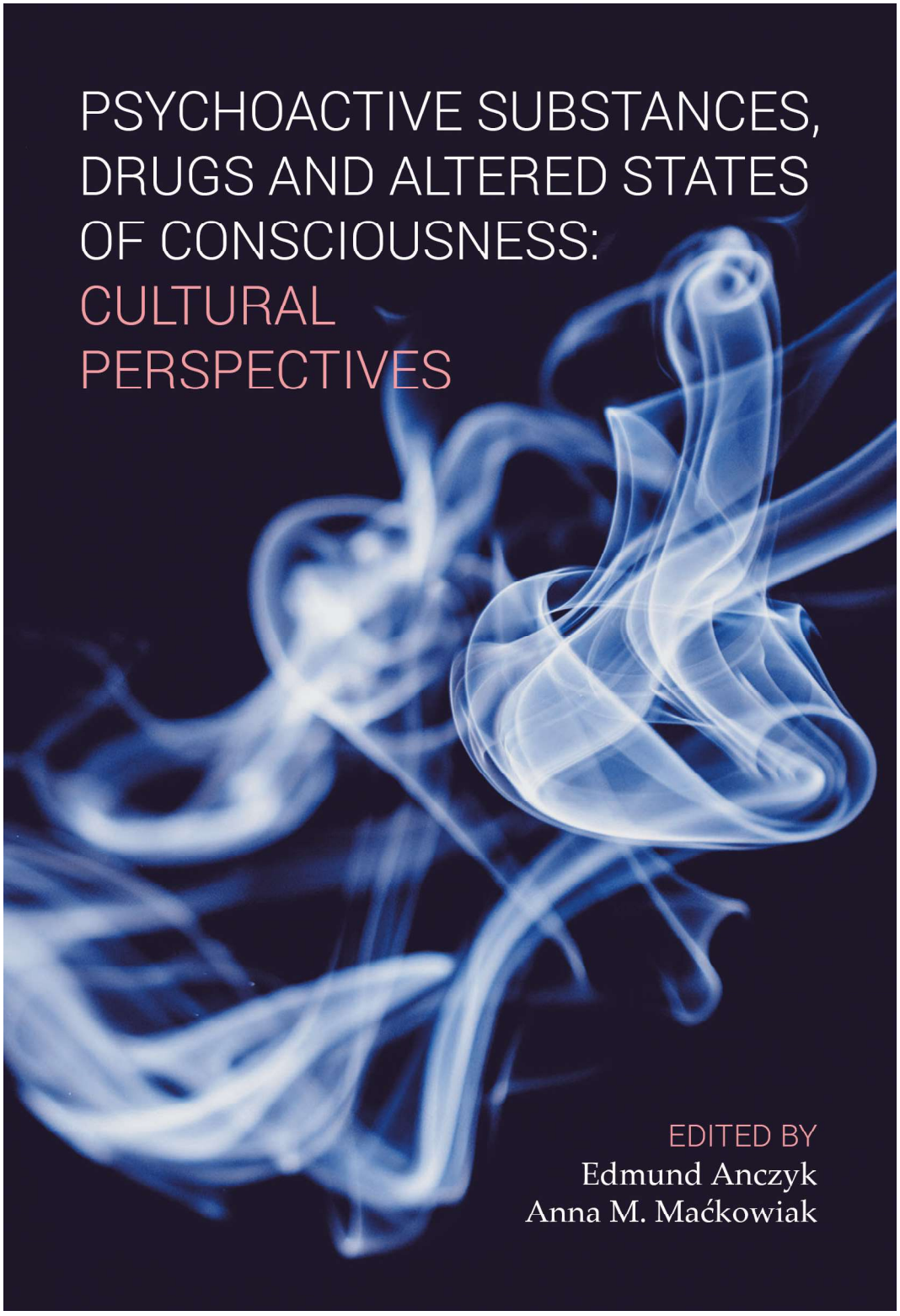
PSYCHOACTIVE SUBSTANCES, DRUGS AND ALTERED STATES OF CONSCIOUSNESS:
CULTURAL PERSPECTIVES
EDITED BY
Edmund Anczyk
Anna M. Maćkowiak

