MATTHEW S. MESELSON

BEHIND THE NIXON POLICY FOR CHEMICAL AND BIOLOGICAL WARFARE

Months of reappraisal and analysis preceded President Nixon's November announcement of chemical-biological weapons policy banning "germ" warfare and renouncing first use of incapacitating chemical agents (except tear gas and riot control agents). An important contribution to this reassessment, in the judgment of the Bulletin editors, is published here.

Last spring, the Senate Committee on Foreign Relations turned its attention to chemical and biological weapons as a result of rising international interest in controlling their use. In order to clarify its understanding of the weapons, the committee called an expert witness to brief members and discuss the implications of the weapons in an executive session April 30, 1969. He was Professor Matthew S. Meselson, Professor of Biology at Harvard University, who had served as a consultant to the Arms Control and Disarmament Agency. Portions of Dr. Meselson's testimony released by the committee provide a graphic description of the present status of chemical and biological weapons and of the questions they pose for the United States. Editorial changes have been made in the transcript by Dr. Meselson and the Editors of the Bulletin for clarity and brevity.

Because of its leading military and political role in the world today, the United States can exert an important and possibly decisive effect on the factors that act to restrain or encourage chemical and biological (CB) warfare. This fact argues strongly against basing our policy on a weapon-by-weapon or situation-by-situation analysis and calls instead for the formulation of an overall policy on which decisions regarding particular weapons or particular situations can be based. Stated another way, decisions involving chemical or biological weapons are likely to have important effects on the military environment we face years after those decisions are made.

Chemical and biological warfare has been defined by the U.S. Army as follows: Chemical warfare (CW)—tactics and technique of warfare by use of toxic chemical agents. Biological warfare (BW)–employment of living organisms, toxic biological products, and chemical plant growth regulators to produce death or casualties in man, animals, or plants; or defense against such action. The United States at present has seven so-called standardized chemical warfare agents.

NERVE AGENT—GB

The first agent is the lethal gas called GB. This was developed in Germany during World War II. The German name for it is Sarin. It is a nerve gas.

GB is one of the highly lethal nerve gases developed but not used by Germany during World War II. It is a quick-acting lethal agent intended to enter the body by inhalation. Protection can be afforded by a gas mask. GB can be made available in a wide variety of munitions and delivery systems including landmines, mortars, artillery shells, rockets, and bombs. It can also be dispensed from aircraft by means of special spray tanks. The performance of poison gas weapons, such as those containing GB, is highly dependent upon meteorological conditions. However, for rough descriptive purposes, it may be said that the explosion of an artillery shell containing six pounds of GB will kill most unmasked personnel within an area approximately the size of a football field.

At the other end of the magnitude scale, an attack on an urban area by a bomber dispensing GB under meteorological conditions favorable to the attacker might be able to kill most unmasked persons within an area of at least five square miles, this being the size of the zone of high mortality caused by the Hiroshima and Nagasaki atomic bombs. I have used the words "might kill" in the previous sentence in order to indicate that the statement is based on rather simple calculations and not on results of actual field tests on a simulated urban target. The properties and means for production of GB are relatively well documented in the open literature.

QUESTIONS AND ANSWERS

SEN. J. W. FULBRIGHT (D.–Ark.), Chairman. Has it any other name?

MESELSON. It has, of course, a chemical name.

CHAIRMAN. When you say "lethal" you mean it kills—not just immobilizes.

MESELSON. No, it doesn't just immobilize.

CHAIRMAN. It kills people?

MESELSON. Somehow the misunderstanding that nerve gases merely incapacitate is rather widespread. I don't

Background Report

know where it comes from, and it is totally false. Nerve gases kill.

SEN. THOMAS J. DODD (D.-Conn.). Have you had tests with animals or anything like that?

MESELSON. Yes; there have been intensive tests with animals.

CHAIRMAN. And it kills animals?

MESELSON. It killed 6,000 sheep in Utah.

CHAIRMAN. Is this what killed them?

MESELSON. No; it is the next agent.

CHAIRMAN. But it is similar?

MESELSON. It is similar. It is one of the family of phosphorous-based nerve gases. GB, as I say, is one of the older ones, developed in Germany.

The next one, VX, which was developed in Great Britain and elsewhere in the middle fifties, is somewhat different.

CHAIRMAN. When you use the word "lethal" you mean killing?

MESELSON. I mean killing.

CHAIRMAN. That is what I want to understand.

SEN. ALBERT GORE (D.-Tenn.). Is the death instantaneous?

MESELSON. No; it is not absolutely instantaneous. With GB it is, however, very rapid, within a matter of seconds.

NERVE AGENT—VX

VX is a lethal agent that enters the body primarily by absorption of liquid droplets through the skin. A gas mask, as well as complete covering of the body, that is, a protective suit, is required for protection against VX. The same general types of munitions and delivery systems as listed for GB may be used for VX. A tiny droplet of VX on the skin will cause death. It appears that VX was responsible for the accidental killing of approximately 6,000 sheep near the Dugway proving ground in Utah last March. The affected sheep were grazing within an area of approximately 200 square miles located at an average distance of approximately 30 miles from a test area where an aircraft had conducted an operation test of a nerve gas spray system. Detailed information concerning VX is classified.

BLISTER AGENT—HD

The third agent I wish to talk about is the blister agent HD or more familiarly, mustard gas, the gas so widely used in World War I. It primarily causes incapacitation rather than death. Casualties are produced by blistering action on the eyes, skin, and respiratory tract. As in the case of nerve agent VX, protection against HD is afforded by a special suit and a gas mask. Weight-for-weight, HD is much less effective than VX in producing casualties.

INCAPACITATING AGENT—BZ

The fourth agent I wish to describe is the incapacitating agent BZ. This agent is classed as a temporary incapacitant. It interferes with normal mental and bodily processes. It can cause violent and irrational behavior and its effects may persist for several days. Most information regarding agent BZ is classified. Aircraft delivery systems are available for its dissemination.

