SCIENCE NEWS

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THE STUDY OF CANCER

Two facts about the fundamental nature of malignant tumor, which may bring nearer the conquest of cancer in man, have been discovered by Mrs. Margaret R. Lewis, anatomist of the Carnegie Institution, and Howard B. Andervont, Johns Hopkins graduate student, conducting joint research at the Johns Hopkins University.

First, they have found that, for one form in the chicken at least, cancer is a mass of white blood cells or corpuscles. White blood cells desert their normal function of being the soldiers of the body that repulse invading germs and poison, and, instead, run wild, multiply and gorge themselves until they form a mass of malignant tumor. Heretofore the nature and exact origin of the cancerous mass has been unknown.

Second, the investigators have discovered that cancer can be transmitted simply by injecting into the muscles of a well chicken either the blood plasma or the white blood cells of a chicken suffering from cancer. Not only is the simple inoculation by transplanted blood successful, but serial inoculations by means of blood have been continued through as many as four generations of malignant tumors. This is evidence of the infectious nature of cancer, for, while heretofore it has been demonstrated that portions of cancerous tissue when transplanted will produce cancer in another animal, it was not known that one could thus transmit the infectious virus repeatedly from animal to animal by means of either the blood plasma or the white blood cells. A statement by Dr. Lewis follows:

The cancer cell is a blood cell. To be sure, it is a greatly changed white blood cell, but nevertheless quite comparable with the white blood cell which grows in tissue cultures. This cell is not characterized so much by the fact that it ingests and digests foreign material as it does at any site of inflammation, as it is by the fact that in this particular case it becomes abnormally enlarged and multiplies greatly at the site of the tumor. The cells increase to such an extent and digest away the surrounding tissue that they invade the muscle of the chicken and are carried to other organs where they bring about the death of the host.

The cells in their over-stimulated condition produce an active agent and this agent is present in the blood stream of the tumor chicken as well as in the white blood cells themselves. For when the white blood cells are separated from the blood fluid leaving only the clear plasma, this plasma upon inoculation into the muscle of a chicken produces a cancer by setting up an irritation in the inoculated region which draws the white blood cells to this region, and these cells become stimulated to abnormal activity by the tumor-producing substance in the plasma.

It is a fact well known to all surgeons that inflammation itself results in some growth-promoting substance which effects repair of the injured tissue and in some instances results in a greater increase of tissue than was lost. Dr. Alexis Carrel showed that the white blood cells themselves contain a growth-promoting factor. In any inflammatory reaction, regardless of how it is brought about, the white blood cells accumulate in great numbers in the region injured and there take up and digest or remove the irritating factor. This can not yet be shown to be the cause of cancer, but we have shown that in the chicken at least it is the underlying factor concerned in the production of the cancer. Just what it is that causes the cells to go further and to enlarge more and multiply more until instead of repairing the injury they invade the tissue and bring about the death of the host is a matter we hope to know more about later.

Whether these results can yet be applied to higher animals or to human beings has not yet been determined. There is no question but that the human cancer is partly made up of blood cells and that it can in some instances be shown to be the result of slow inflammatory conditions. Whether the active principle is contained in the blood of human beings remains to be determined. At any rate the underlying factor concerned in all the tumors which have so far been produced by bacteria, by virus, by chemicals or by parasites is a slow inflammatory reaction with the resulting accumulation of white blood cells in the injured region.

VACCINATION FOR TUBERCULOSIS

WILL our descendants be vaccinated for tuberculosis much as we now are for smallpox? That even the most conservative in the medical world do not consider such a future development impossible is shown by the editorial attitude of the *Journal of the American Medical Association.*

Discussion of the most recent results of the tuberculosis inoculation experiments of Professor Albert Calmette, of the Pasteur Institute, contrasts his methods with those of a German experimenter in this field, Dr. H. Selter, of the medical faculty of the University of Königsberg. Attenuation of a disease germ to such a degree that it will confer immunity but will not cause serious illness has been the aim of many investigators for many diseases. Professor Calmette and his associates believe that they have attained such a weakened strain of bacilli by growing them for thirteen years in a medium consisting exclusively of bile.

Some 4,517 children have been vaccinated by Professor Calmette since June, 1924. While detailed reports on all these cases are not quite ready for publication the following editorial comment is significant: "The vaccinated children all come from an environment in which open tuberculosis close at hand made natural infection seemingly inevitable. The records of 423 infants for the first six months after vaccination have been published. Approximately one third of these children have been exposed within the family. In not one of them has a death occurred from recognized tuberculosis, although thirty have

died from other causes. Calmette and his associates have compiled figures showing a mortality of 24 per cent. in three years for non-vaccinated children of tuberculous parents living under the same conditions.''

Almost simultaneously with the last published account of Professor Calmette's results, Dr. Selter makes the announcement through a German journal, the editorial continues, that to confer real immunity virulent living bacilli should be used for inoculation. In accordance with this theory he has vaccinated nine children with virulent tuberculous cultures none of whom seems to have suffered any ill effects.

As in the French experiment, Dr. Selter used only children free from previous infection but exposed to tuberculosis in their home surroundings. Drastic as introduction of virulent tuberculosis bacilli into the system sounds, he felt that the trial was well grounded on animal experimentation and that the method has proved itself harmless. In no case did the children suffer any impairment to their general health. He is careful to state that he does not think his method will replace natural acquired immunity but he recommends that it be considered as an aid to infants who have to live in a tuberculous environment.

While the efforts of these European workers merit the close attention they are receiving, the editorial concludes with the warning that strains of tuberculosis bacilli vary greatly in strength since the occasional serious infection of animals following inoculation with supposedly attenuated strains of bacteria only shows that many factors are still unknown.

