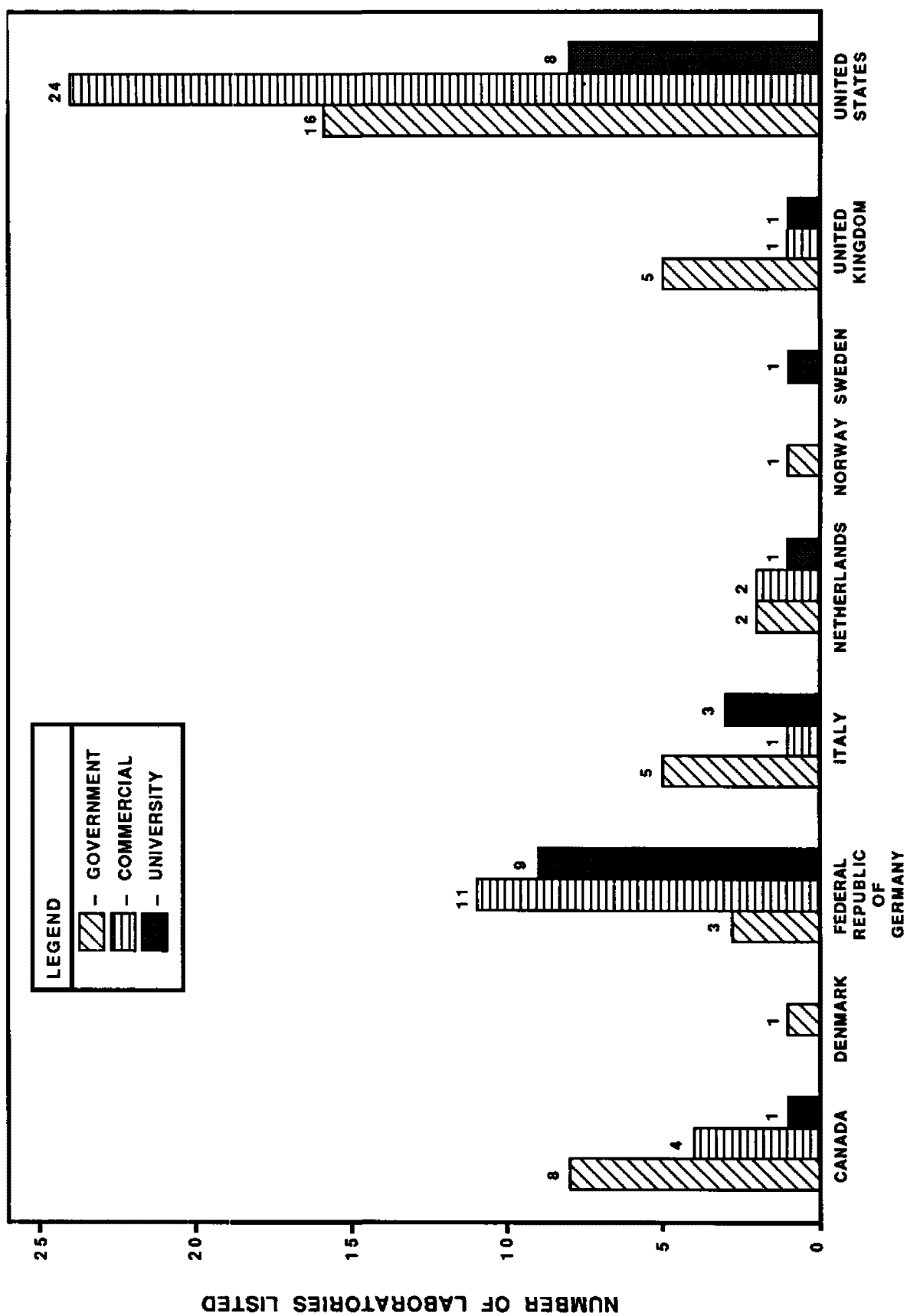