RIOT CONTROL AGENT—CS

The next agent is riot control agent CS. This agent, sometimes called "super tear gas" has been used in large quantities by U.S. forces in South Vietnam. It attacks the eyes, nose, throat, and lungs even in extremely low concentrations and also causes nausea. Its effects continue for approximately 10 minutes after exposure to fresh air. At high concentrations under humid conditions it causes severe blisters. It is not generaly lethal to healthy personnel. However, a few deaths from CS in Vietnam have been claimed.

RIOT CONTROL AGENT—CN

The sixth agent standardized by U.S. forces is the riot control agent CN. This is ordinary tear gas commonly used by police in this country and other countries. It was also used in considerable quantity in World War I and manufactured in large quantity but not actually employed in World War II.

CHAIRMAN. What does it do? In just one word, what does it do? The same as CS?

MESELSON. Basically, yes, Senator. It requires more of CN to temporarily incapacitate a man than CS. CS is more powerful in that regard.

CHAIRMAN. The effect is about the same?

MESELSON. The effect is about the same. And many of us have probably had a whiff of CN. It is the ordinary tear gas.

CHAIRMAN. Yes. Go ahead.

RIOT CONTROL AGENT—DM

The seventh agent is riot control agent DM. This agent causes violent sneezing, nausea, and vomiting. It may also be lethal under certain conditions, and, therefore, it is not approved under current U.S. policy for operations where deaths are not acceptable. It was first produced for military purposes during World War I. It may have been used in Vietnam in 1965.

BIOLOGICAL WARFARE AGENTS

Now, I would like to discuss biological warfare agents.

Specific information on biological agents and weapons systems is classified. Nevertheless, certain general principles regarding the use of biological agents are widely known. Various germs, that is bacteria, rickettsia, fungi, and viruses, have been examined for utility as weapons against humans, animals, and crops.

Because of the very small weight of biological agents needed to cover a given area, biological weapons have been considered for use mainly against large areas. Unlike chemical agents, biological agents take some time before their effect is manifested, the so-called incubation period before the disease appears. So there is a time of between one and a few days between the time of a biological attack and the time that one would expect symptoms to appear. For that reason, because of that delay, they are not generally considered for tactical use on the battlefield, but rather for strategic use.

The most generally considered mode of attack by a biological weapon would be the release of an aerosol cloud, by planes or drones.

Sen. CLIFFORD P. CASE (R.-N.J.). Is that a word or is that a description of something that you buy in a can?

MESELSON. Aerosol is a word meaning a fine mist. [It is] released by planes, drones, missiles, offshore submarines, or offshore ships. For infection of target personnel to occur, particles from the aerosol mist must generally lodge in the deep recesses of the lungs. A well fitting gas mask, or possibly certain simpler protective devices, can afford a large measure of protec-

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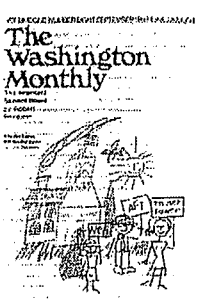


tion, given adequate advance warning of attack.

For military purposes, it is desirable that epidemic spread of the disease to those outside the immediate target area be avoided. Therefore, only those diseases which can infect the target population but which are believed to be incapable of man-to-man transmission are considered for military use.

Let me explain that. There are some diseases for which we think, although we are not absolutely sure, that infection will not spread from one person to another. Such disease would not start an epidemic but would infect all of the persons directly exposed to the aerosol cloud at the time of attack. That is the distinction I intend here.

Aerosol attack would cause the pulmonary form of a given disease. Generally this is not the most commonly occurring form under natural conditions. The pulmonary form of a disease, that is, the form which strikes first in the lungs, is generally more severe, more rapid in its development and more difficult to treat than other forms. Other forms would be the cutaneous form of the disease where the portal of entry is the skin or the intestinal form where the entry is through the gut. The pulmonary form is relatively rare for most diseases and we know much less about the pulmonary form of diseases than we do about other forms.

EFFECTIVENESS OF AEROSOL

The effectiveness of a biological aerosol attack on human populations is extremely difficult to predict. Poorly understood and highly variable factors that determine man's resistance to infection are involved. Additional serious uncertainties can be introduced by meteorological and atmospheric conditions and by complicated factors that influence the survival of infectious organisms in the air.

If biological weapons can be brought close to anything like their potential efficiency, very small amounts would suffice for the attack of large areas. Under such conditions, a single aircraft would be capable of attacking an area of many thousands of square miles.

Field Manual 3–10 presents an illustrative discussion of biological agent employment in terms of three hypothetical antipersonnel biological agents designed as "Lugo fatigue," "September fever," and "Toledo infection." These are hypothetical diseases.

GORE. When you say "hypothetical" do you really mean hypothetical, or do you mean this is a fictitious title?

MESELSON. Because it is unclassified, Field Manual 3–10 does not refer to actual biological agents. Nevertheless the information given for the three hypothetical agents may be taken as illustrative of the properties to be expected for actual biological agents.

I might add that in an earlier edition of Field Manual 3–10—namely, in the edition of February 1962—detailed information is given for the carrying out of a biological attack. A series of graphs or nomograms is presented there which tell how many biological agent bomblets must be dropped by an aircraft to cover a given area under given conditions of daytime or nighttime, type of terrain, et cetera.

STRATEGIC VALUE OF CBW

CHAIRMAN. You know about the debate going on about the ABM? It occurred to me that if the Russians are really trying to do what the Secretary of Defense says, which is develop a first strike capability, which means the physical destruction of our country, if that is their purpose, then wouldn't it be just as simple, or maybe simpler, for them to send over enough anthrax, particularly over our populated areas, and explode it? What are the probabilities, if you exploded one over New York City or the eastern seaboard? Would it have an effect, or not?

MESELSON. To do that would be even more foolhardy than to attack the United States with nuclear weapons for the reason that any biological agent takes a while before casualties begin to appear. Like any disease, you have to catch it, it has to incubate, before the disease comes out. It means whole days would elapse between the time a country knows that something is wrong, and the time that people start dying.

SEN. STUART SYMINGTON (D.—Mo.). So?

