BIOLOGICAL WEAPONS ACT OF 1989; INTER-AMERICAN CONVENTION ON INTERNATIONAL COMMERCIAL ARBITRATION

HEARING

BEFORE THE

SUBCOMMITTEE ON IMMIGRATION, REFUGEES, AND INTERNATIONAL LAW

OF THE

COMMITTEE ON THE JUDICIARY HOUSE OF REPRESENTATIVES

ONE HUNDRED FIRST CONGRESS

SECOND SESSION

ON

H.R. 237

BIOLOGICAL WEAPONS ACT OF 1989

AND

H.R. 4314

INTER-AMERICAN CONVENTION ON INTERNATIONAL COMMERCIAL ARBITRATION

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STATEMENT OF MATTHEW MESELSON, PROFESSOR OF BIOCHEMISTRY AND MOLECULAR BIOLOGY, HARVARD UNIVERSITY

Mr. MESELSON. Thank you, Mr. Chairman. I appreciate the opportunity to take part in your consideration of legislation to implement the Biological Weapons Convention of 1972 in U.S. domestic law.

In considering this legislation, I believe it is important to be aware of the reasoning that led the United States to renounce biological and toxic weapons 20 years ago. At that time, after careful interagency review, the United States unilaterally and unconditionally renounced the development and possession of biological and toxin weapons. Our stockpiles of such weapons were destroyed, and our facilities for developing and producing them were converted to peaceful uses. The United States also declared its support for a global treaty banning these weapons, leading to the Biological Weapons Convention of 1972.

These U.S. decisions went far beyond the mere cancellation of a program, they renounced, without prior conditions, even the option to develop or acquire biological and toxin weapons. Why?

First, it was understood that the principal military characteristic of biological weapons is their potential for killing or threatening to kill human populations over large areas. But this was a capability the United States already possessed in the form of nuclear weapons. There was no need for any additional capability of this sort.

Second, it was evident that biological weapons could be much simpler and less expensive to produce than nuclear weapons, potentially placing them within reach of nations and even dissident groups or terrorists unable to produce or obtain nuclear weapons. Biological weapons therefore had the potential to greatly increase the number of forces that could pose a major threat to the United States.

Third, it was realized that our biological weapons program was pioneering a technology that, once developed, could easily be duplicated and that our program seriously risked inspiring others to follow suit. This stark analysis led directly to the conclusion that our biological weapons program was a serious threat to our own security, with no compensating benefits.

The policy implication was that we should convincingly renounce biological weapons and seek to strengthen international barriers to their development and acquisition. In implementing this basic policy, the U.S. supported negotiations leading to the Biological Weapons Convention of 1972, ratified it with unanimous Senate support in 1975, was a leader in successful efforts to reach agreement on measures to strengthen the convention at its second review conference in 1986, and will seek additional strengthening of the convention at its third review conference in 1991.

Our first and most important line of defense against biological and toxin weapons is the effort to prevent them from coming into existence. We do this by convincingly demonstrating our own compliance and support for the Biological Weapons Convention, by helping to lead the international effort to strengthen confidence

building and verification measures, and by using our influence to persuade nations outside the convention to join it.

All of these objectives are well served by the legislation you are considering to embody the prohibitions of the Biological Weapons Convention into domestic U.S. law. Its passage will fulfill the U.S. obligation under article 4 of the convention to prohibit any development, production, transfer, or acquisition of biological or toxin weapons within U.S. territory or under U.S. jurisdiction anywhere. Passage of this legislation will make it less likely that any U.S. citizen or firm will render aid to any nation, group, or individual seeking to develop or obtain biological or toxin weapons and will make all individuals subject to U.S. law more alert to the prohibitions of the convention and the need for vigilance in preventing violations. Moreover, by reemphasizing U.S. resolve and commitment to blocking any development or acquisition of biological and toxin weapons, enactment of this legislation will enhance the ability of our negotiators to secure maximum support for measures to strengthen the convention at the third review conference next year and will enhance our ability to persuade additional parties to join the convention.

Finally, nothing in the proposed legislation, as exemplified by S. 993 already passed by the Senate, poses any threat to peaceful research or commerce. Indeed, by its very existence, such legislation will help to protect our scientific and commercial biotechnology community from false suspicions of weapons-directed work.

To date, to the best of my knowledge, no nation possesses a stockpile of biological or toxin weapons. Nevertheless, there is justifiable concern that the recent proliferation and use of chemical weapons, particularly in the Middle East where several key states have not yet joined the Biological Weapons Convention, may set the stage for attempts by certain states or even terrorist groups to acquire biological weapons. The enactment of the proposed legislation will importantly strengthen the ability of the United States to prevent any such calamitous development.

