The fruits of medical research with the aid of anæsthesia and asepticism / [by] Charles W. Eliot.

Contributors

Eliot, Charles William, 1834-1926.
Harvey Cushing/John Hay Whitney Medical Library

Publication/Creation

[Boston] : [The Barta press], 1909.

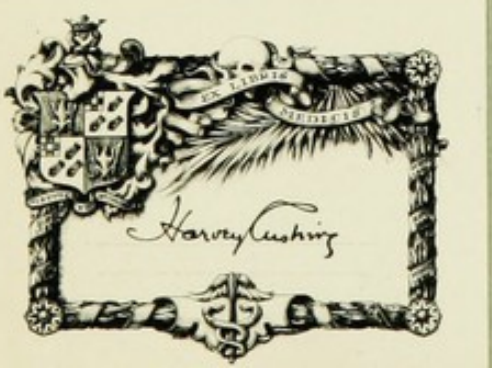
Persistent URL

https://wellcomecollection.org/works/wyqhqfhg

License and attribution

Wellcome Collection
183 Euston Road
London NW1 2BE UK
T +44 (0)20 7611 8722
E library@wellcomecollection.org
https://wellcomecollection.org

The Fruits of Medical Research with the Aid of Anæsthesia and Asepticism



The Fruits of Medical Research with the Aid of Anæsthesia and Asepticism

CHARLES W. ELIOT, LL.D., M.D. (Hon.)
President Emeritus of Harvard University

1909

The Barta Press, Boston.

THE FRUITS OF MEDICAL RESEARCH WITH THE AID OF ANÆSTHESIA AND ASEPTICISM.*

The first public demonstration of surgical anæsthesia, which took place in this hospital on the sixteenth of October, 1846, was the great event that we celebrate anew to-day. From this building the blessed art spread rapidly over the civilized world, the most beneficent gift which chemical and medical science has conferred on mankind. "The Death of Pain," of which Dr. Weir Mitchell sang on the fiftieth anniversary of this memorable event, has not, however, been the only precious fruit of that successful use of anæsthesia in surgery. Dr. Mitchell pointed out that the anæsthesia which was here demonstrated was no comet thought, which shone for a time, but gave no constant light. On the contrary, the discovery was not only to revolutionize surgery and obstetrics, but also to yield unimagined beneficial results, because it would steadily enlarge the range of medical research, and particularly would open to humane and far-seeing investigators the great field of animal experimentation.

"The radiant morning broke, and ampler hope
To art and science gave illumined scope."

Seventeen years after the discovery we here commemorate came the wonderful invention of the antiseptic treatment of wounds, whether the results of accident or of surgical interference. These two discoveries together enable the surgeon and the medical

* Address delivered at the Massachusetts General Hospital on the sixty-third anniversary of Ether Day, October 16, 1909.

investigator to count, first on painless operations, and secondly on safe recoveries. In animal experimentation both the painless operation and the safe recovery are usually necessary to any instructive results. Together they have made the extraordinary development of modern surgery possible, and they have opened a great field of animal experimentation, which has already yielded invaluable additions to our knowledge of physiology, pharmacology, and pathology. Animal experimentation has already given mankind by far the larger part of all the exact knowledge of medicine now possessed, since medical and surgical experimentation on human beings has ordinarily been impossible, at least until animal experimentation has shown the profitable direction and safe limits of experiment.

