

INFORMATION AND INSTRUCTIONS FOR COMPLETING QUESTIONNAIRE

1. Write your answers directly on the questionnaire.
2. If you have any additional comments on any of the questions or on the questionnaire in general, please feel free to include them on the accompanying sheet or on the back of the pages of the questionnaire.
3. Please return this questionnaire by January 16 in the addressed, stamped envelope provided.
4. IMPORTANT: The concept of "biological weapons", in this survey, is used to refer only to "microorganisms that are capable of replication". The concept of "biological weapons", in this survey does NOT include toxin weapons. Please answer the questions only as they apply to "microorganisms that are capable of replication" used as biological weapons.
5. If you have any questions, write or call me collect:

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BW ↙

*Miller*

I. Verification

The concept of "verification" of compliance with the 1972 BW Convention can be divided into two distinct components:

- 1) verification of compliance with the implied purpose of the treaty, ie. the prohibition against the use of BW, and
- 2) verification of compliance with the specific terms of the treaty, ie. the prohibition against the development, production and stockpiling of "microbial or other biological agents" for other than "prophylactic, protective or peaceful purposes".

"Verification measures" to monitor the absence of development, production, and stockpiling of microbial agents are different from those measures which monitor an incident of an alleged use of BW. If procedures for monitoring BW use or the development, production, or stockpiling of microbial agents could be made effective, they would constitute a means of detecting non-compliance with the 1972 BW Convention. Furthermore, if the procedures could, in a timely fashion and to the satisfaction of signatory states, detect violations that pose a threat to national security, they would fulfill the necessary characteristics of the concept of "verification".

QUESTIONS

1. Do you think that it is possible for the United States to monitor the development, production, or stockpiling of microbial agents in another country? If you answer "yes", please specify the most reasonable measure that you would recommend to accomplish this goal.

	YES	NO	MOST REASONABLE MEASURE
<u>Development</u>	___	X	<i>self-inspection in a regime of close international cooperation in infectious disease research</i> <i>on site inspections on demand (with notice) at levels far more intrusive than have been worked out</i>
<u>Production</u>	??	___	
<u>Stockpiling</u>	?	___	

2. Do you think it is possible to monitor an incident of BW use? *so far*  
Yes  ? No \_\_\_ If you answer "yes", please specify the most reasonable measure you would recommend to accomplish this goal.

*Details of epidemiological investigations - depends on detailed circumstances; and on agents used. Many forms of covert attacks would be unattributable.*

## II. Secrecy

"Secrecy" has been said to cause decreased quality in research by inhibiting peer review. Based on this premise, "secret" or classified research on BW could decrease the quality of the BW research, and could also increase the potential for violations of the 1972 BW Convention. "Secrecy" in BW research is, however, considered by some to be necessary for national security.

A trend towards reducing secrecy in BW research was exemplified by the 1986 Review Conference of the 1972 BW Convention which resulted in agreements to exchange more information and to publish more results of BW research. Representatives of The American Society for Microbiology have stated that microbiologists are expected to communicate knowledge of their research through peer review, and that restrictions on research should be avoided.

A renunciation by scientists of all secret research and all security controls over microbiological, toxicological, and pharmacological research has been suggested as a means of strengthening the 1972 BW Convention.

### QUESTIONS

1. Do you think the secrecy surrounding some BW research has a significantly adverse effect on the quality of the research? Yes  No  Please cite the main reason why this would or would not occur. *Inaccessibility to peer criticism.*
2. Do you think secrecy increases the potential for violations of the 1972 BW Convention? Yes  No  Please cite the main reason why this would or would not occur. *Defeats verification. But Research is not covered by the convention.*
3. Do you think secrecy in BW research is necessary for national security? *(1) IF both sides comply with openures in research, both sides' security is enhanced. (2) IF one side has a secret offensive development program, the other side is at risk if its defensive options are known to the offense.*
4. The 1986 Review of the BW Convention resulted in agreements for 1) sharing of BW information, 2) scientist exchange programs and 3) publication of BW research. Do you think that these measures will significantly decrease secrecy in BW research? *We'll see what happens in the April meeting of experts which will address the implementation of the "agreements". I hope so!*
5. Do you think it is reasonable to expect microbiologists to "avoid" secret research? Please cite the main reason for your answer. *I don't understand "expect". I urge microbiologists to support national and international policies consistent with my remarks at (3), and to work within the framework of those policies which are in force.*

### III. BW Research

The concept of "BW research" can initially be divided into basic and applied research. Basic BW research is not subject to the degree of secrecy that surrounds applied BW research. Moreover, basic BW research may provide the foundation for applied research areas other than national defense, such as the medical field. Alternatively, BW research can be divided into offensive and defensive research. These four categories, which may or may not be mutually exclusive, are illustrated in the following matrix:

	BASIC RESEARCH	APPLIED RESEARCH
OFFENSIVE RESEARCH	A	C
DEFENSIVE RESEARCH	B	D

#### QUESTIONS

1. Is there a key element that can be used to distinguish offensive BW research from defensive BW research? What is that key element?