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BZ (3-QUINUCLIDINYL BENZILATE) AS AN EXAMPLE OF A PSYCHOACTIVE SUBSTANCE IN THE NON-LETHAL ARSENAL OF THE UNITED STATES ARMY

Chemical warfare was an important part of the First World War – one of the bloodiest conflicts of the modern history. 125 thousand metric tons of chemical weapons were used, killing an estimated number of a hundred thousand soldiers and mutilating about 1.2 million.[336] Thus, the resulting image of chemical weapons with the general public being extremely negative,[337] efforts were made to curtail use of chemical weapons in future military conflicts,[338] and, apart from a few infamous episodes,[339] mass chemical warfare was discontinued.

Interest in chemical weapons was renewed in the Cold War. The United States have reinstated their work on incapacitating agents after year 1950, when the Committee on Chemical, Biological and Radiological Warfare published the Stevenson's Report – a document stating that the German

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336 L. Konopski, *Historia Broni Chemicznej*, Warsaw 2009, pp. 56–58.

337 The use of chemical warfare in the First World War caused extreme controversy, although it was not an exceptionally lethal weapon. Mostly, the uproar was about the nature of the resulting damages. This was touched upon by the raport of general John Pershing, commander of the American Expeditionary Forces, summing up the 1914–1918 conflict: 'Whether or not gas will be employed in future wars is a matter of conjecture, but the effect is so deadly to the unprepared that we can never afford to neglect the question'. J. Pershing, *Final report of Gen. John J. Pershing, Commander-in-Chief, American Expeditionary Forces*, Washington 1920, pp. 76–77.

338 One of the articles in the treaty of Versailles (1919) obliged the surrendering countries (Germany, Austria, Hungary, Bulgaria) to discontinue use and production of chemical weapons. The Washington Naval Treaty of 1922 was a similar agreement between the USA, UK, France and Japan. A ban on of the use in war of asphyxiating, poisonous or other gases and of bacteriological warfare was also introduced by the Geneva Protocol on 17th of June, 1925.
C. A. Warren, *GAS, GAS, GAS! The Debate Over Chemical Warfare Between the World Wars*, 'Federal History Journal', 2012, 4, pp. 49–54.

339 L. Konopski, op. cit., pp. 65–66; 73–77; 104–108.

technologies and giant chemical factories in the Eastern Germany, obtained by the Soviet Union, could give the Soviets an advantage in the arms race.[340] The obsessive search for new weapons of mass destruction meant that large portions of the US budget were allocated to armaments, including chemical weapons research. While most of this was spent on improving lethal weapons (GB, CS), the US Department of Defence had also conducted experiments on psychoactive weapons.[341] The military scientists saw in those a chance to escape the negative image of chemical warfare (the public image of psychotropic substances had already changed with the invention[342] of LSD[343]): the lethal substances bringing about horrible death were to be substituted by a wondrous method of bloodless incapacitation.

The general public had mostly heard of the abovementioned LSD and lysergic acid – a derivative of alkaloids produced by a range of ergot fungi – as far as new, chemical weapons were concerned. This was due to the LSD's importance in the American counterculture movement.[344] MKUL-

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340 E. Croddy, *Broń chemiczna i biologiczna. Raport dla obywatela*, Warsaw 2003, pp. 51–52.

341 Psychoactive incapacitating agents cause psychical anomalies or impede the functioning of the central nervous system, thus preventing an individual's normal functioning. They can only be used in gas form, and usually are a derivative of benzyl or phenyglycolic acid, tryptamine, phenylalkylamine, cannabinol, or lysergic acid. J. Błądek, *Broń chemiczna i toksyczne środki przemysłowe*, Warszawa 2011, p. 15.

