

Advice on Advances in Science and Technology

(RC-4/DG.1, paragraphs 16-23)

- Given the potential impact on the Convention of the convergence of chemistry and biology, the SAB and Secretariat should keep under review developments in biological and biomediated processes, metabolic engineering, the synthesis of replicating organisms, the use of enzymes for decontamination, and biotechnology, as well as any other related aspects it deems relevant to the Convention, and report on their implications for the Convention.
- The SAB and the Secretariat should continue to work across areas of overlap between the Chemical Weapons Convention and the Biological Weapons Convention and promote joint discussions amongst international experts in these areas.
- The SAB and Secretariat should continue to assess developments in technical fields of increasing relevance to the Convention, such as computational chemistry, Big Data, informatics and artificial intelligence, forensic science, remote sensing, and unmanned automated systems.
- Although biological or biomediated processes do not currently appear likely to be suitable for production of traditional chemical warfare agents, the Secretariat should continue to monitor developments closely.
- The SAB continues to emphasise the recommendation that, taking into consideration the convergence of chemistry and biology as it relates to the synthesis of chemicals, any process designed for the formation of a chemical substance should be covered by the term “produced by synthesis”.
- As the number and variety of facilities using a biological or biomediated process to produce chemicals increase, the degree of relevance of these facilities to the object and purpose of the Convention will need to be assessed to determine whether there are grounds to exempt certain types of facilities or a need to review thresholds for declaration and inspection of other chemical production facilities (OCPFs).
- In view of the many interesting and potentially enabling technologies that are described in this report, the Secretariat is encouraged to consider ways in which such technologies may prove valuable in enhancing its capability to verify compliance with the Convention and to assist States Parties in improving their own capabilities. This should be informed by capability requirements, not the technology itself. In general, the SAB is of the view that technological change is best considered from a practical perspective, focusing on capabilities relevant to the Convention, irrespective of scientific discipline.
- The SAB recommends that the Secretariat adopt a systematic approach to the continued professional development of its technical experts to ensure that they possess the knowledge and expertise to identify, evaluate, and apply scientific and technological advances relevant to its work.

Advice on Chemicals

(RC-4/DG.1, paragraphs 24-29)

- Given the substantial changes in chemistry and chemical industry since the schedules were finalised a quarter century ago, a review of the schedules should be considered to assess whether: (a) the chemicals currently listed are in the appropriate schedule, and (b) any toxic chemicals or specific precursors should be added to or removed from the schedules. In this connection, it should be considered whether it is technically feasible to accurately monitor Schedule III chemicals that are produced in very large quantities (e.g. over 100,000 tons/year).
- The SAB advises against relying solely upon Chemical Abstracts Service (CAS) numbers to define chemicals covered by the schedules. Although relevant as aids to declaration and verification, CAS numbers are not the only means to identify a chemical or to determine whether a chemical is included in or excluded from a schedule. This advice is consistent with previous SAB views on this subject.
- In order to ensure the consistency of declarations, if a chemical is included within a schedule, then all possible isotopically-labelled forms and stereoisomers of that chemical should be included, irrespective of whether or not they have been assigned a CAS number or have CAS numbers different to those shown in the Annex on Chemicals to the Convention. The isotopically-labelled compound or stereoisomer related to the parent chemical specified in the schedule should be interpreted as belonging to the same schedule.
- Technical discussions of so-called “incapacitating chemicals” or central nervous system-acting (CNS) chemicals remain exhausted. The SAB sees no value in revisiting this topic as scientific facts remain unchanged since the SAB first considered the issue. In view of the increasing availability of such chemicals, the Secretariat should be prepared to develop capabilities that could be required to conduct missions involving an alleged use of CNS-acting chemicals for hostile purposes, including sample collection and the addition of analytical data to the OPCW Central Analytical Database (OCAD). This is consistent with previous SAB advice on the subject.
- In view of the use of toxic industrial chemicals (TICs) as chemical weapons, the Technical Secretariat should seek to identify markers that may be formed through reactions of TICs with living tissue or materials present in the environment and assess the utility of such markers in investigations.
- The Secretariat should enhance its efforts to strengthen the capabilities of international laboratories to identify the hostile use of toxins and analyse samples for toxins. This could include: (a) updating the existing ricin and saxitoxin fact sheets; (b) preparing similar fact sheets on other toxins that have been weaponised (such as staphylococcal enterotoxin B) or that are deemed to pose a high risk of potential use as weapons; (c) identifying a priority set of toxins for the development of analytical methods; and (d) collaborating closely with other networks of laboratories that are seeking to build capabilities for toxin analysis.

