

The report of the Third Pugwash Workshop on CW attached is a particularly significant one, which may not be apparent to those who have not followed developments closely, especially the lack of progress in negotiations at the UN Conference of the Committee on Disarmament (CCD) for a treaty to ban chemical weapons. (A ban on biological weapons was achieved in 1972). The main difficulty has been the question of on-site verification, insisted upon mainly by the USA, to ensure that the terms of any treaty banning the development, production and stockpiling of such weapons are adhered to. Until now this principle has not been accepted in any sense or degree by the USSR and allied nations, and has been vigorously apposed in the past by spokesmen from these countries both in the CCD and, to a lesser extent, in previous Pugwash meetings on the subject. The informal nature of Pugwash discussions has allowed slow but steady progress to be made in mutual understanding with respect to this thorny problem, and in fact the continuing discussions at the Pugwash level have been considered by senior US officials to be at least partially responsible for holding up US Congressional approval of funds for the production of binary nerve gas weapons, which are stable and more easily handled logistically than are the presently stockpiled nerve gases.

It will be noted in the attached report, which has been distributed to CCD delegations, that the on-site principle has now been recognized and accepted by all participants, including those from eastern socialist countries. While all participants at Pugwash meetings attend in their individual capacity, and do not necessarily represent government viewpoints, the meeting of minds as recorded could well constitute a significant breakthrough of the impasse of the past two years. Future discussions in CCD will no doubt involve the terms of reference and functions of an International Verification Authority which, in turn, may involve WHO as part of such an Authority.

M. Kaplan

---

The Third Pugwash Chemical Warfare Workshop  
London, 12-14 April 1976

List of Participants

Prof. K.K. BABIEVSKI

Academy of Sciences, Leninsky Prospekt 14, Moscow V-71, U.S.S.R.

Lt. Gen. WOLF GRAF VON BAUDISSION (ret.)

Director, Institute for Peace and Security Policies, University of Hamburg,  
Falkenstein 1, 2000 Hamburg 55, F.R.G.

Mr. G.R. BERDES

Subcommittee on International Security & Scientific Affairs, Committee on International  
Relations, House of Representatives, US Congress, Washington, D.C. 20515, U.S.A.

Prof. Z. BINENFELD

Kraseva 14/I, 41 000 Zagreb, Yugoslavia.

Dr. A.F. CHILDS

c/o Albright & Wilson Ltd., 1 Knightsbridge Green, London SW1X 7QD, U.K.

Prof. V.S. EMELYANOV

Academy of Sciences, Leninsky Prospekt 14, Moscow V-71, U.S.S.R.

Col. J. FRANEK (ret.)

Institute of Experimental Medicine, Czechoslovak Academy of Sciences,  
12808 U Nemocnice 2, Praha 2, Czechoslovakia.

Dr. E.E. GALAL

Director, Drug Research and Control Centre, P.O. Box 29, Cairo, Egypt.

Prof. K. IPSEN

Lehrstuhl für Öffentliches Recht III, Postfach 2148/Geb. GC 8/148, 463 Bochum 1, F.R.G.

Dr. M.M. KAPLAN

World Health Organization, 1211 Geneva, Switzerland.

Maj. Gen. R.E. LLOYD (ret.)

Snooks Farm, Wadhampton, Leamington, Hampshire, U.K.

Prof. Kh. Lohs

Akademie der Wissenschaften der DDR, Forschungsstelle für Chemische Toxikologie,  
Johannisallee 20, 701 Leipzig, G.D.R.

Dr. S.J. LUNDIN

Roslagsgatan 17, IV, S-113 55 Stockholm, Sweden.

Prof. J.K. MIETTINEN

Dept. of Radiochemistry, University of Helsinki, Unioninkatu 35, Helsinki 17,  
Finland.

Dr. A.J.J. OOMS

Chemical Laboratory TNO, Lange Kleiweg 137, P.O. Box 45, Rijswijk-2100, Netherlands

Mr. R. E. ROBERTS

Midwest Research Institute, 425 Volker Boulevard, Kansas City, Missouri 64110,  
U.S.A.

Mr. J. P. PERRY ROBINSON

Science Policy Research Unit, Mantell Building, University of Sussex, Brighton,  
Sussex BN1 9RF, U.K.

Dr. K.J. SCHMIDT

c/o PF-Leitung, Geb. W4, Bayer AG, D 509 Leverkusen, F.R.G.