With your permission, I would like to include in the record an article I have brought with me entitled, "Verification of biological and toxin weapons disarmament" by myself; Martin Kaplan, former scientific director of the World Health Organization; and Mark Mokulsky, a biophysicist in the Soviet Union.

Thank you. I would be glad to address any questions the subcommittee may have.

[The prepared statement of Mr. Meselson follows:]

PREPARED STATEMENT

TESTIMONY OF MATTHEW MESELSON
PROFESSOR OF BIOCHEMISTRY AND MOLECULAR BIOLOGY
HARVARD UNIVERSITY

BEFORE THE SUBCOMMITTEE ON
IMMIGRATION, REFUGEES AND INTERNATIONAL LAW
OF THE COMMITTEE ON THE JUDICIARY

US HOUSE OF REPRESENTATIVES

MAY 1, 1990

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First, it was understood that the principal military characteristic of biological weapons is their potential for killing or threatening to kill human populations over large areas. But this was a capability the US already possessed, in the form of nuclear weapons. There was no need for any additional capability of this sort.

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Third, it was realized that our biological weapons program was pioneering a technology that, once developed, could easily be duplicated and that our program seriously risked inspiring others to follow suit.

This stark analysis led directly to the conclusion that our biological weapons program was a serious threat to our own security, with no compensating benefits. The policy implication was that we should convincingly renounce biological weapons and seek to strengthen international barriers to their development and acquisition.

In implementing this basic policy, the US supported negotiations leading to the Biological Weapons Convention of 1972, ratified it with unanimous Senate support in 1975, was a leader in successful efforts to reach agreement on measures to strengthen the Convention at its Second Review Conference in 1986, and will seek additional strengthening of the Convention at its Third Review Conference in 1991.

Our first and most important line of defence against biological and toxin weapons is the effort to prevent them from coming into existence. We do this by convincingly demonstrating our own compliance and support for the Biological Weapons Convention, by helping to lead the international effort to strengthen confidence-building and verification measures, and by using our influence to persuade nations outside the Convention to join it.

All of these objectives are well-served by the legislation you are considering to embody the prohibitions of the Biological Weapons Convention into US domestic law. Its passage will fulfill the US obligation under Article IV of the Convention to prohibit any development, production, transfer, or acquisition of biological or toxin weapons within US territory or under US jurisdiction anywhere.

Passage of this legislation will make it less likely that any US citizen, or firm will render aid to any nation, group, or individual seeking to develop or obtain biological or toxin weapons and will make all individuals subject to US law more alert to the

prohibitions of the Convention and the need for vigilance in preventing violations.

Moreover, by reemphasizing US resolve and commitment to blocking any development or acquisition of biological and toxin weapons, enactment of this legislation will enhance the ability of our negotiators to secure maximum support for measures to strengthen the Convention at the Third Review Conference next year, and will enhance our ability to persuade additional parties to join the Convention.

Finally, nothing in the proposed legislation, as exemplified by S 993 already passed by the Senate, poses any threat to peaceful research or commerce. Indeed, by its very existence, such legislation will help to protect our scientific and commercial biotechnology community from false suspicions of weapons-directed work.

Today, to the best of my knowledge, no nation possesses a stockpile of biological or toxin weapons. Nevertheless, there is justifiable concern that the recent proliferation and use of chemical weapons, particularly in the Middle East, where several key states have not yet joined the Biological Weapons Convention, may set the stage for attempts by certain states or even terrorist groups to acquire biological weapons. The enactment of the proposed legislation will importantly strengthen the ability of the US to prevent any such calamitous development.

This concludes my prepared statement. I would be glad to address any questions the Subcommittee may have.

Mr. MORRISON. Professor Meselson, your offer will be accepted as far as putting that in the record, without objection, and we would be pleased to ask you questions in a couple of minutes.

Thank you.

[The article follows:]

VERIFICATION OF BIOLOGICAL AND TOXIN WEAPONS DISARMAMENT

Matthew Meselson, Martin Kaplan, and Mark A. Mokulsky

1. INTRODUCTION

The development, production, stockpiling, acquisition, and transfer of biological and toxin weapons are prohibited by the Biological Weapons Convention of 1972 (the BWC), to which more than 100 states are party. Unlike the Geneva Protocol of 1925, that prohibits the use but not the possession of biological and chemical weapons, the BWC is a true disarmament treaty, in that it seeks the actual elimination of a class of weapons. Since the BWC entered into force, in 1975, its very limited confidence-building and verification provisions have been significantly augmented. This has been accomplished not by amending the Convention itself but rather through agreements among its States Parties, reached at its First and Second Review Conferences, and also through actions taken at the United Nations. Additional strengthening of the regime for verifying biological and toxin weapons disarmament is expected to result from the Third BWC Review Conference in 1991.

