Medical Experimentation

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The use of experimentation on human subjects is a necessary method of advancing medical and public health knowledge. However, it has been abused extensively in the context of genocide and crimes against humanity, especially by the Axis Powers during World War II. Experimentation was part of the state-sanction behavior of Nazi doctors within the broader program of extermination of races considered inferior or of targeted political groups. The medical and health personnel involved were charged with having committed war crimes and crimes against humanity during World War II, and many were convicted by a U.S. tribunal set up in tandem with the International Military Tribunal sitting in Nuremberg.

Medical experimentation refers to the testing and evaluation of a new drug or procedure on a human person in order gain generalizable knowledge that can be used for various purposes. In its accepted form, such experimentation is conducted on willing human subjects for the purpose of advancing the curative or preventive role of medicine. In its prohibited form—done in connection with genocide or crimes against humanity—it is conducted without the consent of the individuals tested and for purposes that may purport to have positive value for medical science, such as finding a vaccine against smallpox, or for the misuse of medicine, such as learning how to keep a prisoner from dying under torture, in order to continue the acts of torture.

Medical Experimentation in History

The trial of the Nazi doctors was in many ways the defining moment of standard setting regarding medial experimentation. The practice is, however, an ancient one, found among physicians in ancient Greece and Rome, the Arab and Ottoman Empires, and especially in European medical practice during the eighteenth and nineteenth centuries. Among the best-known examples of medical advances made thanks to medical experimentation are Edward Jenner's inoculation of an eight-year-old boy with cowpox against smallpox, Sir James Young Simpson's use of chloroform for anesthesia, and Louis Pasteur's testing an antidote to rabies. Although these advances have proved important, the experimentation sometimes took place without adequate attention to acquiring informed consent or reference to previous scientific studies, and testing usually took advantage of vulnerable groups, such as children, orphans, prisoners, and mental patients.

One of the first efforts to establish ethical standards for medical experimentation was made by the English physician, Thomas Percival, in 1803. He wrote that doctors performing "new methods of chirurgical treatment . . . should be scrupulously and conscientiously governed by sound reason, just analogy, or well-authenticated facts . . . and no such trials should be instituted
without a previous consultation of the physicians or surgeons." More directly to the point of human experimentation was the code drafted by an American, William Beaumont, in 1833, requiring voluntary consent of the subject and cessation of the experiment when it causes distress to the subject or when the subject is dissatisfied with it. The French physician Claude Bernard, writing in the middle of the nineteenth century, defined the basic principle of "never performing on man an experiment which might be harmful to him to any extent, even though the result might be highly advantageous to science, i.e., to the health of others."

The principle of informed consent evolved as a result of several well-known experiments. During World War I, Walter Reed experimented with mosquitoes as a vector of yellow fever, first on servicemen and then on Spanish workers. His test subjects signed a contract by which they accepted the risk of yellow fever in exchange for $100 in gold, twice that amount was paid if they contracted the disease. The ethical problem with Reed's experiment was that prospective test subjects were recruited on the basis of false information. The certainty of non-participants in the experiment contracting yellow fever was exaggerated, and the possible fatal consequences of the experiment were understated.

In the early twentieth century, a collaborator of Reed, George Sternberg, experimented on children in an orphan asylum, as well as on mental patients and prisoners. Although criticized for it, Hideyo Nogushi and his colleagues tested a drug (luetin) to diagnose syphilis on uninformed mental patients, patients in public hospitals, and orphans. These examples raised problems of medical ethics, and this concern contributed to the rethinking of rules governing medical experimentation in the mid-twentieth century.

During World War II, the Committee on Medical Research of the Office of Scientific Research and Development—the precursor to the National Institutes of Health—conducted major experimental research using human subjects on diseases such as dysentery, influenza, and especially malaria. Again, mental patients and prisoners were infected to determine their response to antimalarial therapies and flu vaccines. The subjects were usually considered volunteers, but little attention was paid to the nature of their consent. For instance, prisoners were often promised early release, but no one stopped to think of how that promise might induce a prisoner to give consent to the experimentation. The overriding concern was for results, because the tests would directly effect the health of soldiers engaged in the war effort. Hepatitis testing on mentally retarded children at Willowbrook, and cancer research, using live cancer cells, on unsuspecting patients at the Brooklyn Jewish Chronic Disease Hospital were also conducted without adequate attention to the consent of the subjects and the ethics of the use of live cancer cells.