Mr. J. STARES

2 Virginia Way, Reading, Berks., U.K.

Col. V. VOJVODIĆ (ret.)

Bulevar Revolucije 257/3, 11000 Belgrade, Yugoslavia.

# REPORT FROM THE THIRD PUGWASH CHEMICAL WARFARE (CW) WORKSHOP

London, April 12 - 14, 1976

## 1. INTRODUCTION

Progress towards a comprehensive ban on the development, production and stockpiling of chemical weapons continues to be slow. In fact, serious concern has been expressed in the UN Conference of the Committee on Disarmament (CCD) that progress has been completely stopped because the USA-USSR joint initiative promised in 1974 never appeared.

The draft CW treaty proposed by seven socialist countries in 1972 follows very closely the 1972 Biological Convention. This draft is considered to be comprehensive in scope but inadequate with respect to verification measures. The Japanese draft CW treaty of 1974 also needs considerable tightening, for example regarding definition, exemptions from the prohibition and verification procedures. Thus, both draft treaties will have to be complemented further.

Binary-weapon technology constitutes an innovation in chemical warfare. However, binary precursors and components can be defined on the basis of the purpose criterion and their non-production could be verified, i. a. in the framework of the phosphorus accountancy system (PAS). It is noted that suggestions in the CCD, i. a. by Sweden and Yugoslavia with regard to definitions, including binary components, possible exemptions from a ban, etc., might improve the existing proposals.

In 1974 the US Ambassador to the CCD suggested that, instead of the joint initiative proposal to ban, as a first step, only "the most dangerous, lethal" agents, an "initial prohibition should deal with all lethal agents".

According to information reaching the Workshop during its session, a new approach has been presented in the CCD by the US Ambassador regarding the possibilities of technical exchange visits, i. a. with respect to verification of destruction of stockpiles, disposal and production facilities. Since such undertakings have been recommended for some time, and in fact were proposed by the previous Workshop, further discussions

of this issue in the CCD will be followed with great interest in view of our own discussion on these subjects at this session.

The two previous Workshops were concerned primarily with verification. Notable progress had been made in clarifying the respective roles of the National and International Verification Agencies that would be required. There had also been detailed discussion of possible techniques for verifying non-production of nerve gas, particularly the PAS technique, and for verifying the destruction of CW stockpiles. Verification matters were retained on the agenda for the Third Workshop, but it was also decided to break fresh ground by exploring in detail prevailing military attitudes towards chemical weapons and chemical warfare. To this end a number of experienced military men were invited to participate, and the report which follows reflects their views as well as those of other participants.

With regard to verification, the agenda was as follows:

Verification and its significance for achieving a treaty:

1. Problems of industry in verification
2. Legislative arrangements
3. International aspects of verification
4. Verification requirements of the smaller states.

In addition, any developments concerning the following aspects of topics discussed at the second Workshop in April 1975 were also given brief attention:

- a) Verification of development and identification of future trends by literature scanning
- b) Verification of production by economic data monitoring
- c) Verification of disposal of stocks through destruction and/or redeployment
- d) Possible contributions for verification from existing international organizations
- e) Need for standardization of verification methods.

In order to develop proposals which seemed to hold out special promise, and at the same time to avoid undue replication of earlier work, it was decided to concentrate

on three main topics, all of which, to some degree, embraced the agenda items listed above: verification of destruction of stocks; verification of non-production, particularly the use of on-site techniques; and the verification requirements of states other than the superpowers.

It was recognized that the urgent need for a total ban to prevent further proliferation, development and stockpiling of chemical weapons should not be obscured by the present technical difficulties in finding graduated solutions to the problems of scope and verification of such a ban.

## 2. MILITARY ASPECTS

Chemical weapons are today part of the arsenals of the operational military forces of presumably only a few states. While the technological processes for producing chemical weapons are not widely known, details of the chemistry of chemical agent production are common knowledge, and this, together with existing chemical weapons, creates a real danger of proliferation of chemical weapons to many more countries, with consequent escalation of conflicts between them. Such proliferation would considerably increase the difficulties of achieving a treaty on the prohibition of the development, production and stockpiling of chemical weapons, and on the destruction of existing stockpiles. There is, therefore, an urgent need to accelerate efforts towards achieving such a treaty.