In this article, we summarize the characteristics of biological and toxin weapons; the nature, capabilities, and limitations of protective measures; and the existing provisions and agreements for confidence-building and international verification of compliance with the BWC. We also present some proposals to enhance the effectiveness of the BWC.

2. CHARACTERISTICS OF BIOLOGICAL AND TOXIN WEAPONS [1,2]

2.1 Infectious Agents

Biological weapons employing infectious agents pathogenic to man have the potential to kill or incapacitate populations over large areas. This potential derives from the extreme smallness of the amount of agent sufficient to initiate infection. Delivered by aircraft, missile, or other means and dispersed near the ground as wind-borne aerosols to be inhaled by a target population, certain infectious agents could in theory approach the anti-personnel effectiveness of thermonuclear warheads, in terms of the weight of the agent and associated dissemination devices required to attack a given area. Moreover, infectious agents could lend themselves to modest, perhaps even rather inconspicuous means of delivery.

Today, no nation is known to possess biological weapons. During World War II, however, Great Britain, Japan, and the United States developed biological weapons based on explosive and insect dissemination of the agents of anthrax, plague, and other diseases. The infectious anti-personnel agents stockpiled for use in weapons by the United States before its unilateral renunciation of

biological weapons in 1969 included Francisella tularensis, the bacterium responsible for tularemia, Coxiella burnetii, the rickettsial organism responsible for Q fever, and VEE, the virus that causes Venezuelan equine encephalomyelitis. In addition, there were stocks of biological agents intended for use against food crops: Pyricularia oryzae and Puccinia graminis, the fungi responsible for rice blast and wheat rust, respectively. Examples of other infectious anti-personnel agents that have been studied for use in weapons or have been actually stockpiled are the viruses that cause Chikungunya fever, eastern equine encephalomyelitis, and yellow fever; the bacteria that cause brucellosis, cholera, and glanders; and the rickettsiae responsible for Rocky Mountain spotted fever and epidemic typhus. In addition, many other naturally-occurring infectious agents may have the stability, infectivity, virulence, and other characteristics suited to use in weapons for use against people, animals, or plants.

Contrary to a prevalent misconception, the development and production of reliable weapons based on infectious agents would be a major undertaking. Large technical resources and expenditures would be required for initial study, development, testing, and production of the biological agent itself, the devices for its dissemination, the means for their delivery, and the fully integrated biological weapon system. Even then, serious uncertainties in performance would remain. Nevertheless, such weapons could be simpler and less expensive to produce than nuclear weapons. Moreover, rudimentary but highly dangerous biological weapons of lower reliability could be produced with much less effort and expense, using widely available technology. Crude biological weapons are within the reach of many nations and even dissident groups and terrorists.

2.2 New infectious agents

The view is sometimes expressed that new methods in biotechnology, especially genetic engineering, could yield infectious biological warfare agents with military properties fundamentally different from those of infectious agents that are already known. It is undoubtedly true that additional agents could be developed by genetic engineering and also by more classical techniques. But no one has even proposed a realistic set of biological, physical, or other properties of a hypothetical novel agent that would endow it with military characteristics fundamentally different from those of known agents. One source of confusion in this regard is the widespread belief that previously developed agents were likely to cause widespread contagion beyond the immediately exposed target population and that more controllable effects would require the development of novel agents. This is not correct. For example, the agents of tularemia and Venezuelan equine encephalomyelitis, formerly stockpiled as biological warfare agents, can initiate infection if artificially disseminated as aerosols, but neither disease is effectively transmitted from person to person.

2.3 Toxins

Toxins are poisonous substances made by living things. The term is also applied to the synthetically produced analogues of such substances. Unlike infectious agents, toxins cannot reproduce. While infectious agents generally require incubation periods of a few days following exposure before illness develops, some toxins can cause incapacitation or death within minutes or hours. Examples of toxins that have been studied for use in weapons are the botulinal toxins, produced by the soil bacterium Clostridium botulinum, the enterotoxins produced by the bacterium Staphylococcus aureus, and ricin, present in castor beans, the seeds of Ricinus communis. Even humans produce substances that could in theory be used to cause poisoning leading to incapacitation or death. The neuropeptides known as tachykinins are an example.

Some toxins, for example tetrodotoxin, made by the globefish, have been chemically synthesized. The BWC states that its prohibitions apply to toxins regardless of their means of production. This point was emphasized in the Final Declaration of the Second BWC Review Conference, which states: "The Conference reaffirms that the Convention unequivocally applies to all natural or artificially created microbial or other biological agents or toxins whatever their origin or method of production. Consequently, toxins (both proteinaceous and non-proteinaceous) of a microbial, animal or vegetable nature and their synthetically produced analogues are covered."