MESELSON. In those days we could fire all the missiles we have at the Soviet Union. In other words, they would not in any way degrade our ability to retaliate against them by using a biological weapon. Biological weapons do not damage missiles. Moreover, even after a BW attack had inflicted its casualties, the survivors could launch a nuclear retaliation.

SYMINGTON. How would you know they had done it?

MESELSON. Done what, Senator?

SYMINGTON. How would you know who had fired it as more and more nations get the bomb?

MESELSON. How would anyone know where any missile came from? I don't know the answer to that question.

SYMINGTON. Well, that is a good answer. Nobody would know if you fired one from a submarine 500 miles south of Hawaii. There was a lot of discussion in World War II about destroying crops. In that case it would be an airplane. I would think a missile would be a very simple way. You don't have the gigantic noise, et cetera, plus all the reaction of a nuclear explosion. But you spread the germs around in an explosion.

MESELSON. Let me put it this way: I certainly agree that you might kill an enormous fraction of the population with a biological weapon.

I also believe, however, that as strategic weapons go, these are ridiculous weapons, ridiculous because they in no way would reduce the ability of the country attacked to retaliate with nuclear missiles, and they also might not work. You point out if the United States were attacked, we might not know who attacked us, but the problem of the enemy is a little different. Their problem is that the United States might know who attacked them or might assume who it was. In that case, they would be facing the United States with all of its gigantic nuclear might fully intact. It seems to me it would be absolutely lunatic to launch a biological warfare attack on a nuclear power.

CHAIRMAN. Is it any more lunatic than launching a nuclear war? They are both lunatic.

MESELSON. I just meant to point out that a biological weapon does not have any counterforce capability and that it is highly unreliable. It does not damage the other side's retaliatory capability. You do not damage Soviet missiles with biological weapons nor they our missiles with their biological weapons.

SYMINGTON. Interesting. You get to

SOMETIMES I AM SORRY FOR THOSE WHO WILL BE OUR SUCCESSORS.

the question of graduation, if you are not in a nuclear war and have no agreement on other things. Some might attempt it on a relatively modest scale, take a tap at Berlin or something. They might attack crops; then there might be an argument as to who did or didn't do it, and you would have to prove it. You wouldn't hear any explosion at all at high altitude.

MESELSON. As you go down the scale, the opportunities for smaller scale offensive actions with BW becomes realistic, but if you are talking about major strategic threats among nuclear powers, I think biological weapons are useless and foolish.

CBW AND NON-NUCLEAR POWERS

Chemical and biological weapons are not good strategic weapons unless you don't have any nuclear weapons. For powers lacking nuclear weapons, it is a different story. Chemical and biological weapons, especially the latter, hold certain advantages for poor countries, small countries, who might not have nuclear weapons—but not for nuclear powers.

CASE. Might there not be some considerable importance to that? If a country had no nuclear retaliatory capacity, this might still provide a retaliation which would be a check against a first strike by the other side?

MESELSON. Yes.

CHAIRMAN. The point, if I understand it, that he is making is this: we have been saying we are not going for a first strike, we have a defensive nuclear deterrent. We could say, then, "If you attack us we will really raise hell with you, and among other things we will use chemical weapons along with nuclear." You said that it takes more weight for chemical. What about biological? How would the equivalent weight, let's say, of anthrax delivered in Moscow, compare with the destructive capacity of nuclear weapons as far as the population is concerned?

MESELSON. Nobody can say today whether an anthrax bomb would work or not work.

CHAIRMAN. Assuming it will work.

MESELSON. If it did work, then the amount required could be much less than the amount of nuclear material required to attack the same area. However, you still have the weight of the delivery vehicle to contend with, and when the vehicle weighs much more than the warhead, then fractional savings in the warhead size don't matter.

Thermonuclear weapons are already so compact and so lightweight that further reduction in warhead size that might be offered by biological weapons, especially keeping in mind that nobody can tell whether they would work or not, is not too meaningful.

CHAIRMAN. They will be able to make them work as well as others, won't they?

MESELSON. No.

CHAIRMAN. Why not?

MESELSON. Because the response of the human body to a micro-organism is far more uncertain than the reaction of the human body to heat, blast and radiation. We can't be sure of the result of placing bacteria in a human lung. It can vary enormously. The bacterium is a living creature. It can be ill or well, you might say. It might be infectious or it might be harmless, depending on many things.

CASE. There is a difference between biological and chemical agents.

MESELSON. Yes, chemicals are a different matter. The effects of chemical weapons are not as difficult to predict.

ANTICROP WEAPONS

Not considered in FM3–10 are the potential anticrop biological weapons. Chief among these are rice blast and wheat rust. These are fungal diseases of rice and wheat that cause considerable damage to crops in the world today. Their effectiveness in any given application would be difficult to predict, due to variable resistance of different plant strains and other technical factors. Potentially, however, relatively small quantities of anticrop biological agents may be capable of devastating very large areas of cropland.

CHAIRMAN. Because once it gets started it spreads.

MESELSON. It spreads, and very little might be needed on each plant, so little that if it really worked you wouldn't need much to cover a big area. Half a century has passed since the world's only major outbreak of poison gas warfare. Large-scale germ warfare has never been attempted. Gas and germ warfare are explicitly prohibited by international law in the Geneva Protocol of 1925.

CHAIRMAN. Did we sign that?

MESELSON. We signed it but did not ratify it. I would like to describe the history of that protocol.

CHAIRMAN. I wish you would. We are only signatories; we did not ratify.

MESELSON. We did not ratify.

CHAIRMAN. How many did?

MESELSON. Over 60 now. All members of the NATO alliance except ourselves, all members of the Warsaw Pact, Communist China, all of the industrial powers except us and Japan.

CHAIRMAN. Including Russia?

MESELSON. Including Russia.

CASE. Is it regarded as being in force among those nations that did sign it?

MESELSON. Yes it is, and some U.S. officials have expressed the opinion that it now constitutes conventional international law binding even on those countries which have not ratified it. Considering the enormous scale of gas warfare in World War I, it is remarkable how well the protocol has been respected. There have been only two instances of verified poison gas warfare since 1925—in Ethiopia, that was the use of mustard gas by Mussolini against the Ethiopians in the 1930s and in the Yemen. In Vietnam, the United States has been employing a powerful but generally nonlethal antiriot agent, maintaining that the protocol does not forbid it.

