



**OPCW**

**Scientific Advisory Board**

Seventh Session  
9 – 11 March 2005

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**REPORT OF THE SEVENTH SESSION OF THE  
SCIENTIFIC ADVISORY BOARD**

**1. INTRODUCTION**

- 1.1 The Scientific Advisory Board (SAB) met for its Seventh Session from 9 to 11 March 2005 in The Hague, the Netherlands. A list of participants is included as Annex 1 to this report.
- 1.2 The Session was opened by the Chairman of the SAB, Jiří Matoušek of the Czech Republic. The Director-General made a statement in which he welcomed 17 new SAB members, thanked the former members who had left since its last Session for their valuable contributions to the work of the OPCW, and set out his views on the future work of the SAB.<sup>1</sup>
- 1.3 The SAB confirmed Jiří Matoušek of the Czech Republic as its Chairman for the coming year, and elected Mahdi Balali-Mood of the Islamic Republic of Iran as its Vice-Chairman.
- 1.4 The SAB adopted the following agenda for its Seventh Session:
  1. Opening of the Session and adoption of the agenda
  2. Welcome address by the Director-General
  3. *Tour de table* for the introduction of SAB members
  4. Overview of developments at the OPCW since the Sixth Session of the SAB
  5. Work of the temporary working groups:
    - (a) Consideration of the report of the temporary working group on biomedical samples
    - (b) Formation of the temporary working group on sampling and analysis

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<sup>1</sup> A separate Note by the Director-General, containing his comments and recommendations to States Parties on the present report, will be issued in due course.



- (c) Formation of the temporary working group on education and outreach, and information on a joint project with the International Union of Pure and Applied Chemistry (IUPAC)
- 6. Issues related to possible future work:
  - (a) Training of inspectors, in particular on developments in the chemical industry that are relevant to the Chemical Weapons Convention
  - (b) Optimisation of verification activities (in particular regarding verification at chemical weapons destruction facilities)
  - (c) International cooperation and assistance
- 7. Any other business
- 8. Closure

## **2. TOXIC CHEMICALS**

- 2.1 Having received an overview of developments at the OPCW since its last Session, the SAB briefly discussed the threat posed by new and unscheduled toxic chemicals. It recognised that there are new threats, including the use of toxic materials by terrorists.<sup>2</sup> There is, of course, a wide range of chemical compounds of potential concern, many of which are subject to control regimes other than the Chemical Weapons Convention (hereinafter “the Convention”), such as old pesticides and certain toxic industrial chemicals. National legislation and enforcement are essential in order for these threats to be dealt with, and national legislation must recognise that the Convention prohibits all chemical weapons—those involving not just the toxic chemicals listed in the Schedules of Chemicals, but also unscheduled toxic chemicals.
- 2.2 Addressing this issue of new toxic chemicals in the context of the Schedules of Chemicals was difficult for the SAB, which recognised that some States Parties had reasons for not wanting to add new toxic chemicals to the Schedules now. When preparing for the First Special Session of the Conference of the States Parties to Review the Operation of the Chemical Weapons Convention (hereinafter “the First Review Conference”), the SAB had already suggested that, for verification purposes, the OPCW should be informed about such unscheduled threat chemicals and that States Parties should consider making information on such chemicals available to the OPCW, in confidence if necessary (paragraphs 2.1 and 2.2 of RC-1/DG.2, dated 23 April 2003). The SAB’s sense was that this would, amongst other things, be important for any future investigations of alleged use, and that the OPCW Central Analytical Database (OCAD) should therefore also contain data on relevant unscheduled chemicals.

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<sup>2</sup> The SAB noted the decision of the Executive Council (hereinafter “the Council”) (EC-XXVII/DEC.5, dated 7 December 2001) on the OPCW’s contribution to global anti-terrorism efforts. The decision recognised that the full and effective implementation of all provisions of the Convention is in itself a contribution to global anti-terrorist efforts, and identified five areas of the OPCW’s work that are of particular relevance in this respect: the promotion of universality, the full implementation of national legislation, the destruction of chemical weapons, measures against the proliferation of chemical weapons, and the ability of the OPCW to respond to the Convention’s provisions on assistance and protection.

### **3. ASSISTANCE AND PROTECTION**

- 3.1 The SAB briefly discussed assistance and protection against a chemical weapons attack, including one launched by terrorists, and agreed that the OPCW should assist States Parties in developing their capacities in this regard, including by making available model protocols for and guidance on effective responses to the use of chemical weapons and toxic chemicals—by terrorists, for example. The SAB agreed that there was a need for enhanced cooperation and information-sharing among States Parties, that the OPCW should facilitate such cooperation, and that, in consultation with other organisations that would be involved in a response to a chemical weapons attack, including national and international agencies and non-governmental organisations, the OPCW should decide what role it would play in an emergency response, and develop its capacities so that it could fulfil that role.
- 3.2 The SAB felt that, because of the need for short response times, the response capacity at the local level and the provision of assistance on a bilateral or regional basis are crucial to the preparedness of States Parties for possible chemical weapons attacks, including by terrorists, and that the OPCW should bear this in mind as it continues to develop its approach to capacity-building in respect of assistance and protection under Article X of the Convention.

### **4. THE OPTIMISATION OF VERIFICATION ACTIVITIES**

- 4.1 The Technical Secretariat (hereinafter “the Secretariat”) briefed the SAB on the efforts it and the States Parties concerned had made to optimise the OPCW’s verification regime, in particular as regards the destruction of chemical weapons. The SAB heard that the Secretariat was already using considerably fewer human resources to monitor the destruction of chemical weapons, and that it had achieved these savings through the increased use of closed-circuit television cameras and recording devices, the monitoring of process-control data, the use of both containment and surveillance measures to prevent undetected diversion, and the streamlining of the inspection methodology so as to avoid unnecessary redundancy while seeing to it that the verification process still provides the required level of confidence.
- 4.2 The SAB welcomed these developments, and encouraged further work in this direction by the Secretariat and by the States Parties concerned. The SAB remains ready to offer comments and advice on further efforts to enhance and optimise the verification regime.

### **5. TRAINING OF INSPECTORS**

- 5.1 The Secretariat also briefed the SAB on the training currently being provided to inspectors, including mandatory training and the training of new inspectors. The SAB recognised two problem areas that deserve its future consideration:
- (a) There is a need for inspectors to keep abreast of developments in the industrial production of chemicals, such as the increasing use of micro- and mini-reactors, and these developments should therefore be reflected in the content of the training given to inspectors. The SAB recommended that the Secretariat continue to provide training that reflects these developments, and

agreed that its members would, if the Secretariat so requested, be available to support it.

