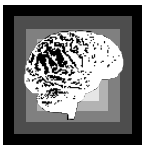

Article

LSD experiments by the United States Army

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Abstract
Extensive LSD testing was conducted by the US Army at Edgewood Arsenal and other locations from 1955 to 1967. A number of different reports have been produced describing the health effects of this testing, including the Veterans Health Initiative Report in 2003. By and large, these reports gloss over and minimize the short and long-term side effects and complications of this testing. However, the reports themselves document frequent, severe complications of the LSD. These side effects were regarded by the Army as having been directly caused by the LSD exposure. In view of the current resurgence of interest in hallucinogens within psychiatry, the sanitized version of the effects of LSD exposure on US soldiers needs to be replaced with a more accurate account.

Keywords
LSD, psychiatric experimentation, US Army

Introduction

The hallucinogen, and chemical and biological weapons experiments conducted by the US Army at Edgewood Arsenal (EARL) and Fort Detrick in Maryland and at other locations are of historical interest; they are also relevant to current events, given the recent resurgence in interest in hallucinogens as potential therapeutic agents within psychiatry (Nichols, 2016; Oram, 2016; Tupper et al., 2015). In addition, hallucinogens and chemical weapons are of general public interest; as widely reported in the media, all entry to and exit from Dugway Proving Ground in Utah was shut down for 12 hours on 26 January 2011 because a vial of the highly lethal nerve agent, VX, was missing from the inventory.[1]

The Department of Veterans Affairs (VHI) publication of October 2003, entitled *Health Effects from Chemical, Biological and Radiological Weapons* was an 84-page independent study guide. It states that: 'The US has maintained an active biological and chemical warfare program since World War I. Today, this program is essentially only defensive.' (VHI, 2003: 1). The adjective 'essentially' is somewhat ambiguous and could imply that the program includes some offensive

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elements, even though it is 'essentially' defensive. 'Essentially' does not necessarily imply 'completely'. Although the official policy of the Government of the United States is that these weapons are studied only for defensive purposes today, information gathered for defensive purposes can easily be adapted for offensive use. Since any ongoing experimentation is classified, it is unknown what safeguards are in place currently and whether the oversight and reporting procedures are significantly different from those used in the 1950s. Nor is it known what hallucinogens or other psychoactive substances are currently being tested by the US military today. In addition, the role of psychiatrists, other physicians and psychologists in any ongoing classified experimentation, and the ethical implications of any such participation, are unknown.

The purpose of reviewing the LSD experiments by the US Army is to counter the claim made by the Army that the experiments caused no long-term harm to the soldiers who were tested. Army and other documents reviewed below prove that this is not the case. A question arises, then: are any ongoing classified experiments, or use of hallucinogens in enhanced interrogations causing long-lasting harm to those who are given such compounds? The US Army LSD experiments took place within a larger context of extensive chemical and biological weapons testing at EARL and other locations.

The US Army LSD experiments were intertwined with LSD experiments conducted by the CIA and US Air Force. For example, The CIA funded LSD experiments through MKULTRA Subprojects 7, 8, 17, 27, 40, 47 and 66, and funded experiments at Fort Detrick through MKULTRA Subprojects 13, 30 and 50 (Ross, 2007). MKULTRA ran from 1953 to 1964. MKNAOMI was a joint project run by the CIA and the US Army's Special Operations Division at Fort Detrick in the same time period. Amedeo Marrazzi (Marrazzi, 1965; Marrazzi et al., 1959) worked as the Chief of the Toxicology Branch at the Chemical Corps Medical Laboratories, Army Chemical Center, Edgewood Arsenal, from 1948 to 1951. Later, at the University of Minnesota, he conducted LSD experiments funded by the US Air Force Office of Scientific Research (through Grant AF-AFOSR-764-65) (Ross, 2007). The purpose of focusing on the US Army in the present paper is the fact that it provides the only follow-up data on subjects of LSD experiments conducted by the US military and the CIA.

Timeline of early chemical and biological weapons experiments at Edgewood Arsenal

The 2003 VHI study guide provides a basic timeline of US chemical and biological weapons experimentation. According to this report, mustard gas caused 400,000 casualties in the First World War. The US chemical warfare program began in response to these casualties. Later, after the use of mustard gas and Lewisite (two blister agents) against the Poles by Germany in 1939, the US military decided in 1942 that human studies of chemical and biological (CB) weapons were required. Mustard gas and Lewisite experiments conducted on US soldiers during the Second World War are described in the report as follows:

> Some of the experiments conducted during this period involved subjects who were not provided with complete protective equipment. In those cases, exposures could be much higher, and some of these subjects experienced burns to the genital areas, including instances of crusted lesions to the scrotum that were characterized by researchers as severe. (VHI, 2003: 4)

It also states that, 'By the end of World War II, the U.S. had produced more than 87,000 tons of sulfur mustard, 20,000 tons of Lewisite, and 100 tons of nitrogen mustard at Edgewood Arsenal, MD; Huntsville Arsenal, AL; Pine Bluff Arsenal, AR; and Rocky Mountain Arsenal, CO.' (p. 5). Clearly, these quantities were far in excess of the amounts required for purely defensive or research purposes.

Safety measures for experimental personnel and handlers of these agents were grossly deficient. An earlier report by the Institute of Medicine (IOM) states that during the Second World War, 'The number of documented injuries among those involved with this program was initially "quite high"' (Pechura and Rall, 1993: 5). According to the IOM, one study of accidental injuries among this group reported more than 1000 cases over a 2-year period at Edgewood Arsenal of mustard poisoning resulting in eye, ear, nose and throat symptoms (p. 44). The report also describes a December 1943 German bombing attack on US vessels in Bari harbour, Italy, which were loaded with mustard agent. Clearly, the mustard agent was not there for defensive purposes. The resulting mustard gas exposure caused 'thousands of injuries and hundreds of deaths among US service members and others in the area … Close to 1,000 civilians from the nearby town also died.' (p.44).