342 LSD-25 arrived in the United States in 1949, when psychiatrist Max Rinkel brought a sample from Sandoz Pharmaceuticals in Switzerland and began work at the Boston Psychopathic Hospital. Dr Harold Abramson, a New York chemist, allergist, and psychotherapist, began studying the clinical characterization of the new drug as well, and promptly published his results. Soon, the CIA was interested in this research as well. J. S. Ketchum, H. Salem, *Incapacitating Agents* [in:] S. D. Tuorinsky (ed.) *Medical Aspects of Chemical Warfare*, Washington 2008, pp. 413–414.

343 LSD (lysergic acid diethylamide) was first synthesised by a Swiss chemist working for the Sandoz Laboratories, Albert Hoffman, in 1938, during his efforts to obtain a cardiovascular stimulant. Since there were no useful results of further research on LSD in pharmaceutical animal trials, the research was discontinued. Hoffman discovered the psychedelic properties of the substance himself in 1943. A. Hofmann, *Odkrycie LSD i jego miejsce wśród substancji psychoaktwnych* [in:] A. Feilding (ed.), *Eliksir Hoffmanna. LSD i nowe Eleuzis*, Warsaw 2011, pp. 32–33.

344 M. A. Lee, B. Shlain, *Acid Dreams. The Complete Social History of LSD: The CIA, The Sixties, and Beyond*, New York 1985, pp. 113–119.

TRA tests also had a big impact on the public opinion, encouraging various borderline-conspiracy theories,[345] especially considering the cases such as the infamous death of bacteriologist Frank Olson in 1953 – Olson was employed by the CIA, and was used as a test subject, being given LSD without his knowledge.[346] After a series of tests and human trials, with initially promising results,[347] the army gradually curtailed its research in military uses of LSD-25, as the substance proved too expensive to synthesise and tactically unsuitable (difficult to use in gas form).[348] 3-Quinuclidinyl benzilate – turned out to be the alternative the American army was looking for.

3-Quinuclidinyl benzilate is an organic chemical compound produced by the Hoffman-La Roche laboratories in 1951. Its purpose was to treat stomach ulcers, but during trials it was re-discovered as a powerful psychedelic, and it was in that capacity that the American armament industry was interested in it. Eight years after its discovery, the University of Chicago College of Medicine[349] investigated those properties, and soon the Edgewood Arsenal in Maryland, where military research and human trials were conducted, started to work on the substance, calling it EA 2277.[350]

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345 Alternative interpretations of the MKULTRA trials are explored in such works as: J. Marks, *The Search for the 'Manchurian Candidate'. The CIA and Mind Control*, London 1979; H.P. Albarelli, *A Terrible Mistake: The Murder of Frank Olson and the CIA's Secret Cold War Experiments*, Waterville 2009; W. Bowart, *Operation Mind Control*, Glasgow 1978, J. Keith, *Mind Control, World Control*, Illinois 1997.

346 Olson was said to have learned that LSD had been slipped into his drink some 20 minutes after ingestion. The experiment was supposed to study the scientist's coping with with the results of the powerful psychedelic. His case was only known by the general public in 1975, when the Rockefeller Committee, investigating the CIA after the Watergate scandal, found out about them. J. Ronson, *Człowiek który gapił się na kozy*, Warszawa 2010, pp. 239–243.

347 LSD's advantage was the small dose necessary to produce psychedelic effects: it can cause delirium in a portion of 20 micrograms. For comparison, mescaline caused delirium when applied in 15 miligrams – over a thousand times more. E. Croddy, op. cit., p. 154

348 L. Konopski, op. cit., p. 166.

349 R. Kirby, *Paradise Lost: The Psycho Agents*, 'The CBW Conventions Bulletin', 2006, 71, pp. 2–3.

350 Ibidem.

One of the researchers in Edgewood was a psychiatrist, doctor James S. Ketchum, who later published a detailed summary of the twenty years of his work on psychedelic substances: 'Chemical Warfare Secrets Almost Forgotten'. Four chapters are devoted, in their entirety, to 3-quinuclidinyl benzilate (BZ). He mentions several difficulties the research was meant to solve, such as the minimal active dose; the relation between the administration method (intra-venal injection,, hypodermic injection, ingestion, inhalation) and the hallucinatory effect; effect duration; the extent to which the effect is incapacitating; influence on basic life signs (arterial pressure, pulse, body temperature); and lastly, its usefulness on the battlefield.[351]