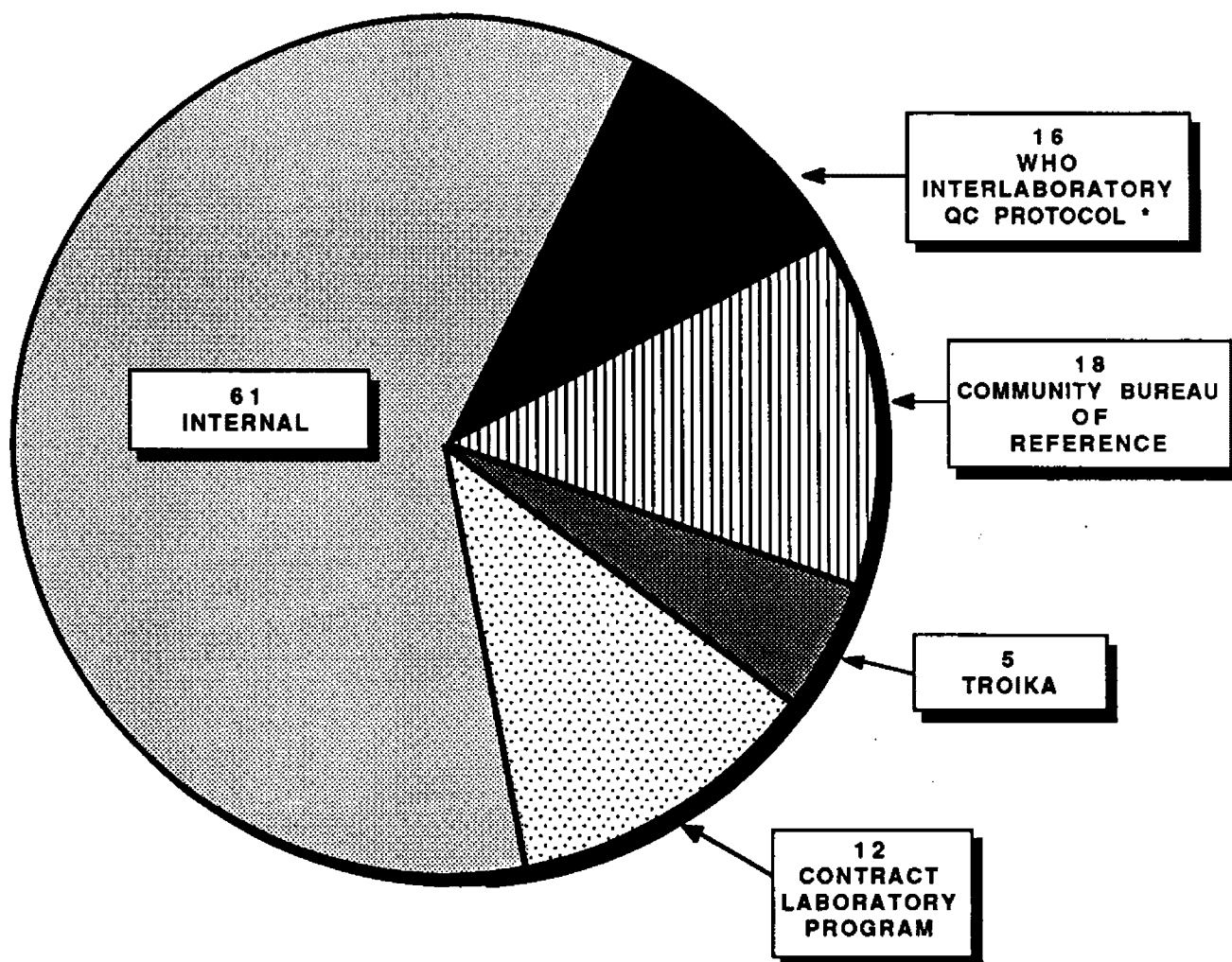