These figures leave no doubt as to the toxicity of the compounds developed and tested at Edgewood Arsenal. A single drop of VX touching the skin can kill a person, for example. In the 1950s, according to the VHI (2003: 5), the US military began to conduct experiments with sarin, VX, LSD, PCP and synthetic cannabis analogs, among other agents. 'Thus, between 1950 and 1975, about 6,700 soldiers took part in experiments involving exposure to 254 different chemicals, conducted at US Army Laboratories at Edgewood Arsenal.' (p. 6). About 1500 soldiers were exposed to blistering agents, 1073 to the riot control agent CS, 750 to cholinesterase reactivators such as 2-PAM, and 741 to LSD. These numbers are likely to be underestimates due to under-reporting, and lack of controls in the early years of the program, which had led to ad hoc field tests conducted by Dr Van Sim and others. Also, the figures do not add up: if 254 different compounds were tested, and given the number of soldiers exposed to LSD alone (741), the total number of soldiers who participated in chemical and biological weapons experiments must be much higher than 6270.

From 1963 through the early 1970s, according to the VHI study guide, the Department of Defense (DOD):

> conducted studies to determine the effectiveness of shipboard detection and protective measures against chemical and biological warfare agents, and less toxic simulants for these agents. The tests were conducted under the broad heading of Shipboard Hazard and Defense (SHAD), which were part of a larger activity DoD called Project 112 that also included similar land-based tests. (VHI, 2003: 7)

Under the heading, 'Biological agent human experiments', the study guide states:

> This VHI describes major events in the US chemical warfare agent test program. However, similar experiments involving tests with biological warfare agents and human subjects were also carried out during this period. For example, beginning in 1954 and over the next 18 years, about 2,300 military draftees, most of them stationed at Ft. Detrick, MD, and most Seventh-Day Adventists, volunteered for Operation Whitecoat (*Washington Post*, 2003). Operation Whitecoat involved 153 tests over the period 1955 to 1973.
>
> Experiments conducted at Ft. Detrick apparently exposed subjects to a variety of biological warfare agents including:
>
> - Tularemia
> - Venezuelan equine encephalitis, and
> - Sandfly fever
>
> Tests also involved human exposure to Q fever at Dugway Proving Ground, Utah in 1955. Although many of the experimental subjects became ill from these exposures, apparently none of the Whitecoat volunteers is known to have died as a result of these tests. However, Army officials acknowledge that little is known about what happened to these test subjects over the long-term. (VHI, 2003: 9)

A 'List of agents used on human volunteers US Army Medical Research Institute of Infectious Diseases Fort Detrick, Maryland 21701' and dated 12 August 1975 lists 28 different viruses, bacteria and vaccines tested from 1958 to 1973 (Ross, 2007). Thus, the history provided by the VHI does not document the full scale of the experimentation. It does, however, provide a summary of the timeline of Edgewood chemical and biological weapons experiments on soldiers.

It is clear from these documents that follow-up of experimental subjects was inadequate, but that an unknown number experienced serious effects from the agents tested.

Government-sponsored reports on health effects from chemical, biological and radiological weapons experiments by the US Army

In 1985 the National Research Council (NRC) produced a document entitled, *Possible Long-Term Health Effects of Short-Term Exposure to Chemical Agents*: working under a contract with the Army, it published this three-volume series of studies between 1982 and 1985 on the long-term health effects of exposure to the chemicals tested on volunteer service members. The NRC study conducted a broad examination of 6720 test volunteers from the chemical test program at Edgewood Arsenal to identify possible long-term health effects of participation in the tests. Of that group, the NRC received 4085 responses. That study did not detect any significant long-term health effects on the volunteer service members.

Screening procedures for the Edgewood experiments are described as follows:

> Screening of the histories and MMPI profiles took place before arrival at Edgewood. After arrival, volunteers were interviewed by officers in the Psychopharmacology Branch. On the basis of further testing (Sentence Completion and Picture Frustration tests), physical examination, and interview, subjects were classified on a four-point scale. Those rated A were considered suitable for psychochemical testing; those rated B were suitable for low-dose psychochemicals only; those rated C were not suitable for psychochemicals; those rated D were suitable for equipment testing only. The main criteria for an A or B rating were absence of evidence of psychologic problems, absence of a tendency to somatize or act out intrapsychic tension, good ego strength, flexibility, maturity, good sense of identity, normal MMPI, and family history. Subjects who seemed to be particularly at ease when handling anxiety and hostile or aggressive impulses were rated A+ – suitable for psychochemical tests considered to be of greater than usual stress. Those rated B were similar to the A group, but had had occasional experiences that suggested less control or minor personality disturbances. Any subject who showed a tendency toward psychosomatic reaction or aggressive acting out, who appeared to be dull or nonverbal, or who had obvious neurotic traits, immaturity, or rigidity was not included in any psychochemical experiments. (NRC, 1985: 48)

This sounds like an adequate screening procedure, but many of the case descriptions in the *LSD Follow-up Study Report* (USAMD, 1980), quoted below, tell a different story. Numerous soldiers are described as having personality disorders, which are chronic in nature. These personality disorders must have pre-existed the soldiers' participation in Edgewood experiments.

Case #76, for example, is described as: 'This subject was found to be a chronic heroin addict who immediately prior to his participation in the LSD follow-up had been incarcerated in a state penitentiary … Psychiatric evaluation showed drug addiction and antisocial personality disorder.' (USAMD, 1980: 119). If Case #76 made it through the screening procedure then the procedure was either a pretence or applied in a haphazard fashion. Either way, systematic, thorough, consistent screening could not have taken place in the LSD experiments. There is no evidence that the screening procedures, as actually implemented, were superior in any other types of chemical weapons testing.