Perhaps the most notorious example in the United States of failure to apply standards of informed consent was the Tuskegee study, which the U.S. government ran from 1932 to 1972. The test subjects were African Americans with secondary syphilis and were not conscripted during the war and in order to allow the scientific team to continue studying the progression of the disease, were not given penicillin even after its efficacy against the disease was discovered. It was not until Henry Beecher published his groundbreaking article, "Ethics and Clinical Research," in 1966 that the laxity of standards for experimentation in medical schools, hospitals, and government institutions was considered urgent enough for clear rules and monitoring procedures to be established.

By far the most significant precedent for the dangers of unrestricted and barbaric medical experimentation was that set by the Nazi and Japanese doctors before and during World War II. Japanese physicians conducted germ warfare experiments in the early 1930s under the
direction of Lieutenant-General Shiro Ishii. Some 20,000 Japanese professionals were involved in experiments on humans and participated in massive germ warfare attacks against Chinese and Korean civilians and U.S. prisoners of war. An estimated 400,000 Chinese died of cholera as a result of these attacks, and the final death toll of Japan's medical-biological war crimes has been estimated at 580,000. Unit 731, the most notorious secret military medical unit of the Imperial Japanese Army, was a facility of 150 buildings on six square kilometers. There, a number of experiments were carried out on human subjects, including vivisections, grenade tests, frostbite experiments, and a bacilli bomb developed for use as a defoliant. The U.S. government did not prosecute the Japanese perpetrators for these acts as they did in the case of the Nazi doctors. Instead, the crimes were left unprosecuted, in exchange for access to test results and documents.

**Experiments Carried Out by Nazi Physicians during World War II**

At the end of World War II, twelve experiments were singled out for prosecution as war crimes. Extensive evidence was presented for each of them during the trial of the Nazi physicians.

**High-Altitude (or Low Pressure) Experiments**

Inmates of the Dachau concentration camp in 1942 were locked in an airtight pressure chamber and the pressure was altered to simulate atmospheric conditions at very high altitude without oxygen. In the words of the official report on this experiment, performed on a 37-year-old Jew:

*After 4 minutes the experimental subject began to perspire, and wiggle his head; after five minutes cramps occurred; between 6 and 10 minutes breathing increased in speed and the experimental subject became unconscious; from 11 to 30 minutes breathing slowed down to three breathes per minutes, finally stopping altogether. Severest cyanosis developed in between and foam appeared at the mouth. About one-half hour after breathing had stopped, dissection was started.*

The report then provides a detailed description of the autopsy.

**Freezing Experiments**

In experiments conducted in Dachau in 1942 and 1943 to learn how to rewarm German pilots downed in the North Sea, victims were forced to stand naked in freezing weather for nine to fourteen hours, or in a tank of ice water for three hours. The official Nazi report notes, "the experimental subjects died invariably, despite all attempts at resuscitation." In October 1942, one of the defendants presented a paper, "Warming Up after Freezing to the Danger Point," based on these experiments to a conference held in Nuremberg on the prevention and treatment of freezing.

**Malaria Experiments**

Over 1,200 Dachau inmates were infected by mosquitoes or injected from the glands of mosquitoes and then treated with various drugs. As a consequence, thirty inmates died from malaria, and 300 to 400 more died from complications and overdoses of some of the drugs.
Mustard Gas Experiments

Victims in Sachsenhausen, Natzweiller, and other camps were deliberately inflicted with wounds. These were subsequently infected by mustard gas, or were injected with the gas, or were forced to ingest it by inhaling or drinking. Nazi reports of these experiments in 1939 describe the swelling and intense pain the victims suffered.

Experiments with Drugs, Muscle and Nerve Regeneration, and Bone Transplantation

Chief Prosecutor Telford Taylor described these experiments as "perhaps the most barbaric of all." They were performed primarily on women in Ravensbrück, and consisted in inflicting wounds to simulate battle injuries, into which a gangrene-producing culture was introduced to cause severe infections. Some victims were then treated with sulfanilamide, others with nothing. Bone transplantation was performed on other subjects. In Buchanwald, victims—usually Polish Catholic priests—were injured and then treated with polygal or sulfanilamide. Many died from these tests or from untreated blood poisoning and other infections.

