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~~Germans. It is dawning on these experts above all that the Germans are asking themselves increasingly urgent questions about their republic's real sovereignty, or in other words, about their national fate being determined by foreign powers. Les Aspin, chairman of the U.S. Congressional Armed Services Committee, realized: "If the Germans were to insist on their sovereignty, we would have an entirely different NATO."~~

Which would not be the worst that could happen.

### Problems of Verifying Biological Weapons Convention Reviewed

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[Article by Oliver Thraenert: "On the Problem Complex of Verifying the Biological-Toxin Weapons Convention"; first paragraph is boxed item]

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#### 1. Introduction

The press reported in October 1988 that Iran's supreme military commander, President of Parliament Hashemi Rafsanjani, expressed the view that Iran should equip itself with biological and chemical weapons in order to counter the possible use of such weapons by Iraq. He maintained that biological and chemical weapons are the little fellow's atomic bombs and can be made easily.<sup>1</sup>

Just how urgent it is to conclude an agreement on a worldwide ban on chemical weapons, to prevent further developments and the use of such warfare agents, became clear last but not least as a result of the employment of chemical warfare agents in the Gulf War. But what about the biological weapons that Rafsanjani touched upon? What does that mean to begin with? What are the arms control agreements that exist regarding biological weapons and, above all, what problems arise in monitoring compliance with these agreements?

#### 2. What Are Biological Warfare Agents?

According to the 1 July 1969 report by the UN secretary-general on chemical and biological weapons, biological warfare agents are "living organisms of all kinds or infectious substances which are obtained from them and which are intended to cause disease or death in man, animals, or plants, and, moreover, their effect is based on their ability to proliferate in the attacked persons, animals, or plants".<sup>2</sup> The organisms involved here can be pathogenic bacteria, viruses, rickettsiae, or fungi.

Besides, biological warfare agents also include toxins—poisonous substances of organic origin, such as snake or scorpion poisons—even though they are made synthetically, something that is becoming increasingly possible today. Not included among biological warfare agents, however, are chemical agents with a toxic effect which do not come from any living organism but which are of a purely synthetic nature. This involves chemical warfare agents.

Biological warfare agents can be absorbed via the respiratory organs, via contaminated food and drink, or through the skin, as a result of insect bites. In the case of biological warfare, the viruses can be sprayed in aerosol form from aircraft, or they can be spread via host animals, above all, insects. Viruses, which are to be used as biological warfare agents, should be suitable for storage, for being released in the aerosol form, for causing a sickness with the shortest possible incubation time, and they should be highly infectious and highly virulent. Moreover, the enemy should not be able successfully to employ any simple antidotes, such as antibiotics; but the attacker should have the capability of protecting his own troops and population through inoculation.

The military establishment might be particularly interested in toxins because some of them, such as botulinum toxin, ricin, or saxitoxin, are considerably more poisonous than the most highly poisonous chemical warfare agents, such as the nerve agents VX, sarin, soman, and tabun.<sup>3</sup> Of course, botulinum toxin, for example, might, because of its molecular structure, not be absorbed via the skin, in contrast to nerve agents, so that wearing respiratory masks would already offer sufficient protection.

#### 3. The Biological-Toxin Weapons Convention

The 1925 Geneva protocol outlawed the wartime use of asphyxiating, poisonous, or other gases, as well as bacteriological (biological) methods of warfare. Nevertheless, almost all big powers participating in World War II developed biological warfare agents. Between 1940 and 1944, Japan attacked at least 11 Chinese cities with viruses, such as anthrax, cholera, typhus, and plague.<sup>4</sup>

President Richard Nixon provided decisive impetus for outlawing biological warfare agents when, in November 1969, he announced the unilateral renunciation of this type of weapon by the United States. The comprehensive research programs, which had been carried out after World War II, had produced the assessment that the military usefulness of biological warfare agents was very poor.

For example, comprehensive studies had been carried out concerning the possibilities of spreading aerosols in big cities. For this purpose, among other things, a sham biological attack was launched against the city of New York in 1966, using nonpathogenic microorganisms. The idea was to find out how easily one could contaminate a city by releasing bacteria in the subway ventilation shafts.