- (b) The implementation of the OPCW tenure policy will have an impact on the effectiveness of verification. Minimising this impact is a matter of sound management, which, in addition to the aforementioned adjustments in inspector training, includes maintaining institutional memory, monitoring trends in the recruitment of inspectors, and seeing to the proper documentation of best practices, including those reflected in the standard operating procedures and work instructions already in wide use under the OPCW's verification regime.

5.2 The SAB encouraged the Secretariat to undertake a study of the likely impact on verification of implementing the policy on tenure, so as to identify the problems that are likely to result from it, and to propose practical solutions to these. The SAB's sense was that such a study should be supported by data from the Inspectorate and Verification Divisions. Members of the SAB expressed their readiness to contribute to such a study if so requested.

## **6. SAMPLING AND ANALYSIS**

6.1 The SAB discussed a preliminary report on sampling and analysis that the Chairman of the temporary working group on sampling and analysis, Miguel A. Sierra of Spain, had prepared, in consultation with some of the members of the SAB, to take stock of the situation and identify areas of future work for the SAB. The SAB was also briefed by the Head of the OPCW Laboratory on the OPCW's current capabilities in on- and off-site analysis.

6.2 The SAB noted that the procedures for the collection and preparation of samples, and for analysis by means of gas chromatography-mass spectrometry (GC-MS), were firmly established and had been tested, and it felt that they should now be used in practice. The OCAD has been considerably expanded and, for the purposes of routine inspections where the presence or absence of scheduled chemicals is the focus of analysis, is now a reliable and reasonably comprehensive tool. The SAB took the view that the OPCW should monitor future developments that would allow for logistical and other improvements and greater efficiency, and continue to check for the appearance on the market of new instruments suitable for on-site use.

6.3 The SAB noted that the decisions that the Council and the Conference of the States Parties had taken to make it easier both to add new items of equipment to the list of approved equipment and to adapt the specifications for approved equipment to evolving needs and conditions, had now been put into practice. In the view of the SAB, this flexibility is important in that it helps the OPCW to take advantage of new developments and enhance the verification regime, thus making it more efficient, effective, and reliable.

6.4 The SAB discussed off-site analysis and in particular the role designated laboratories play in it. The SAB concluded that these laboratories are of particular relevance when it comes to analysing environmental samples during challenge inspections and investigations of alleged use of chemical weapons, and noted that, in routine

inspections, analysis by designated laboratories was called for either exceptionally or not at all. The SAB's sense was that the focus by designated laboratories on the requirements of challenge inspections and investigations of alleged use needs to be better reflected in the objectives and design of proficiency testing, and that it was important both that collaboration be improved among laboratories that are either designated or seeking designation, and that these laboratories share information and experience. The SAB also felt that the OPCW should keep the importance of such cooperation in mind as it continues with its proficiency-testing and international-cooperation programmes.

6.5 The SAB agreed that its temporary working group on sampling and analysis should review the whole issue of designated laboratories to determine to what degree proficiency testing furthers the goals behind the network of designated laboratories, whose focus, again, is on challenge inspections and investigations of alleged use. It was thus the view of the SAB that the following issues, among others, should be reflected in the proficiency testing of designated laboratories:

- (a) the analysis of complex matrices;
- (b) trace-level analysis;
- (c) the possibility of masking effects and of attempts to evade verification; and
- (d) the detection of threat chemicals other than scheduled chemicals (such as "new agents"), of toxins other than ricin and saxitoxin, and of riot-control agents.

6.6 In this context, the SAB also agreed that it would be desirable for designated or other laboratories in States Parties to undertake studies of the possibility of masking analytes in samples to prevent detection or identification, and of pursuing options to confound any such attempts.

6.7 The SAB agreed that the temporary working group on sampling and analysis would also look at the analysis of toxins—an area where the SAB had in the past identified gaps in the OPCW's analytical capabilities. This issue had also come up in the report of the temporary working group on biomedical samples, as a matter that should be addressed separately (see below).

## **7. BIOMEDICAL SAMPLES**

7.1 The SAB received and discussed the report by the temporary working group on biomedical samples, which is included as Annex 2. The SAB recognised that the analysis of biomedical samples differs markedly from that of environmental samples. As a discipline, the analysis of biomedical samples is still evolving, and there are only a few laboratories in the world capable of conducting sophisticated analyses. Analysis is analyte-driven, and analysts do not attempt to identify target chemicals across the board (i.e., from a large number of possible target chemicals), analysing instead for biomarkers that are specific to the suspected agent. Analysis also involves trace analysis, and there are numerous potential biomarkers that could point to the presence of a suspected agent; however, there is no common standard that would determine which biomarker one should use, and the choice depends on the

circumstances. Individual laboratories develop and validate their own methods, but few methods have been promulgated widely. Evaluation criteria for the interpretation of analytical results need to be further developed. The selection of designated laboratories based on proficiency testing and their accreditation, which method the OPCW has adopted for the analysis of environmental samples, is not appropriate for developing a capability in the field of biomedical samples, or at least not at this stage.

- 7.2 Therefore, if the OPCW wants to be able to analyse biomedical samples in investigations of alleged use, then, rather than waiting until a more fully standardised, more widely distributed capability emerges, it will need to take a flexible interim approach that uses the methods, equipment, and experience currently available at laboratories.
- 7.3 The foregoing discussion has to do only with the analysis of biomedical samples for forensic investigation, and not with a response to an incident involving chemical weapons or toxic agents. In an investigation of alleged use, an analysis of biomedical samples could provide valuable evidence. Historical experience shows that there are situations in which the data provided by environmental sampling and analysis may not support unambiguous conclusions. Every piece of evidence matters in an investigation of alleged use, but, at the same time, analytical results need to be evaluated in context and it may be that no one piece of evidence provides conclusive proof. The SAB felt that, on balance, the analysis of biomedical samples is an important tool in investigations of alleged use, and that the OPCW should therefore apply the latest methods available in this field, even though this is still evolving. Doing that, however, would require an approach different from and more flexible than that used in environmental analysis. The SAB also noted that the OPCW had not yet been requested to launch an investigation into any alleged use of chemical weapons.
- 7.4 The SAB therefore supported the suggestions contained in Appendix 4 to the report of the temporary working group, and recommended that the OPCW proceed in this direction. The SAB also noted the need to promote collaboration among laboratories engaged in this field, and took the view that the OPCW should encourage and facilitate the spread of knowledge and capabilities in the analysis of biomedical samples in States Parties beyond the few laboratories that are capable of doing this type of analysis today.<sup>3</sup>
- 7.5 The SAB agreed that the temporary working group on biomedical samples should continue working on the criteria for interpreting results of the analysis of such samples (see Appendix 5 to the report of the temporary working group for an example of how such criteria might be developed), and that, at its earliest convenience, it should submit a proposal for the consideration of the SAB.