We recognize that, ultimately, the solution to this problem lies in the political sphere. However, since military considerations have great influence on political decisions on these matters, we feel that it is important to consider the military attitudes to chemical warfare.

In considering the military attitudes, it is convenient to discuss the potential use of chemical weapons under the headings: (a) major powers and their alliances; and (b) other States.

A. Major powers and their alliances

The military postures of the major powers apparently require the maintenance of defensive measures for their armed forces against chemical warfare, plus an offensive capability. While there exists mistrust between nations, this perceived need will tend to be perpetuated. The inhibitory effect of the Geneva Protocol on the use of chemical weapons should be reinforced by prohibiting the development, production, and stockpiling of chemical weapons and training in their use. This cannot be achieved unless there is reasonable assurance on all sides that such measures are being implemented.

From a strictly military point of view, the entire gamut of chemical weapons, including the super-toxic nerve gases, has little rationale: between States that are well-equipped for and against their use, chemical weapons can provide no decisive strategic advantage that could not be provided by other weapons, are of indiscriminate nature as regards civilian populations, and in fact could even have severe tactical disadvantages because of the cumbersome necessary accompaniment of protective clothing and other equipment for troops. Therefore the consequences of a political decision to eliminate such weapons from military arsenals, via an effective international agreement banning their existence, should not be difficult to accept militarily. This provides a great opportunity for removing one source of distrust without compromising military security. As one step forward, renunciation of use of such weapons under any circumstances, even for reprisals in kind, could well break the present deadlock in progress towards disarmament.

Among the approaches that can be made towards solving the problems of chemical disarmament, we feel that progressive stages of confidence-building measures of every possible nature should be exploited. Some examples of such confidence-building measures are:

- (a) unilateral announcements of the commencement of destruction operations;
- (b) a programme for providing for multilateral exchange, especially between

the two superpowers, of observers at destruction operations and production facilities;

(c) invitations to military manoeuvres so that observers could verify the state of CW training;

(d) unilateral declarations by states that they would never develop, produce, stockpile or transfer chemical weapons, or give aid to other nations in acquiring a chemical warfare capability. A number of the smaller or neutral countries have already made such declarations, and we call upon all States to make similar concrete commitments.

#### B. Other States

Historically, since World War I, chemical weapons have been used only by more powerful States against weaker and defenceless adversaries. Modern chemical weapons continue to represent a potential danger for States which do not possess such weapons nor adequate protection against them, and feel themselves threatened by the existence of chemical weapons. One approach to reduce the consequences of chemical attacks would be to have an adequate level of protection and defensive training, while working on the international level for legal barriers against the possession and use, and threat of use, of chemical weapons.

Some States might, in some circumstances, come to the conclusion that chemical weapons offer military advantages against defenceless adversaries. However, chemical weapons and defences are complex and cumbersome military tools, and the political consequences of their use would be difficult to calculate. Moreover, as with other weapons of mass destruction, the development, acquisition or possession of chemical weapons by smaller States would have severe destabilizing effects, especially in areas of local conflicts, mistrust and tension. In this connection the introduction of other weapons of mass destruction should be urgently opposed by the world community to



prevent a disastrous resort to chemical weapons as a retaliatory measure by the threatened adversaries. Therefore, the interests of smaller States would be best served by refraining from acquiring this option. Declarations and regional agreements to this effect among the small States themselves should be encouraged as much as possible.

An important confidence-building measure would be declarations by possessors of chemical weapons not to use chemical warfare under any circumstances against States who do not possess chemical warfare capabilities, backed up by UN guarantees of assistance and protection to such States and of sanctions against aggressors.

### 3. VERIFICATION ISSUES

#### A. Stockpile destruction

It was noted that the USA and Canada have destroyed stocks of unwanted chemical weapons, and that further destruction of stocks is continuing in the USA. We welcomed the degree of detail in the disclosures by these countries about the CW agents and destruction methods involved in these operations. As noted above, the release of similar information by other States would add significantly to the growth of mutual trust, as would unilateral announcements by States of the commencement of destruction operations, and a programme for providing for multilateral exchange, especially between the two superpowers, of observers at destruction operations and production facilities.