The only way to preserve the claim that the Edgewood screening procedures were adequate is to argue that the personality disorders, drinking, marital and antisocial behavior problems in the LSD subjects did not exist before the screening. This argument, however, leads to the conclusion that these problems were caused – or at a minimum, were significantly contributed to – by the chemical weapons testing. If we accept the word of the supposedly carefully screened, psychological healthy soldiers, many of their problems begin immediately after the testing and were caused by the LSD they ingested. Again, arguing that these statements by the soldiers were self-serving lies, or were highly distorted, leads to the conclusion that the screening was inadequate. Logically, you cannot have it both ways at once.

Informed consent procedures existed to some degree in the Edgewood testing programs, but this was a pretense of consent rather than the real thing. Many subjects were not told what substances they would receive, the known or possible toxicities of the substances, their duration of action, or the cumulative effects of repeated exposures. They were induced to participate with rewards that were never delivered, and may have been directly coerced or threatened with career consequences up to and including court martial, as alleged by participants in the first Gulf War chemical weapons testing.

Certainly, there was no outside counsel or independent review of the consent procedures, the chemicals or the effects of the chemicals. Many soldiers were ordered never to talk about their exposures, even to later Department of Veterans Affairs physicians trying to diagnose and treat their medical and psychological problems.

The introductory statement in the 2003 VHI study guide is by Robert H. Roswell, MD, Under Secretary for Health. Dr Roswell states:

> Clinicians treating our nation's Veterans must be aware of the specific conditions that may confront individuals with injuries associated with CBR [chemical, biological and radiological weapons]. Since some of the Veterans the VA receives may have already experienced the exposure to one of the agents contained in these weapons, it is important that VA health providers are aware of the need to know the best way to treat these life-threatening problems. Greater general awareness of the specialized health issues facing persons with CBR injuries is needed to assure therapeutically appropriate clinical processes … The Veterans are counting on you to provide the best care possible. We owe them nothing less. (VHI, 2003: ii)

The position of the US Government on veterans with injuries from CBR weapons is explicit and clear in Dr Roswell's statement: such injuries can occur; they can be life-threatening; and we owe the exposed troops the best care possible. Such care was not, in fact, provided, nor was adequate caution taken to ensure that exposure of humans to the EARL agents had been demonstrated to be safe through rigorous animal studies.

In summarizing research by Paula Schnurr and colleagues (1996, 2000, 2004) on posttraumatic stress disorder (PTSD) in veterans exposed to mustard gas during US Army experiments, the VHI (2003: 22) stated that, 'These same subjects were examined by researchers again nearly five decades later. In comparison with men of similar age, they were found to still be suffering effects including being less psychologically and physically healthy.' In one study, according to the VHI, 32% of 363 veterans who had been subjects in mustard gas experiments had PTSD decades later.

According to the VHI, in April 2003 the VA undertook a review of VA health care utilization by SHAD experimental subjects. There is no evidence of any systematic follow-up of any kind prior to that date. SHAD and Project 112 ran from 1960 to the early 1970s, therefore there was no systematic follow-up for three decades. VHI (2003: 23) states that, 'This data obtained from VA inpatient and outpatient records does not allow for meaningful comparisons with other SHAD veterans who have not utilized health care, or to comparable military veterans who did not participate in Project SHAD.' The VHI also reports:

> Exposure to sarin and VX chemical warfare agents can lead to rapid intoxication, incapacitation, and even death. However, some patients who survive severe poisoning by these and other OP [organophosphate] nerve agents such as pesticides have been shown to later develop subtle, chronic neurophysiological and neuropsychological abnormalities. (p. 30)

The complete absence, for decades, of any meaningful follow-up for subjects of chemical weapons experiments is an established fact in the judgment of the VA. It states that chemical weapons experiments commonly cause long-term physical and psychological damages lasting decades VHI, 2003: 11), yet the VA and the DOD failed to conduct any systematic, thorough follow-up of test subjects.

The VHI, referring to its own study guide, says, 'perhaps more important, this guide will let health care providers understand the reality of this history and that the feelings and reactions of their patients to these past events really do have a firm historical basis.' (VHI, 2003: 2).

In summary, then, the VHI document leaves the reader in no doubt that there was extensive testing of chemical and biological weapons on US soldiers; that these weapons are toxic and often lethal; that long-term physical and psychological effects occurred; that there was inadequate screening and follow-up; and that these veterans deserve access to quality health care for their injuries.

Senate Committee report 103-97 (1994)

On 8 December 1994 the United States Senate Committee on Veterans' Affairs, chaired by John. D. Rockefeller, published a report entitled *Is Military Research Hazardous to Veterans' Health? Lessons Spanning Half a Century*. The Committee listed its findings and conclusions at the beginning of its report (Rockefeller, 1994: 2–3):

III. Findings and conclusions

- A.} For at least 50 years, DOD has intentionally exposed military personnel to potentially dangerous substances, often in secret
- B.} DOD has repeatedly failed to comply with required ethical standards when using human subjects in military research during war or threat of war
- C.} DOD incorrectly claims that since their goal was treatment, the use of investigational drugs in the Persian Gulf War was not research
- D.} DOD used investigational drugs in the Persian Gulf War in ways that were not effective
- E.} DOD did not know whether pyridostigmine bromide would be safe for use by UD troops in the Persian Gulf War
- F.} When US troops were sent to the Persian Gulf in 1994, DOD still did not have proof that pyridostigmine bromide was safe for use as an antidote enhancer
- G.} Pyridostigmine may be more dangerous in combination with pesticides and other exposures
- H.} The safety of the botulism vaccine was not established prior to the Persian Gulf War
- I.} Records of anthrax vaccinations are not suitable to evaluate safety
- J.} Army regulations exempt informed consent for volunteers in some types of military research
- K.} DOD and DVA have repeatedly failed to provide information and medical followup to those who participate in military research or are ordered to take investigational drugs
- L.} The Federal Government has failed to support scientific studies that provide information about the reproductive problems experienced by veterans who were intentionally exposed to potentially dangerous substances

