The Nazi medical experiments

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Abstract

- All doctors work in the shadow of the Nazi medical experiments.
- An initial concept of differential value of human life led to a situation where physicians could diagnose "useless life" or "useful life", and "treatment" could be prescribed as death in the gas chamber.
- Some experiments were specifically intended to find ways to eliminate the "inferior races". Others were intended to help the German military, and used the concentration camp prisoners as nonconsenting subjects.
- The people who conducted these experiments were guided by the threat of mortal danger to their nation from the "inferior races". Medical practitioners justified their actions on the grounds that the Jew, the gypsy, the homosexual, the handicapped, and the Slav posed a biological intimidation of the Reich.

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INVOLVEMENT OF DOCTORS IN TORTURE and medical experimentation is not new. However, unethical experiments were exceptional and were conducted on a relatively small scale before World War II.

World War II represents a watershed in human experimentation. Funding for research increased, in all countries, and became centrally controlled and coordinated. Many investigations were designed to benefit the army, and the welfare of the research subjects became of little consequence. The war was paramount, and the researchers were congratulated for their efforts. However, no atrocities match the human experimentation carried out by Nazi medical doctors during World War II.

The journey down the slippery slope started with the concept of the differential value of human life, which extended to the programs of the Sterilisation Law and the Nuremberg Laws, then spread to the euthanasia operation, and finally culminated in genocide and human experimentation.

In Auschwitz we saw the ultimate model of Nazi medicine. The physician became the gatekeeper who reserved responsibility for selection on behalf of the state, and became the decision-maker for the "patient". The doctor produced a diagnosis of "useless life" or "useful life", deciding on the differential value of human existence.[1] A medical practitioner could prescribe "treatment" as death in the gas chamber, or slave labour in the factories.

The concentration camps also offered opportunities to doctors who were keen to advance their careers by undertaking medical research. Here I describe some of the experiments; many others were conducted, but there is not space to detail them.

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Methods of killing

A major concern of the Nazis was the "need" to remove the "inferior races". Therefore, much research was directed at methods of killing.

Poisons were the subject of many of these experiments. In one series, poisons of the alkaloid group were secretly administered in food to four Russian prisoners, and German doctors stood behind a curtain to watch the reactions of the prisoners. Some of the victims died immediately; if not, they were killed to permit an autopsy.[2] Another experiment involved the use of poisoned bullets impregnated with aconitin nitrate.[2,3] Prisoners were selected and shot in the upper part of the left thigh and their deaths were observed and documented.[2]

At Dachau, a standard cyanide capsule that could be easily bitten through, either deliberately or accidentally, was developed. These capsules were the very method by which Himmler and Göring killed themselves.[4]

The production of septicaemia was also studied. An intramuscular injection of 1 mL of pus containing streptococci was used. The injection site was in the adductor canal on the inside of the thigh. When an abscess developed, the pus was aspirated and injected intravenously. When the patient died, an autopsy was performed. These studies were carried out in many camps; at Dachau, the victims were almost exclusively Polish Catholic priests. As the method did not invariably cause death, it was considered inefficient.

Another method was the repeated intravenous injection of suspensions of live tubercle bacilli, which produced acute

miliary tuberculosis within a few weeks; this had the advantage of being a totally "natural" cause of death.[2,5]

The most efficient form of medical execution was the use of intracardiac phenol or benzine. In Auschwitz, intravenous injections of hydrogen peroxide, petrol, evipan and phenol were used to kill the more seriously ill people. Physical examinations were not performed, and 30 to 60 people were murdered daily this way.[2]

Mustard gas

Experiments using mustard gas were conducted at Sachsenhausen, Natzweiler and other concentration camps, and extended over the entire period of the war. Injuries were deliberately inflicted on the victims and the wounds were then contaminated with mustard gas. Other subjects were deliberately forced to inhale the gas, or to take it internally in liquid form, and still others were injected with the liquid.[2] About 220 inmates were selected, about 50 of whom died.[2] The first fatalities occurred on or about the fifth or sixth day. At autopsy, it was found that the intestines and lungs were destroyed.[6]

Methods of sterilisation

Sterilisation methods were also widely investigated. The primary purpose was to discover an inexpensive, unobtrusive and rapid method. Surgical sterilisation was too slow and expensive to be used on the large scale required for elimination of the inferior races.[7] Experiments were carried out using drugs, x-rays and intrauterine irritants.

A rapid method developed for sterilisation of women, which could be accomplished in the course of a regular health examination, was the intrauterine injection of various chemicals. Various substances were used. One substance was silver nitrate with contrast. There is also evidence that formalin may have been used.[8] At least 500 women were treated by this method; the procedure required three sessions and was followed up with radiographs. A considerable number of these women developed peritonitis and fever. Those who refused to be experimented on were gassed.[8] Clauberg, who performed these experiments, was an eminent teacher and gynaecological researcher. Some of his hormonal preparations, oestradiol valerate (Progynova) and hydroxyprogesterone hexanoate (Proluton) are still used.