When compared with the recent history of other forms of warfare, the record shows that the governments and peoples of the world have come to practice and expect a degree of restraint against the use of chemical and biological weapons not found for any other class of weapons, except nuclear ones. The chief factor justifying that restraint is the same for both nuclear and CB warfare—apprehension that, once begun, it would open up an unfamiliar and highly unpredictable dimension of warfare that might lead to the extermination of very large numbers of troops and civilians, especially one's own.

DESTRUCTIVENESS OF CBW

There is no doubt that existing nuclear weapons could destroy entire populations. Although the performance of chemical and biological weapons in any particular attack would be less predictable than that of nuclear weapons, they too have very great potential for mass killing. The most effective method of strategic CBW attack would presumably entail the production, by bombers or missiles, of a cloud of toxic or infectious material over or upwind from a target to be inhaled or absorbed through the skin by persons in the attacked population. Although masks, protective suits and special shelters can provide effective protection against known chemical and biological agents, the cloud would readily penetrate dwellings and other ordinary structures.

CHAIRMAN. Could you say that about a bomb shelter, too?

MESELSON. If the bomb shelter were air conditioned it would be secure. If it were not air conditioned, if the air is not filtered, it would not be secure.

CHAIRMAN. Would an ordinary air conditioner filter it out or would it have to be a special filter?

MESELSON. A special filter would be required.

CHAIRMAN. Which do not now exist in ordinary places?

MESELSON. No, they do not. An attack by a single bomber dispensing one of the more deadly nerve gases could kill most unprotected persons within the central region of a large city, if meteorological conditions favored the attacker.

OTHER TOXINS

Although nerve gases are among the most poisonous substances known to be suitable for military use, it may well be possible to devise weapons containing far more poisonous materials, perhaps toxins or related substances. Toxins are poisons made by living creatures, such as bacteria. An example is Botulinus toxin.

CHAIRMAN. We haven't come to viruses yet. Are they toxins?

MESELSON. No. Viruses are germs. For example, Venezuelan equine encephalitis is caused by a virus.

SEN. GALE W. MCGEE (D.—Wyo.). Is it incapacitating in other ways or just discomforting?

MESELSON. It is highly incapacitating. In nature, it is transmitted to man by mosquitos.

The Army considers diseases like this to be incapacitating rather than lethal, if they kill fewer than two per cent of those who become ill. But, Senator, nobody can say with confidence what would happen if humans were exposed to Venezuelan equine encephalitis in the form of an aerosol.

The point is that when administered through the lungs, it could then be lethal.

Although many infectious agents are rapidly inactivated or lose their virulence when dispersed in the atmosphere, this obstacle to the development of biological weapons can probably be circumvented or overcome with sufficient research effort. If so, biological weapons could surpass thermonuclear bombs, in terms of the area coverage possible for a weapon of specified size. However, even after very extensive research, the performance of biological weapons is likely to remain subject to great uncertainty. Their effects would depend in large measure on poorly understood and highly variable factors that determine man's resistance to infection. A biological attack intended to be highly lethal might actually kill very few persons, and, conversely, an attack expected only to cause temporary incapacitation could cause high mortality.

Although biological warfare agents might be chosen from among those that are not highly contagious under natural circumstances, this would not preclude the unexpected initiation of a widespread epidemic under the very unnatural conditions inherent in military use. Indeed, it is possible that bacteria or viruses disseminated in an aerosol cloud could subsequently emerge from the exposed population of humans, insects, birds, rodents, or other animals with increased persistence, contagiousness, and virulence to man. Large-scale operations in regions populated by many persons or animals would be more risky than small operations in desolate places, and viruses might be more hazardous than bacteria. However, we cannot evaluate the risks with any confidence in any of these situations. Therefore, the field testing of live biological weapons, and especially the outbreak of actual biological warfare, would constitute a menace to the entire human species.

UNCONTROLLABILITY OF CBW

A major uncertainty in predicting or controlling the course of CBW, once it is begun, would arise from the great variety of possible weapons and targets, from the incapacitating to the highly lethal and from the local battlefield to entire continents. Once begun at any level in earnest, it would be very difficult to predict how far CBW might go. Distinctions and stopping places would be very difficult to define and to keep. The preparations and training required for one form of CBW would facilitate and therefore tempt escalation to larger scale and more deadly CBW operations. The breakdown of barriers to weapons once regarded as illegal and peculiarly uncivilized can inspire and encourage methods of warfare even more savage than those underway at the time.

The vulnerability of troops or civilians to CBW attack depends very much on the availability and effectiveness of protective facilities, the rigor of defensive training and discipline, and the performance of early-warning systems. All of this may act to place an unusually high premium on surprise or clandestine attack and on the use of novel or unexpected agents or means of dissemination. Once the effect of surprise has worn off, however, and defensive precautions have been instituted, CBW might continue on a large scale but with relatively inconclusive effects until new weapons are introduced or until conventions against the attack of previously inviolate targets are transgressed.