- M.} The Federal Government has failed to support scientific studies that provide timely information for compensation decisions regarding military personnel who were harmed by various exposures
- N.} Participation in military research is rarely included in military medical records, making it impossible to support a veteran's claim for service-connected disabilities from military research
- O.} DOD has demonstrated a pattern of misrepresenting the danger of various military exposures that continues today

IV. Recommendations

- A. Congress should deny the DOD request for a blanket waiver to use investigational drugs in case of war or threat of war
- B. FDA should reject any applications from DOD that do not include data on women, and long-term followup data
- C. Congress should authorize a centralized database for all federally funded experiments that utilize human subjects
- D. Congress should mandate all Federal agencies to declassify most documents on research involving human subjects
- E. Congress should reestablish a National Commission for the Protection of Human Subjects
- F. VA and DOD should implement regular site visits to review Institutional Review Boards
- G. The Feres Doctrine should not be applied for military personnel who are harmed by inappropriate human experimentation when informed consent has not been given

The report spans the time period of the Second World War to the first Gulf War. The basic finding is that not much has changed in military, chemical and biological warfare experimentation since the Second World War in terms of informed consent, follow-up, compensation of veterans for injuries, and transparency and disclosure:

> During the last 50 years, hundreds of thousands of military personnel have been involved in human experimentation and other intentional exposures conducted by the Department of Defense (DOD), often without a service member's knowledge or consent. In some cases, soldiers who consented to serve as human subjects found themselves participating in experiments quite different from those described at the time they volunteered. For example, thousands of World War II veterans who originally volunteered to 'test summer clothing' in exchange for extra leave time, found themselves in gas chambers testing the effects of mustard gas and lewisite. Additionally, soldiers were sometimes ordered by commanding officers to 'volunteer' to participate in research or face dire consequences. For example, several Persian Gulf War veterans interviewed by Committee staff reported that they were ordered to take experimental vaccines during Operation Desert Shield or face prison.

In the report, the Committee provides a number of case examples of how veterans who participated in Army chemical and biological weapons tests were affected and how they were subsequently treated by the Army. For example:

> One test subject was Lloyd B. Gamble, who enlisted in the US Air Force in 1950. In 1957, he volunteered for a special program to test new military protective clothing. He was offered various incentives to participate in the program, including a liberal leave policy, family visitations, and superior living and recreational facilities. However, the greatest incentive to Mr. Gamble was the official recognition he would receive as a career-oriented noncommissioned officer, through letters of commendation and certification

> of participation in the program. During the 3 weeks of testing new clothing, he was given two or three water-size glasses of a liquid containing LSD to drink. Thereafter, Mr. Gamble developed erratic behavior and even attempted suicide. He did not learn that he had received LSD as a human subject until 18 years later, as a result of congressional hearings in 1975. Even then, the Department of the Army initially denied that he had participated in the experiments, although an official DOD publicity photograph showed him as one of the valiant servicemen volunteering for 'a program that was in the highest national security interest.' (Rockefeller, 1994: 9)

The US Army LSD experiments took place in a context of extensive chemical and biological weapons testing. The testing, in general, did not involve adequate consent, documentation, protection of subjects from short- and long-term adverse effects, or adequate follow-up. The number of experimental subjects was grossly under-reported, and the toxic effects of the test compounds were denied and minimized. This was also true of the LSD experiments, as documented below.

US Army Medical Department report (1980)

In October 1980 the US Army Medical Department and the US Army Health Services Command published a 158-page report entitled, *LSD Follow-up Study Report*. The report reviewed LSD experiments conducted by the Army Chemical Corp from 1955 to 1967, mostly at Edgewood Arsenal. The first follow-up study was conducted in 1974–75 and was called Project 33 because 33 veterans were involved. It was followed by Project 28 and Project 50/50. The latter was intended to study 50 LSD test subjects and 50 matched controls, but this design was abandoned because of the difficulty of finding matched controls, according to the report. It is unclear and unexplained why the Army was unable to recruit controls from its large population of male soldiers.

In 1978, a larger follow-up study was initiated by the US Army Health Services Command. This involved 741 individuals identified on a computer roster who received LSD from 1955 to 1967, but 55 were excluded due to their being Air Force personnel, leaving 686 Army veterans. By the end of the study,

> 220 subjects had been examined directly, and an additional 100 had returned completed medical history questionnaires, for a total of 320 subjects or 47 per cent of the original 686 individuals identified as LSD recipients. Of the remaining 366 potential subjects, 24 were known to have died prior to the follow-up, and 193 were unlocatable. (USAMD, 1980: 11)

However, in a memorandum dated 15 July 1975, Kenneth R. Dirks, MD, Brigadier General, MC, Assistant Surgeon General for Research and Development, US Army, estimated that at least 1500 soldiers were given LSD in Army experiments (cited in Ross, 2007). It therefore seems unlikely that 741 LSD test subjects accurately reflect the total number of US soldiers who received LSD in US Army experiments: 220 subjects examined directly out of 1500 is only 15% of the total subject pool. This calls into question the validity of the sample and the Report's conclusions.

Additionally, of the 320 LSD subjects, only 281 could actually be confirmed to have received LSD (USAMD, 1980: 15). Another problem with the LSD follow-up study is the fact that 117 of the 320 soldiers are known to have received other chemical warfare agents during testing, including BZ, riot control agents and alcohol.

Single doses of LSD ranged from 28 to 5250 micrograms, the latter being an astronomical dose, far exceeding typical street doses in the 300–400 micrograms range; 176 subjects received one dose of LSD, 43 received two, 12 received three, and 2 received five, while the number of exposures was unknown for the remaining 48. Of the 281 LSD test subjects, 24 subjects had died by the time of follow-up. This included: heart disease, 10; gunshot wound, 4 (2 in combat, 1 known

suicide, 1 suspected suicide); aircraft crash, 2; cancer, 2; respiratory failure secondary to amyotrophic lateral sclerosis, 1; acute alcohol intoxication, 1; emphysema, 1; and unknown, 3.