Seawater Experiment

Conducted in Dachau in 1944, these experiments involved feeding the victims shipwreck rations. Some were given no water, others received ordinary seawater, or seawater in which the salty taste was concealed, or seawater that had been treated to remove the salt. The tests were performed primarily on Roma (Gypsies). The test subjects suffered deliriums and convulsions, and some died.

Epidemic Jaundice Experiments

Eight Jews of the Polish resistance were selected for this experiment in Sachsenhauser and Natzweiler camps. The experiment began in an effort to find an inoculation against epidemic jaundice and resulted in the torture and death of the subjects.

Sterilization Experiments

These experiments, conducted on victims in Auschwitz, Ravensbrück, and other camps, were part of Nazi planning for genocide by the most efficient, scientific, and least conspicuous methods. The aim was to eliminate Russians, Poles, Gypsies, Jews, and other undesirable populations by using medicinal rather than surgical sterilization, primarily through injection of caladium sequinum and other substances. In addition, gland transplantation was performed on fourteen inmates of Buchanwald, two of whom died. Others were subjected to sterilization by X-rays and castration. The aim was to prevent reproduction among Jews who were preserved from extermination in order to perform labor.

Typhus and Other Virus Experiments

For nearly five years, until the end of the war, medical experiments were performed on inmates of Buchanwald and Natzweiler to test vaccines for typhus, yellow fever, smallpox, paratyphoid A and B, cholera, and diphtheria. For the typhus experiments, hundreds of prisoners were infected with typhus. Some of these had received an antityphus vaccine to be tested, the others
were used as the control group or simply infected to provide a supply of the virus for further testing.

Poison Experiments

Russian inmates of Buchanwald were injected with poisons, sometimes administered through poison bullets. The tests were designed to permit the Nazi doctors to observe the victims' reactions to the poison up to the point of death.

Incendiary Bomb Experiments

These experiments took place in Buchanwald in 1943. Five inmates were burned with phosphorous material taken from an English bomb and were severely injured as a result.

Anthropology Experiments

Two of the defendants in the Doctors' Trial were obsessed with racial theories and had collected skulls representative of "all races and peoples," but lacked those of the "Jewish race." In order to complete the collection, they had requested that Jewish victims be photographed and that "anthropological measurements" of their skulls be taken while they still lived. The victims were then killed and beheaded, and their heads were brought to the laboratory in a sealed tin filled with conserving fluid. In requesting this service from the Wehrmacht, one of the defendants had explained that he wanted skulls to "represent the prototype of the repulsive but characteristic subhuman." Prosecutor Taylor called these experiments "perhaps the most utterly repulsive charges in the entire indictment."

The Trial of the Nazi Doctors

The trial of the Nazi doctors, known as the United States vs. Karl Brandt et al, the Medical Case, or the Nazi Doctors Case, was based on the Agreement for the Prosecution and Punishment of the Major War Criminals of the European Axis, signed in London on August 8, 1945 by the United States, the United Kingdom, France, and the Soviet Union, which created the International Military Tribunal (IMT). The Nazi doctors were not tried by the IMT, but rather by a U.S. tribunal acting pursuant to Control Council Law No. 10, signed on 20 December 1945.

The trial of the Nazi doctors was officially Case No. 1 of Military Tribunal I, constituted on October 25, 1945, and consisting of Walter Beals, Harold Sebring, Johnson Crawford, and Victor Swearingen. Telford Taylor served as chief of counsel for the prosecution, and James McHaney was chief prosecutor. Taylor charged the defendants with "murder, tortures, and other atrocities committed in the name of medical science." There were four counts in his indictments:

1. Conspiracy to commit war crimes against humanity: The ordering, planning, and organization of the war crimes and crimes against humanity charged in counts two and three. Although all the defendants were charged on this count, the tribunal decided not to convict.
2. War crimes: The tribunal found fifteen defendants guilty on this charge and acquitted eight.
3. Crimes against humanity: Charged against all defendants. Fifteen were found guilty, eight were acquitted.
4. Membership in a criminal organization: Ten defendants were charged with membership in the SS. All were found guilty.