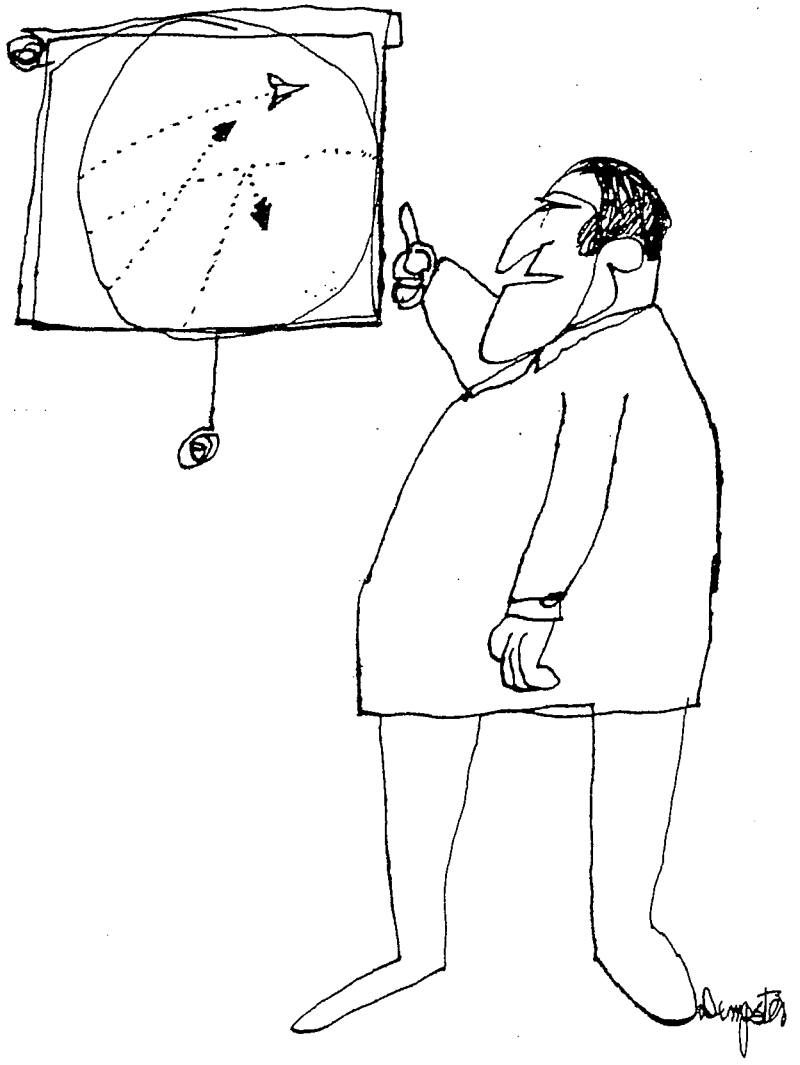
The difficulty of allowing the limited employment of gas without running the risk of bringing the whole chemical and biological arsenal into use has been concisely stated by T. C. Schelling in his book "Arms and Influence" (Yale University Press, 1966):

> Some gas raises complicated questions of how much, where, under what circumstances; "no gas" is simple and unambiguous. Gas only on military personnel; gas used only by defending forces; gas only when carried by projectile; no gas without warning—a variety of limits is conceivable . . . But there is a simplicity to "no gas" that makes it almost uniquely a focus for agreement when each side can only conjecture at what alternative rules the other side would propose and when failure at coordination on the first try may spoil the chances for acquiescence in any limits at all.

These principles appear to have been understood by the leaders of both sides in World War II, during which neither lethal nor nonlethal gases were employed. At the outbreak of the war, both sides exchanged assurances that they would observe the Geneva Protocol of 1925, that is, Germany, France, and Britain, exchanged such assurances.

Later when the United States became involved in the war, President Roosevelt declared in 1943:

> Use of such weapons has been outlawed by the general opinion of civilized mankind. This country has not used them and I hope



that we never will be compelled to use them. I state categorically that we shall under no circumstances resort to the use of such weapons unless they are first used by our enemies.

Although many rules of war were violated in that conflict, it is fortunate for all sides that the rule against gas was observed. Germany had secretly developed and produced a large quantity of nerve gas. Although the Allies had no weapon of comparable deadliness, they could have produced vast quantities rather soon after becoming aware of its existence. Since the previous restraints against anticity warfare had already broken down, the introduction of nerve gas in the midst of World War II would almost certainly have caused a death toll vastly greater than it was.

I feel, Senator, that I perhaps should now depart from this prepared testimony, because I would like to talk about U.S. policy from the time of World War II until the present regarding chemical and biological weapons and I fear that since time is passing I should move to that subject now.

U.S. POST-WORLD WAR II POLICY

The policy of the United States with regard to the prohibition on gas has been different at different times. In 1956 the policy of the United States, as stated in "Army Field Manual 27–10," page 18, this is 1956, was as follows:

> The United States is not a party to any treaty now in force that prohibits or restricts the use in warfare of toxic or non-toxic gases, of smoke or incendiary materials or of bacteriological warfare. A treaty signed at Washington 6 February 1922 on behalf of the United States, the British Empire, France, Italy and Japan, contains a provision forever prohibiting the use in war of asphyxiating, poisonous, or other gases and all analogous liquids, materials or devices but that treaty was expressly conditioned to become effective only upon ratification of all the signatory powers, and not having been ratified by all the signatories has never become effective.

That was the Washington treaty. The Army Field Manual goes on to state:

> The Geneva Protocol for the prevention of the use in war of asphyxiating, poisonous or other gases and bacteriological methods of warfare signed on 17 June, 1925 on behalf of the United States and many other powers has been ratified or adhered to by and is now effective between a considerable number of states. However, the United States Senate has refrained from giving its advice and consent to the ratification of the protocol by the United States and it is accordingly not binding on this country.

A similar view was expressed by the Departments of Defense and State in 1960 in response to a joint House-Senate resolution introduced by Congressman Kastenmeier in 1959. The Department of Defense and the Department of State sent letters to the chairman of the House Committee on Foreign Affairs. The Defense Department letter dated March 29, 1960, opposed the resolution. I might say that the resolution stated that its sponsors did not oppose research and development of chemical and biological weapons, did not oppose readiness to retaliate in kind if attacked, but did wish at a time when the budget was in fact rising steeply for chemical and biological weapons to reiterate the policy stated by President Roosevelt that the United States would not use these weapons unless it was first attacked by its enemies. The Defense Department opposed this resolution stating as follows:

> Similarly, declarations might apply with equal pertinency across the entire spectrum and no reason is conceived why biological and chemical weapons should be singled out for this distinction.

I would emphasize again that the resolution did not oppose research, development, stockpiling or use of these weapons in retaliation. It asked only for the reiteration of our policy of no-first-use.

The apparent policy of reserving the right to use these weapons first was again stated in a State Department historical office publication, research project No. 449, dated November 1960, a portion of which I shall read, which states:

> The Departments of State and Defense have expressed strong opposition to a proposed congressional resolution that would have committed the United States not to use biological or chemical weapons under any circumstances unless they were first used by our enemies. The resolution has not been approved. The President thus remains free to determine American policy on the use of such weapons in any future war.