The LSD testing was done from 1955 to 1967. If we assume that the average enrolment date of the 281 test subjects was 1961, and most of the follow-up interviews were done in 1979, then there were 18 years between LSD exposure and follow-up. The base rate of completed suicide in the general population is 13/100,000/year, and therefore over 18 years there would be 13 x 18 = 216 suicides among 100,000 individuals, and among 281 individuals there would be 216 x 281/100,000 = 0.61 suicides. If we say there were two gunshot suicides and one self-inflicted death from alcohol, this would be 3/0.61 = 4.9 times the number of expected self-inflicted deaths. If we eliminate the deaths from combat and air crash, the death rate was 20/281 = 7.1% among healthy young soldiers over an 18-year follow-up, which seems very high. Among the 320 subjects, the average age at follow-up was 45 years; a death rate of 7.1% by age 45 is alarming.

Although there were 281 follow-up subjects known to have taken LSD, actually only 110 participated in the final follow-up in 1978–79; the remainder was interviewed in the previous follow-up studies. Therefore the average period of follow-up was actually shorter than 18 years and the self-inflicted death rate was more than 4.9 times the expected rate.

The Halstead-Reitan test battery, which provides the most thorough neuropsychological evaluation available, was administered to 172 LSD-exposed individuals. Of the subjects, 55 (32%) were classified as having 'mild impairment' and in 34 there was a known aetiology according to the researchers. 'The proposed etiologies were as follows: neurological disorder (12), psychiatric disorder (8), alcohol abuse (8), head trauma (6), exposure to toxic chemicals (16), use of illicit drugs (4), and hypertension and head trauma (1).' (USAMD, 1980: 19). All these aetiologies could well be complications of chemical testing at Edgewood. Neurological, psychiatric and substance abuse problems can be expected to lead to an increase in violent deaths, fights and head injuries.

Of the 172 soldiers who received the Halstead-Reitan, only 95 (55%) were found to be normal. Compared with expected results, this is a very low rate of normal findings in a group that was selected as being physically and psychologically healthy enough to participate in chemical weapons testing, and which now has an average age of 45. This is too young for Alzheimer's or other cognitive impairments of old age.

Seventy-six test subjects 'reported one or more long-term adverse reactions from LSD exposure' (p. 22). According to the US Army, 12 reported 'possible' long-term effects, and 55 reported symptoms that met Army criteria for probable long-term LSD effects. This number is likely to have been low because any effects starting more than two years after exposure were excluded from the 'probable' category. There were 24 soldiers who reported LSD flashbacks, including 18 with multiple flashbacks. Nine soldiers reported depression, with one suicide attempt, one 'suicide gesture' and two cases of suicidal ideation.

Other long-term effects described by the soldiers and attributed to the LSD exposure by the Army included: dissociative episodes, anxiety, nightmares, paranoia, alcohol abuse, poly-drug abuse, episodic withdrawal, acute confusional state, seizure disorder, headache, tinnitus, a peculiar 'fizzing noise' and transient impotence.

The Report quotes from the philosopher David Hume: 'A wise man proportions his belief to the evidence.' (USAMD, 1980: 24). Having said that, under the heading 'Summary of findings and observations', the authors of the report state:

> As a group, the 'LSD subjects' appeared to be relatively stable socially, unusually well educated, and economically successful. The medical and psychiatric findings for these 220 subjects examined directly, as well as that obtained from the additional 100 subjects examined by questionnaire, appeared to generally parallel both in type and frequency to the findings which could be expected to be found in a comparable segment of the general male population. (p. 63).

This conclusion and this reassurance are refuted by the data in the report. A comparable segment of 320 members of the general male population would not include 55 men with long-term side effects from LSD on the Halstead-Reitan, 76 with one or more self-reported long-term effects of LSD, and three self-inflicted deaths. These rates are particularly alarming because the Edgewood sample should have had a lower than normal rate of psychiatric and neurological problems due to the healthy soldier effect.

Individual case descriptions of subjects in LSD experiments

The following are case examples from the *LSD Follow-up Study Report* (USAMD, 1980). Cumulatively, they provide overwhelming evidence of long-term complications from the LSD testing and they refute the conclusions of the report.

Case #85 (p. 119): 'Psychology testing suggested a depressive reaction and a schizoid personality with some paranoid characteristics. Psychiatric evaluation was obtained and the examining psychiatrist felt that this subject showed signs of a passive dependent personality/passive aggressive personality disorder of a chronic, severe nature along with depressive neurosis.'

Case #102 (p. 121) experienced a serious dissociative fugue episode: 'In addition, the subject reported a number of episodes in which he carried out relatively complex activities for which he subsequently had no memory. For example, the subject stated that he once found himself in New York City having apparently driven there in his car but being unable to remember any of the details of how or why he did so.' This hardly sounds like a healthy, high-functioning person with no serious psychiatric problems, and it is inconsistent with the overall impression of the LSD test subjects (p. 63) quoted above.

Case #128 (p. 122): 'About 1 year after the initial LSD exposure the subject began to experience a series of episodes characterized by feelings of suspiciousness, withdrawal, and the idea that "he was a super spy" who had to keep important secrets. These episodes were strongly reminiscent of the feelings which the patient had experienced while under the influence of LSD. These episodes tended to be precipitated by drinking or by stress and recurred intermittently until about 1970. Since 1970 the subject has had no further episodes but according to information obtained during psychiatric evaluation he has "harbored a fear since the experiment that he had a glimpse of something terrible about himself that the experiment began to reveal, and a fear that in dreams or under times of stress he might discover further feelings of badness or worthlessness".' Like many of the other case descriptions included near the end of the report, Case #128 sounds like a highly disturbed individual on a chronic basis.