Three doubts are often suggested concerning the value of the animal experimentation which with the help of anæsthesia and asepticism has been earnestly prosecuted by many disinterested and humane seekers for truth during the past forty years. The first doubt relates to the connection between medical research and medical practice. Is there, as a matter of fact, any close connection between medical and surgical research and the treatment of diseases or wounds? Or, in other words, has biological research really contributed to the success of the medical art? The second doubt is more complex and obscure, but not less crippling. What is the use of trying to ascertain the nature of a disease in animals when it is not known that the same disease occurs in men, or that the treatment successful for an animal would be successful for men? Or, in other words, is the search for truth through experiments on animals justifiable, when it is

not known that the scientific results, though true, or sound as knowledge, can have any effect whatever on human well-being? The third doubt is felt most commonly by persons who make pets of domestic animals, and particularly of dogs. It may be fairly stated in this form — is truth-seeking in biology commendable, even with the help of anæsthesia and asepticism, if the search be conducted at the expense of the comfort, joy, or life of animals? In the minds of many intelligent persons these questions are at a stage of doubt or inquiry; but by many others, whose temperaments and mental habits are more impetuous, these questions have already been hotly answered in the negative.

The first doubt may be resolved in two ways; first, by mention of the actual achievements in medicine which have unquestionably resulted from the last century's studies in comparative medicine and from fifty years of active animal experimentation; and secondly, by describing the legitimate hopes for the future of medicine and surgery which are founded on the rapid progress of medical science and art since bacteriology became a recognized science.

The first immense practical result of the combined study of diseases in animals and man was vaccination, instead of inoculation, as a protection against smallpox. It is not too much to say that the most destructive and appalling scourge of mankind* has been

*Careful records give documentary evidence that "In the twenty-eight years before vaccination in Sweden there died each year from smallpox out of each 1,000,000 of population, 2,050 persons; during the forty years following vaccination, out of each 1,000,000 of population the smallpox deaths annually averaged 158. Such figures might be multiplied by reference to the records of other countries. . . . The decline in death rate has been limited entirely to persons below the age of fifteen. The percentage of mortality borne by children the subject of measles, scarlet fever, and whooping cough, does not differ materially from what it was a century ago." *J. F. Schamberg, Jour. Am. Med. Assn., 1909, lii., p. 69.*

The mean number of deaths from smallpox per 1,000,000 inhabitants for

brought under control by Jenner's discovery "that the cowpox protects the human constitution from the infection of the smallpox," the source of the infection for cowpox being "a peculiar morbid matter arising in the horse." Aristotle, Galen, Leonardo da Vinci, and Harvey studied animals and experimented on them in making their great contributions to anatomy and physiology; but their discoveries, though fundamental, did not have such immediate and world-wide applications to medical art as Jenner's discovery had. Moreover, to maintain vaccination as a universal practice among civilized nations requires the constant use of heifers to supply an uncontaminated vaccine.

Another great gain in medical art, and consequent great gain for the human race, is the newly acquired power to control infectious diseases which has resulted from the discovery of their living contagia and of the means of defeating those contagia. Under this head comes serum therapy, which is now applied with extraordinary success in diphtheria,* tetanus, and

---

twenty years (1880–1899) was: in the German Empire, with compulsory vaccination and revaccination, 1.8; in Belgium and Spain, without compulsory vaccination, respectively 206 and 605. In the Prussian army there has not been a single death from smallpox since the vaccination law was first enforced in 1874.— *S. W. Abbott, Buck's Handbook of the Medical Sciences, 1904, viii., pp. 126, 130.*

In seven provinces of the Philippine Islands there has been for a number of years an annual mortality from smallpox of more than 6,000 — indicating about 25,000 cases. In the twelve months following the completion of vaccination in the seven provinces there was not reported one death from the disease. — *Annual Report of the Bureau of Health for the Philippine Islands, 1907, p. 20.*

* In the year 1883 (the year before the bacillus of diphtheria was discovered) in the eighteen greatest cities of the world, 97 in each 100,000 of the population died of diphtheria; in 1893, 81. In 1894 (just before the general introduction of sero-therapy) 79 died, and in 1904 only 20. In twenty years, therefore, the mortality had been reduced to less than one-fourth of what it had been. In New York City alone the reduction in mortality means a difference of 3,000 lives annually. — *W. H. Park, Department of Health, New York City, in a pamphlet on Diphtheria.*