NO-FIRST-USE

However, our present policy, Senator, has evolved from there. I believe there has been a beneficial direction and I would like to quote from a letter of December 22, 1967 to Congressman Rosenthal of New York from William B. Macomber, Jr., Assistant Secretary of State for Congressional Relations:

> We consider that the basic rule set forth in this document (i.e., the Geneva Protocol) has been so widely accepted over a long period of time that it is now considered to form a part of customary international law.

CASE. What is that principle again?

CHAIRMAN. No-first-use.

MESELSON. No-first-use of chemical and biological weapons.

However, I would submit that our policy may still seem to be somewhat ambiguous. This is partly because of our previous statements saying that we did not feel bound by the Geneva Protocol, and partly because of certain more recent statements of the Defense Department. I would like to quote from a letter or rather from the testimony of former Deputy Secretary of Defense Cyrus Vance, which was presented to the Disarmament Subcommittee of this committee on February 7, 1967. In his prepared testimony Deputy Secretary Vance stated:

> We have consistently continued our de facto limitations on the use of chemical and biological weapons. We have never used biological weapons. We have not used lethal gases since World War I and it is against our policy to initiate their use.

MESELSON. The question that occurs to me is why the State Department characterizes the protocol as customary international law, binding on all nations alike, whereas the Defense Department's prepared statement emphasizes that our policy is de facto.

SEN. GEORGE D. AIKEN (R.—Vt.). De facto?

CASE. There is also a difference in the subject. Mr. Vance doesn't say we haven't or wouldn't use tear gas.

MESELSON. That is right.

TEAR GAS

I would like to say something specifically about tear gas.

CASE. It does not say that we will not use tear gas?

MESELSON. No. Our present policy is that tear gas is not covered by the Geneva Protocol.

AIKEN. In this case de facto means subject to change without much notice, doesn't it?

CASE. That is what we are doing.

MESELSON. I think our policy on this is illuminated by the statement of Mr. Nabrit on behalf of the United States speaking before the United Nations General Assembly on December 5, 1966. Mr. Nabrit spoke as follows:

> The Geneva Protocol of 1925 prohibits the use in war of asphyxiating and poisonous gas and other similar gases and liquids with equally deadly effects. It is framed to meet the horrors of poison gas warfare in the first World War and was intended to reduce suffering by prohibiting the use of poisonous gases such as mustard gas and phosgene. It does not apply to all gases. It would be unreasonable to contend that any rule of international law prohibits the use in combat against an enemy for humanitarian purposes of agents that governments around the world commonly use to control riots by their own people.

BRITISH QUERY

CASE. That is certainly the American doctrine.

MESELSON. That is our current position, as I understand it, Senator.

However, I believe that Mr. Nabrit was in error to say categorically, that the Geneva Protocol was not framed with the question of tear gas in mind. The reason I say that is, first of all, great quantities of tear gas were produced and used in World War I. Second of all, in 1930 the Government of Great Britain addressed a question to other nations regarding the applicability of the Geneva Protocol to tear gas, and I have here a copy of the British question, a memorandum on chemical warfare presented to the Preparatory Commission for the Disarmament Conference in Geneva November 18, 1930. The British Government points out that there may be some difference of opinion as to whether the Geneva Protocol covers lacrimatory gas—that is, tear gas—and they state that—

> From every point of view it is highly desirable that a uniform construction should prevail as to whether or not the use of lacrimatory gases in war is considered to be contrary to the Geneva Protocol of 1925.

The British Government states that, for its own part, it considers that tear gas is prohibited. It states:

> Basing itself on this English text, the British government has taken the view that the use in war of "other" gases including lacrimatory gases was prohibited.

CHAIRMAN. Your point is that if you use one gas it is an open invitation to use any other. As you noted a moment ago, if you used tear gas it would lead to the use of other gases.

MESELSON. That is certainly a hazard, and I think the question of tear gas might be approached in the following way. The record shows that a number of countries have stated that tear gas is covered by the Geneva Protocol. The response to this British question was that the following month the delegates of Rumania, Yugoslavia, Czechoslovakia, Spain, Japan, USSR, France, China, Italy, Canada, Turkey all stated that their governments considered that tear gas was forbidden under the protocol.

PROS AND CONS OF TEAR GAS

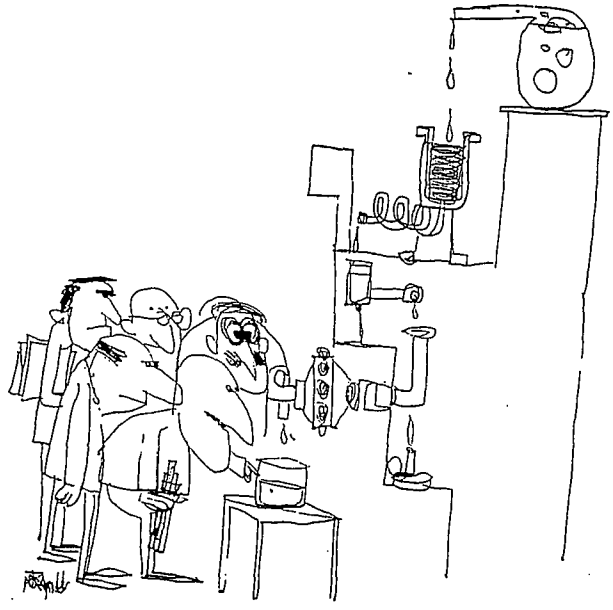
MESELSON. I would like to express the opinion that the question of tear gas might be approached as follows. On the one hand, there is no question that there is a danger of escalation when any gas is used.

On the other hand, it might be felt that tear gas is a useful weapon and under some conditions might actually cause less fatalities than other means.

I would point out that one should expect any gas to be used in conjunction with other weapons, and that, therefore, even tear gas, although it is nonlethal, would, under the conditions of war, be used to enhance the effectiveness of lethal weapons. That is indeed the way it had been used in World War I. That is also the way it has been used routinely in Vietnam.

CHAIRMAN. In Vietnam, you mean to flush out soldiers and then shoot?