In his book, Ketchum describes his experiments[352] as member of research team. He described three phases of the BZ's effect:

1. The first phase, 1 to 4 hours from ingestion of BZ,[353] is characterised by such symptoms as difficulty in enunciation, dry mouth, stupor and spasms,[354] and general body exhaustion.
2. The second phase is the sedation phase, where the patient enters a semi-coma[355] and only responds to strong stimuli.
3. The third phase, about 12 hours from ingestion, is characterised by psychotic behaviour – the patient regains speech and indulges in long, nonsense rants as well as violent tantrums. Hallucinations supersede consciousness, real people and objects are ignored. A common behaviour is drinking hallucinated beverages and smoking illusory cigarettes. Time perception is lacking. This is followed by panic attacks and paranoia episodes, where the patient strongly believes someone

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351 J. S. Ketchum, *Chemical warfare Secrets almost forgotten*, California 2006, p. 44.

352 Ketchum mentioned that all the work on various aspects of BZ use took three years – 100 000 hours of work by Edgewood Arsenal staff. Ibidem.

353 Ibidem.

354 J. S. Ketchum, H. Salem, op. cit., p. 429.

355 'Sopor sleep – an abnormally deep sleep, wherein the patient manifests a deep depression of consciousness while responding to strong stimuli, but only momentarily. Pathological motor reactions can occur.'.
J. Wciórka, *Psychopatologia ogólna – objawy i zespoły zaburzeń psychicznych* [in:] A. Bilikiewicz, W. Strzyżewski (eds) *Psychiatria: podręcznik dla studentów medycyny*, Warszawa 2006, p. 97.

want to kill them. Test subjects were also prone to recognise the medical staff of Edgewood as their friends or relatives, to hold long conversations with objects, and to hallucinate animals such as elephants, giant snakes or insects crawling on one's clothing. Test subjects were also unable to perform, and often even understand, simple instructions of the medical staff.[356]

Other, physical symptoms of BZ use include coughing and sneezing (since it' s an irritant), and vomiting[357] (since it reduces stomach acidity). The time it takes for the effect to wear off depends on the dosage: ingesting the minimal dose, inducing a mild delirium, meant the patient regained mental and physical aptitude after about 24 hours.[358] A dose of 5 to 7 micrograms per kilogram of body mass meant the effect endured up to eighty hours.[359]

BZ acts as, among other effects, an inhibitor of the muscarinic receptors of the central nervous system,[360] as well as those present in the neurons of the peripheral nervous system and stomach lining (for which reason it was tested as a stomach ulcer cure by Hoffman-La Roche).[361] It can certainly be described as hallucinogen (impeding the perception of reality, similarly to LSD). It does not produce symptoms of any known psychosis as these – for example the schisoaffective disorders – rarely include visual hallucinations.[362] Besides, as Ketchum had noted, BZ does not cause a need for social isolation, which is typical for schizophrenia,[363] and does

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356 J. S. Ketchum, op. cit., pp. 48–49.

357 L. Konopski, op. cit., p. 167.

358 J. S. Ketchum, H. Salem, op. cit., p. 424.

359 Ł. Kamieński, *Farmakologizacja wojny. Historia narkotyków na polu bitwy*, Kraków 2012, p. 233.

360 J. S. Ketchum, H. Salem, op. cit., p. 422.

361 K. Orzechowska-Juzwenko, *Leki przeciwnowotworowe* [in:] W. Kostowski, Z. S. Herman (eds), *Farmakologia. Podstawy farmakologii. Podręcznik dla studentów medycyny i lekarzy*, Vol. 1, Warszawa 2010, pp. 405, 406.