The trial began on December 9, 1946. The judgment was returned on August 19, 1947, and sentencing was pronounced on the following day. The tribunal met 139 times, heard 85 witnesses, and examined 1,471 documents. There were twenty-three defendants, seven of whom were found guilty of war crimes and crimes against humanity and sentenced to death. Four of these were physicians. Five other defendants were sentenced to life imprisonment. Seven were found not guilty and one was found guilty of the charge of belonging to the SS but not of crimes relating to medical experimentation. Thirty-one lesser officials were put on trial and found guilty, of whom twenty-two were sentenced to death.

Taylor gave the opening statement for the prosecution, noting that "most of [the defendants] are trained physicians, and some of them are distinguished scientists." He set aside from the medical trial the charges of "euthanasia" and slaughter of tubercular Poles because they did not relate to actual medical experiments. The charges retained against the defendants related to experiments that constituted war crimes or crimes against humanity, and murder for so-called anthropological purposes. Some of these experiments were aimed at assisting the German Wehrmacht in coping with battlefield problems and diseases encountered in occupied territories. However, others, in Taylor's words, were not aimed at determining "how to rescue or to cure, but how to destroy and kill." Among the latter, he listed the sterilization experiments and shooting of poison bullets at prisoners in Buchenwald to see how quickly they died. He called these crimes "thanatology," or the science of producing death.

The Nuremberg Code

The judgment of the tribunal included a section on "permissible medical experiments," in which the judges enumerated ten principles that "must be observed in order to satisfy moral, ethical, and legal concepts." Through these principles, the judges intended to identify "requirements which are purely legal in nature" and not to venture into the field of medicine, which they deemed a "field that would be beyond our sphere of competence." Nonetheless, the principles have come to be known as the "Nuremberg Code," and have had far-reaching significance for bioethics.

The Nuremberg Code begins with that core principle that "the voluntary consent of the human subject is absolutely essential." The other requirements are that any experiment on a human subject should be for the good of society; it should build on the results of animal experimentation and scientific knowledge, it should "avoid all unnecessary physical and mental suffering and injury;" there should be no "a priori reason to believe that death or disabling injury will occur" (with the possible exception of the experimental physicians serving as subject); the degree of risk should be proportionate to the humanitarian gain; adequate precautions should be taken "to protect the experimental subject against even remote possibilities of injury, disability, or death;" only scientifically qualified persons should conduct the experiment; the subjects should be able to halt the experiment "if he has reached the physical or mental state where continuation of the experiments seems to him to be impossible;" and the lead scientist should be prepared to end the experiment at any stage "if he has probable cause to believe, in the exercise of the good faith, superior skill, and careful judgment required of him, that a continuation of the experiment is likely to result in injury, disability, or death to the experimental subject."
The Nuremberg Code sets a very high standard, for which it has sometimes been criticized, especially in relation to the absolute character of voluntary consent. It should be noted that it only deals with adult consent in the context of the Nazi experiments, and was not intended to cover all situations. The tribunal drew heavily on two expert witnesses, Andrew Ivy and Leo Alexander, who compiled historical precedents and proposed most of the points that were eventually incorporated into the judgment. Michael Grodin, an expert on the Nuremberg Code, has called it "the cornerstone of modern human experimentation ethics."

Since the tribunal's judgment, standard-setting regarding medical experimentation has followed two major trends. The first is the development of detailed ethical codes and procedures for protecting human subjects involved in experimentation. This has been accomplished primarily through the World Medical Association's Helsinki Declaration and the Council for International Organizations of Medical Sciences (CIOMS)'s Ethical Guidelines for Biomedical Research Involving Human Subjects. These standards are implemented primarily through national legislation and institutional review boards. The second is through the incorporation of provisions that ban impermissible medical experimentation in international humanitarian and human rights treaties.