MESELSON. For example, Senator, a large quantity of tear gas was dropped



in one instance before a B-52 raid. Again a large quantity of tear gas was dropped from the air before an artillery attack. These events are reported in the press. A very large quantity of tear gas is being used in Vietnam in this fashion.

My point is that there are pros and cons to the use of tear gas in war. The argument against it, of course, is that it could lead to a highly undesirable escalation and to proliferation of CB weapons and a weakening of restraints against their use in future wars.

I would like to say this about the question of nonlethal gas. Various rules can be imagined. One could have the rule that no lethal and no nonlethal gas at all could be used. One could have the rule that it is permissible to use nonlethal gas but not in order to kill, that is, not in order to facilitate the effectiveness of lethal weapons. One could have various rules.

UNIFORM TEAR GAS RULE

It seems to me that the important thing is that there be a uniform rule, and that the approach of the United States might be to discuss with other nations what a uniform rule might be. Unless we consider it vital to our security interests to decide this question unilaterally, a reasonable procedure would be to consult with other nations with the objective of finding a uniform rule.

As I have stated, there is an expression on the record by a number of countries that they believe tear gas is prohibited by the Geneva Protocol.

CASE. Were there any dissents to that British inquiry?

MESELSON. The U.S. representative, Ambassador Hugh Gibson, stated that this was a complicated question and that he hoped it would receive further consideration. He did not specifically say that the United States believed that tear gas was widely used for domestic purposes.

Subsequently, the Disarmament Convention in Geneva in the 1930's addressed this very question. It set up an advisory committee on which the United States was represented. It eventually came to the conclusion that in any future disarmament treaties the use of tear gas should be prohibited but the manufacture of tear gas could not be prohibited. This point of view was explicitly accepted by the U.S. delegate, Mr. Hugh R. Wilson, at that time, but the treaty, which was being worked on by that conference, never came into effect.

USSR AND CBW

CHAIRMAN. I am told that in a recent briefing made to Congress, Brigadier General Hebbeler said this: "Today the Soviet Union is better equipped, militarily, and physiologically, for chemical warfare than any other nation in the world." And he also said "indications are that they"—chemical weapons—"would be used if this served the Soviet Union's purpose." What would be your comment of that? Is it true?

MESELSON. I don't have accurate knowledge of what Soviet preparations are. I would make several remarks. The first is that, if possible, one should always search for a policy which is proof against whatever other countries are doing. If there is a policy which is wise enough and general enough that it is not too dependent on what other countries could or might do in the future, that is obviously the best policy.

I think that the policy of no-first-use has this attribute. The policy of ratifying the Geneva Protocol, for example, making it clear to all that we would never use these weapons first, is relatively independent of what other countries are doing.

EXTENT OF U.S. CBW EFFORT

CHAIRMAN. Well, in this connection, do you know about the extent of the effort of the United States in chemical and biological warfare?

MESELSON. Yes, I have a rough idea.

CHAIRMAN. How would you characterize it? Is it great and for how long has it been going on?

MESELSON. Well, to some extent it has been going on since World War I, of course. The current budget for chemical, biological warfare research and development I understand is in the vicinity of $100–200 million a year, exclusive of testing, evaluation, maintenance and procurement.

CHAIRMAN. Has it been at about that level for the last several years?

MESELSON. No, at the close of the Korean War it was much less, I think about $10 million a year. It rose particularly in the late 1950's and then it continued to rise to its present level. It was because of that rather steep rise in the late fifties, I understand, that Congressman Kastenmeier introduced his joint House-Senate resolution.

CHAIRMAN. I notice General Hebbeler didn't mention biological weapons. Do you think that was on purpose or simply through inadvertence?

MESELSON. I really don't know, Senator. In discussing the capabilities of the Soviet Union, I think one must go beyond asking simply how much they have, but ask what would really happen in any given contingency, in any given war, if one confronted an enemy with these weapons.

What I have in mind is, for example, in Europe, it might be desirable to maintain a limited war fighting capability with nerve gas for use in Europe. However, it is hard to imagine a protracted nerve gas conflict in Europe. What I am saying is that beyond a certain amount, beyond the amount necessary simply to let the other side know that to start this kind of war would be—wouldn't cause anything but trouble to both sides.

SECOND-STRIKE WEAPONS

CHAIRMAN. I want to come back to this. Earlier we talked about this as a first strike weapon and you demolished the idea that it is useful because of the time element, that is, it takes too long.

MESELSON. That is biological weapons.

CHAIRMAN. Biological weapons. But I didn't pursue this idea of their potential use as a second strike weapon, that is, as a retaliatory capacity. It seems to me that if we are attacked, if an attempt is made to strike us and we are attacked first, this would still remain a very effective second strike weapon, and, in that sense, it is a deterrent. The theory of our nuclear strategy is that we are going to have a second strike so devastating that the enemy will not launch a first strike. That is the theory, isn't it; the so-called balance of terror?

The existence, it seems to me, of a substantial capacity to inflict chemical and biological damage would add greatly to our deterrent, wouldn't it?

MESELSON. I don't think it would add anything useful, Senator.

I myself do not see any sense for the United States in stockpiling biological weapons. I think we would do our-

selves far more harm than good by stimulating interest in these weapons, by breaking down the barriers against them. I think we are adequately safeguarded, insofar as deterrence is functional at all, by nuclear weapons which are reliable.

CHAIRMAN. You see, the Secretary of Defense was raising great fears about this. That is why we are asking about it.

MESELSON. But I do not think our country would want to rely on a totally unpredictable weapon. It is not the kind of weapon that a large power should consider for strategic use. However, I might add that once a country advertises that it is prepared to use biological weapons as strategic weapons, it has in effect announced a program of antipopulation warfare. This is to throw away all chance of a damage-limiting understanding if war gets started. It seems to me that this would be an extremely foolish thing to do.

CHAIRMAN. What you are saying relates only to biological weapons. Does it relate to chemical weapons as well?

MESELSON. Since it would require far more of chemical weapons than of nuclear weapons, and since chemical weapons also cannot prevent enemy missiles from being launched against us, it also applies to chemical weapons.