## **8. EDUCATION AND OUTREACH**

- 8.1 The SAB received an update from one of its members, Alberto B. Fratadochi of Italy, Chairman-designate of the temporary working group on education and outreach, on the results of a planning meeting with IUPAC. This update is included as Annex 3.

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<sup>3</sup> The SAB felt that, to this end, the OPCW should encourage collaboration among laboratories, in States Parties, that work in this field, including through knowledge transfer and other types of mutual support such as the provision of reference standards.

The planning meeting was conducted in preparation for an international workshop to be jointly organised by IUPAC and the OPCW, and will focus on codes of professional conduct, ethical issues, education in chemistry, and how the requirements of the Convention can be better reflected in these areas. The workshop is scheduled to take place from 10 to 12 July 2005 in Oxford, the United Kingdom of Great Britain and Northern Ireland. The SAB discussed which organisations and individuals could contribute to the workshop and should therefore be invited.

- 8.2 The SAB encouraged the continuation of this work, on the understanding that over the long term it would lead, *inter alia*, to awareness-raising, efforts to provide educational materials and guidance to school and university science teachers, and the incorporation of the Convention's requirements into codes of conduct and ethics for scientists and engineers.

**9. ISSUES SUBMITTED TO THE SCIENTIFIC ADVISORY BOARD FOLLOWING CONSULTATIONS WITHIN THE FACILITATION PROCESS OF THE EXECUTIVE COUNCIL**

**Captive use**

- 9.1 This issue was received from the facilitator for chemical-industry issues, Mr Martin Rudduck of the United Kingdom of Great Britain and Northern Ireland, and the SAB held a preliminary discussion on it. Mr Herbert de Bisschop of Belgium agreed to coordinate a study on the issue, with input from other SAB members. He will prepare the SAB's response, which will be discussed and agreed in the SAB's Internet discussion forum, and the result will be submitted to Mr Rudduck.

**Ricin**

- 9.2 The SAB recalled the details of the discussions it had had on this matter and the recommendations it had made, and it now noted that the Council had received a paper reviewing findings of the SAB that had been submitted to the First Review Conference (EC-40/S/7, dated 7 March 2005) and that indicated that the SAB is expected to continue work on this issue and report back to the Council expeditiously. What remains to be further clarified is a nomenclature issue: Which chemical entities are covered by the term "ricin" as used in the Convention? Miguel A. Sierra of Spain agreed to serve as coordinator on this issue, and stated that he would contact experts outside the SAB who have experience with ricin and whom he would invite to contribute to a response. He also indicated that he would use the SAB's Internet discussion forum to invite other SAB members to make contributions and to discuss and agree on the final response.

**Salts of scheduled chemicals and Chemical Abstracts Service registry numbers**

- 9.3 The SAB had discussed these mutually related issues, which were also included in EC-40/S/7. Both issues had also been discussed during the negotiations at the Conference on Disarmament in Geneva, and decisions on how to deal with them were taken in full recognition of what it was then thought they would entail. However, the SAB recognised that they may have to be reviewed as a result of new considerations and conditions. Bob Mathews of Australia agreed to act as coordinator on these issues and also indicated that, with the assistance of other SAB members, he would use the SAB's Internet discussion forum as outlined above to prepare a report.

## 10. FUTURE WORK OF THE SCIENTIFIC ADVISORY BOARD

The SAB agreed that, during the remainder of 2005, it would continue working on the following issues (as already set out in the preceding paragraphs):

- (a) temporary working group on biomedical samples: meeting to further discuss and elaborate criteria for interpreting results of the analysis of biomedical samples;
- (b) temporary working group on sampling and analysis: analysis of toxins, and discussion both of the objectives of the network of designated laboratories and of the design that shapes the further development of the network (including as regards how to confound the masking of target compounds);
- (c) temporary working group on education and outreach: continuation of the joint OPCW-IUPAC project; and
- (d) captive use of Schedule 1 chemicals; ricin, salts of scheduled chemicals, and Chemical Abstracts Service registry numbers: preparation in due course of reports, coordinated by designated SAB members, for inclusion in the Council's facilitation process after SAB members have used the Internet discussion forum to prepare their responses.

## 11. CONCLUSION OF THE SESSION

The SAB concluded its Seventh Session on 11 March 2005 at 16:25 with the adoption of this report.

### Annexes:

- Annex 1: List of Participants in the Seventh Session of the Scientific Advisory Board
- Annex 2: Report of the Temporary Working Group on Biomedical Samples
- Appendix 1 Temporary Working Group on Biomedical Sampling and Analysis: Terms of Reference
- Appendix 2 Participants in the Meeting of the Temporary Working Group on Biomedical Samples
- Appendix 3 List of Members of the Temporary Working Group on Biomedical Samples
- Appendix 4 Recommendations for Utilisation of Current Resources in the OPCW Context
- Appendix 5 Criteria for the Interpretation of Analytical Results
- Appendix 6 Sampling and Analysis of Biomedical Samples for the Presence of Chemical Agents: Summary of Key Points
- Annex 3: Update on a Planning Meeting (17 January 2005) with the International Union of Pure and Applied Chemistry on a Joint Project on How to Reflect the Chemical Weapons Convention in Codes of Professional Conduct of Scientists and in Chemistry Education



**Annex 1**

**LIST OF PARTICIPANTS IN THE SEVENTH SESSION OF THE SCIENTIFIC  
ADVISORY BOARD**

	<b>Participant</b>	<b>Member State</b>
1.	Rolando A Spanevello	Argentina
2.	Bob Mathews	Australia
3.	Herbert de Bisschop	Belgium
4.	Zhiqiang Xia	China
5.	Danko Škare	Croatia
6.	Jiří Matoušek	Czech Republic
7.	Jean-Claude Tabet	France
8.	Detlef Männig	Germany
9.	László Halász	Hungary
10.	R Vijayaraghavan	India
11.	Mahdi Balali-Mood	Iran (Islamic Republic of)
12.	Alberto Breccia Fratadochi	Italy
13.	Koichi Mizuno	Japan
14.	Abdool Jackaria	Mauritius
15.	José Gonzáles Chávez	Mexico
16.	Godwin Ogbadu	Nigeria
17.	Bjørn-Arne Johnson	Norway
18.	Titos Quibuyen	Philippines
19.	Young-chul Lee	Republic of Korea
20.	Philip Coleman	South Africa
21.	Miguel A Sierra	Spain
22.	Velery Kukhar	Ukraine
23.	Robin Black	United Kingdom of Great Britain and Northern Ireland
24.	James Robert Gibson	United States of America