It is for tactical battlefield use, where rapid action is an important factor, that toxins have been principally considered. For this purpose, however, the utility of toxins, including those that might be developed by genetic engineering or other new technologies, must be judged in comparison with that of already developed, weaponized, tested, and stockpiled chemical warfare agents, such as the highly lethal and rapidly-acting organophosphorus nerve agents and the blister and blinding agent, mustard. Unlike these well-known chemical warfare agents, which are highly stable liquids of simple chemical structure, toxins are generally complex organic substances. Accordingly, they are solids and often have lower stability to heat, surface forces, and oxidation. Not unexpectedly, attempts to weaponize toxins encountered serious difficulties in maintaining agent stability during and after release and in achieving efficient aerosolization. Other factors, including the difficulty of formulating toxin agents able to penetrate the skin and the expense and difficulty of manufacture also mitigated against successful development of toxin weapons.

Although considerable efforts were made to weaponize certain toxins during World War II and afterwards, no nation is known to possess toxin weapons or to have developed a battlefield weapon based on toxins that would be competitive with chemical weapons already stockpiled.

2.4 Weight requirements

For purposes of comparison, the approximate weights of representative bacterial, toxin, and chemical weapons estimated to be sufficient to kill or incapacitate a high proportion of an unprotected population within a 100 square kilometer target under atmospheric conditions favorable for efficient dispersal are listed in the Table. In addition, the Table gives the approximate weight of a 200 kiloton thermonuclear warhead, for which the area of high casualty production for air burst is also about 100 square kilometers.

2.4 Protection against anti-personnel biological and toxin weapons

Under certain conditions, medical procedures such as immunization or administration of antibiotics or other drugs can offer protection against some biological agents and toxins. For immunization, adequate supplies of vaccine or anti-serum against the specific threat agent must be on hand in advance and sufficient time must be available for administration to the population at risk. In addition, for vaccines, a period of days to weeks must be allowed for immunity to develop. For many infectious agents and toxins no effective vaccines or anti-sera have been developed and, in some cases, even persistent development efforts have been unsuccessful. For certain infectious agents, but excluding most viruses, antibiotics can be effective, either as prophylaxis or as therapy. Such protection may be circumvented, however, by the use of strains resistant to antibiotics. Moreover, no cure is known for any of the numerous systemic virus diseases of man. These severe limitations on medical means of protection against infectious agents and toxins make such protection ineffective or impractical except under certain quite restrictive conditions.

The only generally effective protection against all airborne biological agents and toxins is not medical but mechanical, namely the provision of filtered or otherwise purified air. A well-fitted military gas mask provides a high degree of protection against inhalation of infectious agents and toxins. Collective shelters and vehicles with filtered air serve the same purpose. Such equipment is already widely deployed with modern armed forces for protection against chemical warfare agents and radioactive fallout. There is as yet, however, no completely reliable equipment for rapid detection of airborne biological and toxin agents. Of course, if a sufficient degree of threat is thought to exist during a particular mission, military units could be placed in protective posture for the duration of the mission. Moreover, if chemical or biological weapons have once been used in a particular conflict, military forces are likely to be ordered into an advanced state of protection when under any form of surface or air attack.

The protection of large civilian populations would be much more difficult than the protection of military units. It would require the development and provision of reliable alarm systems, the issuance of gas masks, the construction of neighborhood and workplace shelters, the conduct of regular education and drill for the entire population, and massive preparations for medical diagnosis and care. Such a defence would be immensely expensive and stressful to create and maintain.

Of course, there is clearly merit in having fast-response epidemiological teams and limited emergency supplies of certain vaccines, antibiotics and other supplies in order to cope with natural threats to public health. Such preparations may also be able to mitigate the effects of limited acts of sabotage, depending on the agent employed. Nevertheless, protection of the civil population against a determined large-scale biological attack would be a very large undertaking.

Clearly, the proliferation of biological weapons would constitute a grave threat to the civilian populations and economies of all states, including those of the nuclear powers. Once started, the proliferation of biological weapons could be much more difficult to arrest than that of nuclear weapons, owing to the relative simplicity and wide availability of the underlying technology. These considerations were central to the decision of the United States to renounce biological and toxin weapons unilaterally and to the achievement of the BWC.

3. THE BIOLOGICAL WEAPONS AND TOXIN DISARMAMENT REGIME[3,4]

3.1 The Biological Weapons Convention of 1972

Biological weapons provide a case in which the usual approach to arms limitation was reversed. Instead of first negotiating a treaty and then implementing its provisions, an entire class of weapons was renounced by a major possessor without any prior international agreement. This was in November 1969, when President Nixon, after extensive review, declared that the United States would unconditionally renounce the development, procurement, and stockpiling of biological weapons, would destroy all stocks of agents and weapons, and would convert facilities for their development and production to peaceful purposes. In announcing these decisions, he also declared support for the principles and objectives of a draft convention prohibiting biological weapons that had been proposed by the Great Britain. Three months later, the United States unconditionally renounced toxin weapons. These events were soon followed by international agreement at the Conference of the Committee on Disarmament in Geneva on a treaty banning biological and toxin weapons--the BWC. After gathering the required ratifications, the BWC entered into force in March 1975 and now has more than 100 parties, including all members of the North Atlantic Treaty and Warsaw Treaty alliances, Japan, and the Peoples Republic of China.