FIGURE 2. LABORATORY AFFILIATION IN EACH COUNTRY



TOTAL NUMBER OF LABORATORIES LISTED = 108

FIGURE 3. QUALITY ASSURANCE SCHEMES EMPLOYED

* FIVE LABORATORIES PARTICIPATE IN THE COMMUNITY BUREAU OF REFERENCE AND THE WHO INTERLABORATORY QC PROTOCOL PROGRAMS.

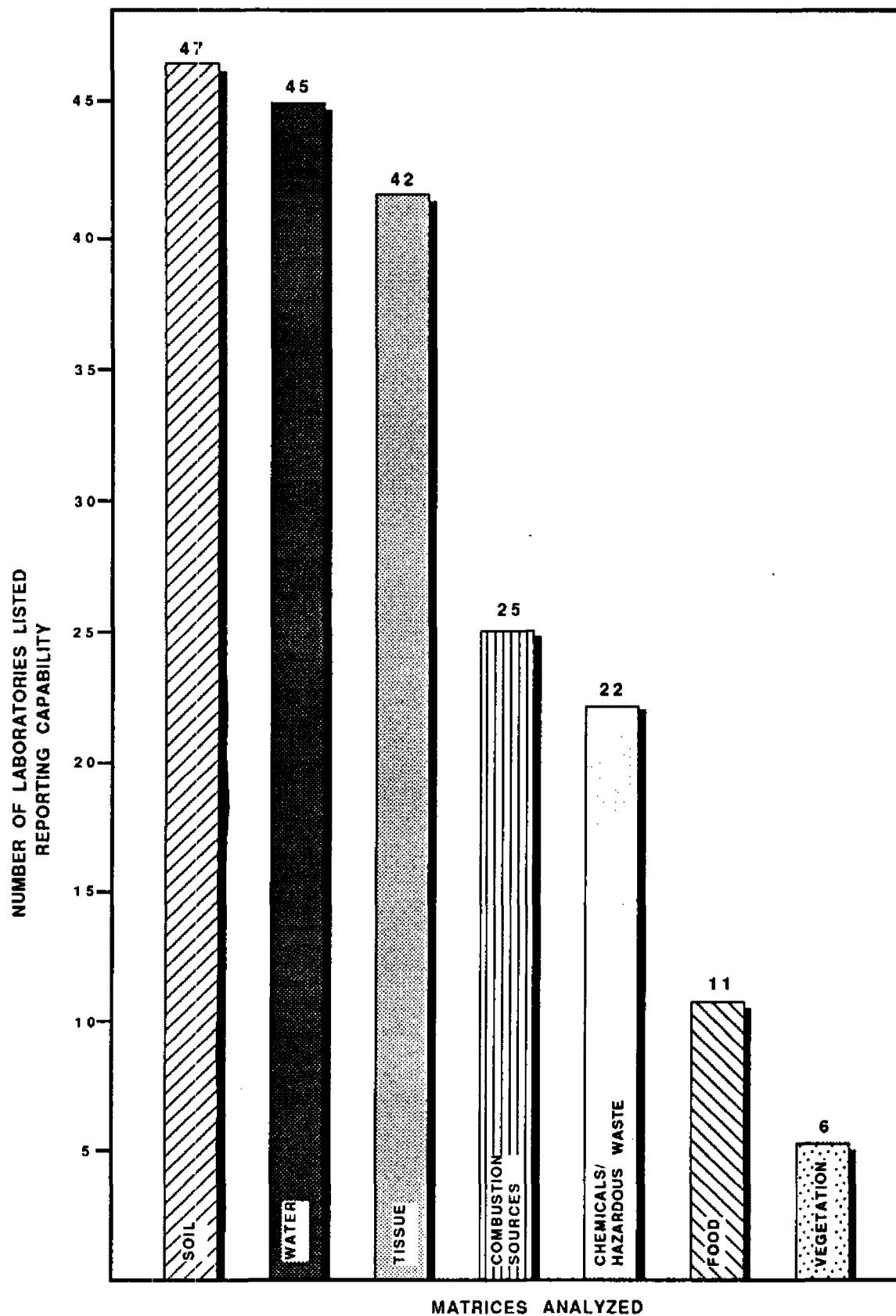


FIGURE 4. MATRICES ANALYZED*

*BASED ON 75 LABORATORIES INCLUDING INFORMATION ON MATRICES ANALYZED

5. THE LISTING OF LABORATORIES WITH EXPERTISE IN THE ANALYSIS OF
DIOXINS AND RELATED COMPOUNDS

NATO/CCMS Pilot Study on International Information Exchange on Dioxins and Related Compounds
Listing of Laboratories with Expertise in the Analysis of Dioxins and Related Compounds

Country	Location	Principal Analysts	Matrices Analyzed	Quality Assurance Scheme
Canada	Bureau of Chemical Hazardous Environmental Health Directorate Health and Welfare Canada Ottawa, Ontario K1A 0L2 (613) 957-3126	Dr. D. Williams	Water	Internal
	Bureau Chemical Safety and Food Directorate Food Research Division Health and Welfare Canada Ottawa, Ontario K1A 0L2 (613) 959-0976	Dr. J. Ryan	Food Tissue	WHO
	Dioxin Laboratory Laboratory Services Ontario Ministry of the Environment P.O. Box 213 125 Resources Road Rexdale, Ontario M9W 5L1 (416) 235-5896	Mr. B. Bobbie Dr. R. Clement	Water Soil Tissue Combustion Sources	Internal
	Laboratory Services Division Food Inspection Directorate Agriculture Canada CEF Carling Avenue Ottawa, Ontario K1A 0C5 (613) 995-4907	Dr. J. Singh	Chemicals/ Hazardous Waste	Internal
	Mann Testing Laboratories, Ltd. 5550 McAdam Road Mississauga, Ontario L4Z 1P1 (416) 890-2555	Mr. Tim Munshaw Mr. Pierre Beaumier	Water Tissue Soil Vegetation Combustion Sources	Internal

NATO/CCMS Pilot Study on International Information Exchange on Dioxins and Related Compounds

Listing of Laboratories with Expertise in the Analysis of Dioxins and Related Compounds (continued)

Country	Location	Principal Analysts	Matrices Analyzed	Quality Assurance Scheme
Canada (continued)	National Water Quality Laboratory Inland Water Directorate, CCIW Environment Canada 867 Lakeshore Road, P.O. Box 5050 Burlington, Ontario L7R 4A6 (416) 336-44661	Dr. B.K. Afghan	Water Tissue Soil	Internal
	National Wildlife Research Institute Environment Canada 100 Gamelin Boulevard Hull, Quebec	Dr. R. Norstrom	Tissue	Internal
	Movalab Ltd. 9420 Cote de Liesse Lachine, Quebec H8T 1A6 (514) 636-6219	Dr. J.D. Fenwick	Water Soil Tissue Combustion Sources	Internal
	River Road Environmental Technology Centre Technology Development and Technological Services Conservation and Protection Environment Canada Ottawa, Ontario K1A 0E7 (613) 998-3677	Dr. R. Lao	Water Soil Chemicals/ Hazardous Waste Combustion Sources	Internal
	Ultratrace Laboratory Bayfield Institute Great Lakes Laboratory for Fisheries and Aquatic Sciences Fisheries and Oceans Canada Burlington, Ontario (416) 336-4863	Mr. D.B. Sergeant	Tissue Water Soil	Internal

NATO/CCMS Pilot Study on International Information Exchange on Dioxins and Related Compounds
Listing of Laboratories with Expertise in the Analysis of Dioxins and Related Compounds (continued)