## Annex 2

### REPORT OF THE TEMPORARY WORKING GROUP ON BIOMEDICAL SAMPLES

The Hague, 17-19 November 2004

#### Introduction

1. The temporary working group on biomedical samples was constituted by the Director-General based on the recommendations of the SAB in the report of its Sixth Session (SAB-6/1, dated 18 February 2004). Annex 1 to that report also contained the terms of reference under which the work of the group proceeded. For ease of reference, these have been included as Appendix 1 to the present report. The group met in The Hague from 17 to 19 November 2004 and prepared this report.
2. The group adopted the following agenda:
  1. Welcome
  2. Approval of the agenda
  3. Background issues:
    - (a) Current status of biomedical sampling in the OPCW context
    - (b) Overview of the OPCW's current procedures for environmental sampling and analysis
    - (c) Investigation of alleged use of chemical weapons: historical aspects, and investigations under the terms of the Convention
  4. Review and clarification of the temporary working group's terms of reference
  5. Technical presentations:
    - (a) Detection of exposure to:
      - (i) Nerve agents
      - (ii) Mustard
      - (iii) Lewisite
      - (iv) BZ, cyanide, and phosgene
    - (b) Sampling and analysis of toxins (including immunoassays)
    - (c) Collection, transport, and storage of biomedical samples

6. Discussion (based on the Terms of Reference):
  - (a) Specification of key biomarkers for the chemical-warfare agents in the Schedules
  - (b) Recommendation of the most-appropriate methods for analysing blood, urine, or other matrices for agents, agent markers, metabolites and/or adducts, and other techniques that can provide evidence of chemical weapons exposure
  - (c) Identification of shortcomings in existing methodologies, and a proposed plan of action to establish a standard set of tests, which proposal should include:
    - (i) Required sensitivities and detection limits
    - (ii) Analytical standards and reference compounds needed
    - (iii) Standard operating procedures for validating methodologies
    - (iv) Criteria for the interpretation of analytical results in the context of confirming alleged use of chemical weapons
  - (d) Administrative and organisational aspects of analysing biomedical samples that may be relevant, including:
    - (i) Suggestions regarding procedures to develop a suitable network of laboratories
    - (ii) Recommendations regarding procedures for inter-laboratory comparison exercises and/or proficiency training
    - (iii) Updates on the number of laboratories active in this field and that have an interest in extending their capabilities
7. Draft OPCW work instructions for:
  - (a) The collection of biomedical samples during an investigation of alleged use
  - (a) Evidence procedures during an investigation of alleged use
8. Follow-up activities of the temporary working group
9. Approval of the temporary working group report

3. Dr Tom Inch of the United Kingdom of Great Britain and Northern Ireland had been appointed Chairman of the temporary working group by the Director-General, and he chaired the meeting. A list of participants of the meeting is included as Appendix 2; a complete list of members of the temporary working group, as Appendix 3. Members who were unable to attend the meeting were consulted by the Chairman after the meeting in order to ensure that their views were duly reflected in the report.
4. The following background material was available to the group:
  - (a) Report of the Group of Experts on Biomedical Sampling and Analysis, December 1999;
  - (b) Draft Secretariat Work Instruction for the Collection of Biomedical Samples during an Investigation of Alleged Use of Chemical Weapons (2005);
  - (c) Draft Secretariat Work Instruction for Evidence Procedures During an Investigation of Alleged Use of Chemical Weapons (2005);
  - (d) National Capacities for the Analysis of Biomedical Samples, OPCW Questionnaire, Summary Of Responses (no date);
  - (e) Abstract: Biological Indicators of Exposure to Sulphur Mustard, by Robin Black, Dstl Porton Down, Salisbury, United Kingdom of Great Britain and Northern Ireland;
  - (f) Abstract: Detection of Exposure to Nerve Agents, by Dr. D. Noort and Dr. M.J. van der Schans, TNO Prins Maurits Laboratory, Rijswijk, the Netherlands;
  - (g) Abstract: Analysis of Cyanide, Phosgene, and BZ, by John R. Barr, Centers for Disease Control and Prevention, Atlanta, United States of America;
  - (h) Abstract: The Analysis of Biomedical Samples for the Verification of Lewisite Exposure, by J. Richard Smith, US Army Medical Research Institute of Chemical Defense, Aberdeen Proving Ground, United States of America;
  - (i) Methods for the Retrospective Detection of Exposure to Toxic Scheduled Chemicals, Part A: Analysis of Free Metabolites, by R. M. Black and D. Noort; advance copy, John Wiley & Sons Ltd. Sourced from Chemical Weapons Convention Chemical Analysis, M. Mesilaakso (editor);
  - (j) Methods for Retrospective Detection of Exposure to Toxic Scheduled Chemicals. Part B: Mass Spectrometric and Immunochemical Analysis of Covalent Adducts to Proteins and DNA, by D. Noort and R.M. Black; advance copy, John Wiley & Sons Ltd. Sourced from Chemical Weapons Convention Chemical Analysis, M. Mesilaakso (editor); and
  - (k) Sampling and Analysis of Biomedical Samples for the Presence of Chemical Agents: Summary of Key Points (draft).

## **Background**

5. The collection and analysis of biomedical samples is one of the methods referred to in the Chemical Weapons Convention in the context of conducting investigations of alleged use. The primary objective of collecting and analysing biomedical samples is to provide facts that would help establish whether chemical weapons had in fact been used. The purpose of biomedical sample analysis in the context of the OPCW is forensic, and not related to the emergency response to an incident.
6. If access to the alleged incident site is rapid, relevant information may be obtained by observation of clinical symptoms and by on-site analysis of environmental samples. Where access to an alleged incident site is delayed or not possible, analysis of biomedical samples from allegedly-exposed humans or animals (blood, urine or tissue) may provide a unique source of information, or complement information obtained from the analysis of environmental samples.
7. A previous report on the analysis of biomedical samples from 1999 had pointed to the need for a system to be put in place by the OPCW for analysis of biomedical samples similar to the system in place for environmental samples. On the basis of experience gained it is now clear that a much less regimented and more flexible system is required. In short, the OPCW operating procedures for the analysis of environmental samples are inappropriate for the analysis of biomedical samples.
8. What is needed for biomedical analysis are procedures that are practical, cost-effective and well validated, and that are fit for the purpose and provide accurate information on very infrequent incidents. The emphasis should be on achieving the lowest limit of detection possible rather than on large throughput of samples and rapid analysis. Quality control is of the utmost importance. At the same time, criteria are needed to properly interpret the analytical results. The implications of all this are considerable, in particular in view of the infrequent occurrence of such incidents. It is not expected that more than a few laboratories will wish to maintain all or some of the necessary expertise (including research-grade equipment, quality control systems, engagement in methods development, staff training, standards, and custom synthesis capability). The modalities for the designation of laboratories for the analysis of biomedical samples need to differ from those adopted by the OPCW for laboratories analysing environmental samples, and need to be more flexible and based on the demonstrated capabilities of the laboratories.

