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WHAT POLICY FOR TOXINS?

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Characteristics of Toxins

Toxins are poisonous substances produced by living organisms including plants, animals and bacteria. Examples are ricin (from the castor bean), tetrodotoxin (from the globe fish), and botulinal toxin (from the bacterium Clostridium botulinum). Today, their production entails the growth or harvesting of large quantities of plants, animals or bacteria from which the toxin may then be separated and purified. Looking several years ahead, it will be possible to synthesize a number of toxins directly, without the need for toxin-producing organisms. Eventually, direct chemical synthesis will provide a practical alternative to extraction from living organisms, although the latter method is likely to remain the least expensive for bacterial toxins.

In contrast to the organisms that produce them, toxins are not capable of reproduction. For this reason, illness caused by toxins is not transmissible from man to man. Toxins cannot themselves cause spreading epidemics. Nevertheless, toxins do cause disease. The principal pathological symptoms of many bacterial diseases are in fact caused by toxins produced within the human body by living bacteria. In this sense, bacteria make toxins, toxins cause disease. Examples of diseases that can be produced either by bacterial infection or by direct administration of the corresponding toxin are anthrax, cholera, diphtheria and tetanus.

Some toxins are highly lethal to man (botulin) while others usually cause only temporary incapacitation (staphylococcus enterotoxin). Many

toxins cause illness or death only after a considerable delay. This varies with the particular toxin and with the dosage and can range up to several days. For use as weapons, toxins may be dispersed as aerosol clouds over or up-wind from a target, to be inhaled by the target population. Because toxins are not absorbed effectively through the skin, a gas mask provides good protection, as do shelters with properly filtered air. Protection can also be afforded by prior immunization with specific toxoid. However, each toxoid is effective only against a particular kind of toxin and, for some toxins, the margin of protection is not enough to be of practical significance.

Are Toxins Chemicals or Biologicals?

Some texts classify toxins as chemical agents because they do not multiply and cannot cause spreading epidemics. Other texts define toxins as biological agents because the technology of their production resembles that of biological agents rather than that of chemical agents and because the symptoms produced by bacterial toxins are like those produced by bacterial infections. The report of the U.N. Secretary General on chemical and bacteriological weapons defines toxins as chemicals whereas, until recently, U.S. military writings defined them as biological agents. The intermediate status of toxins is manifest in the United Kingdom draft BW convention. Although this treaty does not explicitly prohibit the possession of toxins it does prohibit the production and possession of bacteria for the manufacture of toxin weapons. Apparently in recognition of these points, the British Government has declared its willingness to consider amendments that would extend the convention's prohibitions to cover toxins explicitly. In any case, the United States should not attempt to derive its policy for toxins from purely technical arguments regarding their definition. Instead, our treatment of toxins should aim to achieve our major policy objectives.

Policy Choices

The United States is already pledged not to initiate the use of lethal or incapacitating chemical weapons and to refrain from all use whatsoever of germ weapons. Thus, whatever policy is decided for toxins, there is no question of initiating their use in war. Rather, the principal questions for decision are:

1) Should the United States reserve the right to use toxins in retaliation for CB attack against us?
2) Should the United States pursue the development and production of toxin weapons?

Our answers to these question should be decided in terms of our major policy objectives. These are (1) meeting military requirements, (2) achieving arms control and non-proliferation, (3) maintaining the authority and credibility of the President. Each of these objectives is discussed below.

Military Requirements

Today, lethal toxins are militarily inferior in almost every important respect to our standardized lethal chemical agents, the nerve agents. Nerve agents act rapidly, many toxins do not. Nerve agents can attack through the skin, thus forcing an enemy into cumbersome protective suits. Toxins do not act through the skin, protection is afforded by a mask alone. Nerve agents can be chosen to contaminate territory for several days, denying it to unprotected troops. Toxins, once they are deposited on the ground, do not constitute an important hazard. We already have a substantial supply of nerve agent munitions and have spent much effort in learning their field characteristics. The research, development and testing necessary to produce satisfactory toxin weapons, assuming that can be done, would entail considerable cost.

With enough development effort, some of the military shortcomings of toxins relative to nerve agents could probably be overcome. The main possibility of technological change that requires closer analysis of the value of toxins to the U.S. would be the development of lethal toxins substantially more poisonous under military field conditions than are existing nerve agents. Such development is probably feasible. The weight of toxin munitions needed to cover a given area would then be lower than the corresponding requirement for nerve agent munitions. For example, substantial chemical operations in Europe would require some tens of tons of nerve agent munitions per day. If developed to anything like their full potential, a much smaller quantity of toxin munitions would suffice to cover the same area. However, this reduction of logistic requirements in a major war zone is not so great as to provide an overwhelming argument for having toxins instead of nerve agent. For comparison, we expend thousands of tons of munitions per day in Vietnam and would expect to use considerably more in a major conventional war in Europe.