*only at the extreme: e.g., survivability of infectious agents in munitions; large scale aerosol dissemination; construction of new genotypes with no evident peaceful purpose. Collocation with military production and deployment facilities and related organizational criteria.*

2. If you named a key element above, is it measurable? How can it be measured? If it is not measurable, can you suggest an alternative element that could be measured or observed externally?

Secrecy.

#### IV. Prophylactic, Protective and Peaceful Purposes

The 1972 BW Convention allows the development, production, stockpiling and retention of "microbial or other biological agents" for prophylactic, protective and peaceful purposes. These purposes are not defined in the treaty. While some observers have argued that ambiguous language is a positive feature in a treaty, others have noted that this lack of definition has contributed to the questions and suspicions concerning treaty violations.

There appears to be some consensus in the literature on the meanings of the three terms. Measures to protect civilians or military personnel against BW agents would be considered prophylactic or protective. These measures would include such things as vaccine production or development and production of protective clothing. Peaceful purposes might include medical or pharmaceutical research on infectious diseases, including those which are endemic in militarily significant parts of the world.

#### QUESTIONS

1. How would you interpret the concept of "prophylactic purposes" as applied to "microbial or other biological agents"?
2. How would you interpret the concept of "protective purposes" as applied to "microbial or other biological agents"?
3. How would you interpret the concept of "peaceful purposes" as applied to "microbial or other biological agents"?

*The legislative history of BWC. Anything not a deployable weapon for hostile use is "peaceful".*

4. Do you believe that clarifying the concepts of "prophylactic, protective and peaceful purposes" would weaken or strengthen the perceived strength of the 1972 BW Convention. Please cite the main reason for your answer.

*Desirable but difficult.*

*Openness (contra secrecy) would go a long way.*

## V. BW and Recombinant DNA Technology

Recombinant DNA technology is a process for altering the genetic material of microorganisms. This process can be used to alter certain characteristics of microorganisms, such as antibiotic resistance and increased or decreased virulence factors. Two potential effects of recombinant DNA technology on the usefulness of BW in conflict situations are:

- 1) the theoretical capability of designing organisms to the specifications of military planners, and
- 2) the availability of increased defenses against a BW attack, primarily through the use of genetically engineered vaccines and rapid detection and identification systems.

Opposing viewpoints note that BW produced by recombinant DNA technology would not offer any advantages over existing BW agents. Moreover, studies have shown that these genetically engineered organisms do not survive well in the environment.

### QUESTIONS

1. Do you think that the capability of designing organisms to the specifications of military planners will increase the chance of BW being used in the future? Yes  No  Please cite the main reason for your answer.

*Enhanced controllability (control ability).*

2. Do you think that the availability of increased defenses against BW, provided by recombinant DNA technology, will increase the chance of BW being used in the future? Yes  No  Please cite the main reason for your answer.

*except as coupled with 1.*

3. Do you think BW agents produced by recombinant DNA technology offer any significant advantage over conventional agents in a conflict situation? Yes  No  Please cite the main reason for your answer.

*Not today. Natural agents are effective enough.  
With 10-20 year concentrated R+D, yes!*

4. For the following two questions, please check "yes" or "no" in the space provided.

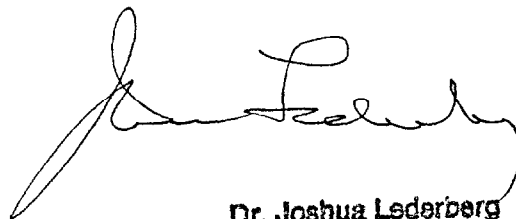
4a. Do you think that genetically altered organisms survive well in the environment? Yes  No

4b. If you answered "no" in 4a. above, do you think this trait can be easily "overcome" by genetic selection? Yes  No

*might take 10-20 years.*

ADDITIONAL COMMENTS OR QUESTIONS

*I applaud your interest!*

A handwritten signature in black ink, appearing to read "Joshua Lederberg". The signature is fluid and cursive, with a large initial "J" and a long, sweeping underline.

**Dr. Joshua Lederberg  
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