Country	Location	Principal Analysts	Matrices Analyzed	Quality Assurance Scheme
Canada (continued)	University of Waterloo Department of Chemistry Waterloo, Ontario N2L 3G1	Prof. Frank W. Karasek	----	Internal
	Wellington Laboratories P.O. Box 1261 291 Woodlawn Road West, Unit 2 Guelph, Ontario N1H 6N6 (519) 822-2436	Mr. Brock Chittim Ms. Jocelyn Madge	Water Tissue Soil Chemicals/ Hazardous Waste Combustion Sources	Internal
	Zenon Environmental Inc. 845 Harrington Court Burlington, Ontario L7N 3P3 (516) 631-6320	Dr. Glenys Foster Mr. John Coburn	Water Tissue Soil Combustion Sources	Internal
Denmark	National Agency of Environmental Protection Department of Analytical Chemistry Mørkøjs Bygade 26 DK-2860 Søborg Telephone 1-697088	Dr. Jørgen Carle	Tissue	WHO
Federal Republic of Germany	B.A.M. Berlin	Dr. T. Win	----	BCR
	Bayer AG Zentrale Analytik Leverkusen/OAL Gebäude 013 D-5090 Leverkusen-Bayerwerk	Dr. Heinz Weis	----	BCR

NATO/CCMS Pilot Study on International Information Exchange on Dioxins and Related Compounds
Listing of Laboratories with Expertise in the Analysis of Dioxins and Related Compounds (continued)

Country	Location	Principal Analysts	Matrices Analyzed	Quality Assurance Scheme
Federal Republic of Germany (continued)	BASF AG Bereich Umweltschutz und Arbeitssicherheit, ZHU - E 210 Carl-Busch-Strasse 38 6700 Ludwigshafen (0621)60-0(Vermittlung)	Dr. K.S. Brenner	----	BCR
	Biochemisches Institut für Umweltcarcinogene Sieker Landstrasse 19 2070 Großhansdorf	Prof. Dr. G. Grimmer	----	Internal
	Biocontrol GmbH Hamburger Strasse 1 6507 Ingelheim	Dr. Schlesing	----	Internal
	Chemisches Landesuntersuchungsamt Nordrhein-Westfalen Sperlichstrasse 19 D-4400 Münster Telephone 251-7793200	Dr. P. Furst	Tissue	WHO
	Deutsche BP AG Institut für Forschung und Entwicklung Postfach 369 2000 Wedel/Holstein Tel.: 04103/701-310	Dr. W. Garbe Dr. Kaschani	----	Internal
	ERG0-Forschung Luruper Chaussee 145 2000 Hamburg 50 Tel.: 040/8969-2322	Dr. Ball	----	Internal

NATO/CCMS Pilot Study on International Information Exchange on Dioxins and Related Compounds

Listing of Laboratories with Expertise in the Analysis of Dioxins and Related Compounds (continued)

Country	Location	Principal Analysts	Matrices Analyzed	Quality Assurance Scheme
Federal Republic of Germany (continued)	Gesellschaft für Arbeitsplatz und Umweltanalytik Nottulner Landweg 102 4400 Münster-Roxel	Dr. Funke	----	Internal
	Hoechst AG Analytisches Labor Postfach 80 30 20 6230 Frankfurt 80	Dr. Hoffmann	----	Internal
	Ingenieur-Gemeinschaft Technischer Umweltschutz Ansbacherstraße 5 1000 Berlin 30 Tel.: 030/211 70 93 u. 7095	Dr. Joh. Jäger	----	Internal
	Institut Fresenius Im Maisel 14 6204 Taunusstein/Neuhof Tel.: 06128/74 43 30	Dr. Scholz Prof. Fresenius M.N. Paltacheck	----	BCR
	Institut für Naturwissen- schaftliche Dienste GmbH (NATEC) Postfach 1568 Behringstraße 158 2000 Hamburg 50 Tel.: 040/8827	Dr. Eckert	----	Internal
	Institut für Ökologische Chemie und Geochemie der Universität Bayreuth Postfach 3008 8580 Bayreuth Tel.: 0921/55 22 54	Prof. O. Hutzinger Dr. Thoma	----	BCR

NATO/CCMS Pilot Study on International Information Exchange on Dioxins and Related Compounds
Listing of Laboratories with Expertise in the Analysis of Dioxins and Related Compounds (continued)

Country	Location	Principal Analysts	Matrices Analyzed	Quality Assurance Scheme
Federal Republic of Germany (continued)	Institut für Organische Chemie der Universität Tübingen Auf der Morgenstelle 18 7400 Tübingen Tel.: 07071/29-2099	Prof. Dr. Hagenmeier	----	Internal
	Institut für Rückstandsanalytik St. Anskarplatz 10 2000 Hamburg 36	Dr. Winkelmann	----	Internal
	Institut für Umweltanalytik Luitpoldstraße 190 6700 Ludwigshafen Tel.: 0621/69 10 51	Dr. F. Kuhlmann	----	BCR
	Institut für Wasser-, Boden- und Luftthygiene des Bundesgesundheitsamt 1000 Berlin 33 Tel.: 030/8308-2344/2405/2290	Dr. Rotard	----	Internal
	Kernforschungszentrum Karlsruhe Institut für Heiße Chemie Postfach 3640 7500 Karlsruhe	Dr. Stieglitz	----	Internal
	Max von Pettenkofer - Institut des Bundesgesundheitsamtes Postfach 330013 Thielallee 88-92 1000 Berlin 33 Telephone (030)83082665 Telefax (030)8308741	Dr. Beck Dr. Mathar Dr. Eckart	Tissue	BCR, WHO

NATO/CCMS Pilot Study on International Information Exchange on Dioxins and Related Compounds
Listing of Laboratories with Expertise in the Analysis of Dioxins and Related Compounds (continued)