Most of the research work was done in Fort Detrick, Maryland, where as many as 700 scientific personnel were employed from time to time. A plant for breeding viruses was erected in Pine Bluff, Arkansas. The Dugway Proving Grounds had been used by the military establishment since 1953 to test biological ammunition. In 1969, President Nixon ordered a thorough review of these programs. The result was the finding that biological warfare agents could not be used in a militarily meaningful manner because your own troops and population could not be adequately protected against them.<sup>5</sup>

The Biological-Toxin Weapons Convention, which was signed on 10 April 1972, contains in Article I a ban on the development, production, storage, and miscellaneous acquisition of microbiological or other biological agents and toxins of types and in quantities that are not justified for prevention, protection, or other peaceful purposes. Moreover, weapons, equipment, or other resources suitable for the use of such agents and toxins for hostile purposes were also banned. According to Article IV, the treaty states themselves are to see to compliance with this ban in their sovereign territory.

The convention's verification provisions are extremely weakly developed. The contracting states pledge to consult each other and to cooperate with each other to guarantee the implementation of the convention. Every treaty state is granted the possibility of complaining to the United Nations Security Council and each contracting state pledges to permit an investigation to clarify treaty violation charges.<sup>6</sup>

In other words, the convention does not spell out detailed verification rules. The risks connected with that appeared to be calculable at that time because biological warfare agents, in contrast to chemical warfare agents, hardly promised any military options. Moreover, research for peaceful and protection purposes was expressly permitted. As James F. Leonard, the head of the American negotiating delegation at that time, explained during a congressional hearing in May 1988, it was clear from the very beginning that there are no objective criteria whatsoever when it comes to being able to distinguish between research for peaceful and protection purposes, on the one hand, and research for offensive purposes, on the other hand. According to Leonard, this risk would have to be accepted because one cannot forbid states to develop vaccines against biological warfare agents. Moreover, many potential biological warfare agents presumably appear as viruses in a natural manner and this is why mankind must study them and improve its possibilities of handling them.<sup>7</sup>

#### 4. Did the Soviet Union Violate the Convention?

The problems which can arise in connection with monitoring compliance with the convention can be illustrated by two treaty violation charges which the United States made against the Soviet Union.

In October 1979, a Soviet emigre periodical published in the Federal Republic reported for the first time that an

anthrax epidemic had taken place in the city of Sverdlovsk in the Urals, in the spring of that same year; this epidemic reportedly could be traced back to an explosion in an institute where work was being done on biological warfare agents. During the first monitoring conference on the Biological-Toxin Weapons Convention in March 1980, the American delegation officially asked the Soviet delegation to clarify this case. The Soviet reply was that this was a natural anthrax epidemic that had been triggered by the sale of contaminated meat on the black market.

The Defense Intelligence Agency of the United States Defense Department, however, following this Soviet explanation, advocated the view that this was an explosion in a laboratory. According to the intelligence experts, this was indicated by the massive use of military personnel in fighting the epidemic as well as the spraying of the decontamination agents by aircraft. The Soviet Union did not take any further steps to refute these charges and so it was the word of one side against that of the other.

Nevertheless, there were a series of indications that supported the Soviet version from the very beginning. To be sure, according to subsequently published Soviet data, the "Department for Military Epidemiology of the Defense Ministry Research Institute for Microbiology" was indeed in Sverdlovsk. But that department did not have a highly safe laboratory because it was not working with pathogenic microorganisms. Western scientists found that anthrax had indeed appeared in the Sverdlovsk area as a natural epidemic in recent times. In July 1979, two persons had been sentenced by a local district court for selling meat contaminated with anthrax.

But the decisive question is whether the epidemic involved lung anthrax as a result of the inhalation of the viruses, or whether this was intestinal anthrax resulting from the ingestion of infected food. These two forms of sickness differ from each other above all by the fact that lung anthrax causes death in infected persons after 1-3 days, whereas this process takes considerably longer in the case of intestinal anthrax. But because neither of the infected individuals—in whom the disease took a lethal course—died after 3 days, it would seem that this was a case of intestinal anthrax. This again supports the Soviet version of events.