362 'Visual hallucinations are rare, and usually are associated with ideas of external intervention (such as "having a film projected in front of one's eyes") or a symbolic, supernatural transformation of the world (changes in colour or light)'. J. Wciórka, *Psychozy schizofreniczne* [in:] A. Bilikiewicz, W. Strzyżewski (eds), *Psychiatria: podręcznik dla studentów medycyny*, Warszawa 2006, p. 329.

363 Ibidem, p. 328.

not show any symptoms known to be part of the manic episodes in a Bipolar Disorder.[364] However, the hallucinatory effects of 3-quinuclidinyl benzilate are not unique: identical, though short-lived, symptoms can be observed in cases of overdose on such medicines as antihistamines,[365] tricyclic antidepressants,[366] ipratropium bromide[367] or barbiturates.[368]

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An interesting case, studied in Edgewood and described by Ketchum, was that of a chess master who volunteered to test the substance. The goal was to determine the military usefulness of BZ. The goal being to exclude soldiers from fighting by making them unable to think normally, the question was whether BZ could inhibit the decision process of an individual specialised in a given field. The subject was a man specialised in playing chess, described by Ketchum as an exceptionally intelligent individual. Before ingesting LSD, he had played a few chess matches with the Edgewood staff, where he beat them in only a few movements. After a dose of BZ, he engaged in a three hour series of matches with one of the facility technicians, which he won, but needing more and more time. Four hours after ingestion of BZ, he had committed a few tactical errors, but was still capable of beating the rival. Five hours into the experiment, the patient, after a series of mistakes in his play was sure of his defeat and refused to play on.[369]

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364 J. S. Ketchum, op. cit., p. 51.

365 An antihistamine overdose is characterised by disorientation, agitation, short-term memory and speech impediment. Pointless body movement and visual hallucinations can also occur. E. Zawisza, *'Dobre i złe' leki antyhistaminowe*, 'Alergia', iss. 3/2009, pp. 25–27.

366 1 to 2 hours after an antidepressant overdose, symptoms such as vertigo, drying of mucous membranes, drowsiness (may transform into coma), loss of consciousness and raving. J. Szymańska, *Zatrucia lekami* [in:] W. Seńczuk (ed.) *Toksykologia współczesna*, Warszawa 2006, pp. 280–281.

367 Ipratropium bromide poisoning causes dry mouth, drying and reddening of skin, aggressive behaviour, memory impediment and hallucinations. K. Orzechowska-Juzwenko, op. cit., pp. 420–421.

368 J. Szymańska, op. cit., p. 265.

369 J. S. Ketchum, op. cit., p. 50.

Ketchum had visited the patient in a few hours, observing the aforementioned symptoms of the delirium phase,[370] and proposed a game of chess, which was enthusiastically accepted. Despite growing signs of disorientation, the chess master was able to concentrate on the game and to make logical moves, but his tactical ability was greatly diminished and he committed absolutely basic errors. This resulted in Ketchum, who described himself as a mediocre chess player, winning the game. This time, however, the patient did not react with frustration, but described the match as a 'good game' and offered a rematch. Ketchum had noticed that the patient's experience in chess games had ingrained in him a certain kind of muscle memory which prompted him to make game moves almost automatically – but 3-quinuclidinyl benzilate had suppressed this ability.[371]

Another interesting case elaborated upon in the 'Chemical Warfare' was a BZ session with an 'average man'[372] as a volunteer: an ex-mailman and soldier dubbed 'John Blake' in the experiment. He received 7 micrograms of BZ per kilogram of body mass, so a larger dose than was usually recommended to induce delirium. The effects were simultaneously observed on a second test subject, dubbed 'Eddie Clark.' The tests took two weeks, and used the crossover double-blind method, wherein Eddie received 3-quinuclidinyl benzilate, while John received placebo drugs, and after a week, this was exchanged. The notes on this test are especially interesting as the only existing report which comprises an hour-by-hour description of the effects of 3-quinuclidinyl benzilate over a long period of 145 hours. During the experiments, the volunteers were subjected to routine health checks and simple tests that evaluated their mental state.[373]

In the first hours of John's intake of BZ, he exhibited all three abovementioned stages of effect, though they were produced much faster than with

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370 Ibidem.