Country	Location	Principal Analysts	Matrices Analyzed	Quality Assurance Scheme
Federal Republic of Germany (continued)	TÜV Norddeutschland Große Bahnstraße 31 2000 Hamburg 54 Tel.: 040/8957-457/454	Dr. Ullrich Dr. Schnabel	----	Internal
	Universität Ulm Analytische Chemie Oberer Eselsberg 026 Postfach 4066 7900 Ulm Tel.: 0731/176-2181	Prof. Dr. K. Ballschmiter Dr. Buchert Dr. M. Swerev	----	BCR
	Wacker Chemie Postfach 8263 Burghausen	Dr. Bientert	----	Internal
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Italy	Commission of the European Communities* Joint Research Centre Ispra Establishment 210210 Ispra (Varese) Phone: (Italy-Ispra-) 332-789969 Telex No.: 380-042 EUR I or 380-058 EUR I Telefax No.: (Italy-Ispra-) 789-001	Dr. Sergio Facchetti	Tissue	WHO, BCR - Moderating Laboratory
	Consiglio Nazionale delle Ricerche Istituto di Inquinamento Atmosferico Via Salaria, km 29.300 - C.P. 10 00016 Monterotondo Stazione (Roma) Phone: (Italy-Rome-) 90020-652 Telex No.: 624-809 CNR MLI	Dr. Paolo Ciccioli Mr. Enzo Brancaleoni Dr. Angelo Cecinato	----	BCR

* Although geographically located in Italy, the CEC Joint Research Centre is the moderating lab for numerous laboratories in the participating nations.

NATO/CCMS Pilot Study on International Information Exchange on Dioxins and Related Compounds
Listing of Laboratories with Expertise in the Analysis of Dioxins and Related Compounds (continued)

Country	Location	Principal Analysts	Matrices Analyzed	Quality Assurance Scheme
Italy (continued)	ENEL (DCO) Laboratorio Centrale Via Bixio, 39 29100 Piacenza Phone: (Italy-Piacenza-) 791-224 Telex No.: 530-541 Telefax No.: (Italy-Piacenza-) 791-219	Dr. Luisa Binecchio	----	Internal
	Istituto di Ricerche Farmacologiche "Mario Negri" Viale Eritrea, 62 20157 Milano Phone: (Italy-Milan-) (02) 3554-546 Telex No.: 331-268 NEGR I	Dr. Roberto Fanelli	Tissue	BCR, WHO
	Istituto Superiore di Sanita Laboratorio di Tossicologia Comparata ed Ecotossicologia Viale Regina Elena, 29 00161 Roma Phone: (Italy-Rome-) 4990, ext. 995 or 653 Telex No.: 610-071-ISTSAN I Telefax No.: (Italy-Rome-) 4957-621	Dr. Alessandro di Domenico Dr. Franco Merli	Tissue	WHO
	Servizio Multizionale di Prevenzione - USL 2 Via del Patriota, 2 54100 Massa Phone: (Italy-Massa-) 40676	Dr. Gino Camici Dr. Gino Biancardi	Soil	Internal
	Servizio Multizionale di Prevenzione - USL 10/A Via Ponte alle Mosse, 211 50144 Firenze Phone: (Italy-Florence-) 2758-4360	Dr. Moreno Berlingioni	Tissue	WHO

NATO/CCMS Pilot Study on International Information Exchange on Dioxins and Related Compounds
Listing of Laboratories with Expertise in the Analysis of Dioxins and Related Compounds (continued)

Country	Location	Principal Analysts	Matrices Analyzed	Quality Assurance Scheme
Italy (continued)	Unita Socio-Sanitaria Locale 75/11 Unita Operativa Chimica Via Juvvara, 22 20129 Milano Phone: (Italy-Milan) 717-713	Prof. Aldo Cavallaro Dr. Alfredo Gorni	Tissue	WHO
	Universita di Milano Istituto di Scienze Farmacologiche Facolta di Farmacia Cattedra di Biochimica Applicata Via Balzaretti, 9 20133 Milano Phone: (Italy-Milan-) 209-817	Prof. Giovanni Galli Prof. Flaminio Cattabeni	----	Internal
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The Netherlands	University of Amsterdam Laboratory of Environmental and Toxicological Chemistry Nieuwe Achtergracht 166 1018 WV Amsterdam (020) 52 56 504	Dr. K. Olie	Water Soil Tissue Combustion Sources Chemicals/ Hazardous waste Food	BCR, WHO
	National Institute of Public Health and Environmental Hygiene Laboratory for Organic- Analytical Chemistry P.O. Box 1 3720 BA Bilthoven Tel: 030-742871 Telex: 47215 nrvb bl Telefax: 030-742971	Drs. Ronald C.C. Wegman (head) Drs. A.K. Djien Liem George S. Groenemeijer Gert A.L. de Korte Ir. Ad P. de Jong Drs. Gerrit van de Venken Arie C. den Boer Evert Evers G. Jan ten Have Marjo J. Vredenburg	Water Soil Tissue Combustion Sources Chemicals/ Hazardous waste Vegetation Food	WHO

NATO/CCMS Pilot Study on International Information Exchange on Dioxins and Related Compounds
Listing of Laboratories with Expertise in the Analysis of Dioxins and Related Compounds (continued)