Sterilisation of men by using x-rays was also examined. The penis and testicles were subjected to irradiation for 15 minutes, and 2 weeks later, under caudal anaesthesia, both testicles were removed for examination. Needless to say, no consent was sought.[2,6,9]

In another experiment, the "success" of x-ray burns to the ovary was studied. The irradiated women were given a spinal anaesthetic, and then tied to the operating table. The abdomen was incised and the ovary removed. Often the ovarian artery was not ligated. Instruments were neither washed nor sterilised, and the victims were often fully aware of everything that took place.[10]

Aid for the military

Some research was conducted to aid the military forces.

Haemorrhage

It was well recognised that the main cause of death on the battlefield was haemorrhage. Polygal, a substance concerned with blood crystallisation, was tested at Dachau. It was postulated that one tablet of polygal slowed haemorrhage down for about 6 hours. There is evidence that four Russian prisoners were shot through the spleen after they had been given polygal. The victims took 20 minutes to die and were then subjected to autopsy.

Altitude

The "high-altitude" or "low-pressure" experiments conducted at Dachau during the course of 1942 were also aimed at helping the war effort.[11]

It was considered important to conduct research into the effect of high altitude, because of the higher ceilings reached by Allied fighter planes. These experiments used a movable pressure chamber, which the German Air Force provided.[7] A long report written in July 1942 describes how a victim was given an oxygen mask, and then the pressure was lowered in the chamber to an elevation of 14 000 feet, at which stage the oxygen mask was removed and parachute descent was simulated. The report describes the victim's spasmodic convulsions, agonal breathing and, eventually, death.[5]

The development of air embolism was investigated by opening the skull and chest under water after death. To ensure that these studies would be valid, the subjects were kept under water till they died. In one case, the heart was still beating after the chest and skull had been laid open.[6] The conclusion from these experiments was that air embolism is not necessarily fatal, and that it occurs in practically all vessels while pure oxygen is being inhaled.[2]

Hypothermia

Freezing experiments were also conducted at Dachau. The aim of these experiments was to determine the most effective way to re-warm German aviators who parachuted into the sea. These experiments were regarded to be of the greatest importance to the German Army, Air Force and to the Fleet, to establish the most effective way to treat rescued shipwrecked crews.[6] The scientists involved perceived themselves as seeking answers to "legitimate scientific goals".[11]

In the course of these experiments, the victims were forced to remain in a tank of iced water for 3 hours at a time. One report described temperature measurements of 26.4° C in the stomach, and 26.5° C in the rectum.[2] Fatalities occurred only when the brainstem and the back of the head were also chilled. Autopsies showed large amounts of free blood, up to 0.5 L, in the cranial cavity. The heart invariably showed right-sided failure.

During the winter of 1942 and 1943, experiments with "dry cold" were conducted. Thirty people were forced to stand naked in the open air for 9–14 hours at temperatures below freezing.[2] Re-warming of the subjects was attempted by a variety of means. The most successful method was the use of a hot bath. In September 1942, re-warming was attempted by the use of the warmth of human bodies. Four gypsy women were produced for this purpose, and the chilled victims were placed between the naked bodies of the gypsies.[2] The conclusion was that re-warming using animal warmth is very slow.[2]

Up to 400 experiments were conducted, with 280–300 subjects; 89 subjects died.[6] These experiments documented physiological signs that occur with hypothermia in humans. They suggested that the cause of death from hypothermia was probably ventricular fibrillation; that re-warming was effective; that the neck and the occiput have to be protected to minimise the effects of hypothermia, and that significant increase in blood sugar and blood viscosity was associated with hypothermia due to immersion. Some of the data produced are considered scientifically useful.[11]

The results of these experiments were widely known in German medical circles. In October 1942, the "Prevention and Treatment of Freezing" and the "Warming up after Freezing to the Danger Point" was presented.[2] In December 1942, the findings were presented at a conference of Army medical advisers in Berlin.[6]

Seawater

Experiments were conducted in Dachau, at the behest of the German Air Force and the German Navy, to develop a method of rendering seawater drinkable.[5] The experiments began in August 1944, and continued until the middle of September.

