

Pharmacological non-lethal weapons

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Non-lethal weapons are such means of combat and weapon systems designed to eliminate man from combat or any other conscious activity by incapacitating him physically and psychologically for a certain period of time.

Depending on the mechanism of effect, non-lethal weapons can be divided into physical and chemical (pharmacological) ones. The former include weapons emitting microwave pulses as well as sonic canons or laser devices. Foam systems discharge polyurethane resin-based synthetic polymers, which tend to solidify quickly once exposed to air. They incapacitate man by rendering him completely unable to move within a short period of time. There are chemicals dissolving the solidified foam thus setting the victim of attack free. Bombs with obnoxious odor, e.g., skatol, produce such an adverse emotional response that the affected person makes every effort to leave the polluted space as soon as possible.

Tear-producing agents (lacrimators) constitute a number of compounds of various chemical composition exerting irritant effects on the eyes, skin, and mucosa of the respiratory and digestive tracts. They are used to control riots, rallies, produce panics, and expel adversaries from hideouts. The agents currently in military and police use include chloracetophenol, 2-chlorbenzalmalondinitril (CS), dibenz-1,4-oxazepine, (CR), diphenylaminchlorarzine.

Psychologically incapacitating agents without a major effect on one's consciousness produce perceptive and cognitive impairment. The toxicity of these agents is low. They are referred to as psychomimetics, hallucinogens or psychedelics. Many of these agents are used as illegal drugs. They include lysergic acid and its derivatives, scopolamine, BZ substance (3-chinuclidinyl benzilate) and others.

Calmatives comprise a non-homogeneous group of synthetic pharmaceuticals with different modes of action. They are referred to as immobilizers and include dissociative anesthetics (phencyclidine, ketamine) inducing sedation, catalepsy up to anesthesia; benzodiazepines (midazolam) with anxiolytic and sedative action and even hypnotic effects when administered at higher doses; opioids (fentanyl, carfentanyl) raising pain threshold while inducing a sedative-hypnotic state of blissfulness, and muscle rigidity if used at higher doses; α_2 agonists (medetomidine, dexmedetomidine), possessing an analgesic effect and causing sedation readily controlled by external stimuli. Another group of agents are myorelaxants (suxamethonium) causing immobilization due to skeletal muscle relaxation.

All these pharmaceuticals can be used as pharmacological non-lethal weapons. In experiments with primates, we tested various combinations of the above agents, e.g., a combination ketamine with α_2 agonists and benzodiazepines. The onset of effect can still be stepped up using accelerators, e.g., hyaluronidase, producing immobilization within 60-90 seconds of administration! A major drawback of opioid use is the development of respiratory depression, particularly if administered at higher doses inducing immobilization. Therefore, in experiments with rabbits, we test a combination of alfentanil or remifentanil together with a specific opioid antagonist (naloxone) seeking to identify the optimal agonist/antagonist ratio while maintaining immobilization and markedly reducing respiratory depression. In addition to traditional techniques of administration, an important role with non-lethal weapons is played by non-traditional techniques of administration such as inhaled, nasal, transbuccal, conjunctival and transdermal. In experiments with rabbits and rats, we noted a very rapid onset of effect even when employing these techniques of administration. The animals became immobilized within a couple of minutes of administration. Inhaled administration of opioids, ketamine, and α_2 agonists is also associated with a very rapid onset of effect. The ultrapotent opioid etorphine, when combined with dimethylsulfoxide, is capable of crossing normal skin and induce immobilization within to 3-8 minutes! Currently, a number of potentially suitable agents are available which can be used to develop novel pharmacological non-lethal weapons.