Country	Location	Principal Analysts	Matrices Analyzed	Quality Assurance Scheme
The Netherlands (continued)	The Netherlands Organization for Applied Scientific Research TNO Division of Technology for Society Department of Analytical Chemistry P.O. Box 217 2500 AE Delft (031)15569330	Dr. J.W.J. Gielen P. Verhoeve	Combustion Sources Chemicals/ Hazardous Waste	BCR
	Duphar NV V. Houtenlaan 36 Weeps Telephone 02940-79794	Dr. H.A.M. DeKuik	Combustion Sources Chemicals/ Hazardous Waste	BCR
	TAUW Infra Consult B.V. Environmental Laboratory P.O. Box 479 7400 AL Deventer Tel: (05700)99911 Telex: 49545 Telefax: (05700)99270	Dr. G.H.W. Baalhuis	Water Soil	BCR
Norway	Norwegian Institute for Air Research P.O. Box 64, N-2001 Lillestrom, Norway Tel: 06/81 41 70. Telex: 74854 Telefax: 06/81 92 47	Dr. Michael Dehme Dr. Stein Mano Dr. A. Mikalsen	Combustion Sources Water Tissue	WHO
Sweden	University of Umea Department of Organic Chemistry S-901 87 Umea, Sweden	Dr. Christoffer Rappe	Tissue Combustion Sources Water Soil	WHO - Moderating Laboratory

NAIO/CCMS Pilot Study on International Information Exchange on Dioxins and Related Compounds
 Listing of Laboratories with Expertise in the Analysis of Dioxins and Related Compounds (continued)

Country	Location	Principal Analysts	Matrices Analyzed	Quality Assurance Scheme
United Kingdom	Analytical Services Centre (PCMU)	Dr. Ian Stenhouse	Water	Internal
	Harwell Laboratory	Dr. Peter Ambridge	Soil	
	United Kingdom Atomic Energy Authority	Dr. Dick Atkins	Tissue	
	Didcot		Chemicals/ Hazardous Waste	
	Oxfordshire		Vegetation	Combustion Sources
	OX11 0RE			
	Laboratory of the Government Chemist	Mr. R.E. Lawn	Soil	Internal
	Cornwall House	Mr. D. Carter	Tissue	
	Waterloo Road	Dr. R.A. Hoodless	Chemicals/ Hazardous Waste	
	London	Dr. K. Webb	Combustion Sources	
	SE1 8XY			BCR, WHO
	Ministry of Agriculture, Fisheries and Food	Dr. J.R. Startin	Tissue	
	Food Science Laboratory		Vegetation	
	Halpin House			
	Old Bank of England Court			BCR
	Queen Street			
	Norwich NR2 4SX			
	603-611712			
	SCHERING	Dr. D.J. Martin	----	Internal
	Agrochemical Limited	Dr. P.L. Carter		
	Chesterford Park Research Station			
	Saffron Walden			
	Essex CB10 1XL			
	(0799) 30123			
	School of Chemical Sciences	Dr. C.S. Creaser	Soil	Internal
	University of East Anglia			
	United Kingdom			

NATO/CCMS Pilot Study on International Information Exchange on Dioxins and Related Compounds

Listing of Laboratories with Expertise in the Analysis of Dioxins and Related Compounds (continued)

Country	Location	Principal Analysts	Matrices Analyzed	Quality Assurance Scheme
United Kingdom (continued)	Strathclyde Regional Council Regional Chemist Department 8 Elliot Place Glyde Glasg	Dr. B.I. Brookes	Combustion Sources Soil Tissue	Internal
	G3 BEJ			
	Warren Springs Laboratory Gunnel's Wood Road Stevenage, Herts SG1 2BX 438-741122	Dr. M.G. Kibblewhite	----	BCR
United States	American Analytical and Technical Services 10926 E. 55th Place Tulsa, OK 74146 (918) 665-2069	Mr. Robert Harris	Water Soil	CLP
	Argonne National Laboratory (U.S. DOE) Organic Analysis Group 9700 S. Cass Avenue Argonne, IL 60439 (312) 992-7625	Dr. Ron Wingender	Combustion Sources Soil	Internal
	Battelle-Columbus Division 505 King Avenue Columbus, Ohio 43201 (614) 424-8424	Dr. Judy Gephart Dr. Marcus Cook Dr. Jean Czuczwa	----	Internal
	California Analytical Labs - ENSECO 2544 Industrial Blvd. W. Sacramento, CA 95691 (916) 372-1393	Mr. Mike Millie	Water Soil	CLP

NATO/CCMS Pilot Study on International Information Exchange on Dioxins and Related Compounds
Listing of Laboratories with Expertise in the Analysis of Dioxins and Related Compounds (continued)

Country	Location	Principal Analysts	Matrices Analyzed	Quality Assurance Scheme
United States (continued)	California Department of Health Services Hazardous Material Laboratory 2151 Berkeley Way Berkeley, CA 94704 (415) 540-3003	Dr. R.D. Stephens	Tissue	WHO
	Division of Environmental Health Laboratory Sciences Center for Environmental Health Center for Disease Control Atlanta, Georgia 30333 (404) 329-4176 (FTS) 236-4176	Dr. L.L. Needham Dr. Donald G. Patterson Jr.	Tissue	WHO
	CompuChem Labs 3308 Chapel Hill/Nelson Hwy P.O. Box 12652 RTP, NC 27709 (919) 549-8263	Ms. Diana Schame[]	Water Soil	CLP
	Dow Chemical 2020 Dow Center Midland, MI 48640 (517) 636-1000	Dr. Terry Nestrick Dr. Les Lamparski	Soil Water Chemicals/ Hazardous Waste Combustion Sources Vegetation	Internal
	Envirodyne Engineers 12161 Lackland Road St. Louis, MO 63146 (314) 434-6960	Mr. Shaaban Ben-Poorat Ms. Margaret Winter	Water Soil	CLP