It was decided that gypsies would be used for these experiments.[12] The subjects, fed only with shipwreck emergency rations, were divided into four groups. One group would receive no water at all; the second would drink ordinary seawater; the third would drink seawater processed by the "Berka" method, which concealed the taste but did not alter the saline content; and the fourth would drink seawater treated to remove salt (the "Schaefer" method). The Schaefer method had the disadvantage of requiring substantial amounts of silver, which was available only in limited quantities.[2]

The object of the study was to elucidate whether it would be better to go without liquid altogether; whether the Berka method might improve the digestibility of seawater; and what happened to the metabolism of the subjects.[6] Damage to the kidneys occurred after 6 days, and death (which occurred in at least two cases) after 12 days.[11]

No major discovery was made. The conclusion was that the Berka method was useless and that the Schaefer method was effective, and that shipwrecked people should drink tiny quantities of seawater, as small quantities of seawater are better than no water.[3,6]

Disease

Typhus

One series of experiments that might have made an important medical contribution was the study of the efficacy of various vaccines and drugs against typhus.

Typhus vaccine from egg yolks was to be tested on humans to determine its efficacy.[2] The typhus experiments at Buchenwald were carried out on a very large scale and resulted in many deaths. An estimated 300 concentration camp inmates were studied. This was the starting point for the production of an anti-typhus vaccine for the German Army, produced according to the Giroud method by the Pasteur Institute.

A group of prisoners was selected and injected with anti-typhus vaccine. Then they and a group of unvaccinated prisoners were infected with typhus. Additionally, another group of prisoners were infected with typhus for the sole purpose of keeping the typhus alive and available in the bloodstream. The study assessed the incubation period, the gravity and course of the disease, the symptoms and the rapidity with which the Weil–Felix test became positive.[2]

In 1944, a series of "therapy experiments" was commenced, in which a variety of remedies were tried in 90 subjects who had been artificially infected with typhus.[6] The agents tried were rutenol, nitroacridin, methylene blue and acridin-granulate. Thirty-two of these subjects died.[6,9] In another study, a preparation identified by a number 3582, and granulated rutenol (both manufactured by the Bayer medical company) were tried on 50 prisoners in Auschwitz. Fifteen patients (30%) died after treatment had been completed. The subjects vomited up to seven times a day. Bronchial pneumonia, nephritis, intestinal bleeding, subcutaneous phlegmons below the larynx, parotitis, gangrene, furunculosis, bronchitis and decubitus sores developed as a result of this treatment.[2] The study confirmed that the preparations had no influence on the inflammatory reaction or pathological process.[9]

Another Bayer preparation, "Be 1034", was tried as a potential therapeutic agent for typhus, as well as an agent called "Periston". These agents were found to have no influence on the duration or outcome of the disease, but did have harmful side effects, such as haemorrhage, jaundice and

albuminuria.[9] None of the subjects volunteered for the experiments.

These experiments revealed nothing that civilised medicine can use. The results that might have made an important medical contribution were ignored. After a certain number of inoculations, the Matelska strain of typhus became less virulent to man. Instead of seizing upon this as a possibility to develop a live vaccine, the experimenters discarded this strain and continued testing their relatively ineffective dead vaccines against a new virulent strain.[7]

Malaria

Another series of experiments concerned immunisation for, and treatment of, malaria. More than 1200 inmates were experimented on.[12] During the course of the experiments, healthy people were infected by mosquitoes, or by an injection from the glands of mosquitoes. After the victims had been infected, they were treated with quinine, neoarsphenamine, antipyrine, and combinations of these agents. Many deaths occurred from overdose.

Malaria was the direct cause of 30 deaths, and 300 to 400 others died from resultant complications.[2,5,13] Many victims suffered permanent disability.[5]

Hepatitis

Following the attack on the Soviet Union, hepatitis became a major problem for the German Army. In some units, casualties of up to 60% were reported from this disease. Great efforts were made to discover the cause and possible prevention of the disease. For some of this work, hepatitis virus was injected into prisoners.[2]

Regeneration and transplantation

Experiments concerned with the regeneration and transplantation of bone took place in the Ravensbrück concentration camp.

The bones of both legs were broken into several pieces with a hammer. They were then joined with or without clips and encased in a plaster cast.[2] In some cases, whole pieces of fibula were excised and transplanted with or without periosteum.[2] Bone grafting was also carried out using bone splints on the tibia of both legs.[2] Healthy Polish prisoners were used for these experiments. Some Polish girls were operated on several times.

Heteroplastic transplantation experiments were also carried out. Whole limbs — shoulder, arm or leg — were amputated from living prisoners at Ravensbruck, wrapped in sterile moist dressings and sent by car to the hospital at Hohenlychen, where a futile attempt was made at heteroplastic transplantation. The "donor" prisoners were usually killed by lethal injection.[2,4,6]

Allopathy and biochemistry

During 1942 and 1943 at Dachau, phlegmon (an inflammatory tumour, boil or carbuncle) was artificially induced. The object was to assess the therapeutic treatments of allopathy (curing a disease by remedies that induce effects different to those of the disease) and biochemistry.