In 1888, before the discovery of sero-therapy, there were 1,729 deaths from diphtheria in Paris; in 1895 the practice of sero-therapy became general in Paris, and the number of deaths was 435. By 1902 the best methods of using the serum were learned and definitely established; the mortality for the three years 1903–05 was 288. — *Richet, "Pros and Cons of Vivisection," p. 123.*

meningitis. These three diseases might fairly be said to have been uncontrollable by medical art, until comparative medicine and animal experimentation discovered and brought into use their appropriate treatments. The mortality from these diseases was frightful, and the terror and suffering they caused were therefore extreme. Many other formidable diseases have been brought under much better control through the results of medical research, such as dysentery, cholera, typhoid fever, puerperal fever,* the plague, tuberculosis, syphilis, and certain tropical diseases caused by parasites. Sanitary science, including the diagnosis and control of contagious diseases and the detection of injurious foods and adulterated drugs, is deeply indebted to the new biological science of bacteriology, the whole of which has been built up by researches on and with lower forms of life in connection with higher. In thus obtaining through animal experimentation a better knowledge of the causes and sources of disease in both men and animals, the economic results have had very great importance in addition to the deliverance of the human race from suffering and untimely death. Thus, the discoveries that Texan fever was induced in cattle by the bite of a tick, that chills and fever were produced in human beings by certain parasites in the blood corpuscles introduced through mosquitoes, and that the contagion of yellow fever was carried from one human being to another through the body of

* Frequently in maternity hospitals outbreaks of puerperal fever occurred that had appalling mortality. In Vienna, from October, 1841, to May, 1843, 5,139 women were delivered and 829 died. In Paris during April and May, 1856, 64 of 347 patients died; in 1864 there were 310 deaths in 1,350 cases; in 1866, 28 deaths in 103 cases. "Women of the lower classes looked upon the Maternité as the vestibule of death." In 1877–78 came the use of carbolic acid and mercury perchloride. The death rate in maternity hospitals to-day is about 0.02 per cent. — *Paget "Experiments on Animals," pp. 80, 83. Richet "Pros and Cons of Vivisection," p. 45.*

another kind of mosquito, are all triumphs of comparative medicine and animal experimentation whose economic value is very high. The men who did this work had spent their lives in laboratories, and all their conceptions in research were based on animal experimentation. It should also be observed that the successful treatment of diseases in man which can be controlled through the use of anti-toxins depends as yet upon testing those anti-toxins on animals, after they have been prepared from the blood of animals inoculated with them. For example, there is no way at present of determining that a given sample of diphtheria anti-toxin made from the blood of a horse is strong enough to use on a human child except by trying it on a guinea-pig or some such animal. The day may come when men will be able to prepare synthetically the effective agent of diphtheria anti-toxin in a pure and isolated form; but at present biological chemistry is utterly unable to say what that effective agent is, or what proportion of it exists in a given sample of serum. Medicine is making successful use of a complex preparation which it can neither analyze nor compound synthetically. On the whole, is it not clear that the comparative exemption of the human race to-day from the occasional pestilences and the ordinary contagious diseases, which used to agonize and devour it, is due to the fact that biological research has placed at the service of every surgeon and physician effective means first of preventing disease, and secondly, of curing it? In other words, the human race received during the nineteenth century immense benefits, hardly yet understood and appreciated, from the contributions of biological research to the medical art.