Article I of the BWC prohibits the development, production, stockpiling, acquisition, or transfer of (1) "Microbial or other biological agents, or toxins whatever their origin or method of production, of types and in quantities that have no justification for prophylactic, protective or other peaceful purposes" and of (2) "Weapons, equipment or means of delivery designed to use such agents or toxins for hostile purposes or in armed conflict." In order to avoid any suggestion of superseding the authority of the 1925 Geneva Protocol, the BWC makes no explicit reference to the

actual use of biological or toxin weapons. Nevertheless, the provisions of the BWC clearly have the effect of proscribing any such use.

3.2 Verification provisions of the BWC

The verification provisions contained in the BWC are limited to:

(i) An obligation of States Parties to consult and cooperate with one another in solving problems (Article V) and

(ii) An agreement to cooperate with any investigation the UN Security Council may undertake in response to a complaint submitted to it by a party (Article VI).

Any investigation sought under the latter procedure, however, would be subject to the veto power of the permanent members of the Security Council. Beyond the provisions of Articles V and VI, assurance of compliance with the BWC was left to national means of verification.

The United States had already decided, in 1969-70, that its own interests were best served by unilateral renunciation of biological and toxin weapons and was aware of the difficulties and delays that would be entailed in negotiating treaty provisions for more extensive international verification. It did not, therefor, seek such provisions in the BWC. Neither were they sought by the Soviet Union, which at that time generally favored national rather than international means of verifying compliance with arms control agreements. Other nations, particularly Sweden, sought to include additional measures of verification, but such proposals were not adopted.

3.3 Progress in procedures to verify compliance with the BWC

Notwithstanding the shortcomings of its verification provisions, the Convention has been strengthened to a limited although significant degree by a series of agreements reached by its parties at the First and Second BWC Review Conferences, held in Geneva in 1980 and in 1986, respectively. The BWC Review Conferences have not sought to amend the Convention, a time-consuming process that, unless essentially unanimous, could threaten the authority and near universality of the Convention. Instead, the Review Conferences have arrived at political agreements among the States Parties on certain clarifications of the Convention and have instituted a number of reporting procedures to enhance confidence in the operation of the Convention.

At the First BWC Review Conference, the practical operation of Article V was clarified by an agreement that any State Party may request a consultative meeting of experts to deal with problems that may arise. Such consultations could provide an opportunity to discuss and resolve issues at a technical level when exchanges at a political level might lead to premature conclusions difficult to retract if later found to be unsubstantiated.

More recently, at the second Review Conference, in September, 1986 and at the following ad hoc Meeting of Scientific and Technical Experts in April, 1987, there was instituted a

potentially far-reaching system of regular annual reporting of data on research centers and laboratories and on unusual outbreaks of infectious or toxin-related disease. Detailed information is required for all research centers and laboratories, whatever their purpose, having a "maximum containment laboratory" as specified by the World Health Organization (corresponding to Biological Safety Level 4 or BL4). In addition, such information is also required for all research centers and laboratories which specialize in biological defense work and which have a "containment laboratory", corresponding to the next-lower safety level (BL3 or P3)[5]. The required information includes the name, location, source of financing, size of containment units, and scope of activities including types of microorganisms and/or toxins involved. Nations not possessing such containment facilities and having no unusual disease outbreaks are not explicitly required to file declarations. In accord with this agreement, nearly 30 nations have deposited declarations with the United Nations Department for Disarmament Affairs.

The United States has declared one laboratory with BL3 containment facilities under contract to the Army (the Salk Institute vaccine unit at Swiftwater, Pennsylvania) and 5 research centers with facilities at or near BL4, one of them military (at Fort Detrick, Maryland). The Soviet Union declared 4 military research centers or laboratories with BL3 facilities and 8 research centers or laboratories with BL4 facilities, none of them military. Although not required to do so, the Soviet Union also listed a military establishment without containment facilities (the Division of Military Epidemiology in the city of Sverdlovsk) and gave references to papers published by staff members of the Scientific Research Institutes of Military Medicine and of Microbiology of the Ministry of Defense for the period 1968-88. Altogether, 11 parties to the Convention (Bulgaria, Canada, Czechoslovakia, the Federal Republic of Germany, France, Norway, the Peoples Republic of China, Sweden, the UK, tne US, and the USSR) have declared military facilities with BL4 or BL3 containment units engaged in activities permitted by the BWC.