NATO/CCMS Pilot Study on International Information Exchange on Dioxins and Related Compounds
Listing of Laboratories with Expertise in the Analysis of Dioxins and Related Compounds (continued)

Country	Location	Principal Analysts	Matrices Analyzed	Quality Assurance Scheme
United States (continued)	Environmental Chemistry Laboratory Office of Pesticides and Toxic Substances U.S. Environmental Protection Agency National Space Technology Lab Bay St. Louis, Mississippi 39529 (601) 688-3212 (FTS) 494-3212	Dr. Aubry Dupuy	Water Tissue Soil Hazardous Waste/ Chemicals Combustion Sources Food	Troika
	Environmental Monitoring Systems Laboratory Office of Research and Development U.S. Environmental Protection Agency Las Vegas, Nevada 89114 (702) 798-2103 (FTS) 545-2103	Dr. Ronald K. Mitchum	Soil Water Hazardous Waste/ Chemicals Combustion Sources Tissue Food	CLP
	Environmental Monitoring Systems Laboratory Office of Research and Development U.S. Environmental Protection Agency Research Triangle Park, North Carolina 27711 (919) 541-2248 (FTS) 629-2248	Mr. Robert L. Harless	Water Tissue Soil Hazardous Waste/ Chemicals Combustion Sources Food	Troika
	Environmental Research Laboratory Office of Research and Development U.S. Environmental Protection Agency 6201 Condon Boulevard Duluth, Minnesota 55804 (218) 720-5558 (FTS) 780-5558	Mr. D.W. Kuehl	Water Soil Tissue Hazardous Waste/ Chemicals Combustion Sources Food	Troika

NATO/CCMS Pilot Study on International Information Exchange on Dioxins and Related Compounds
 Listing of Laboratories with Expertise in the Analysis of Dioxins and Related Compounds (continued)

Country	Location	Principal Analysts	Matrices Analyzed	Quality Assurance Scheme
United States (continued)	Environmental Services Laboratory U.S. Environmental Protection Agency Region 7 25 Funston Road Kansas City, Missouri 66115 (913) 236-3681 (FTS) 757-3681	Mr. Robert Greenall	Water Soil Hazardous Waste/ Chemicals Combustion Sources Tissue	Internal
	Environmental Testing & Certification P.O. Box 7808 Edison, NJ 08816 (201) 225-6782	Mr. Jack Farrel	Soil Water	CLP
	Florida State University Tallahassee, Florida 32306	Dr. Ralph Dougherty	Tissue	Internal
	U.S. Food and Drug Administration 200 C Street, SW Washington, DC 20204 (202) 245-1381 (FTS) 245-1381	Dr. David Firestone	Food	Internal
	U.S. Food and Drug Administration Chicago District Laboratory Facility IITRA 10 West 35th Street Chicago, IL 60616 (312) 353-9764 (FTS) 353-9764	Dr. J.C. Brucciani	Food	Internal

NATO/CCMS Pilot Study on International Information Exchange on Dioxins and Related Compounds

Listing of Laboratories with Expertise in the Analysis of Dioxins and Related Compounds (continued)

Country	Location	Principal Analysts	Matrices Analyzed	Quality Assurance Scheme
United States (continued)	U.S. Food and Drug Administration Detroit District Laboratory 1560 East Jefferson Avenue Detroit, MI 48207 (313) 226-7658 (FTS) 226-7658	Dr. L.F. Schneider	Food	Internal
	U.S. Food and Drug Administration National Center for Toxicology Research Jefferson, Arkansas 72079 (501) 541-4288 (FTS) 790-4288	Dr. Walter A. Korfmacher	Inactive	Internal
	Geochem Research, Inc. 16920 Park Row Houston, TX 77084 (713) 492-2510	Mr. Charles Bohnstedt	Water Soil	CLP
	Harvard University Cambridge, Massachusetts 02138	Dr. M. Meselson	Inactive	Internal
	Hazleton Labs 3301 Kinsman Blvd. P.O. Box 7545 Madison, WI 53707 (608) 241-4477	Mr. David Hills	Water Soil	CLP
	Idaho National Engineering Lab EG&G Idaho, Inc. Chemical Sciences P.O. Box 1625 Idaho Falls, ID 83415 (208) 586-1292 (FTS) 592-1202	Dr. Clyde Frank	Water Soil Hazardous Waste/ Chemicals	Internal

NATO/CCMS Pilot Study on International Information Exchange on Dioxins and Related Compounds
 Listing of Laboratories with Expertise in the Analysis of Dioxins and Related Compounds (continued)