U.S. policy proscribes the first use of lethal or incapacitating chemicals. Our ability to use chemicals in retaliation against a chemical attack on us would force enemy troops to don protective equipment. This provides such a high order of protection that our chemicals would not be very effective in causing casualties directly. Instead, the military effectiveness of using chemicals against an enemy prepared to protect himself resides mainly in the reduction of mobility and general fighting efficiency caused by the cumbersomeness of protective equipment and by the complexity of the precautions needed to survive in a chemical environment. The chief argument for our possession of chemicals is that it enables us to force the enemy into the same awkward protective posture as his chemicals would force on us, reducing his incentive to initiate chemical warfare and denying him a comparative advantage in case deterrence fails. Although this argument deserves critical examination, it is accepted here without challenge in order to assess the requirement for toxins as a replacement for nerve agent weapons.

There would be little military advantage in having agents much more toxic than nerve gas. Even a very large increase in toxicity would not overcome the high degree of protection afforded by sophisticated defensive gear. Indeed, in spite of their potential for extraordinary toxicity, toxins are likely to be less effective for tactical purposes than are nerve agents. Toxins do not penetrate the skin and therefore would not force enemy troops to wear protective equipment as cumbersome as the suits required for defense against nerve agents. Their dissemination over large areas would cause high casualty levels among unprotected civilians while not greatly impeding the activities of enemy soldiers. Indeed, even if skin penetrating toxins could be developed, contrary to present expectation, their only advantage would be the rather modest reduction of logistic requirements discussed above.

The situation with incapacitating agents is somewhat different because no very satisfactory incapacitating agent now exists. It is conceivable that a satisfactory incapacitating toxin could be developed, whereas no conventional chemical may be found with the necessary properties. However, so long as we are committed to use incapacitating agents only in retaliation for chemical attack upon ourselves, we have no major need for an incapacitating chemical capability.

Arms Control and Non-Proliferation

Today no nation appears to have operational toxin weapons or even to have generated any great momentum toward developing them. In the context of both tactical and strategic war, it is very much in our interest to preserve this situation. Our great wealth allows us to expend enormous quantities of conventional munitions in tactical combat. Very few countries even approach this capability. Toxin weapons have the potential of large

area coverage at low cost. If effective toxin weapons are developed and if there are no strong restraints against their acquisition, countries and forces less wealthy than the U.S. will wish to acquire them, to our disadvantage.

At the strategic level, the hazard for us is much more serious. Toxins could open up a whole new dimension of strategic threat. For strategic purposes, their potential for large area coverage per pound of agent could make them more like germ weapons than like chemicals. Countries not possessing nuclear weapons and unwilling to accept the odium and uncertainties of reliance on strategic germ weapons might well be tempted to acquire a population-killing capability based on toxins.

Clearly, it is in our interest to discourage other nations from diverting resources to the development and procurement of toxin weapons. We do this by creating the expectation that such weapons will not be used, by not pioneering their technology, and by strengthening the psychological and legal barriers against them.

The arms control benefits of our newly decided policy of not using germ weapons for any purpose will be reduced if we maintain biological laboratories where secret work is done and if we keep military facilities capable of the large-scale production of germ weapons. An active U.S. toxin weapons program would prevent us from demilitarizing and declassifying our biological research laboratories at Fort Detrick and our germ weapons production facility at Pine Bluff Arsenal. Conversely, if we choose not to develop toxin weapons, Pine Bluff can be completely demilitarized and our defensive biological research program can be done at Fort Detrick or other locations with little or no secrecy. This would constitute a comprehensive and convincing renunciation of the use of disease

as a weapon of war. It would deprive present and potential advocates of biological weapons in other countries of the time-honored argument that such weapons must be made because the other side is doing so. It would reinforce the psychological attitudes which incline political leaders not to divert resources to biological weapons and which incline technical personnel not to work in this area. Such a policy would allow us to focus maximum political pressure on other nations in order to discourage them from undertaking or prosecuting biological weapons programs of any kind.

Maintaining the Authority and Credibility of the President

The initiative of the President in renouncing the use of biological weapons under all circumstances was greeted with praise and admiration throughout the world and across a broad political spectrum. However, the toxin issue threatens to undermine the credibility and authority of the President's policy, even in the eyes of persons generally counted as supporters of Presidential policy. Many senior scientists have expressed the view that a toxin weapons program would be inconsistent with the President's initiative in attempting to forestall the use of disease as a weapon of war. A toxin weapons program would require us to divert many of the recent and forthcoming advances in biology and medicine toward new methods of killing and of controlling living processes for military purposes. Most persons hold this to be unnecessary and abhorrent. This attitude was stated editorially in the Washington Post of January 9. "The revulsion generally felt against biological warfare arises from the conviction that disease should not be used as a weapon of war. Surely the President did not mean that, while a disease induced by living bacteria is out of bounds, a disease induced by a toxin is acceptable. He can scarcely have renounced typhoid only to embrace botulism." This view is likely to be shared by a large segment of responsible opinion in the United States and abroad. To the extent that this is the case, a decision to

maintain a toxin weapons program would rob the President of the initiative he has gained and would generate cynicism and disaffection amongst persons who would otherwise come strongly to the support of his policy.

Conclusions and Recommendations

1) U.S. military requirements for toxin weapons are no more than marginal.
2) The proliferation of toxin weapons would be disadvantageous to us in tactical war and would pose a major new strategic threat. Our principal objective should be to discourage interest in developing toxin weapons. This can best be done by grouping toxins with biological weapons for policy purposes.
3) Doing this would allow the President to take an unequivocal and convincing stand against any use whatsoever of disease as a weapon of war.