A development independent of the BWC that has also strengthened the prohibition of biological and toxin weapons is the mandate given to the UN Secretary General by the General Assembly in 1987 and unanimously reaffirmed in 1988, requesting him to investigate reports of the use of chemical, biological, or toxin weapons brought to his attention by any Member State. Under this authority, the Secretary General may send expert investigators to sites of alleged chemical or biological attack. The role of the UN Secretary General in investigating alleged violations of the Geneva Protocol was also endorsed unanimously by the 149 nations represented at the 1989 Paris Conference on the Prohibition of Chemical Weapons.

It is interesting to compare the verification regime created by the BWC and enhanced by the agreements achieved at the Review Conferences and at the UN with the verification provisions of the first draft treaty for biological weapons disarmament, that

proposed by Great Britain in July 1969. The British proposal would have given the UN Secretary General authority to investigate allegations of the use of biological weapons, an authority he now indeed possesses, not from the BWC itself, but rather from the more recent actions of the General Assembly. In the 1969 proposal, as now, UN investigations of other allegations of non-compliance, such as production or stockpiling of biological weapons, cannot be undertaken solely on the authority of the Secretary General, but require a request from the Security Council. The annual data-exchanges agreed to by the Second BWC Review Conference, however, go well beyond the provisions of the original British proposal, which had no such reporting provisions. Thus, although the verification of biological and toxin weapons disarmament can certainly be strengthened further, as will be discussed below, there has been considerable progress beyond the British draft treaty of 1969 and beyond the BWC itself.

3.4 Allegations of non-compliance

Regardless of the progress that has been made and is expected to continue in strengthening the international regime for verifying compliance with the BWC, no treaty provision or political agreement can provide confidence in the functioning of the Convention unless its parties make proper use of its provisions and behave responsibly when suspicions arise. Unfortunately, the performance of both the United States and the Soviet Union in dealing with compliance issues has fallen short of this standard.

Two major allegations of non-compliance with the BWC have been made, both of them by the United States against the Soviet Union. Both allegations continue to be made at the highest political level, as recently as February, 1990.[6] In the first, an outbreak of anthrax in the Soviet city of Sverdlovsk in April and May 1979 is claimed by the United States to have been caused by an airborne release of anthrax spores from an alleged biological weapons factory.[7] The Soviet Union maintains that the outbreak resulted from handling and consumption of meat from cattle and sheep that had contracted anthrax from contaminated animal feed. Since 1986, Soviet physicians who dealt with the outbreak have provided a considerable amount of detailed information.[8] The U.S government has welcomed the provision of new information and, according to recent Congressional testimony, has begun publicly to recognize that it may not be able to determine the true explanation of the outbreak.[9]

Nevertheless, neither government has undertaken the full and frank exchange of evidence and views that will be required to resolve the dispute. On the Soviet side there needs to be a political decision to allow qualified US officials freely to examine what remains of the relevant evidence and to meet with surviving patients and local medical, public health, and veterinary personnel in Sverdlovsk. In addition, US experts should be invited to visit, on a suitable reciprocal basis, the facility described in its allegations. This apparently corresponds to the Sverdlovsk military epidemiology center declared by the Soviet Union pursuant

to the agreement reached at the Second BWC Review Conference. On the US side there needs to be a political decision to conduct a full and objective review of its earlier conclusions. This should be structured so as to be unprejudiced by the understandable reluctance of intelligence and political authorities to revise a highly publicized previous conclusion.

The second compliance issue that continues to undermine confidence in the BWC concerns the allegation by the United States that the Soviet Union was involved in the production, transfer, and use of trichothecene mycotoxins in Southeast Asia and Afghanistan, in violation of the BWC and the Geneva Protocol.[10,11] The scientific and other evidence presented by the United States to support its allegation of toxin warfare has been discredited, in large part by unpublished studies conducted by the US government itself.[12] Nevertheless, the charge continues to be made, with no serious attempt to take account of the new information. Such lack of accountability in making allegations of non-compliance with the BWC and the Geneva Protocol is a threat to the effectiveness of both treaties and to the achievement of stronger constraints against chemical and biological weapons. The common interest of the United States and the Soviet Union in eliminating biological and toxin weapons requires resolution of these disputes.

4. MEASURES TO STRENGTHEN THE PROHIBITION OF BIOLOGICAL AND TOXIN WEAPONS

Further strengthening of the international biological disarmament regime can be accomplished in a number of ways, most of them requiring increased openness.

Today there is much greater acceptance of openness in verifying arms-control agreements than there was when the BWC was negotiated. Examples of this include the stationing of American and Soviet inspectors on each others' territory under the Intermediate Nuclear Forces Agreement; the routine and challenge inspections of NATO and Warsaw Treaty Alliance military exercises under the Stockholm Agreement on Confidence and Security Building Measures in Europe; and the wide acceptance of the concept of mandatory challenge inspection for the Chemical Weapons Convention now in an advanced phase of negotiation at the Conference on Disarmament in Geneva.