Only poor countries or underdeveloped countries, countries that do not have nuclear weapons, it seems to me, could possibly see any attraction in chemical or biological weapons as strategic deterrents.

SOVIET CAPABILITY

CHAIRMAN. Do you know anything about Soviet stockpiles of chemical or biological weapons?

MESELSON. I spent one day at the Central Intelligence Agency quite a while ago trying to familiarize myself with Soviet capabilities.

CHAIRMAN. Yes.

MESELSON. One must bear in mind two things regarding intelligence estimates. One is the difference between possible, probable, and confirmed capability. If one receives, for example, an estimate that the Soviets have so many pounds of nerve gas, one must know whether this is a possible number of pounds, a probable number of pounds, or a confirmed number of pounds. This is very important.

The second thing is that in the intelligence community, of course, there are priorities. There are certain things we must obviously know with higher priority than others. It is relevant then to ask with what priority, how much effort has been put into finding out these things. Generally speaking, this is a relatively cheap kind of work to do. The Soviet Union is a big country. They have excellent chemists and biologists just as we do. They have, therefore, the possibility of going as far as we can.

NOT ORDINARY WEAPONS

MESELSON. It seems to me that the main questions before the United States now as these negotiations get underway are, Do we want to ratify the protocol and what additional agreements do we want? One can have the largest or the smallest CB establishment you like. The protocol merely would prohibit first use. It seems to me that it is confusing to ask in detail what is being done or what might be done by various countries when considering the question of a no-first-use pledge. I think this is an important point.

I think it is clear that it would not

serve the interests of the United States if 10 or 20 years from now we faced a world in which the barriers against the use of chemical and biological weapons were gone and they were regarded as ordinary weapons. At all levels of hostility, I believe this would create a world in which, although the United States could perhaps outmatch all other countries,we would still be much worse off.

At the strategic level, it would mean that countries which do not now possess the ability to cause great devastation would possess it if those barriers and restraints were gone.

At lower levels, even in guerrilla wars, it seems to me, that our position would be greatly worse than it is today if the barriers against poison gas were dropped for this reason: poison gas is a lightweight weapon, with a capability of covering a large area.

If lightweight mortar shells containing nerve gas, for example, were available to guerrilla forces who knew where government forces are located, this would serve them far better than would such weapons in the hands of government forces, because they know where the government forces are and the reverse is less often the case.

I believe that if we try to visualize what the world would be like if there were no special distinctions about chemical and biological weapons, that it would be a world in which the security of this country and all countries would be vastly reduced.

TEAR GAS

Let me return to the question of tear gas. I think it is wrong to look at the question of tear gas in isolation.

If one places emphasis on avoiding a world in which chemical and biological weapons are legitimized, displayed, proliferated, and even used, then one must consider tear gas in the context of a step toward breaking down the barriers.

Now, this is not a question, it seems to me, that can be decided unilaterally. If you are talking about rules of warfare, you have got to talk about what is the practice and custom of other nations. If we were just creating the Geneva Protocol, it would be relevant to ask all the other countries what they wanted to do about tear gas. But we are not just creating it. Although we have not ratified it, over 60 other nations have. We are not talking about a dead treaty. It is the oldest major arms control agreement now in force. It is a live treaty even though it is old.

Therefore, we should approach this question of tear gas I think, as follows: It is not by itself a moral issue: but it is a very important technical issue. Can we find rules under which tear gas can be used that will be respected by most countries or all countries, and, therefore, use it without fear of escalation, or can we not? If we cannot find rules that give us some assurance that the whole spectrum of chemical and biological weapons will not come into use, then I think we should not use tear gas in war. After all, tear gas is only of trifling importance to our national security.

It may not be possible to find a clear and workable rule that would distinguish nonlethal gas from lethal gas and that would be acceptable to other nations.

CHAIRMAN. Is that CN?

MESELSON. CN is a tear gas developed after World War I. But other tear gases were used in that war and they were used in close conjunction with lethal and nonlethal weapons. This means that the distinction between lethal and nonlethal is robbed of a great deal of its meaning. You must ask the question therefore, How can an essentially meaningless distinction be maintained? I submit that it would be difficult. That was the reason why many nations have held that tear gas is prohibited by the protocol.

One might still, however, create a rule under which tear gas could be used in war but not in order to kill. One could try that way. If the important nations in the world said, "Yes, we see the validity and the reason for doing this, we will modify our position on the Geneva Protocol," we could all then say it is not a moral question, it is a technical question, we think we have reached a satisfactory approach to it. From now on the tear gas chloracetophenone, used not in order to kill, is all right. But I consider that this would still be risky and also difficult to achieve. Furthermore when you have whittled it down that far, it makes so little difference that one must ask if it is really worth trying to open up the whole question of the protocol which has been ratified by so many countries. Is it really worth causing all that trouble and all that risk for the future?

RATIFICATION OF PROTOCOL URGED

I think the way to approach it is to consult with other nations open mindedly on this issue.

There was a time when even the United States felt that tear gas should be prohibited. There was a time when the leaders of the armed forces believed that. Our views have changed back and forth. I submit this is a question that can be studied in rational form but that the important thing is to get a uniform and workable standard. That is important.

If we are not bound by the Geneva Protocol, proposals will be made at low levels up to higher levels, for using a particular chemical or biological weapon. That flow of proposals would stop if it was the declared treaty policy of the United States never to start this. It does not mean we would not have the capability, the potential, of doing it in retaliation, but it does mean you would not have to worry about a day on which the President of the United States, faced with a crisis, found on his desk a proposal to use, let us say, a biological weapon, having never had the time to give this deep consideration, but being told by advisers that this would be a good thing to do. In such a case he might authorize it. He would not be protected by a previous treaty commitment.

If you come to the decision that you want to keep out of this business unless somebody pushes us into it, you should implement that decision in the form of a treaty obligation that is lasting.

We have seen that President Roosevelt had one policy, and that other administrations seemed to have different policies subsequently. Now we seem to have returned to the no-first-use policy, at least for poison gas and lethal germs. But the policy of a President is not as binding as a treaty.