Case #141 (p. 124): 'In 1974 the patient had a "reaction" in which he mistook his girl friend for another person whom he claimed to have met during chemical warfare experimentation … Psychiatric evaluation showed evidence of a depressive neurosis and mixed personality disorder and recommended that the subject be entered into treatment at a local mental health clinic.'

Case #142 (p. 124): 'Information obtained by questionnaire indicated that during periods of stress and fatigue the subject has experienced a "near return to the panic feeling experienced during LSD experiments." The subject stated that he has been able to overcome this panicky feeling only by "sheer will power." The subject stated that as a result of his participation in chemical warfare experiments he has "lost a lot of my stamina."' Case 142's symptoms included 'difficulty in making decisions, dislike of criticism, a quick temper, easy annoyance by little things, and excessive fatigue.'

Case #149 (p. 124): 'Information obtained by questionnaire indicated that the subject had multiple symptoms which he attributed to prior LSD exposure. These symptoms included severe headaches, blurred vision, intermittent chest pain, "moodiness," "nightmares," "bad cough," hard breathing with sinus condition all the time, "lost memories," and "doesn't always hear."' The

subject declined to participate in the follow-up examination out of 'the fear (he) would be used again for test of some sort or be doped and sign papers releasing the Army for these problems'.

Case #181 (p. 125): 'The subject also stated that his "nerves are shot" and "his whole body shakes." … in the past two years he has become separated from his wife and has gone through bankruptcy proceedings.' This does not sound like a person who is 'relatively stable socially, unusually well educated, and economically successful.'

Case #202 (p. 126): 'In 1969 he experienced a "flashback." While mopping a floor, he hallucinated the strands of the mop becoming elongated and wrapping themselves around his feet and ankles anchoring him to the floor. There have been no subsequent flashback experiences. The patient reported that also in 1969 he began to experience severe marital difficulties because of his "personality change." This culminated in separation from his wife, the subject became severely depressed with suicidal ideation and began having violent nightmares. In addition he reported auditory and visual hallucinations of a frightening nature. These, however, were not reminiscent of his LSD experiences … Psychiatric evaluation showed severe anxiety neurosis with considerable paranoid ideation, anxiety, and hypochondriasis. The examining psychiatrist felt that many of the patient's symptoms, particularly a history of recent onset of visual and auditory hallucinations, suggested a pre-psychotic process and that further psychiatric evaluation was mandatory.'

Case #222 (p. 127) 'For 3 days after the initial injection of a substance presumed to be LSD, the subject experienced marked lapses of memory. During these 3 days he frequently carried out complex activities such as driving to another town, only to suddenly be unable to recall how or why he had arrived at his destination. These symptoms resolved within 96 hours of the initial exposure to LSD. Through the next four years the subject experienced periodic episodes of depression and in 1961 the subject became severely depressed and contemplated suicide. He was about to jump from a bridge when he was stopped by a stranger and taken to a hospital where he remained under psychiatric care for 1 week.' This is another case of dissociative fugue, similar to Case #102 but occurring on an acute basis. Dissociative fugue is a rare disorder: specialists in dissociative disorders such as myself encounter only the occasional case. Two cases occurring in this LSD series is far above expectations.

Case #223 (p. 128): 'The patient reported by questionnaire that he developed a serious drinking problem subsequent to his LSD exposure. The subject reported having been hospitalized for alcoholism in 1967, 1970, and 1974. The subject stated that as a result of his alcohol abuse he has experienced considerable job instability.'

Case #234 (p. 128): 'The subject stated that during the first year after participating in LSD testing he had frequently recurring dreams in which he would experience the feeling of fear in connection with having revealed secrets to outsiders. This fear of having revealed important secrets constituted the most significant acute symptomatology during his LSD exposure. The subject also stated that during this same year he became somewhat withdrawn because of the same fear of having revealed secrets. He also related to becoming more intolerant and more demanding toward his family.'

Case #237 (p. 129): 'The subject reported prolonged depression following LSD exposure which lasted approximately for 12 months.'

Case #244 (p. 129): '… participated in chemical warfare experiments in 1964. Over the next 3 years the subject had occasional episodes of brief, transient depression. About 3 years after LSD exposure the subject experienced an acute severe depression including feelings of "not caring for anything and not being able to control myself." The subject stated that at the time of onset of these symptoms he was driving his car and became afraid that he would be unable to control the vehicle. He stopped the car and began walking into some nearby woods where he remained for approximately 40 minutes. At the end of this period of time the depression resolved and he returned to his usual state of functioning.'

Case #256 (p. 130): '… unemployed … This subject stated that subsequent to his LSD exposure in 1958 he underwent a personality change becoming much more aggressive. Periodic violent outbursts began to occur. Specifically, the subject stated that he had beaten every woman with whom he had been involved in a love relationship and had been involved in numerous barroom brawls. Psychiatric interview revealed that the subject was the product of a broken home and had lived with his father from the age of 13 years. Two years prior to LSD exposure the subject received a court martial for unauthorized use of a pass and was reduced in rank. Past medical history obtained during hospitalization included one episode of gonorrhea, habitual excessive alcohol intake, mild hepatic dysfunction, probably secondary to alcohol …'

Case #257 (p. 130): 'Information obtained by questionnaire indicated that in the period immediately following participation in LSD testing the subject experienced "flashbacks" and "periods of great loneliness and depression." The subject stated that as a result of his abnormal emotional state he suffered marital disruption and acted in a financially irresponsible manner causing credit problems which have persisted to the present time.'

Case #270 (p. 140): 'Information obtained by questionnaire indicates that within one year of LSD exposure the subject experienced a 3-4 week period of "nervous fatigue." This was characterized by the inability to concentrate, complete assigned work, and trembling. As a result of these difficulties the subject lost his job as a commercial artist.'