The growing realization of the value of openness as a factor for stability in international relations and the long-standing tradition of free communication and international cooperation in biology, medicine, and public health create an outstanding opportunity to strengthen the verification of biological and toxin weapons disarmament and to reinforce the international consensus against such weapons.

Multilateral political impetus and machinery for improving the verification of biological and toxin disarmament and otherwise strengthening the Convention will be provided by the Third BWC Review Conference. A number of States Parties to the Convention are

seeking practical ideas for discussion at the Preparatory Conference scheduled for the Fall of 1990 and for possible agreement at the Review Conference, including ideas from independent scientists and others outside government. The measures we outline in what follows represent our view of what may be particularly useful and achievable.

4.1 Universal adherence

A serious threat to the BWC exists in certain areas of the world where nations involved in bitter regional conflicts have refrained from joining the Convention. In the Middle East, for example, Jordan, Lebanon, and Saudi Arabia are parties to the BWC while Egypt, Iraq, and Syria have signed but not ratified, and Israel has done neither. The U.S., the Soviet Union, and other parties to the Convention have made little diplomatic effort to encourage non-parties to join the treaty. The need is now urgent to remedy the situation, through bilateral diplomatic representations and also in the context of multilateral regional peace efforts. Parties to the BWC should make every effort to draw the attention of non-parties to the desirability of joining in time to attend the Third BWC Review Conference as full members of the Convention. Although even non-signatories may attend as observers, only full members of the Convention may take part in decisions of the BWC Review Conferences. Consideration might also be given to elevating diplomatic representation at the Third Review Conference to the Ministerial level, as a means of increasing the priority given to the matter by national governments and motivating those that have not yet seriously reviewed the case for becoming parties to do so.

4.2 Declarations of research centers and laboratories

The system of data-reporting agreed upon at the Second BWC Review Conference has now passed through three annual cycles. At this stage it would be useful to have informal consultations among the parties regarding the functioning of the reporting system and its possible improvement. Subjects for discussion include completeness and ambiguities of the information provided in the declarations, additional information the inclusion of which would effectively advance the objectives of the BWC, and procedures for States Parties having nothing to declare to give explicit annual notice to that effect.

In the category of additional information, it would be a useful confidence-building measure to list all publications in the open literature authored or co-authored by staff members of each declared research center or laboratory. While the Second BWC Review Conference agreed that "results of biological research directly related to the Convention" should be published in generally available scientific journals, there is no requirement to list such publications in the annual exchanges of information. By giving a concrete picture of work being done at each declared establishment, the provision of such reference lists could enhance confidence in the operation of the Convention.

Another important area for consideration at the Third BWC Review Conference is the further specification of research centers and laboratories to be declared. At present, declarations are required only for those with BL4 containment facilities or with BL3 facilities if they also specialize in biological defense work. This fails to include certain sites that are unquestionably of interest in connection with the BWC. Examples are the US Army Dugway Proving Ground in Utah and the Division of Military Epidemiology in Sverdlovsk. Although permitted work on biological defense or military epidemiology is said to be done at these sites, they apparently have no BL4 containment units nor do they have BL3 units and specialize in BW defense work. The later installation is included in the annual Soviet declarations even though, according to its description, it need not be. Nevertheless, a less restrictive definition of installations to be declared is clearly desirable. Such a broadened definition might include: (1) all research centers and laboratories that specialize in biological defense work, whether or not they have containment units, and (2) all research centers and laboratories that have containment units and conduct biological defense work, whether or not they "specialize" in it.

4.3 Verification at declared sites

Following the precedent established by recent conventional and nuclear arms-control agreements and the draft Chemical Weapons Convention, agreement might be reached on a system for on-site verification at declared research centers and laboratories conducting work relevant to the BWC. This could be done in a number of ways, ranging from bilateral and multilateral inspection tours to working visits and exchanges of individual scientists and others.

Particularly valuable and also consistent with the generally open practice in biological and medical science would be longer-term exchanges of working scientists, accompanied by their families when appropriate. Such exchanges could enhance confidence in the openness of the participating facilities and could also lead to scientifically beneficial collaboration and joint efforts in medicine and public health.

A type of exchange not previously considered would be that of scientific administrators and biological safety officers. If genuinely integrated into the operation of a research center or laboratory, individuals with such duties would acquire a particularly broad understanding of its activities and might also make useful contributions both at the host institution and, upon return, at their home establishments.