Advice on Science and Technology of Relevance to Verification

(RC-4/DG.1, paragraphs 35-47)

- Effective verification requires assessment of all relevant information pertaining to a site and the State Party, not simply the evaluation of a single inspection. Consequently, the Secretariat should move toward an integrated approach where all of the separate elements of information are combined and analysed systematically.
- In order to enable the Secretariat to take a more analytical approach to verification, using all available information, the Secretariat should review the Verification Information System (VIS), develop new templates for Article VI inspection reports that would make it possible to upload the entire report to the VIS as a searchable document and explore possibilities for the secure transmission of documents and data between an inspection site and OPCW Headquarters.
- The SAB notes that satellite imagery has proven useful in planning contingency operations and recommends that the Secretariat consider cooperating with other international organisations and experts to enhance its capability to interpret and apply satellite information to non-routine operations. The use of hyperspectral, thermal, and near-infrared imagery can provide information related to chemical changes in the imaged area.
- In order to enable inspection teams to operate in dangerous or remote areas, the Secretariat should review remote and automated monitoring technologies to identify where their capabilities could be beneficial. Corresponding equipment should be added to the list of approved inspection equipment.
- Appropriate analytical data for chemicals that may pose a risk to the Convention or that are needed to help differentiate permitted activities from prohibited activities should be added to the OCAD. This could include isotopically labelled relatives and stereoisomers of scheduled compounds, salts of scheduled chemicals, toxic industrial chemicals, CNS-acting chemicals, riot control chemicals, bioregulators, toxins, and unscheduled chemicals that have been identified as posing a risk to the Convention.
- In order to strengthen the capability of the designated laboratory network to analyse operational samples, the SAB recommends that preparedness to do so be a factor in maintaining designation and that the network be expanded both geographically and in terms of capabilities.



- The SAB recommends that technical data related to sample analyses conducted for the OPCW be shared among laboratories in the network and published in peer-reviewed scientific journals, enabling all laboratories to benefit from proven methods and technologies.
- Given the requirement for the OPCW to be able to investigate alleged use of non scheduled toxic chemicals, the capability to detect and identify traces of such chemicals and associated degradation and reaction products should be strengthened, inter alia, through suitable exercises.
- In view of the critical role of biomedical samples in investigations of alleged use of toxic chemicals, the Secretariat should actively encourage further research on potential markers of exposure to such chemicals. The Secretariat should engage with experts from a broad range of fields to identify promising analytical approaches.
- In order to facilitate investigations of alleged prohibited activities, the Secretariat should maintain a curated collection of reference samples and chemical data, including compiled data on abandoned chemical weapons, the environmental fate of toxic chemicals, and impurities associated with synthetic routes to nerve and blister agents.
- The Secretariat could develop a repository of technical information on the environmental impact of old, abandoned, and/or sea dumped chemical weapons in order to facilitate knowledge sharing through the Secretariat. This type of information contains useful data for understanding the environmental fate and transport of chemical warfare agents, which has value for investigative and retrospective analysis.
- Investigative techniques required for the verification of use of toxic chemicals include approaches used by the forensic community. The Secretariat, in consultation with relevant experts, should identify such commonly used forensic techniques and protocols to assess their applicability for its own activities.
- The SAB supports the project to upgrade the OPCW Laboratory to a Centre for Chemistry and Technology. This would enable the Laboratory to increase capabilities to meet its expanded mandate. An upgraded facility would be better able to facilitate proficiency testing and confidence building exercises, contingency operations, the handling and storage of authentic samples, provide training, and bring higher scientific visibility to the OPCW.