## **Summary of discussions**

9. At this stage, the OPCW has not put in place a system of collecting, transporting, storing and analysing biomedical samples. The Central OPCW Laboratory is not equipped or otherwise prepared to receive, process or store biomedical samples. Furthermore, no laboratories have been designated by the Director-General for the analysis of such samples. On the other hand, a draft working instruction for the collection and transportation of biomedical samples by OPCW inspection teams has been prepared, was reviewed by the group, and found to be an acceptable basis for the continuation of the work in this area. It should now be tested. The group also developed a proposal for measures that would allow utilising the currently existing OPCW capabilities, together with capabilities of laboratories of Member States that

are working in this field, to establish a start-up capability for the analysis of biomedical samples in investigations of alleged use (Appendix 4).

10. In reviewing available methodologies, the group gave most attention to nerve agents and mustards because most biomedical analyses, particularly of blood and urine, have been carried out on these agents and because the work done exemplifies the issues that needed discussion. In the annexed table (at Appendix 6), information is provided on key biomarkers that can be used for establishing past exposure to these and other agents (lewisites, BZ, cyanides, phosgene). The analytical methods that can be used, as well as comments on their advantages and disadvantages, are also included in the table.
11. It was concluded that for cyanide and phosgene, the potential for high background levels resulting from sources unrelated to CW use (e.g., cigarette smoking for CN, incineration of material containing chlorine for phosgene) can complicate the situation. Any biomedical analysis is likely to provide inconclusive results unless unusually high concentrations of biomarkers for these agents were found.
12. The group also briefly reviewed the possibility for analysis of a wide range of toxins in biomedical and other samples. It was felt that the whole topic of toxin analysis was so broad that it went beyond the scope of this temporary working group. The issue of analysis of toxins (in environmental as well as biomedical samples) should be taken up separately.
13. There remains the possibility that an agent allegedly used may not be on the Schedules (including the alleged use of riot control agents as a method of warfare). Some of the techniques currently being used might be able to provide evidence of poisoning with such agents but research is needed to identify biomarkers for a broader range of chemicals relevant to investigations of alleged CW use.
14. The group agreed that for collecting samples in an IAU, the emphasis should be on collecting blood and urine samples. Other samples (tissue, saliva, etc.) may also be useful but the current state of method development provides the highest level of confidence in the case of blood/urine samples.
15. The following points raised during the discussions influenced the conclusions of the group:
  - (a) Since samples for analysis may be obtained at varying times after the alleged incident, and the levels of markers available for analysis are very time-dependent, only the most sensitive methods of analysis might be suitable.
  - (b) Unlike with environmental samples, where contamination levels are expected to be relatively high as assumed by the proficiency testing regime used by the OPCW, biomedical samples will require trace analysis techniques, bringing with it all the problems associated with the control for these techniques.
  - (c) High costs are associated with such techniques, including for equipment, reference standards and staff; staff have to be highly competent and maintain a thorough knowledge of the procedures and processes, which is only

achievable after long training experiences; this is likely to be best maintained in what is essentially a research, rather than a routine, environment.

- (d) The proficiency testing approach used by the OPCW for designation of laboratories for environmental analysis is therefore not an appropriate way to select laboratories for the analysis of biomedical samples. Instead, selection of laboratories should be based on knowledge about their capabilities (including QA/QC systems in place, compliance with standards such as GLP, methods validated at the laboratory, and proven ability to perform certain types of analysis) and designation made when the OPCW has adequate assurance that all the requirements are in fact met.
  - (e) Laboratories wishing to be selected should participate in inter-laboratory exercises to enhance confidence in their capabilities.
  - (f) Each and every sample needs to be supported by data (circumstances and observed effects of the incident and information on the sample source) so as to allow methods to be chosen that are most suitable for the suspected agent.
  - (g) The availability of standards is one of the greatest obstacles to the broader establishment of analytical capabilities for biomedical samples. This is particularly so for protein adducts. Although blood incubated with mass-labelled agent can be used as internal standard for protein adducts once a method has been established, a synthetic sample of the alkylated amino acid or peptide is required in the development or establishment of the method. A comparison of such synthetic methods for standards would be useful. If standards are acquired from other sources, it should be noted that their costs are high.
  - (h) Criteria for the interpretation of analytical results should be developed to avoid false-positives and in order to help interpret the analytical results in context (see Appendix 5 for details). In addition to such criteria, a rigid quality control system is required for trace analysis. Recommended operating procedures (ROPs) should be adopted that include mandatory requirements for negative and positive controls. For example, a complete system blank is required immediately prior to a positive analysis.
16. It appeared desirable to the group that the number of laboratories capable of undertaking the types of analysis described in this report should further increase. It was emphasised during the discussions that the transfer of the details of the techniques used was best done by short visits of staff to or from laboratories that already work with those techniques, as well as good documentation of the main techniques.
17. The OPCW should compile and maintain a comprehensive description of the various techniques for the analysis of biomedical samples, and should make this information available to States Parties. It should also develop, and distribute to States Parties, guidelines on the collection, storage, and transport of biomedical samples.

## **Conclusions**

18. The analysis of biomedical samples is useful mainly in the context of investigations of alleged use, as a forensic tool to be used together with evidence. The Convention makes provision for the collection and analysis of such biomedical samples. At present, the OPCW does not have such a capability. The capability in Member States in this field is still also very limited.
19. In order to establish such a capability, the OPCW should:
  - (a) implement the measures set out in Appendix 4 as well as test and adopt its work instruction for the collection and transportation of biomedical samples, in order to establish a start-up capability at OPCW to analyse biomedical samples for investigations of alleged use;
  - (b) build up and maintain an inventory of laboratories of Member States that are active in the field of biomedical analysis, and of their capabilities;
  - (c) develop and adopt a separate mechanism for the designation of laboratories for the analysis of biomedical samples, based on their capability (including: quality systems in place; accreditation if applicable; methods, standards and experience at hand) and with the necessary flexibility; and
  - (d) develop, with the assistance of members of this group, and adopt criteria to be used to interpret the results from trace analysis to provide the highest confidence in the results and their interpretation in the context of the investigation (see Appendix 5).
20. Furthermore, the OPCW should:
  - (a) encourage methods development in the field of analysis of biomarkers for scheduled chemicals, as well as for non-scheduled chemicals that are relevant to investigations of alleged use;
  - (b) review the issue of analysis of toxins (biomedical as well as environmental samples) for the purposes of implementing the Convention, including in respect of investigations of alleged use;
  - (c) compile and maintain a comprehensive description of the various techniques for analysis of biomedical samples, and make this information available to States Parties; and
  - (d) develop and distribute to States Parties guidelines on the collection, storage and transport of biomedical samples.