4.4 Challenge inspections

The Chemical Weapons Convention being negotiated in Geneva is expected to provide for a special system of inspections that could be conducted anywhere at any time on short notice by a team of inspectors designated by the Technical Secretariat of the Convention. Such inspections on challenge could be requested by

any party to the Convention, with no right of refusal by the requested party. Since toxin weapons will be covered by the chemical treaty, its provisions for challenge inspection will automatically extend into an area also covered by the BWC. A system of challenge inspection could also be considered for verification of those prohibitions of the BWC that are not included in the chemical treaty. It would probably be impractical and distracting, however, to seek additional agreements on challenge inspection for biological disarmament until the challenge provisions of the Chemical Weapons Convention are agreed.

4.5 Non-secrecy of work at declared facilities

Verification of compliance with the BWC can be simplified if it is accepted as a basic principle that there should be no secret work at declared installations. This simplification results from two factors. First, if there is no secret work, the practical impediments to verification activities on-site are greatly reduced, both for the inspectors and for the managers of an installation. Second, non-secrecy is in itself an indicator of compliance, and the task of defining and verifying it may often be simpler than that of defining and verifying more technical indicators of compliance. To take an example, the presence of unrestricted international researchers or safety officers at an installation, by demonstrating non-secrecy, may by itself provide adequate confidence in its compliance with the BWC, without the need for formal inspections.

Acceptance of the principle of non-secrecy at declared facilities hinges on the proposition that any benefit of secrecy in permitted biological defense programs is outweighed over time by the effectiveness of openness in reducing the biological threat and enhancing confidence in the Convention.

Non-secrecy at declared facilities could be embodied as a basic principle in the international political agreement expected to emerge from the Third BWC Review Conference, or in a more formal protocol or treaty dealing with BW verification. If that cannot be accomplished at this time, individual states wishing to do so might declare non-secrecy unilaterally in their annual declarations.

The specific scope to be encompassed in affirmations of non-secrecy deserves careful consideration. For example, while secret laboratory research in BW defense should be renounced, the commitment to non-secrecy should not be so broad as to preclude confidentiality in legitimate national means for verification of the BWC.

4.6 Dealing with compliance issues

With general improvement in international relations, we may hope that hasty or mischievous allegations by governments of non-compliance with the BWC will not occur. Nevertheless, reliable procedures are needed to deal with honest suspicions that might arise and to curb any temptation to make political capital of ill-founded allegations. The system of declarations established by the second BWC Review Conference and the new authority of the UN

Secretary General to investigate allegations of use are important steps in this direction. In addition, it would be useful to consider institutionalized mechanisms that could address BWC compliance issues at a technical rather than a political level. In some cases, this could be accomplished pursuant to a request by a State Party for a consultative meeting of experts, as agreed at the First BWC Review Conference. In order to facilitate the procedure, the Third Review Conference might consider establishing a standing panel of experts, along with suitable mechanisms for its activation and financial support.

If compliance questions that may arise in the future are to be addressed responsibly, it is important that the US and the Soviet Union make every effort to resolve the outstanding compliance issues between them before the Third BWC Review Conference takes place. Failure to make sincere efforts in this direction sets a poor example for other States Parties and imperils the successful operation of the Convention.

4.7 Summary

All nations have a profound interest in ensuring the success of the BWC. This derives from the potential of biological weapons for indiscriminate mass destruction and from the ease with which such weapons could proliferate. The unilateral renunciation of biological and toxin weapons by the United States in 1969-70, followed by the BWC in 1972, and subsequent agreements at the BWC Review Conferences and at the United Nations constitute a sound framework for biological disarmament. Especially noteworthy is the system of data reporting agreed at the Second Review Conference and the authority unanimously given by the General Assembly to the Secretary General to conduct on-site investigations of allegations of chemical or biological attack. Additional progress is expected to result from the Third BWC Review Conference in 1991. Measures for further strengthening the biological disarmament regime, outlined above, include: (1) efforts to achieve universal membership in the BWC; (2) improvements in the system of data reporting; (3) procedures for on-site verification of compliance, including challenge inspection; (4) agreement on non-secrecy of work at declared facilities; and (5) resolution of past compliance disputes and provision for technical consultations to avert or resolve possible future disputes.

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TABLE

ESTIMATED WEIGHT REQUIREMENTS FOR VARIOUS WEAPON TYPES

Weapon Type	Illustrative Agent	Approximate Weight to Attack 100 Square Kilometer Target (tons)
Thermonuclear		0.2 (warhead weight)
Biological	F. tularensis	5*
Toxin	botulinal toxin	300* (assumes toxin can be stabilized)
Chemical	nerve agent (sarin)	800*

* Based on estimates in Health Aspects of Chemical and Biological Weapons, World Health Organization, Geneva, 1970. The estimates depend on a number of uncertain variables and should be regarded as only illustrative. The weight of devices for disseminating the agent payload is assumed to be 3 times that of the agent for sarin, 10 times for botulinal toxin, and 25 times for dry F. tularensis.