So much for actual achievements. A few words now on the legitimate hopes for the future which these achievements inspire. The prospects are brilliant indeed. In the first place, we have already learnt much about the means of overcoming the peculiar difficulties of biological experimentation. That sort of experimentation is in general slower than experimentation in the exact sciences which do not deal with living bodies and vital processes. A single biological experiment may need to run through generations of living and breeding animals. With prolific animals whose generations are short the element of time may not be exorbitant, but with the slow breeding the time for the complete performance of a satisfactory series of experiments may be long in proportion to the thinking life of the experimenter. Thus Jenner's demonstration of the value of vaccination took many years* of his observing life, and Pasteur's series of connected experiments covered his observing, imagining, and reflecting lifetime.† In the next place, biological experimentation is more difficult than experimentation in chemistry, physics, or mechanics, because of the obscurity and complexity of vital processes, and because exact weighing and

* In conversation with John Hunter in 1770 Jenner suggested the prophylactic power of cowpox. A dread of disappointment led him to spend many years in observation and investigation before promulgating his discovery. He performed his first public inoculation with vaccine on May 14, 1796. And in 1798 appeared his first publication, "An Inquiry into the Cause and Effects of Variolæ Vaccinіæ," detailing his views and giving his proofs.

† In 1853 occurred Pasteur's crucial observation that Penicillium glaucum destroyed the dextro-tartaric, not the lævo-tartaric acid, which indicated the relation between fermentation and living organisms. His papers on lactic acid in 1857 inspired Lister. In 1860 he began his studies of spontaneous generation, and by disproving its existence supported his experiments on fermentation. The years from 1865 to 1884 were spent in practical application of his previous work; silkworm disease (1865), studies on beer (1871), the determination of the constancy of species, the ammoniacal fermentation of urine and its check by boracic acid (1873), anthrax (1877), furunculosis, and his hospital investigations of puerperal fever (1878), chicken cholera (1880), rabies (1884).

measuring, which are the ordinary methods of exact inquiry, are not always possible where the subjects of experimentation are living bodies in health or in disease. In spite of these formidable obstacles, an extraordinary increase of knowledge applicable to the medical art has actually taken place since surgical anæsthesia was demonstrated in this hospital, and many men have learnt how to overcome in part the peculiar obstacles which beset the path of the biological inquirer. A second reason for expecting more rapid progress hereafter than was possible in the third quarter of the nineteenth century — productive as that period was — may be discerned in the fact that in recent years the medical inquirer has been supplied through the progress of physical science with new instruments of precision for observing and recording his facts. Thus the telephone, the X-rays, and all the electrical apparatus for recording fluent observations and making note of very minute portions of time and space have been valuable additions to the resources of the medical investigator. Again, in advancing into new fields and winning their great successes biologists have clearly seen that they were only working on the edges or outskirts of a great field of beneficent discovery. Every achievement has justified a great new hope. Every success in the past justifies a strong expectation of triumphs to come. We have seen how prodigious have been the successes of medical research of the past fifty years. The legitimate hopes for the future based on these successes justify us in looking forward with delight to the continuation and enlargement of medical research, and to an endless series of its invaluable contributions to medical practice and public medicine. Now, well grounded hope is a pow-

erful and legitimate motive in guiding human conduct. Indeed, there is none more so, except love.

The second doubt, whether biological research through experiments on animals is justifiable when it is not sure that the results obtained, though true, will have any immediate application to human uses in medical and surgical practice, is best allayed or removed by considering how impossible it is to tell beforehand what the ultimate results of a scientific discovery are to be. A discovery which to-day seems to be what is called "pure," that is, without application, turns out to-morrow to have applications of incalculable value. This is quite as true in biological science as in physical. Galvani was a comparative anatomist who studied osteology, and made excellent observations on the kidneys and the ears of birds. His observation that the dissected legs of frogs twitched when brought in contact under certain empirical conditions with dissimilar metals turned out to have corollaries and applications which neither Galvani nor any man of his generation could possibly have imagined. The invention of the compound microscope and the introduction of the oil immersion lens, which increased illumination and diminished spherical and chromatic aberration, made it possible to discover the infective agents which cause disease, and to study the minute changes they produce in living tissues. But these improvements in the microscope have been due to investigation of the way in which light is refracted when passed through media of different density, that is, they were obtained through physical researches not in the slightest degree prompted or guided by any concern for human suffering, or any hope or expectation of contributing to