Advice on Technologies for the Delivery of Toxic Chemicals and Drugs

(RC-4/DG.1, paragraph 34)

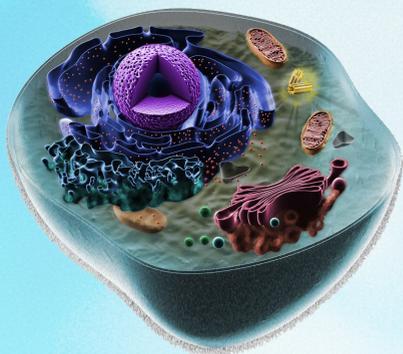


- The continued development of unmanned aerial vehicles (UAVs) to deliver payloads for permitted purposes should be monitored to assess risks of development for chemical weapon delivery purposes.



Advice on Developments in Chemical Production and Chemical Discovery

(RC-4/DG.1, paragraphs 30-33)



- OPCW verification could benefit from risk assessment tools and practices employed in the chemical industry, specifically those that have been developed to facilitate safer process and product design, and for regulatory compliance.
- Aspects of good practices employed in the chemical industry for knowledge management could enable more efficient use of information in OPCW operations.
- Efforts to ensure that the verification regime remains effective would benefit from more extensive engagement with technical experts from industry, and review of industry focused research and development, including the driving forces for adoption of new technologies into industrial processes.
- Many facilities worldwide produce toxic chemicals that may be relevant to the Convention in quantities below current declaration thresholds (e.g. highly active pharmaceutical ingredients or toxins used for cosmetic purposes or cancer therapy). The corresponding verification thresholds for facilities producing such chemicals should be addressed by the SAB and its recommendations should be considered.



Advice on Assistance and Protection

(RC-4/DG.1, paragraph 48)

- In order to enhance OPCW's capability to assist States Parties in response to a chemical weapon attack or incident involving toxic chemicals, the Secretariat should strengthen its preparedness and monitor advancements in medical countermeasures, detection, physical protection, and decontamination.

Advice on Science and Technology of Relevance to Chemical Safety and Security

(RC-4/DG.1, paragraphs 49-51)

- The SAB encourages the Secretariat to engage with technical experts to ensure that its efforts to assist States Parties with chemical safety and security have a sound scientific and technological foundation.
- The SAB recommends that the Secretariat encourage research in chemical security to prevent toxic chemicals from being acquired by non-State actors with intent to use them as chemical weapons. The research support programme under Article XI provides a possible mechanism.
- The SAB has been informed that a number of States Parties, where the economies are either developing or in transition, have expressed interest in improving their chemical safety and security capabilities, specifically with regard to monitoring the transfer of chemicals into and out of their territories. The SAB recommends that the Secretariat strengthen its partnerships with international organisations engaged in the research and development of technologies for this purpose. Further, the SAB recommends that the Secretariat pursue collaborative projects with such organisations in order to develop additional internal expertise to assist States Parties.



Advice on Scientific Literacy and Science Advice

(RC-4/DG.1, paragraphs 52-56)

- Greater interaction between the SAB and Secretariat staff who perform operational roles would strengthen the Board's ability to identify science and technology-related issues facing the OPCW and augment the Board's ability to provide practical advice.
- Given the increasing degree to which scientific and technological change impacts the effective implementation of the Convention, the Secretariat should continue to strengthen its capability to monitor and forecast developments and their implications.
- Both the Secretariat and the SAB should maintain a “watching brief” in the areas most likely to have the greatest impact on the Convention's verification regime. In particular, these include chemicals and technologies that markedly increase potential for the hostile use of chemicals, as well as technologies that provide substantially enhanced capabilities for verification purposes. In maintaining this “watching brief”, the SAB and the Secretariat should be mindful of the importance of separating technological possibility from demonstrated technological capability.
- In view of the increasingly interdisciplinary nature of advances in science and technology relevant to the Convention, the SAB should continue to build close working relationships with relevant professional societies and science advisory bodies of other relevant international organisations to enable it to identify and assess developments that may impact the Convention or the OPCW. Such relationships should also be utilised to raise awareness of the Convention and to promote its norms.
- The SAB briefings to States Parties and the “Science for Diplomats” sessions held on the margins of meetings of the Executive Council and Conference of the States Parties have fostered greater discourse between scientists and policy makers and promoted greater scientific awareness. These initiatives should continue.



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