Pus was used to artificially infect concentration camp inmates. At least two series of experiments were performed; half the subjects were treated by biochemical means and the other half with sulfanilamide. Thirty deaths occurred from these experiments,[3] which were carried out against all orthodox medical concepts.

Mengele

The Mengele experiments on twins have been highly publicised. They included pathological comparisons of healthy and diseased organs in twins, whom Mengele had killed for the purpose of simultaneous evaluation. Growth defects, variation such as eye colour, endocrine and anatomical anomalies were of interest to him.[14] Although many of Mengele's experiments covered a range of studies, from bacteriology to bone marrow transplants, their principal purpose seems to have been to unlock the secret of creating multiple births with genetically engineered Aryan features.[15]

His task was not merely to increase fecundity in German women, but also to hone the features of the new mythical Aryan super-race — to create blue eyes, blond hair and strong and healthy bodies. Mengele had made a bizarre start in this by investigating the possibility of changing eye pigmentation by injecting different coloured dyes.[15]

Crude surgery and painful tests were part of the research. Unnecessary amputations, lumbar punctures, typhus injections and deliberate infection of wounds were carried out to compare how each twin reacted. Blood transfusions were given from one set of twins to another, so that Mengele could observe their reaction. Twins were forced to have sex with other twins to discover if twins would reproduce twins.[15]

In one case, gypsy twins, one of whom was a hunchback, were sewn together, back-to-back; Mengele had attempted to create a Siamese twin by connecting blood vessels and organs. The twins screamed day and night until gangrene set in, and after 3 days they died.[15,16]

Preservation for future study

Towards the end of January 1942, it was assumed in German scientific circles that the Jewish race was about to be completely exterminated, and alarm was expressed over the fact that very few skulls and skeletons of Jews were at the disposal of science. In a true manifestation of the collector's spirit, it was proposed that a collection of body casts and

skeletons of Jews be preserved for perusal by future students of anthropology.

One hundred and fifty Jewish inmates of Auschwitz were selected for this purpose.[2] They were killed, with special care taken not to damage the head. The corpses were sent, in a special container of preserving fluid, to the Anatomical Institute of Hirt in Strasbourg University.[2,6] Comparison tests, anatomical research, studies regarding race, pathological features of the body, form and size of the brain, and other tests were made. The bodies were then sent to Strasbourg and defleshed.[3,12] By June 1943, 115 bodies had been processed: 79 male Jews, 30 female Jews, two Poles, and four "Asiatics".[2] These corpses were preserved in the cellar of the Anatomical Institute in tanks. Much of the collection was captured by the Allies before the Germans could destroy them.[2]

Discussion

These medical experiments were not an assortment of unrelated crimes. They constituted a well-integrated program of mutual and interdependent collaboration. They were a conspiracy of common design to discover, or to improve, various medical techniques. They were also consistent with the Nazi eugenic policies of improving the race.

What manner of men committed these crimes? They were representatives of the entire spectrum of the German medical profession, from the leaders of German scientific medicine down to the dregs of the profession. Their common denominator was a callous lack of consideration for the poor, unfortunate, defenceless people who had been dispossessed. These doctors all violated the Hippocratic oath, especially its fundamental principle *primum non nocere.*

The Doctors' Trial at Nuremberg, "The Medical Case", focused primarily on the actions of the defendants performing medical experiments in concentration camps,[2] even though the accused also participated in, were aware of, and did nothing to protest the mass murder of millions of people in the same camps. The explanations given for the conduct of the experiments were identical to those cited to defend genocide, murder, sterilisation and torture.[2] The startling feature of the Doctors' Trial was that none of the accused begged forgiveness, showed contrition, or denied that they had done what the prosecution alleged. They merely tried to explain what they had done in different terms, and vigorously justified their actions on ethical grounds.

Examination of the pleas for the defence shows that those who worked in the concentration camps were guided by the threat of mortal danger to their nation from the "inferior races" and the "useless eaters". Medical practitioners justified their actions on the grounds that the Jew, the gypsy, the homosexual, the handicapped and the Slav posed a biological intimidation of the Reich. The appropriate response to such a threat is to remove it, just like a burst appendix.[5]

Conclusion

All medical practitioners work in the shadow of the Nazi epoch. What occurred in the Nazi concentration camps has influenced patient care, the ethics of human experimentation, and whether doctors can or should cite these experiments in their current research projects. The Nazi history provides examples of what can happen, and what did happen, in state-sponsored euthanasia programs. The Nazi experience is also relevant to the ongoing debates on informed consent, abortion, genetic counselling, racial susceptibility to illness, human experimentation, stem cell research, reproductive technology, and more recently, medical monitoring of torture on prisoners in Abu Ghraib.

Competing interests

None identified.

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