the better treatment of disease in men or animals. Again, the ophthalmoscope, called by Helmholtz his *optical toy*, was another application of inventions in physics which has had great value not only in studying and treating diseases of the eye, but also in discovering abnormal conditions of the brain. Again, in modern medical and surgical practice the X-rays proved of great value for detecting bone fractures or displacements, calculi, pulmonary tuberculosis, aneurisms, foreign bodies, and many other pathological states, for investigating the functions of internal organs like the stomach and intestines, and for curing superficial cancer. Now the X-rays were discovered in the course of a research on electrical discharge through attenuated gases, with no idea in the mind of the discoverer of any resulting values in medicine. Again, the researches on oxidation and combustion and the proofs of the conservation of energy were at first interests of chemists and physicists alone. The application of these conceptions to food values, to respiration and animal heat, and the demonstrations that animal bodies obey these physical and chemical laws, are seen to-day to be essential to any rational conception of bodily activities in both health and disease. And yet Lavoisier, who first stated the true theory of oxidation and combustion, never could have had the smallest vision of the innumerable biological applications of his doctrine concerning oxygen. Let me draw a further illustration from discoveries which are peculiarly interesting in connection with the anniversary we are celebrating. The discovery of ethyl ether by Valerius Cordius in 1540, and the discovery of chloroform by Soubeiran in 1831 and by Liebig in 1832, were both made without the slightest idea of

the blessings these liquids were to confer on mankind through their use as anæsthetics. The aniline dyes were elaborately studied with an eye single to their industrial uses; and their invaluable uses in bacteriology have been an unexpected and unplanned beneficial application. The basic aniline dyes have a specific affinity for bacteria, and thus they render these minute organisms easily visible. Certain bacteria are differentiated from other bacteria by peculiar staining reactions to these aniline dyes, a use never thought of or imagined in the original chemical investigations. The modern science of pharmacology has been largely dependent on advances in organic chemistry. These advances permitted syntheses of related compounds, and the pharmacologist then studied the physical actions of these isolated compounds in the hope of securing better control of vital processes within the body. Thus through the application of methods developed in organic chemistry new local anæsthetics, such as cocaine and eucaine, new soporifics like sulphonal, trional, and tetronal, new drugs for reducing fever — antipyrin, phenacetin, acetanelid — and other substances of large medical and surgical utility have been made available; but the organic chemists who made these inventions or discoveries were in search of pure scientific truth, without any thought of, or interest in, the applications of that truth. The development of Louis Pasteur's ideas and of the applications of his ideas illustrate forcibly the way in which researches apparently in pure science, and of prime interest only to individual investigators, may yield practical results of highest value to all mankind. Starting as a chemist, Pasteur was struck by the fact that a certain mould fungus, Penicillium glaucum, de-

stroyed dextro-tartaric-acid, and did not affect lævo-tartaric-acid in the same solution. From that observation he went on through studies on lactic acid formation, disease of beer, silkworm disease, anthrax, boils, puerperal fever, chicken cholera, and rabies, till he and others, stimulated by his researches, were led step by step to a demonstration of the microbic nature of infectious diseases, to the discovery of methods of conferring immunity to certain diseases, and to the bases of aseptic surgery. Although the ingestion of foreign bodies by living cells had been suggested as a means of overcoming invading organisms, Metchnikoff, a zoölogist, first observed this phenomenon, phagocytosis, in a small crustacean, Daphnia. This observation was fundamental in comprehending the relation of phagocytosis to immunity, and in treating disease by stimulation of phagocytosis. One of the most striking conquests of disease in recent times is the practical abolition of yellow fever* in civilized countries, made possible by the

* According to available records 100,000 deaths from yellow fever have occurred in the United States since 1793. The cities which suffered most have been New Orleans (40,000) and Philadelphia (10,000). As late as 1878, the mortality from yellow fever in the city of Memphis, Tenn., was more than 5,000 in a single epidemic. About 25,000 are recorded for Rio de Janiero and nearly 36,000 for the city of Havana from the same cause.—*James Carroll in Osler's Modern Medicine, II., p. 739.*

YELLOW FEVER DEATH RATE IN HAVANA, 1870-1906, PER 100,000 POPULATION:

Report of the National Sanitary Department of the Republic of Cuba, 1906, p. 79.