## Appendix 1

### TEMPORARY WORKING GROUP ON BIOMEDICAL SAMPLING AND ANALYSIS

#### TERMS OF REFERENCE<sup>4</sup>

1. This temporary working group on biomedical sampling and analysis will consist of experts in those biomedical sampling and analysis techniques relevant to the activities of OPCW. The experts should represent laboratories that are working actively in this area and have current knowledge of relevant technologies and scientific developments. Interested members of the SAB may also wish to join the group.
2. The group is requested to report to the SAB on the following:
  - (a) the specification of key biomarkers for the chemical warfare agents in the schedules;
  - (b) recommendations regarding the most-appropriate methods for analysing blood, urine, or other matrices for agents, agent markers, metabolites, and/or adducts, and other techniques that can provide evidence of chemical weapons exposure;
  - (c) the identification of shortcomings in existing methodologies, and a proposed plan of action to establish a standard set of tests, which proposal should include:
    - (i) required sensitivities and detection limits;
    - (ii) analytical standards and reference compounds needed;
    - (iii) standard operating procedures for validating methodologies; and
    - (iv) criteria for the interpretation of analytical results in the context of confirming the alleged use of chemical weapons; and
  - (d) administrative and organisational aspects of analysing biomedical samples that may be relevant, including:
    - (i) suggestions regarding procedures to develop a suitable network of laboratories;
    - (ii) recommendations regarding procedures for inter-laboratory comparison exercises and/or proficiency training; and

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<sup>4</sup> These terms of reference were prepared by Ashok Datta, Robert Gibson, Thomas Inch, and Miguel Sierra.

- (iii) updates on the number of laboratories active in this field and that have an interest in extending their capabilities.
- 3. Depending on the results achieved during its initial deliberations, the temporary working group's follow-up activities could include:
  - (a) elaborating on scenarios in which biomedical analysis may become important, and, for each scenario, providing guidance on the urgency of analysis in relation to the stability of markers and on lag-times for bringing samples to the laboratory;
  - (b) standardising sample collection and handling, development of standard operating procedures (including as regards transport);
  - (c) assessing training needs and resources required for the extension of the OPCW's capabilities in biomedical sampling and analysis; and
  - (d) preparing the OPCW Laboratory to handle biomedical samples.

**Appendix 2**

**PARTICIPANTS IN THE MEETING OF THE TEMPORARY WORKING GROUP  
 ON BIOMEDICAL SAMPLES**

	<b>Participant</b>	<b>Member State</b>
1.	Jiří Matoušek	Czech Republic
2.	Marja-Leena Kuitunen	Finland
3.	Martin Söderström	Finland
4.	Bruno Bellier	France
5.	Franz Worek	Germany
6.	W Selvamurthy	India
7.	Daniel Noort	Netherlands
8.	M Verschragen	Netherlands
9.	Seng Miu Tiang	Singapore
10.	Phillip Coleman	South Africa
11.	Sten-Åke Frederikson	Sweden
12.	Robin Black	United Kingdom of Great Britain and Northern Ireland
13.	Thomas Inch	United Kingdom of Great Britain and Northern Ireland
14.	Robert Read	United Kingdom of Great Britain and Northern Ireland
15.	J. R. Barr	United States of America
16.	James Gibson	United States of America
17.	J. R. Smith	United States of America

### Appendix 3

#### LIST OF MEMBERS OF THE TEMPORARY WORKING GROUP ON BIOMEDICAL SAMPLES

**Chairman: Thomas Inch, United Kingdom of Great Britain and Northern Ireland**

	<b>Participant</b>	<b>Member State</b>
1.	Jiří Matoušek	Czech Republic
2.	Marja-Leena Kuitunen	Finland
3.	Martin Söderström	Finland
4.	Bruno Bellier	France
5.	Franz Worek	Germany
6.	H. V. Batra	India
7.	Ashok Datta	India
8.	W. Selvamurthy	India
9.	Abbas Shaffie	Iran (Islamic republic of)
10.	Daniel Noort	Netherlands
11.	M Verschragen	Netherlands
12.	Stanislaw Witek	Poland
13.	Viktor Petrunin	Russian Federation
14.	Seng Miu Tiang	Singapore
15.	Phillip Coleman	South Africa
16.	Miguel A Sierra	Spain
17.	Sten-Åke Frederikson	Sweden
18.	Robin Black	United Kingdom of Great Britain and Northern Ireland
19.	Thomas Inch	United Kingdom of Great Britain and Northern Ireland
20.	Robert Read	United Kingdom of Great Britain and Northern Ireland
21.	J. R. Barr	United States of America
22.	James Gibson	United States of America
23.	J. R. Smith	United States of America

## Appendix 4

### RECOMMENDATIONS FOR UTILISATION OF CURRENT RESOURCES IN THE OPCW CONTEXT

1. The group discussed the situation that would arise should an incident involving the need for biomedical sampling and analysis occur in the near future.
2. Recognising that the Secretariat is not currently staffed or equipped for the reception and handling of biomedical samples, the group recommended that:
  - (a) the Secretariat should test and validate its procedures for the collection and transport of biomedical samples, using as a basis the document that was provided to the TWG for review (Work Instruction for the Collection of Biomedical Samples during an Investigation of Alleged Use), edited according to the group's proposals;
  - (b) the Secretariat should maintain a database of Member State laboratories active in the field of biomedical sampling and analysis, specifying the range of procedures and functions that each laboratory may be able to perform in the context of OPCW activities;
  - (c) the Secretariat should conclude agreements with willing laboratories that have been identified as capable of performing the following activities:
    - (i) reception and handling of biomedical samples collected during OPCW activities;
    - (ii) analysis of biomedical samples, utilising the key methods identified in Appendix 5 to this report; and
    - (iii) storage of biomedical samples;
  - (d) in the case of an incident, the Secretariat should:
    - (i) collect samples in accordance with the procedures referred to above, and if possible, in quantities to allow the assembly of four identical sample sets;
    - (ii) dispatch one set of samples to a laboratory identified in (c) above for storage;
    - (iii) dispatch one set of samples to each of two laboratories for analysis according to the methods recommended in Appendix 5 (these laboratories should be selected according to criteria which should be further developed);
    - (iv) provide one set of samples to the inspected or requesting State Party.