But even if this had been a case of lung anthrax, caused by an explosion in a laboratory, this would still not be proof of a violation of the Biological-Toxin Weapons Convention. The degree to which the epidemic was spread could be clarified by the United States just as little as could the question of whether a small quantity of viruses was disseminated very effectively or whether a large quantity was spread around in a very ineffective fashion. Storing small quantities of viruses, however, is certainly permitted when they are intended to serve for research on defensive purposes, such as development of vaccines.

In April 1988, a Soviet delegation headed by Deputy Health Minister Burgasov, travelling in the United States, provided detailed information on this incident.

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Accordingly, contaminated meat was sold on the black market and that meat had come from animals that had been fed fodder that was contaminated with anthrax. That triggered the epidemic. The Soviets, among other things, also submitted autopsy photos of some of the victims and their explanations were judged to be presumably correct by United States experts.<sup>8</sup>

The second American charge against the Soviet Union concerned the alleged use of a toxin—called "Yellow Rain"—in Laos. The origin of this assertion consisted of reports from refugees who had told the American embassy in Bangkok about corresponding events. They also brought samples of the substance on leaves, some of which were investigated at the University of Minnesota. Accordingly, the samples indeed contained mycotoxins. Thereupon, United States Secretary of State Haig declared on 13 September 1981, during a speech in Berlin, that there was now clear evidence as to toxic warfare in Southeast Asia.

A group of American scientists who took up the case, however, became increasingly doubtful regarding the tenability of this thesis. At first, they were able to prove that the samples brought by the refugees consisted mostly of secretia from bees. At that time the behavior of certain varieties of wild bees in Southeast Asia had not yet been explored. In March 1984 Thomas Seely, an apiary expert, was able to show that there are wild bee colonies there which undertake purification excursions at such great altitudes that one could not see them. In the process, they release pollen which greatly resembles "Yellow Rain." Second, it was possible to prove that the mycotoxins, which were found in the samples in Minnesota, also appear naturally in Southeast Asia, specifically as mold products. For example, a study was made of the blood of a group of Asians who had not been in the area in which "Yellow Rain" had reportedly fallen. It was possible to prove traces of mycotoxins. But this, on the other hand, was never accomplished in persons who had been exposed to "Yellow Rain."

Finally, an investigating team, which had been sent to Southeast Asia by the Reagan Administration, found that the renewed questioning of the "eyewitnesses" to the spread of "Yellow Rain" revealed that those witnesses turned out to be highly doubtful. For example, one man who had earlier maintained that he had seen the "Yellow Rain" with his own eyes said that he gotten his information from a third person.<sup>9</sup>

It must be kept in mind that there were considerable analytical problems in both cases. Both charges could not be refuted 100 percent, but there is a high degree of plausibility that they are irrelevant. This was also indicated, last but not least, by the fact that neither the Carter nor the Reagan administrations lodged a complaint with the United Nations Security Council as would have been possible according to the terms of the Biological-Toxin Weapons Convention.

##### 5. Defensive or Offensive Research?

One may well question today whether the premise, which applied when the Biological-Toxin Weapons Convention

was signed, is still valid; according to that premise, biological warfare agents can hardly be used in a militarily meaningful fashion. It has been above all gene engineering that has promised new possibilities. Viruses can be bred via mass production, their structure can be altered, and their aggressiveness can be boosted. New vaccines can be produced with the help of gene manipulation, and bacteria can be rendered resistant to antibiotics. Toxins can be produced by genetically reprogrammed bacteria. It even appears possible to implant data about the production of toxins in the microorganisms that are familiar to the human organism, such as, for example, the bacteria coli. This means that we could, for example, have the option of using a very effective virus against which the enemy has no antidote, but against which are our own troops can be protected in advance by vaccination.<sup>10</sup>

In the United States, expenditures on defensive research in the field of biological warfare rose from \$15.5 million in 1981 to \$90 million in 1986. According to information supplied by the Defense Department, research projects were ongoing in February 1988 in 19 government laboratories, in 50 nongovernmental laboratories and institutions, and in more than 85 colleges and universities.<sup>11</sup> All projects reportedly are intended only for defensive purposes, such as the exploration of viruses and the development of vaccines. The necessity for these projects was justified by the government in terms of the existence of an offensive Soviet research program.

