

## YUGOSLAVIA

Working Paper

## INCAPACITATING AGENTS

(Some aspects of definition, classification and  
toxicological characteristics)

According to the general purpose criterion, incapacitating agents, owing to their physical, chemical and other characteristics, can be used for both military and non-military purposes (better known as a part of dual-purpose agents). According to the degree of toxicity, these compounds should be classified as non-lethal or other harmful chemicals (USSR-USA Joint Report, CD/112, 7 July 1980).

The need to establish the toxicity (not only the lethality) criteria as part of the definition of scope for a chemical weapons convention has been generally agreed in the Committee on Disarmament. For these reasons, the classification of incapacitating agents can be made on the basis of the toxicological manifestations (symptoms) or on the basis of the time of their onset and the duration and disappearance of symptoms after exposure to these substances (Table 1). For the purpose of the future convention on the prohibition of chemical weapons, it seems more acceptable to us to classify incapacitating agents according to the duration of toxic effects into two main categories:

- Short-term incapacitants
- Long-term incapacitants

In the military sense, both categories could be defined as chemical agents which impair the subjects' ability to carry out duties, but the use of which does not incur serious risk or death or permanent injury. Therefore, incapacitating agents produce in normal (healthy) people a temporary, reversible disability with few, if any, permanent effects. However, in young children, old people and those with impaired health, the effect may sometimes be aggravated. They are called incapacitating agents because the ratio between the lethal and incapacitating doses is very high.

## SHORT-TERM INCAPACITANTS

Short-term incapacitants may be defined as chemical compounds that are capable of rapidly causing a temporary disablement that lasts a little longer than the period of exposure. They have also been called "harassing agents", "riot agents", etc. They are unlikely to kill or produce long lasting injury, except when used in doses (concentrations) much higher than those necessary to produce disablement. Short-term incapacitants have been extensively employed in wars and by police forces (about 15 sensory irritants have been used at various times in different

parts of the world). They are peripheral sensory irritant materials which interact, at the site of action (contamination), with sensory receptors in the skin and mucosae, causing local uncomfortable sensation with related reflex effects (Table 2). The uncomfortable sensation and reflex effects hinder the performance of co-ordinated activities and this forms the basis for the short-term incapacitating or harassing properties of these chemical substances. We would like to underline that what is characteristic of these substances is the prompt onset of effect upon exposure and the rapid disappearance of signs and symptoms after the period of exposure.

On the basis of exposure to aerosols or smokes, sensory irritants have been broadly classified into those for which the principal site of action is the upper respiratory tract ("sternutators"), and those having their main effect on the eye ("lachrymators" or, euphemistically, "tear gases").

The most important members of this group are:

- O-chlorobenzylidenemalononitrile (CS) ("Irritant agent")
- Dibenzoxazepine (CR) ("Irritant agent")
- Chloracetophenone (CN) ("Tear gas")
- Diphenylaminochlorarsine (DM) ("Sickening agent", "Vomiting agent").

On the basis of the onset of symptoms (several minutes after exposure) and recovery time (several hours), DM is unsuitable as a short-term incapacitating agent.

#### LONG-TERM INCAPACITANTS

Long-term incapacitants may be defined as chemical compounds whose application causes temporary illness or induces temporary mental or physical disability, the effect of which may be delayed in onset and whose duration greatly exceeds the exposure period. These incapacitating agents could be classified as physical incapacitants or mental incapacitants, according to whether they act predominantly on the physical or mental activities of the subject.

#### Physical incapacitants

The effects of physical incapacitants - that is to say, agents which do not depend for their incapacitating effects solely upon action on the central nervous system, or on military performance - are more predictable than those with dominant action on the central nervous system ("psychochemicals", "mental incapacitating agents"). On the other hand, physical incapacitants, i.e. agents which disrupt the basic life-sustaining system of the body and thus prevent the execution of physical activity (lower blood pressure, paralysis of skeletal muscles, respiratory depression, etc.) almost invariably have a low margin of safety between the effective (incapacitating) and possible lethal doses and thus do not fulfil the basic purpose of an incapacitating agent which is to reduce military effectiveness without endangering life.

Possible mechanisms of physical incapacitation are many, but the mentioned criterion of low margin of safety means that no practical physical incapacitant is known at present, although the vomiting agent DM is described as a physical incapacitant.

### Mental incapacitants

There are many chemical substances which act upon the central nervous system to produce incapacitation. Few of these are sufficiently potent and "safe", or possess the necessary chemical and physical properties to make them potential chemical agents. An example of this type of agent is the BZ-compound whose application produces severe mental disturbances. In minute doses it will merely give changes in mood, varying from an apparent drunken happiness to deepest despair. In larger doses, it produces severe hallucinations and one no longer knows who they are or what they are doing. The military effect, therefore, varies from disturbance of morale to a complete breakdown of military discipline, resulting in the inability to appreciate and carry out orders. The onset of symptoms may be delayed from one to several hours while the duration of effects from a few hours to several days. During this phase, the subject may inflict injury on himself or on others. Memory during the period of intoxication may be lost or fragmentary.

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On the basis of all that has been mentioned, the problem of quantitative evaluation of incapacitants, especially psychochemicals, regarding experimental animals in relation to lethal chemical warfare agents seems to be more complicated. As we have pointed out, different incapacitating agents produce different effects and each type requires a separate method for the determination of the effective (incapacitating) dose and the possible extrapolation with regard to humans.

If the toxicity criterion is to be one of the foundations for the prohibition of highly toxic or lethal chemical warfare agents, then incapacitating agents and among them riot control agents only, should be the subject of further consideration and agreement. The other incapacitating agents should be encompassed by the Convention in order to be banned. In our opinion, a quantitative limitation of production and a limitation of the types of incapacitating agents and types of devices for their use should be set in order to distinguish them as much as possible from those agents which can be used as chemical weapons. If new short-term incapacitating compounds are discovered in the future, the criterion for their possible use should be based on the safety threshold for humans and should in any case be of a similar or lesser toxicity than the existing ones.

Table 1

CLASSIFICATION OF INCAPACITATING AGENTS  
ACCORDING TO DIFFERENT SOURCES

Medical (Toxicological)  
Classification

Equivalent Military (Service)  
Classification

SHORT-TERM INCAPACITANTS

Sensory irritant agents  
(Lachrymators - tear gases,  
Sternutators, Vomiting or  
Sickening agents, etc.)

Riot control agents  
Harassing agents

LONG-TERM INCAPACITANTS

1. Peripherally-acting  
physiochemicals
- Non-irritant agents
- Non-irritant physiochemicals
2. Centrally-acting  
physiochemicals
- Psychotomimetic agents

Physical incapacitants  
Immobilizing agents  
Physically incapacitating agents  
Mental incapacitants  
Psychochemicals  
Mentally incapacitating agents

Table 2

LOCAL EFFECTS OF SENSORY IRRITANTS AT VARIOUS BODY AREAS<sup>\*/</sup>

Affected area	Symptoms
Eyes	Burning sensation or pain, heavy flow of tears. Involuntary closing of eyes.
Mouth	Stinging or burning sensation of palate and tongue.
Nose	Irritation, burning sensation. Nasal discharge.
Chest	Irritation, burning sensation. Coughing, feeling of suffocation. Tightness in chest, often accompanied by a feeling of panic.
Skin	Stinging or burning sensation on moist skin areas, usually accompanied by redness (erythema). Blisters from very heavy concentrations.

<sup>\*/</sup> Mentioned effects on the recipient create a sense of panic, make him cease performing acts of violence and force him to abandon the immediate area.