371 Ibidem, p. 51.

372 Two days prior to the experiment, health tests such as ECG and EEG, which showed John Blake to be in good condition, and MMPI psychological tests, which showed no anomaly. Ibidem, p. 82.

373 Draw-a-Man test was one of the methods used. Subjects were also given playing cards and told to describe the card number and suit. They were also asked simple control questions. All these the subjects found incredibly difficult under the incapacitating effects of BZ delirium. Ibidem, pp. 86–92.

the smaller doses (hallucinations started as fast as 5 hours after intake). During the experiment, subject showed typical BZ delirium behaviour, such as repeated smoking of non-existent cigarettes, ravings, interaction with imaginary objects and animals, irrational dialogue with staff as well as imaginary interlocutors. John found it very difficult, or indeed impossible, to perform basic tasks such as getting dressed or eating. He had rarely eaten the meals that were brought to him. Despite his fatigue, he could not sleep (exhibiting heightened motor activity), he was disoriented and incontinent. These symptoms had only started to wear off after about 84 hours of testing. They wore off entirely after 118 hours.[374] The staff had naturally performed extensive tests on a sober patient, which showed no anomalies.[375]

At the conclusion of the tests, John Blake had described his own experience while under the influence of 3-quinuclidinyl benzilate, of which strange dreams stood out most. He also complained of memory loss, being unaware of what happened during the experiment, and under impression that he had slept through most of it.[376] Interestingly enough, Ketchum had noted that most patients did not find the BZ delirium to be a negative experience. They had compared it to a two-three day drinking spree and many of them agreed to repeat the tests.[377]

Thus, the experiments showed that BZ was quite efficient at rendering individuals helpless while being relatively safe, and as such could be used as basis for a new non-lethal incapacitating agent.

A non-lethal weapon has been defined by the USA Department of Defence as a kind of weapon that incapacitates human opponent or damages equipment, while minimising fatal casualties and body mutilation.[378] It was supposed to be an alternative or counterbalance to 'traditional'

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374 Ibidem, p. 94.

375 Ibidem, pp. 93–94.

376 Ibidem, p. 95

377 'In reality, most volunteers did not consider incapacitation with BZ to be a seriously unpleasant experience[…] It was pretty much like a lost weekend – 2-3 days of drunkenness, but quickly forgotten.' Ibidem, p. 82.

378 G. T. Allison, P. X. Kelley, R. L. Garwin, *Nonlethal Weapons And Capabilities*, New York 2004, p. 12.

weapons, the purpose of which is primarily to eliminate the target entirely. The non-lethal weapons are designed for optimal balance of maximum incapacitation of target with minimum chance of killing or wounding it.[379] Several characteristic traits that can distinguish non-lethal weapons from lethal weapons are: 'a capacity to stun, slow, inhibit or disorientate, instead of destroying and killing; reversible effects on personnel; serious reduction of possible lethal casualties, wounds and destruction'.[380] Non-lethal incapacitating agents, 'substances that cause a temporary loss of operational capability in personnel can be an important non-lethal weapon. Naturally, they should not have any lasting effects on the physical or mental health of the target'.[381]

BZ had fulfilled most[382] of these conditions – it could incapacitate the enemy for 24–80 hours, the effects were reversible,[383] and did not cause any lasting damage on human mental and physical health (in short term use). This caused it to become the first psychoactive drug to be included in the US military arsenal. Ketchum notes that the 'success' of BZ was mostly due to its pharmacological properties.[384]

At the end of 1963, the Millmaster armament company had started to mass produce BZ for the American army – 45 000 kilograms were delivered to the Pine Bluff Arsenal to be converted into ammunition. Hand grenades were considered at the start, as well as ballistic rockets and smoke generators. Two types of cluster bomb had eventually proven to be the best choice: the M44, 80 kg bomb used in light aircrafts, containing three thermic generators, 22 kg each,[385] and the 340 kg M43, carrying 57

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379 N. Świętochowski, *Współczesna broń nieśmiercionośna. Podział i charakterystyka*, 'Zeszyty Naukowe WSOWL', 2013, 2 , p. 6.