Before American intervention.		After American intervention.	
1870	300.5	1898	67.8
1880	324.5	1899	42.5
1890	153.6	1900	124.0
1895	275.8	1901	6.9
1896	639.5	1902	0
1897	428	1903	0
		1904	0
		1905	8.0
		1906	4.3

The mortality during the month of October, between the years 1889 and 1899, ranged from 240 in 1896 to 25 in 1899 (average for ten years 66.27). After Reed's work in 1900, Gorgas began his campaign, and in November, 1901, reported, "During the month we have had no cases and

researches of Walter Reed and his comrades in Cuba. The happy results of their work could not have been obtained if it had not been for the previous researches of entomologists who were interested in the scales and veins on the wings, and the scales and hairs on the bodies of mosquitoes. The pure entomologists had used these phenomena as means of classifying mosquitoes, and had then studied the breeding habits of the different varieties of mosquitoes. The same remark might be made concerning the entomological researches into the habits of the tick, which is capable of infecting cattle with Texan fever.

These are only a few of the more striking examples of the way in which facts obtained in a disinterested search for truth, whether in biology, physics, or chemistry, have subsequently proved to be of the highest importance in medical and surgical practice, and in sanitary science. There are innumerable instances in the history of science and art in which discoveries made without any reference whatever to applications for the benefit of mankind have turned out to be sources of immense benefits. Hence, the lack of certainty as to the results of a given biological research establishes no presumption whatever that the research should not be made, or that it is not justifiable. In this respect there is no distinction between the biological sciences and the so-called exact sciences of chemistry and physics ; and within biological science itself no distinction should be made between a research into the nature or source of a disease or mor-

---

no deaths from yellow fever. Last year (1900) we had during this month 214 cases and 54 deaths. This year the last case occurred September 28th, that is, we have gone over two months without a single case or death belonging to Havana." This record has been continued, and Havana has ceased to be one of the epidemic foci of the disease. *G. M. Sternberg, Buck's Handbook of the Medical Sciences, viii., p. 585.*

bid condition, and a direct search for a cure or a promising treatment. Hence well-directed animal experimentation is clearly not only justifiable, but altogether expedient and desirable, even when it is not sure that the results obtained will have any immediate application to medical and surgical practice.

The third doubt which I propose to examine is this — Is truth-seeking in biology commendable, even with the help of anæsthesia and asepticism, when the research must be conducted at the expense of the comfort, joy, or life of animals? This doubt starts the whole question about the proper relation of mankind to the other animals which live with man on the surface of the earth and in its atmosphere. The traditional idea on this subject has been that mankind has dominion "over every living thing that moveth upon the earth," and may use every living thing as he pleases for his own advantage. Accordingly, men train many sorts of animals to labor for them and serve them. The subjection of many animals to human uses is considered, indeed, one of the evidences of civilization. Both civilized and savage men kill animals in order to eat them. Millions of creatures are killed daily for human food.* People have no scruple whatever about destroying animal life for human uses. The habits and the natural joys of animals are interfered with on an immense scale by the most humane people without the slightest compunction. Think what it means to millions of cows every year that their calves are killed and they are kept for the

*Every year there are slaughtered in the United States more than 50,000,000 beeves, sheep, and hogs, and 250,000,000 chickens, turkeys, ducks, and geese. Last year more than 360,000 dogs and cats were killed in a single year in twenty of the largest cities of the country, merely to remove stray animals from the streets. In New York City alone during the past fourteen years more than 800,000 cats and 400,000 dogs have thus been destroyed.