Case #286 (p. 131): '… participated in Army chemical warfare experiments in 1958. The subject stated that following his LSD exposure he was completely asymptomatic until one year later when he awoke from sleep and had a hallucination of a distorted soldier that lasted from 10 to 15 minutes. Ten years after this, in 1969, the subject again awoke from sleep and hallucinated a platoon of soldiers of different colors in his room … This hallucination lasted from 10 to 15 minutes … In 1953, the subject was involved in an automobile accident and suffered a severe concussion remaining unconscious for 3 days.'

Case #320 (p. 132): '… participated in chemical warfare experiments in 1958 … During his period in the service, the subject received several medals but was also court-martialed three times, once for killing a Korean, and twice for missing bed checks. Shortly after retirement from the service in 1968 the subject was admitted to an alcohol rehabilitation center followed by an 18-month course of Antabuse … Psychiatric evaluation showed a passive dependent/passive aggressive personality disorder and chronic alcoholism.'

Case #337 (p. 134): 'The subject gave a history of frequent use of marijuana, cocaine, and heroin.'

Case #347 (p. 134): 'The subject was exposed to LSD in 1966. The subject stated that following his LSD exposure he had frequent recurring nightmares involving snakes. These nightmares often caused him to awaken in the state of severe anxiety. The subject also stated that he developed a snake phobia and would go to some lengths to avoid even seeing pictures of snakes. In addition, the subject reported a marked increase of alcohol intake subsequent to his LSD exposure. The subject stated that while drinking he experiences a change in his personality consisting of ideas of being somewhat unusual and having special powers as well as feelings of general unreality. The subject stated that on some occasions he has blacked out while drinking and has been amnesic for his subsequent behavior … It was suggested that the patient consider entering an alcohol rehabilitation program at a facility near his home.'

Case #349 (p. 135): '… retired Army officer who received LSD in 1960. One year following his LSD exposure the subject had a grand mal seizure. Neurological evaluation at that time showed abnormal electrical activity over the right temporal lobe but further studies ruled out surgically correctable lesions … In 1967 the subject was advised by a physician not to attempt to have further children because of his exposure to LSD … Psychiatric evaluation revealed an obsessive compulsive personality with depressive features.'

Case #355 (p. 135): 'Information obtained by questionnaire revealed that 2 years after LSD exposure the subject experienced "severe mental depression." This culminated in an unsuccessful suicide attempt.'

Case #376 (p. 136): 'The subject stated that 2 days after participating in LSD testing at Edgewood Arsenal (1958) he went to a nearby town and had "a couple of beers" after which he became disorderly and woke up naked in a jail. The subject stated that his behavior was unusual for him and that he was unable to remember the details of the incidents leading to his arrest.'

Case #377 (p. 136): 'This subject reported that for several years after his exposure to LSD he had occasional nightmares that he was going insane due to the drug and would have to go to an asylum permanently.'

Case #405 (p. 137): 'The subject reported that within 1 to 3 weeks after returning to his normal duty station following LSD exposure he experienced a few episodes of feeling isolated." The sensation was reminiscent of his LSD experience. One month following his discharge from the Army in 1958 he experienced the abrupt onset of feelings of intense isolation followed by visual hallucinations and panic. Shortly afterwards the patient passed out. Subsequently the patient had numerous similar episodes, the last of which occurred approximately 8 months prior to his participation in the LSD Follow-up Study. The subject reported that each year since 1957 he has had three to four "mild flashbacks" and one "severe" flashback … Immediately prior to being evaluated by the LSD Follow-up Study the patient was placed on thorazine by his regular physician. This resulted in sexual impotence.'

Case #406 (p. 138): 'The subject stated that one year subsequent to his LSD exposure in 1959 he experienced the onset of feelings of severe distortion of reality. He was hospitalized for approximately one week and treated with tranquilizing medications. At the time of discharge from this hospitalization the diagnosis was acute paranoid state manifested by a self-limited psychotic episode.'

Case #408 (p. 138): 'Information obtained by questionnaire indicated that for the first 6 months following his exposure to LSD the subject experienced almost daily headaches.'

Case #432 (p. 138): 'The subject stated that for about one week following his LSD exposure he experienced a number of "flashbacks." He also stated that he has recurrent "bad feelings" and great general concern over having been exposed to LSD inasmuch as he is strongly opposed to taking drugs in general. In addition, the subject stated that even in the present time he has occasionally experienced some "strange episodes" which are characterized by sensation of sudden enlargement of his head. These episodes are somewhat reminiscent of his LSD experience. Other encounters with toxic chemicals include exposure to phosgene and chlorine gases prior to the LSD experiments.' Note that the report includes the LSD experiments in the category of 'encounters with toxic chemicals'.

Case #442 (p. 139): 'Information obtained by questionnaire indicated that "several times" after drinking alcohol the subject blacked out and carried on activities for which he subsequently had no memory. During one of these occasions the subject reported shooting another person in the leg. The subject reported that shortly after his exposure to LSD he was reduced in grade and charged with inefficiency by his commander.'

Case #445 (p. 139): '… participated in chemical warfare experiments in 1963. Information obtained by questionnaire indicated that following discharge from the Army in 1965 the subject started experiencing severe allergy problems as well as recurrent heartburn and indigestion. The subject stated, since he had neither allergies nor gastrointestinal problems prior to participating in the chemical warfare experiments, he attributed the sudden onset of his problems in 1965 to those experiments.'

Case #458 (p. 139): 'The subject stated that for 4 years from the time of his LSD exposure in 1967 he experienced numerous "flashback" episodes characterized by the spontaneous occurrence

of feelings of apprehension, anxiety, and unreality frequently associated with visual and auditory hallucinations. Many of these episodes were apparently triggered by environmental noise and the subject stated that as a result he became very sensitive to noises, afraid to drive his car, developed insomnia and depression and had a marked decrease in libido. The patient also became very afraid of dying.'