But the decisive problem is that—as James F. Leonard confirmed—there are no objective criteria when it comes to distinguishing between offensive and defensive criteria. There is only the subjective criterion of offensive or defensive intentions.

Thus we see that the development of vaccines presupposes a precise knowledge of the corresponding virus. One can follow this up clearly now for example in connection with AIDS research. But this also means that one must have the virus. Besides, vaccines often consist of weakened viruses which are administered so that the organism can then develop antibodies. In addition there is the fact that, in the age of advancing knowledge in the field of gene engineering, precautions must be taken against conceivable viruses. If, for example, a state should decide to go for biological warfare, then it is to be expected that it will employ a gene-manipulated virus: for example, viruses whose external structure has been altered and which are not recognized by the human immune system as "enemies." But this again means that it is necessary to explore the offensive possibilities in order to be able to develop countermeasures. Finally, the development of vaccines and their possible administration itself cannot be clearly marked as a defensive measure because it could be interpreted by other states as a preparation for biological warfare.

During the May 1988 congressional hearings in the United States—which involved a biological warfare

agent testing program planned by the United States Army for the purpose of pushing defensive research—experts again and again pointed out that this kind of procedure could not be distinguished from an offensive biological warfare program. It is of course entirely logical that one must explore the way in which biological warfare agents work under field conditions in order to be able to develop corresponding countermeasures, but this at the same time means that viruses, which are considered to be potential biological warfare agents, must be present in a certain volume.<sup>12</sup>

At this point, we can clearly detect another problem. Very small quantities of viruses or toxins could already be militarily relevant. Besides, bacteria in corresponding nutrient solutions or viruses in symbiosis with other cells could multiply very rapidly. On-site inspections in laboratories, which are carried out only very sporadically, thus would be of little help. To that extent, effective verification of the ban on biological warfare agents is much more difficult than in the case of chemical warfare agents. Nevertheless, on-site inspections, above all in high-security laboratories in which work is being done with pathogenic bacteria and viruses as well as toxins could be meaningful because they would offer a certain deterrent effect. But this presupposes that all corresponding laboratories can be covered. Because high-security laboratories must have special ventilation exhaust shafts, reconnaissance satellites could have a supporting effect here. Less risk-conscious countries of course could also have the pertinent work done in other laboratories.

Simple solutions to the verification problem—such as a ban on reportedly defensive research projects—cannot be expected. Of course, one might ask oneself why, for example, the West German Armed Forces want to develop vaccines against such exotic diseases as Venezuelan equine encephalitis, which just about never turn up in European latitudes, but which would be of interest to biological warfare. Moreover, it is questionable how corresponding vaccinations are to be administered to military personnel or even to the population in case of war. But, first of all, such diseases appear outside of Europe entirely, and one cannot institute a worldwide ban on developing countermeasures against them. For example, in 1977-78, Rift-Valley fever broke out in Egypt and only the Pentagon had a vaccine which it made available to particularly endangered persons. Second, basic research—such as the exploration of the group of alpha viruses, which includes the virus of Venezuelan equine encephalitis—cannot be banned from general microbiological and medical research.