Country	Location	Principal Analysts	Matrices Analyzed	Quality Assurance Scheme
United States (continued)	U.S. Department of the Interior Columbia National Fisheries Research Laboratory Fish and Wildlife Service Columbia, Missouri 65201 (314) 875-5399 (FTS) 276-5399	Dr. David L. Stallings Mr. L. M. Smith	Tissue	Internal
	International Technology Corporation 304 Directors Drive Knoxville, TN 37923 (615) 690-3211	Ms. Helen Chandler Mr. Tom Adams Ms. Carol Pudelek Mr. Barry Hall	Water Soil Hazardous Waste Chemicals	Internal
	International Testing Laboratories, Inc. 578-582 Market Street Newark, NJ 07105 (201) 589-4772	Dr. M. M. Sackoff	Water Soil	Internal
	Laucks Testing Labs, Inc. 940 S. Harney St. Seattle, WA 98108 (206) 767-5060	Mr. Michael Nelson	Water Soil	CLP
	Midwest Research Institute 425 Volker Boulevard Kansas City, Missouri 64110 (816) 753-7600	Dr. John S. Stanley	Tissue Combustion Sources	Internal
	U.S. Environmental Protection Agency P.O. Box 11 Mississippi State, MS 39762 (601) 825-3101	Dr. Gary McGovern	Water Soil	Internal

NATO/CCMS Pilot Study on International Information Exchange on Dioxins and Related Compounds

Listing of Laboratories with Expertise in the Analysis of Dioxins and Related Compounds (continued)

Country	Location	Principal Analysts	Matrices Analyzed	Quality Assurance Scheme
United States (continued)	University of Missouri Environmental Trace Substances Research Center Route No. 3, Sinclair Road Columbia, Missouri 65203 (314) 882-2151	Dr. Armon F. Yanders	Soil Water	Internal
	Monsanto Company Environmental Sciences Center St. Louis, MO 63167	Dr. Fred Hileman	Chemicals/ Hazardous Waste Tissue	Internal
	National Institute of Environmental Health Sciences Laboratory of Molecular Biophysics P.O. Box 12233 Research Triangle Park, North Carolina 27709 (919) 541-1966 (FTS) 629-1966	Dr. Kenneth Toner	----	Internal
	University of Nebraska at Lincoln Department of Chemistry Hamilton Hall Lincoln, Nebraska 68588-0304 (402) 472-3501	Dr. M.L. Gross	Water Tissue Soil	Troika
	Wadsworth Center for Laboratories and Research New York State Department of Health Albany, NY 12201	Dr. P. O'Keefe	Tissue Soil	Internal

NATO/CCMS Pilot Study on International Information Exchange on Dioxins and Related Compounds
Listing of Laboratories with Expertise in the Analysis of Dioxins and Related Compounds (continued)

Country	Location	Principal Analysts	Matrices Analyzed	Quality Assurance Scheme
United States (continued)	University of Nevada, Las Vegas Environmental Research Center 4505 Maryland Parkway Las Vegas, NV 89154 (702) 739-3382	Dr. David McNeill	Water Soil Tissue Food Hazardous Waste/ Chemicals Combustion Sources	CLP Referee Lab
	O'Brien & Gere Engineers 1304 Buckley Road Syracuse, NY 13221 (315) 451-4700	Mr. Antonio LoSurdo	Combustion Sources Water Soil	CLP
	Occidental Chemical Corporation Hooker Chemical Center 360 Rainbow Boulevard - South Box 728 Niagara Falls, NY 14302 (716) 286-3000	Mr. John Nicther	Hazardous Waste/ Chemicals Soil Water	Internal
	Raba-Kistner Consultants, Inc. 12821 West Golden Lane P.O. Box 690287 San Antonio, TX 78269 (512) 699-9090	Dr. Wong	Water Soil Tissue	Internal
	Radian Corporation P.O. Box 9948 Austin, TX	Dr. Lawrence H. Keith	Hazardous Waste/ Chemicals Water	Internal
	Rocky Mountain Analytical Lab 4955 Yarrow Street Arvada, CO 80002 (303) 421-6611	Mr. Ken Faust Mr. Jeff Lowry	Water Soil	CLP

NATO/CCMS Pilot Study on International Information Exchange on Dioxins and Related Compounds
Listing of Laboratories with Expertise in the Analysis of Dioxins and Related Compounds (continued)

Country	Location	Principal Analysts	Matrices Analyzed	Quality Assurance Scheme
United States (continued)	Savannah Laboratories and Environmental Services, Inc. P.O. Box 13842 Savannah, GA 31416 (912) 58 58	Dr. James W. Andrews	Water	Internal
	Triangle 4915 F Prospectus Drive Research Triangle Park, NC 27713	Mr. Ron Haas	----	Internal
	Twin City Testing Corporation 662 Cromwell Avenue St. Paul, MN 55114 (612) 641-9485	Ms. Barbara Larka	Water Soil Tissue Hazardous Waste/ Chemicals	Internal
	University of Utah Salt Lake City, Utah 84112	Mr. Eugene Futrell	----	Internal
	United States Testing Company, Inc. 1415 Park Avenue Hoboken, NJ 07030 (201) 792-2400 x459	Dr. Seyed Dastgheib Ms. Jane Dunn	Water Soil	Internal
	Versar, Inc. 6850 Versar Center Springfield, VA 22151 (703) 750-3000	Dr. Charles Carter	Water Soil	CLP
	Wright State University 3640 Colonel Glenn Highway Dayton, Ohio 45435	Dr. T.O. Tiernan	Tissue Water Soil	Troika