Case #478 (p. 140): 'The subject stated that following his exposure to LSD in 1958 he experienced feelings of non-specific anxiety and depression which persisted until 1963 at which time he received psychiatric therapy.'

Case #481 (p. 140): 'The subject stated that as a result of his exposure to LSD while in the Army he became a polydrug abuser with a particular preference for hallucinogens including LSD, mescaline, peyote and others. The subject's drug abuse continued to the present time.'

Case #564 (p. 144): 'The subject received LSD on three separate occasions during the period from mid-1957 to late 1958. After each LSD exposure the subject experienced sexual impotence of 1 to 4 weeks' duration.'

Case #596 (p. 144): 'The subject reported that during his acute LSD intoxication he was handed a salt shaker which caused him to become severely frightened. He also noted that during the LSD experiments he was given a number of psychological tests and due to the effects of the drug was indecisive and immobilized. The subject stated that following his exposure to LSD he developed an unreasoning saltshaker phobia. In addition, he developed feelings of panic and severe indecisiveness when required to make emotionally charged decisions. Both of these phenomena have continued to the present time …'

Case #599 (p. 145): 'This subject reported by questionnaire that he had intermittent inner ear problems over the past several years resulting in sensations "essentially the same as while under the influence of LSD".'

Case #627 (p. 146): 'The subject was exposed to LSD in 1958. Subsequent to LSD experience he claims to have undergone a personality change characterized by a general loss of interest in his work and episodes of unaccountable rage. From 1958 through 1965 the subject reported a series of dissociative episodes in which he would carry out complex, sometime violent, behavior for which he later claimed to have no memory. For example in one episode the subject reported finding himself partially disrobed and dancing on a table in a bar with no memory of how he got there. In 1960 the subject was reduced in rank because of his aberrant behavior. In 1970 the subject's first marriage ended in divorce. The subject attributed his marital difficulties in large part to his personality change subsequent to LSD exposure.'

Case #649 (p. 146): 'The subject stated that subsequent to receiving chemical warfare agents he began to experience recurrent visual hallucinations and severe inability to concentrate. The subject stated that he has had one to three visual hallucinations weekly for the past 20 years. Since 1961, the subject has had "over 50" different jobs and states that his mental instability caused by exposure to chemical warfare agents has been responsible for his poor work performance. The subject also complained of frequent recurrent episodes of severe fright, hysteria, nervousness, fear of insanity, and fear of death. The subject claimed not to have been free of these episodes for any significant period of time since his exposure to chemical warfare agents. As a result of these continuing symptoms, the subject has been under psychiatric care and has required psychiatric hospitalization on several occasions, most recently at a VA hospital near his place of residence in 1976.'

Case #680 (p. 147): 'The subject stated that ever since his exposure to LSD 18 years ago he has had recurrent episodes of paroxysmal headache, nausea, giddiness, and transient confusion. These episodes generally last 1 to 3 minutes and occur once or twice monthly. The subject has never lost consciousness and generally cannot remember events going on around him during these episodes. The only disability reported as a result of these episodes is minor embarrassment because of his

confusion. These episodes have remained completely stable with respect to frequency and duration since the onset 18 years ago. The subject stated that these episodes are triggered by "certain cues" such as certain kinds of music, spoken phrases, and vague memories.'

Case #717 (p. 148): '… participated in chemical warfare experiments in 1958. Twenty-four hours following discharge from the testing area, the subject had a several-hour episode of slurred speech and ataxia, both of which had occurred during his prior LSD ingestion. Over the past 10 years, the subject reported recurrent episodes of jamais vu, intermittent confusion, nightmares, decreased ability to concentrate, temper outbursts, suspicious feelings and thoughts, and memory loss. These symptoms have been variable in frequency but have persisted to the present time.'

Case #723 (p. 149): 'Evaluation of this subject revealed a history of chronic alcoholism characterized by drinking binges of up to 2 to 3 quarts of hard liquor daily. His alcoholism had caused numerous serious secondary complications including an organic brain syndrome, alcoholic peripheral neuropathy, cerebellar dysfunction, enlargement of the liver, and skin changes characteristic of chronic alcohol abuse including spider angiomata on the trunk, palmar erythema, and a diffuse yellowish discoloration of the skin. The subject stated that while he could not entirely attribute his abuse of alcohol to LSD that in part his increased use of alcohol followed his LSD exposure in 1958 and that he was "looking for the same good feeling" that he experienced while taking LSD.'

The report (p. 63) describes this group of veterans as comparable to a similar general population sample from a medical and psychiatric perspective. This description is disproven by the case descriptions included at the end of the report. The cases could be better described as a vivid collection of complications of LSD exposure, psychiatric and medical disability and, often, a poor pre-LSD-exposure psychiatric status.

As discussed above, screening procedures for the Edgewood experiments are described by the National Research Council (1985: 48). They give the impression of an adequate screening procedure, but many of the case descriptions quoted in the present section tell a different story. Numerous soldiers are described as having personality disorders, which are chronic in nature. These personality disorders may have pre-existed the soldiers' participation in Edgewood experiments in which case they would provide evidence of inadequate screening or, alternatively, the screening was adequate and they were caused or contributed to by the LSD.

There was no outside counsel or independent review of the consent procedures, the chemicals or the effects of the chemicals. Many soldiers were ordered never to talk about their exposures, even to later VA physicians trying to diagnose and treat their medical and psychological problems.

Conclusion

The ethics, consent procedures, safeguards and complications of any ongoing chemical and biological weapons experimentation, and the involvement of physicians including psychiatrists in such experiments, should be the subject of review by organized medicine. This is particularly the case because of the damage to experimental subjects, documented above, from a half century of chemical and biological experimentation by the US Army, including its LSD experiments.

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Note

1. NPR report, available at: http://www.npr.org/blogs/health/2011/01/27/133279018/dugway-proving-ground-reopens-after-missing-nerve-agent-found (accessed 3 November 2015).

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