**International Humanitarian and Human Rights Law**

As a result of the Nazi medical trial, the issue of medical experimentation and other biological experiments was a preoccupation of the drafters of the principal post–World War II instruments of international humanitarian and human rights law. Under the First and Second Geneva Conventions, the wounded, sick, and shipwrecked armed forces "shall not be . . . subjected to torture or to biological experiments" (Article 12 of each convention). Article 13 of the Third Geneva Convention, regarding the treatment of prisoners of war stipulates: "In particular, no prisoner of war may be subjected to physical mutilation or to medical or scientific experiments of any kind which are not justified by the medical, dental, or hospital treatment of the prisoner concerned and carried out in his interest." In the Fourth Geneva Convention, regarding the protection of civilians in time of war, Article 32 bans "mutilation and medical or scientific experiments not necessitated by the medical treatment of a protected person." Protocol I, relating to the protection of victims of international armed conflicts (Article 11) states the following:

> It is prohibited to subject the persons described in this Article to any medical procedure which is not indicated by the state of health of the person concerned and which is not consistent with generally accepted medical standards which would be applied under similar medical circumstances to persons who are nationals of the Party conducting the procedure and who are in no way deprived of liberty.

It further prohibits carrying out "on such persons, even with their consent: (a) Physical mutilations; (b) Medical or scientific experiments; (c) Removal of tissue or organs for transplantation." As for Protocol II, which deals with the protection of victims of noninternational armed conflicts, it is similarly "prohibited to subject the persons described in this Article to any medical procedure which is not indicated by the state of health of the person concerned, and which is not consistent with the generally accepted medical standards applied to free persons under similar medical circumstances." This prohibition appears in Article 5.2, concerning internment or detention. All four Geneva Conventions of 1949 list among the grave violations, which all parties are required to punish, "willful killing, torture or inhuman treatment, including biological experiments."
The 1998 Rome Statute of the International Criminal Court continues this trend in international law. It defines "war crimes" in Article 2 as:

*Grave breaches of the Geneva Conventions of 12 August 1949, namely, any of the following acts against persons or property protected under the provisions of the relevant Geneva Convention: . . . Torture or inhuman treatment, including biological experiments; [and] Willfully causing great suffering, or serious injury to body or health.*

In addition, Article 2(b) lists the following as serious violations of the laws and customs applicable in international armed conflict:

*Subjecting persons who are in the power of an adverse party to physical mutilation or to medical or scientific experiments of any kind which are neither justified by the medical, dental, or hospital treatment of the person concerned, nor carried out in his or her interest, and which cause death to or seriously endanger the health of such person or persons.*

Although the Genocide Convention does not specifically mention medical experimentation, the 1992 International Covenant on Civil and Political Rights stipulates, in Article 7, "No one shall be subjected to torture or to cruel, inhuman or degrading treatment or punishment. In particular, no one shall be subjected without his free consent to medical or scientific experimentation." In its General Comment 7 on this article, the Human Rights Committee took special note, as follows:

*[T]he reports of States parties have generally given little or no information on this point. It takes the view that at least in countries where science and medicine are highly developed, and even for peoples and areas outside their borders if affected by their experiments, more attention should be given to the possible need and means to ensure the observance of this provision. Special protection in regard to such experiments is necessary in the case of persons not capable of giving their consent.*

The issue of experimentation was also included in principles for the protection of persons with mental illness and the improvement of mental health care, adopted by the UN General Assembly in 1991. Principle 11 stipulates the following:

*Clinical trials and experimental treatment shall never be carried out on any patient without informed consent, except that a patient who is unable to give informed consent may be admitted to a clinical trial or given experimental treatment, but only with the approval of a competent, independent review body specifically constituted for this purpose.*

Finally, in the Draft Comprehensive and Integral International Convention on the Protection and Promotion of the Rights and Dignity of Persons with Disabilities, it is provided that "States Parties shall prohibit, and protect persons with disabilities from, medical or scientific experimentation without the free and informed consent of the person concerned, and shall protect persons with disabilities from forced interventions or forced institutionalization aimed at correcting, improving, or alleviating any actual or perceived impairment."

Through these normative developments since the trial of the Nazi doctors, the medical profession and authors of international treaties on human rights and humanitarian law have sought to draw lessons from the atrocities and wonton misuse of science during World War II and the disregard for welfare of human subjects involved in biological and medical experimentation in democratic societies in peacetime. Medical experimentation continues to
be a critical step in improving human health but must come under strict limitations and control in accordance with the Kantian imperative (in his *Metaphysical Foundations of Morals*) to "act so as to treat man . . . always as an end, never merely as a means."

**SEE ALSO** Auschwitz; Eugenics; Euthanasia; Japan; Mengele, Josef; Physicians

**BIBLIOGRAPHY**


**Stephen P. Marks**

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