3. The group recognised that this is a departure from the procedures established by the OPCW for the processing of non-biomedical samples, but considered that this was the most practical way available to make use of current resources.

## Appendix 5

### CRITERIA FOR THE INTERPRETATION OF ANALYTICAL RESULTS

1. The criteria currently adopted by the OPCW for the identification of relevant compounds in environmental samples assume that the concentration will be sufficient to obtain full scan mass spectra or other unequivocal fingerprints such as NMR and IR data. A confirmatory analysis requires two such techniques to be used.
2. In scenarios of allegations of CW use, and particularly in the case of biomedical samples, good quality full scan mass spectra are unlikely to be obtainable. Biological markers of poisoning, such as urinary metabolites and protein adducts, are most likely to be present in concentrations in the low or sub ppb range, except in cases of high level exposure and where samples are collected soon after the event.
3. Identification is likely to require two analytical techniques such as GC-MS-(MS) or LC-MS-(MS) where pre-selected ions or fragmentations are monitored. With some biomarkers, detection may be possible by only a single technique, and monitoring only one ion or fragmentation. A different set of criteria will be required for a confirmatory analysis. An additional feature of biomedical samples is that a number of quite different biomarkers of exposure may be detectable, depending on the agent and matrix. The criteria for a confirmatory analysis therefore need to be much more flexible than for environmental samples.
4. A flexible system for confirmatory analysis is suggested based on similar principles to those proposed by the Council for the identification of certain substances in animals and animal products<sup>5</sup>.
5. This system requires a minimum number (3 or 4) of “identification points” for a confirmatory analysis. Identification points may be obtained using a combination of different analytical methods, different derivatives/analytes, or number of selected ions or fragmentations monitored. The system (which may need some modification for biomedical sample analysis) is illustrated by the following:

<b>MS Technique</b>	<b>Identification Points</b>
Low-resolution (LR) MS, single ion	1
Low resolution (LR) MS, two ions	2
LR MS-MS, single transition	2.5
LR MS-MS, two transitions	4.0
High-resolution (HR) MS, single ion	2
HR MS-MS, single transition	4.5

6. GC-MS (EI) and GC-MS (CI) are regarded as separate techniques.

<sup>5</sup> See European Commission decision of 12 August 2002 implementing Council Directive 96/23/EC concerning the performance of analytical methods and the interpretation of results.

7. Where more than one ion is monitored, criteria for acceptable ratios are also proposed.
8. Using this system, a confirmatory analysis for sulphur mustard poisoning could be obtained by GC-MS-MS and LC-MS-MS analysis of  $\beta$ -lyase metabolites, each monitoring a single transition. Alternatively, the detection of  $\beta$ -lyase metabolites by GC-MS-MS (single transition) could be combined with the detection of the albumin cystine adduct, monitoring a single transition by LC-MS-MS. Some aspects may need more detailed consideration, e.g. the acceptability of TDG/TDGO as biological markers, and the fact that detection of the N-terminal valine adduct of sulphur mustard, monitored using only a single ion by GC-MS, could earn only one identification point.



## Appendix 6

### SAMPLING AND ANALYSIS OF BIOMEDICAL SAMPLES FOR THE PRESENCE OF CHEMICAL AGENTS SUMMARY OF KEY POINTS

Sample	Key Biomarkers	Recommended Analytical Methods	Standards	Advantages	Disadvantages
<b>Sulfur mustard</b>					
Urine	TDG TDGO $\beta$ -lyase metabolites	GC-MS-MS LC-MS-MS	(deuterated) TDG TDGO $\beta$ -lyase metabolites	Relatively easy synthesis of analytical standards  LOD <sup>6</sup> : 1 – 0.1 ng.ml	Short window for detection TDG and TDGO present in unexposed persons.
Blood	Protein adducts: N-terminal valine on Hb* histidine residues on Hb. Cysteine residue on albumin* Asp. acid/glutamic acid residues on blood proteins and keratin	Chemical or enzymatic digestion, followed by:  GC-MS or GC-MS-MS LC-tandem MS  LC-tandem MS  GC-MS	PFP-thiohydantoin of valine adduct i.s.: d8-sulfur mustard-globin  His-adducts I.s.: d8-sulfur mustard globin Cys*-Pro-Phe i.s.: d8-sulfur mustard plasma	Longer window for detection  Can be run on a benchtop GC-MS LOD: 100 nM human blood, in vitro  His-adduct also present in proteins of other tissues Easy work-up of sample LOD: 1 nM human blood, in vitro	More demanding analytical methods.  Laborious  Laborious  Alkylated tripeptide required as analytical standard

<sup>6</sup> Limit of detection

Sample	Key Biomarkers	Recommended Analytical Methods	Standards	Advantages	Disadvantages
			Thiodiglycol (derivatised); i.s.: d8-thiodiglycol	Easy work-up of sample LOD: 25nM	
Urine	DNA adducts:  Alkylation of deoxyguanosine (N7)	LC-MS-MS for N7-HETE-guanine	N7-HETE-guanine + d8 derivative as i.s.	Macromolecule present in all bodily tissues.	Shorter window for detection than protein adducts
Blood	Alkylation of deoxyguanosine (N7) <sup>7</sup>	ELISA assay for N7-HETE-guanosine-5'-phosphate	Sulfur mustard exposed DNA	Low cost LOD 50 nM human blood in vitro	Monoclonal antibody required Less specific than MS-based methods
<b>Nerve Agents</b>					
Blood	Cholinesterase activity			Rapid, available in the field	Does not identify the OP False positive results; only relatively high levels of activity depression are detectable.

<sup>7</sup> Standard operating procedure available.

Sample	Key Biomarkers	Recommended Analytical Methods	Standards	Advantages	Disadvantages
Blood	<u>Fluoride reactivation method:</u> <sup>8</sup> Phosphylated BuChE (+ other proteins)	GC-MS GC-HR-MS With large volume injection;	Phosphonofluoridates i.s.: deuterated OP or plasma exposed to deuterated OP	Easily accessible internal standards and reference compounds; LOD 10 pg/ml (0.05-0.1% BuChE inhibition)	Not applicable to all OPs
Blood	<u>Analysis of phosphylated peptides:</u> Phosphylated BuChE	LC-MS-MS (after enzymatic digestion of modified cholinesterase.	Phosphylated nonapeptides; i.s. plasma exposed to CD3-OP	Covers all OP's LOD: 1-5% BuChE inhibition	Expensive instrumentation and reference compounds

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<sup>8</sup> SOP available.