#### 6. Second Monitoring Conference on Biological-Toxin Weapons Convention

A series of confidence-building measures were approved at the second monitoring conference on the Biological-Toxin Weapons Convention, which was held between 8 and 26 September 1986:

- Exchange of data on research installations and high-security laboratories in which work is done for defensive purposes regarding biological warfare;
- Exchange of information on the spread of infections and similar events that deviate from normal processes;
- Promotion of exchange of publications whose results are directly connected to the convention;
- Support of contacts between scientists who are concerned with biological research.<sup>13</sup>

The disadvantage of these measures consists above all in the fact that they are not binding under international law. By the way, far from all of the countries that signed the Biological-Toxin Weapons Convention participate in these measures. For example, in the Autumn of 1988, there was an informational conference staged by the Defense Science Duty Station in Munster concerning the latter's facilities; however, few countries turned up for this event and those of the Warsaw Pact, for example, did not show up at all. Nevertheless, efforts to be more open in this connection will improve the verification of the ban on biological warfare agents. For example, in 1987 scientists from nine countries, including the Chinese People's Republic, Japan, and Senegal, were given advanced training in Fort Detrick, Maryland, where a large part of the American research effort takes place. The first scientists from the Soviet Union are expected by the end of 1988.<sup>14</sup> As a result of such limited steps, the countries could try to convince each other that they do not have the intention of operating an offensive biological research program.

When it comes to banning biological warfare agents, one can say that 100-percent-effective verification will be possible just as little as in the case of all other arms control or disarmament measures. A certain risk will always be there. Even if, on the basis of progress in the field of genetic engineering, this type of weapon might again be of interest to the military establishment, one should not dramatize the dangers that could result from this because the military usefulness of biological warfare agents has not been clarified. On the other hand, it must be kept in mind that, if a convention banning chemical warfare agents is signed, which would contain far-reaching verification rules such as on-site inspection, the verification measures for the Biological-Toxin Weapons Convention should also be improved. Because otherwise, there might be loopholes which might make it possible to get around a chemical weapons convention. For example, chemical warfare agents could be substituted by the secret production of toxins. Most of the 40 member states of the Geneva Disarmament Conference, however, appear to try to work toward the coverage of toxins both in a future CW [chemical weapons] convention and in a future BW [biological weapons] convention. Nevertheless, there will always be verification gaps here because on-site inspections would be doubtful in attempts to verify the ban on biological warfare agents. First of all, the quantities that are possibly of military relevance are much smaller here than in the case of chemical warfare agents, and viruses could multiply in a short time. Besides, such inspections would have to be

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capable of being performed in almost all research installations where work is being done with microorganisms.

The improvement of verification measures should be discussed at the next monitoring conference of the Biological-Toxin Weapons Convention, which is scheduled for no later than 1991. The issue of whether and how on-site inspections could contribute to strengthening the Biological-Toxin Weapons Convention should be investigated here.

The first prerequisite for improving verification capabilities would be the obligation on the part of all signatory states to list laboratories with a high safety standard in which permitted biological research efforts, which are directly connected with the BW Convention, take place. The Federal Republic—applying the previously mentioned, nonobligatory, confidence-building measures—listed the following facilities:

The Defense Science Duty Station for NBC [nuclear, biological, and chemical] protection of the West German Armed Forces in Munster;

The Federal Research Institute for Virus Diseases of animals in Tuebingen;

The Bernhard Nocht Institute for Tropical Diseases in Hamburg;

The Institute of Microbiology of the Academy of Medical Services of the West German Armed Forces in Munich.<sup>15</sup>

Similar to the inspections agreed upon in connection with the KVAE (Conference on Confidence-Building and Disarmament in Europe) in 1986, each member country would have to declare itself ready to permit a certain number of on-site inspections per year at short notice. Of course, even that would not enable us to achieve 100-percent effective verification for the above-mentioned reasons; but potential treaty violators could probably be deterred much better than before. Of course, here again we would be stuck with a clear problem: Some of the potential BW countries, such as Iraq for example, so far have not even signed or ratified the BW Convention.

## Footnotes

1. Cf., SUDDEUTSCHE ZEITUNG, 21 October 1988.

2. Chemical and Bacteriological (biological) Weapons and the Effects of Their Possible Use—Report of the Secretary-General of the United Nations, date 1 July 1969, Bonn-51, Vienna, Zuerich (German translation), 1969, p 15.