most part tied up in barns. Think what indifference to the potentialities of animal life and joy the immense trade in eggs implies. How absolutely insignificant is the number of animals used for animal experimentation in all the scientific laboratories compared with the daily use of animal products the world over as food and clothing for mankind! Immeasurably more good is likely to come to mankind from the few hundreds of animals used in medical and surgical research than from a hundredfold their number used as food or clothing. Is the old conception that the animal as well as the vegetable kingdom is for the use of man a wrong one, or is special regard to be paid to those few animals which are made the subjects of medical and surgical experiment? Man not only makes use of all sorts of animals for his own advantage, but he destroys without the slightest compunction multitudes of creatures that he considers noxious to him. The careful housewife kills as many flies, spiders, and vermin as possible. A city threatened with bubonic plague hastily destroys all the rats within its borders. No community has the least compunction about exterminating any insect injurious to vegetation, if it can. It cannot be seriously questioned that this has been and still is a rational state of mind in the human race. If the educated public could only see clearly the immense benefits to mankind which have already come and may reasonably be expected to come in much larger amount from the experiments on animals which are necessary to the progress of medical research, if the public could only clearly realize the saving of human suffering and woe which has already resulted and is sure to result in still greater proportion from the sacrifice of a very

limited amount of animal comfort and joy, the world would hear nothing more of objections to medical research. The most tender-hearted human being is ordinarily unable to fix a limit to the number of inferior animals he would sacrifice to save the life of one human baby. Now a baby is itself only a hope or a potentiality, its present power of enjoyment being extremely limited. "How much then is a man better than a sheep?" (Matthew XII. : 12.) What mother could fix a limit to the number of times a comfortable horse should be bled moderately, or to the number of guinea-pigs that should be sacrificed, in order to save her baby attacked by diphtheria? The tender-hearted men and women who object to animal experimentation have no vision of the relief of human beings from agony and woe which has come out of animal experimentation. If they had any such vision, they would themselves manifest extraordinary cruelty and inhumanity in opposing medical research; in their present blindness they attribute delight in inflicting suffering to the patient, far-seeing, and far-hoping seekers for biological truth. Which is the truly humane and merciful man, the Director of the Rockefeller Institute for Medical Research, who by producing cerebro-spinal meningitis in a few monkeys* lately succeeded in providing men with a successful mode of treating that formidable disease, or the lawyer or newspaper writer who endeavored to prevent those experiments on monkeys, and is ready to let the human race remain help-

* Dr. Flexner used about 25 monkeys and perhaps 100 guinea-pigs. He now has records of nearly 1,000 human beings treated by the serum, with a continuation of the first successes — a reversal of the percentages, from 70–80 per cent mortality to 70–80 per cent recovery, and already a saving therefore of approximately 500 lives.

Dr. Flexner describes the experiences of the monkeys in the experiments; most of them became profoundly and stuporously intoxicated by the disease, and therefore did not suffer pain.

less on the occasional visitations of that heretofore fatal disease? Humanity and mercy are conspicuously the attributes of medical research in the eyes of all people who can see what it has already done and what it promises to do.

The civilized world has come to believe in freedom of inquiry in all fields as the best means of progress in knowledge, in manners, and in righteous living. Now the field of inquiry from which, within the last sixty years, mankind has received the largest visible, tangible, concrete, demonstrable benefits is the field of medical research, applied in the medical and surgical art, and in sanitary science. If freedom of inquiry be in general expedient and righteous, should not inquiry be free in this most productive of all fields? To secure and maintain this freedom against the assaults of ignorance and misdirected sentimentality it is only necessary that the public should know what medical research has done and is likely to do.

The appropriateness to the day we celebrate of the subject of this address will not be doubted by anyone who bears in mind the fact that anæsthesia and asepticism have been indispensable to the medical research of the last forty years.