The idea of exchange visits of international observers to witness stockpile destruction was first raised at our 1975 Workshop, and their confidence-building potential was again emphasized. The existence of on-going stockpile destruction operations, which will take many years to complete, offers the opportunity to arrange such visits. The visits could provide the opportunity to test the concepts and methodology of verification, prior to the final negotiation of a treaty. It was noted that, with existing chemical and toxicological monitoring techniques, destruction of stockpiles could be verified adequately. These techniques would be applicable in a variety of situations, even when the agent being

destroyed is not known.

Provisions for verification of stockpile destruction ought to be a part of a CW treaty. The verification of stockpile destruction is seen as a function of international trust. The prerequisite would be that States parties to the treaty declared their stockpiles. While the conduct and verification of stockpile destruction would primarily be the responsibility of states possessing stockpiles, and their National Verification Agencies (NVA), each State should give prior notice of each destruction operation to the International Verification Agency (IVA). The invitation, at the same time, of observers from an international body, such as the IVA, would be a powerful tool for building mutual trust. While recognizing the concept of national sovereignty, the IVA has the right and duty to request, on a routine and ad hoc basis, the presence of international observers, under established procedures, to witness each destruction operation.

#### B. Production

The organizational arrangements noted above for the verification of stockpile destruction were considered to be applicable in principle also to the verification of non-production. However, it was recognized that issues of considerably greater sensitivity (such as industrial secrecy) were involved in the production of chemical compounds than in the destruction of chemical warfare agents. Accordingly, the discussion of non-production verification concentrated on remote and near-site techniques, such as the PAS and those analytical methods reported below. Though some of these non-intrusive techniques already possess remarkable capabilities, they require further development, and the need to employ complementary on-site techniques cannot be excluded. This requires further study, taking into account the sensitivities of the chemical industry. However, the verification techniques used in the WEU system (which include on-site techniques) appeared acceptable to the industries to which they were applied. It is realized that if a CW-agent production ban were violated, it would be on the initiative of

governments rather than chemical industries, and that less than adequate verification methods could be most damaging for States party to a CW treaty.

It was suggested that an invitation to visit an industry producing organophosphorus chemicals should be sought as a confidence-building measure. In combination with that, a seminar on the acceptability to industry of different systems for verification of non-production of CW agents should follow. Also technical and economical problems in this connection should be discussed.

These proposed activities would provide insight only into the verification problems presented by the organophosphorus compounds. This would, however, be a basis from which techniques for existing and potential CW agents could be developed.

#### C. Verification problems for smaller States

The so-called smaller States have a special approach to the verification problem regarding the international control of inspection as a part of a national and international verification system based on defined demands and elected international experts. They should be interested in putting it to work for two reasons: (a) in order to prevent or identify the proliferation of these weapons; and (2) most of these countries possess no adequate technical facilities, necessary knowledge or professional staff needed for NVA duties, so that all necessary measures should be provided to assist them through IVA (staff, equipment, and laboratories) or by other kinds of international cooperation, thereby increasing their ability to take part in the overall verification. It should also be realized that smaller States do not possess "national technical means" of verification for monitoring the situation in other States, and that this might put them at a considerable disadvantage in observing the compliance of other States with the treaty.

D. Possible verification techniques

Several possible verification techniques were discussed, with particular attention being devoted to the PAS technique and to three methods for sample analysis, those described in the papers of A.J.J. Ooms and H.I. Boter, R.E. Roberts, and S.J. Lundin.

Lundin envisaged a toxicological method that would be applicable to destruction verification. The toxicities of blind samples taken from the destruction-process input and output streams would be compared by injection into animals according to established procedures. This method could be used to verify detoxification without disclosure of the chemical identity of the agent or of its destruction products.

The other two methods could be applied in near-site verification procedures. Roberts described immobilized-enzyme sensors of exquisite sensitivity that had been developed for the real-time detection of anticholinesterase agents. They were capable of detecting emitted organophosphorus compounds even from production or destruction processes subject to the most stringent emission controls: in air from distances exceeding two kilometres, and in ground water from distances several times further. Ooms described a gas-chromatographic technique that had been developed in his laboratory for the detection of methylphosphonate residues in highly polluted river water, sensitive down to levels beyond the capacity of existing carbon-adsorption waste-treatment processes. For the present, nerve gases are the only methylphosphonic acid derivatives likely to be manufactured on anything larger than an experimental scale.

It was noted in the discussion that, while each of these methods had its limitations, they might nonetheless form an important component of an overall verification scheme. Such was their promise that it was hoped that the results so far obtained would stimulate further work on these and other such non-intrusive techniques.