3. Cf., The Table in Erhard Geissler, Karlheinz Lohs, "The Changing Status of Toxin Weapons," in: Erhard Geissler (editor), Biological and Toxin Weapons Today, Stockholm 1986, pp 36-55, specifically p 41.

4. Cf., Arthur Westing "The Danger of Biological Warfare," in: Werner Dosch, Peter Herrlich (editors), "Aechtung der Giftwaffen. Naturwissenschaftler warnen vor chemischen und biologischen Waffen," [Banning Poison Weapons—Natural Scientists Warn Against Chemical and Biological Weapons], Frankfurt/M-65., 1985, pp 73-89, specifically p 75f.

5. Survey Studies on American BW Research Efforts during the 1950's and 1960's are as follows: Robert Harris, Jeremy Paxman, "A Higher Form of Killing—The Secret History of Biological and Chemical Weapons," Duesseldorf, Vienna, 1983; Robin Clarke, "Silent Weapons—Chemical and Biological Warfare," Vienna, Hamburg, 1969; John Cookson, Judith Nottingham, "A Survey of Chemical and Biological Warfare," London, Sidney, 1969; Seymour Hersh, "Chemical and Biological Warfare, American's Hidden Arsenal," Indianapolis, New York, Kansas City 1968.

6. The treaty is printed in: Heinrich Siegler, Dokumentation zur Abruestung und Sicherheit [Documentation on Disarmament and Security], Vol. IX, 1971, Bonn, Vienna, Zurich 1972, pp 253-258.

7. Cf., Statement of James F. Leonard, (retired) chief negotiator, Biological Weapons Convention (1972), in: Biological Warfare Testing, Hearing before the Subcommittee on Arms Control, International Security and Science of the Committee on Foreign Affairs and the Subcommittee on Energy and Environment of the Committee on Interior and Insular Affairs and the Subcommittee on Military Installations and Facilities of the Committee on Armed Services, House of Representatives, One Hundredth Congress, second Session, May 3, 1988, U.S. Government Printing Office, Washington 1988, pp 70-74.

8. Cf., Elisa D. Harris, CBW Arms Control: A Regime Under Attack?, in: ARMS CONTROL TODAY, September 1986, pp 8-13; Reinhard Kaiser, "Federal Republic and Biological Weapons," International Police Institute, Working Paper No. 5, June 1988, Wuppertal, pp 8-11.

9. Cf., Julian Robinson, Jeanne Guillemin, Matthew Meselson, Yellow Rain: The Story Collapses, in: FOREIGN POLICY No 68 (Fall 1987), pp 100-117; cf., On both charges also: Elisa D. Harris, Sverdlovsk and Yellow Rain. Two Cases of Soviet Noncompliance?, in: INTERNATIONAL SECURITY, Spring 1987, pp 41-95.

10. Cf., Oliver Thraenert, "Biologische Kampfstoffe-Ruestungsdynamik im Reagenzglas?" [Biological Warfare Agents—Armament Dynamics in the Test Tube?], Bonn, Friedrich Ebert Foundation, June 1988, pp 17-21.

11. Cf., Jonathan Tucker, Gene Wars, in: FOREIGN POLICY No 57 (Winter 1984/85), pp 58-79; Statement of Jeremy Rifkin, president of the Foundation on Eco-

conomic Trends, in: Biological Warfare Testing, loc. cit. pp 75-91.

12. Cf., Statement of Jay A. Jacobson, *ibid.*, pp 57-69; Anthony Robbins, *ibid.*, pp 92-99.

13. Cf., Josef Goldblat, The Review of the Biological Weapons Convention, in: SIPRI YEARBOOK 1987, New York 1987, pp 409-422.

14. Cf., Fighting Dirty: Quest for Way to Block Biological Weapons Is Itself Called a Threat, in: WALL STREET JOURNAL, 19 September 1988.

15. Cf., Federal Republic of Germany: Report in Accordance with the Final Declaration of the Second Review Conference of the Parties to the Convention on the Prohibition of the Development, Production, and Stockpiling of Bacteriological (Biological) and Toxic Weapons and on Their Destruction, Geneva, 10 October 1987.