Sample	Key Biomarkers	Recommended Analytical Methods	Standards	Advantages	Disadvantages
Urine / serum	<u>Hydrolysis products:</u>  Alkyl methylphosphonic acids (does not include Tabun)	GC-MS-MS LC-MS-MS	(derivatised) alkyl methylphosphonic acids; i.s.: CD <sub>3</sub> analogues	High levels shortly after exposure Easily accessible internal standards and reference compounds; LOD 0.2 – 1 ng/ml	Relatively short window of detection
<b>Lewisite</b>					
Urine	CVAA	Solid phase microextraction headspace sampling, followed by GC/MS with EI ionisation	Deuterated CVAA  Phenylarsine oxide	LOD: 500 ppt	Short window for detection.  Lack of validation in human samples.
Blood	CVAA (globin bound and free)	GC-MS	As above	LOD: 1nM	As above

Sample	Key Biomarkers	Recommended Analytical Methods	Standards	Advantages	Disadvantages
<b>Phosgene</b>					
Blood	<u>Protein adduct:</u> Albumin peptide	LC-MS-MS	Whole blood treated with known phosgene concentrations	Specific and sensitive LOD: 1uM	Standards not easily available
<b>Cyanide</b>					
Blood	CN itself	GC	HCN	LOD: 100ppb	Background levels (smokers, pollution etc)
Urine	Cystine adduct SCN 2-amino-thiazoline, 4-carboxylic acid	HPLC GC-LC	SCN	(SCN) LOD: 3ug/ml 0.3 uM	As above
<b>BZ</b>					
Urine	BZ, BA Q	LC-MS-MS	BZ, BA, Q	Rapid and sensitive LOD: 1ppb	Standards expensive and not easily obtainable

### Annex 3

## UPDATE ON A PLANNING MEETING (17 JANUARY 2005) WITH THE INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY ON A JOINT PROJECT ON HOW TO REFLECT THE CHEMICAL WEAPONS CONVENTION IN CODES OF PROFESSIONAL CONDUCT OF SCIENTISTS AND IN CHEMISTRY EDUCATION

**Presenter: Alberto Breccia Fratadochi (Italy)**

#### Slide 1

##### IUPAC/OPCW OBJECTIVES

- To increase awareness of the Chemical Weapons Convention
- To involve the scientific community of chemists and chemical engineers
- To enhance knowledge and implementation into chemistry teaching
- To promote ethical conduct of chemists and chemical engineers

#### Slide 2

##### ISSUES IUPAC/CEE

- IUPAC organises international conferences on science of education. The next one will be held in South Korea (2006). Those meetings offer the opportunity to distribute the recommendations that the joint project with OPCW would develop.
- IUPAC has formed a task force. It means further development of collaboration

#### Slide 3

##### PURPOSE OF WORKSHOP IN JULY (suggested 09-11)

- Preparation of workshop
- Identification of issues and contributors
- Agreement on main parameters such as time and venue, responsibilities and programme committee
- Discussion of funding

#### Slide 4

##### TARGET AUDIENCE AND CHANNELS OF INFLUENCE

This would include:

- Government Organizations
- Chemistry Societies and Academies
- Universities
- Student Unions
- Science Journalists
- Funding Organizations

Slide 5  
ISSUES OF WORKSHOP

- Focus on professional ethics of chemists, chemical engineers, chemical industries
- Sustainable development, sustainable disarmament and peace
- CWC issues into regular chemistry teaching, chemistry degree courses and seminars
- Regular information to the public through science journalists on the activity of the OPCW

Slide 6  
QUESTION TO ADDRESS FOR JULY WORKSHOP

- Approach in the context of sustainable development and CWC issues: the OPCW is aware of the law and can speak with authority
- To provide a report to the States Parties to keep them informed and encourage any action necessary on their side
- To provide information to educators via ICCE
- IUPAC to inform Chemistry Societies and the chemical industry
- Follow-up publications in OPCW publications and IUPAC periodicals

Slide 7  
HOW TO APPROACH AUDIENCE ON THE MAIN THEMES OF THE WORKSHOP

- 1) How can undergraduate and postgraduate programmes address the ethical and practical aspects of preventing the misuse of chemistry in the context of the CW Convention?
- 2) How can we encourage universities, national societies, industry, research bodies and governments to reflect CWC issues in the context of sustainable development?
- 3) How can we promote the proper use of chemistry-based activities and encourage appropriate oversight, in particular for research that generates unpredictable results?

Slide 8  
THE PROGRAMME COMMITTEE

- The following Programme Committee was formed: Peter Atkins, Natalia Tarasova, Ted Becker, Ralf Trapp (convenor), Alberto Breccia Fratadocchi, Robert Robson

Slide 9  
RESPONSABILITIES OF THE PROGRAMME COMMITTEE

- Prepare the workshop agenda and programme
- Identify key issues that require background documentation before the meeting
- Identify subjects and speakers that require presentation to the plenary of the workshop
- Identify for each of the thematic blocks facilitators and *rapporteurs* to chair the break-out sessions

Slide 10  
FRAMEWORK OF THE WORKSHOP

- Number of days: 2-3
  - Number of people: 50
  - Day 1: Plenary and break-out sessions
  - Day 2: Plenary and break-out session
  - Day 3: Wrap-up and future actions
- Review points each day

Slide 11  
PARTICIPANTS

- Direct audiences: Chemist, Educators
- Audiences we wish to influence: National Societies, Regulatory Authorities (National Authorities, OPCW PMOs), Media (journalists specialising in science affairs), Students Unions
- Other specific individuals

Slide 12  
POSSIBLE VENUES

- 1) Oxford, UK
- 2) Ditchley House
- 3) Cumberland Lodge
- 4) RI

Dates: arr. 9; dep. 12 pm  
Plenary meeting room, full meals, 4/5 breakout rooms

Slide 13  
FUNDING

- Cost for participants (transportation, local amenities)
- Additional workshop cost and post-meeting expenses (documentation, services, equipment rental, overheads, publication, follow-on projects)
- It can be assumed that some of the participants will be able to find their own travel funding
- OPCW intends to establish a trust fund for SAB work that is not supported by its annual budget

Slide 14  
PERSONAL COMMENTS

I suggest that the Members of the SAB should contact in their country: National Chemical Society, Associations of Chemical and Pharmaceutical Industries, Universities and Academies; also with local seminars to provide knowledge of the Workshop and to speak about the issues of the OPCW also suggesting a new kind of teaching chemistry.