380 Ibidem, p. 7.

381 Ibidem, p. 12.

382 The substance's effect was unpredictable and could provoke patients into self-harm, as testified by one of the Edgewood volunteers, Franklin D. Rochelle, in his interview for the 'Guerres sur ordonnance' documentary. He mentions cutting open the skin on his arms with the shaving equipment provided, while under the influence of BZ. *Guerres sur ordonnance*, dir. Stéphane Benhamou, France, 2013.

383 Doctor Ketchum and his team had developed an antidote to BZ – physostigmine. J. S. Ketchum, op. cit., p. 116.

384 Ibidem, p. 66.

385 R. Kirby, op. cit., p. 3

smaller M138 bombs and adapted for supersonic aircrafts. The ammunition had a limited area of effect – 1100 to 8800 square kilometres, and could influence 10 to 110 infantrymen at a time.[386] It was supposed to be used in special operations of high intelligence capacity, in hostage rescue or in cases of the enemy troops moving simultaneously with home troops.

BZ-containing weaponry was tested as part of the SHAD operation which was itself part of the larger Project 112,[387] as shown by the de-classified files of the Deseret Test Center.

The documents from the sixties mention trials of BZ use in the Hawaiian nature preserve areas (Waiakea Forest Reserve and Olaa Forest Preserve). The so called Pine Ridge tests (DTC Test 65-16) were meant to evaluate the performance of the cluster bombs in difficult conditions: jungle or rainforests.[388] Though not officially stated, it can be inferred that the tests were conducted with the specific conditions of the Vietnam War in mind.[389] Officially, BZ was never used in combat by the American army. However, the idea of 3-quinuclidinyl benzilate being used on troops in

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386 Ibidem.

387 Between 1962 and 1974 the Deseret Test Center in Fort Douglas, Utah had conducted tests of biological and chemical weapons efficacy. These were called Project 112 and Project SHAD. Fact Sheet of the 'Office of the Assistant Secretary of Defence (Health Affairs) Deployment Health Support Directorate', *Deseret Test Center. Pine Ridge*, 2002, http://mcm.dhhq.health.mil/Libraries/CBexposuresDocs/pine_ridge.sflb.ashx [20.12.2014].

388 L. D. King, *Test 64-8 – Tall Timber (U) and trial groups B and D of tests 65-16 Pine Ridge (U). Final Report*, Utah – Deseret Test Center 1967, pp. 24–28, http://www.dod.mil/pubs/foi/operation_and_plans/Exercises_and_Projects/1018.pdf [20.12.2014].

389 The vast majority of the Vietnam territory was covered in forest, vastly decreasing infantry efficacy.
G. L. Rottman, D. Anderson, *The US Army in the Vietnam War 1965–73*, Oxford 2008, p. 4.

the Vietnam War had entered pop culture in 1990 due to the plot of the *Jacob's Ladder* film by Adrian Lyne.[390]

Although BZ had never become a main incapacitating agent in the American arsenal – as opposed to various nerve agents[391] – it was doubtlessly one of the most original weapons in the US history. It was eventually forfeit, and the stockpiles destroyed (probably due to its unpredictable effects and the impractical spray form which reduced the element of surprise). Nevertheless, research on BZ and various psychoactive incapacitating agents (mescaline, THC, LSD), though ethically questionable, were a step towards a humanitarian conflict resolution. Although 3-quinuclidinyl benzilate had not found use on the battlefield, it promoted other work towards non-lethal weapon development.

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[390] The movie's plot concerns a Vietnam veteran Jacob Singer, suffering from strange hallucinations and flashbacks. The protagonist suspects they are a result of medical experiments conducted on him in Vietnam without his knowledge. The closing credits include an unsourced claim of BZ tests being conducted during the Vietnam War. *Jacob's Ladder*, dir. Adrian Lyne, USA 1990.

[391] E. Croddy, op. cit., p. 53.

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