BLOOD TRANSFUSION

IMPORTANT experiments on blood transfusion, made by Professor Yourevitch and Mlle. Teleguina, of Prague, appear to lead to the conclusion that special human blood donors will no longer be required in cases where transfusion is necessary to save a patient's life. The blood of a sheep or a cow might serve the same purpose, and special preparations of solution could be made in advance, and kept in bottles until required.

It has long been known that the most important point about blood in regard to transfusion is its specificity. That is to say, a rabbit can only be saved by the injection of the blood of another rabbit. If the blood of a different animal is injected into its tissues, it dies immediately. In the case of human beings, blood has been divided into four groups. When an injection has to be made, the blood of the patient has first to be tested to see which group he belongs to. Only rare individuals of the fourth group can give blood to any of the others with beneficial and not dangerous results.

Professor Yourevitch and Mlle. Teleguina have opened up an entirely new line of treatment. They separated the red blood corpuscles from the serum by centrifuging methods. They found that the poisonous qualities which on injection have such harmful effects are in the plasma, and that if the separation or ''washing'' is thoroughly carried out, the red blood corpuscles of an animal of one species can be injected into another without the slightest danger, but, on the contrary, with completely satisfactory results.

Rabbits which had lost an absolutely fatal quantity of blood could be saved by the injection of sheep's blood which would have been highly poisonous to them, provided only the washed red corpuscles were injected. A rabbit which had received 10 to 15 cubic centimeters of unwashed ox blood died within five or six minutes. Another rabbit was given similar blood which had been partially washed, added to some of its own. After a period of serious prostration, it recovered. But a rabbit which had received only the red blood corpuscles of ox blood, which had been thoroughly washed, recovered completely without any detrimental symptoms.

It is confidently suggested by the investigators that in cases where human blood of the right group is not immediately available for transfusion, blood of any other group would be equally beneficial, provided only the washed red corpuscles were used. They also indicate that in their opinion blood of animals could probably be used in the same manner, if no human blood could be obtained.

It is further stated that a preparation of red blood corpuscles in a salt solution has been kept perfectly in bottles, and that there is no reason why such a preparation could not be made up in a standard manner and stocked for use according to necessity.

RELATIVITY

FAILURE to find any evidence for the motion of the earth through the ether which is supposed to pervade all space, and thus to confirm the recent work of Dr. Dayton C. Miller, at the Mt. Wilson Observatory in California, is announced by Dr. Rudolph Tomaschek, of the University of Heidelberg, in the *Annalen der Physik*.

Dr. Miller, who is professor of physics at the Case School of Applied Science at Cleveland, repeated the Michelson-Morley experiment on Mt. Wilson, 6,000 feet above sea level. This experiment measures the difference in the time taken by two beams of light to travel in two paths at right angles to each other. While a negligible effect was obtained when it was performed at Cleveland, the Mt. Wilson results showed what was apparently a drift through the ether, because the light beam traveling in the direction of the supposed ether drift took longer to return to the starting point than the one going at right angles to it.

Dr. Tomaschek has repeated two other experiments designed to test the ether drift, both of which use a charged condenser, somewhat similar to the condensers used in radio-receiving apparatus. In the first one he sought to observe the magnetic field which should be produced by the motion of such a condenser through the ether, but none was observed, even though it was performed at altitudes of 65 feet, 1,850 feet and 11,400 feet, the latter being on the Jungfrau, one of the highest peaks in the Alps.

The other experiment was one originally performed in England by Professor F. T. Trouton and H. R. Noble, of the University of London, in 1903. This consisted in suspending a light disc-shaped condenser, also electrically charged, by a fine wire, so that it was free to turn. If the ether is drifting by, the condenser would tend to hang at right angles to the direction of the drift, so the

experimenters hung it with its plane in the direction of the supposed motion through the ether, and sought to observe the slight turning of the condenser.

No such turning was observed by the original experimenters, or by Dr. Tomaschek at any of the altitudes, although his apparatus was sufficiently delicate to detect a relative motion of the ether and the earth much smaller than that indicated by Dr. Miller's results. As the Einstein theory of relativity was based partly on the fact that no such ether drift could be observed, and as Professor Miller's work has been said by some authorities to necessitate a considerable modification of the relativity theory, Dr. Tomaschek's work is taken as evidence in its favor.

RADIOACTIVE DECOMPOSITION

COMMON brass is radioactive matter, according to Dr. Robert A. Millikan, director of the Norman Bridge Laboratory of Physics of the California Institute of Technology, in a statement following recent scientific experiments conducted in brass apparatus placed several fathoms deep in alpine lake waters. This conclusion comes as a by-product of the epochal discoveries of the activities of high-frequency cosmic rays. Incidentally, Dr. Millikan suspects that all matter is capable of spontaneous breakdown, or radioactive decomposition, though evidence in most cases is naturally lacking.

By immersing electroscopes shielded by brass and zinc containers, far down in the icy waters of Muir Lake in the high Sierras, Dr. Millikan was able to shut out even the highly penetrant cosmic rays then under observation. In spite of the reasonable assurance that the lake water, which is merely pure melted snow, contained no radium, it was found that the electroscopes were slowly discharged, showing that both the copper and the zinc in the instruments were slowly disintegrating at a rate fast enough to emit electromagnetic energy in the form needed to affect the electroscope.

Radioactivity—or the transformation of matter into a new species of matter plus new energy—has been considered a special prerogative of a few freak elements, notably radium, uranium and thorium. It now appears probable that the whole gamut of elements carries such possibilities within one grand system of evolution of matter.

THE COLOR OF FLOWERS

IT makes no difference whether a flower is red or blue, its hue is due to the same fundamental substance. Its redness or blueness depends on the chemical nature of the plant sap. For example, deep red dahlias and blue cornflowers contain the same pigment, but the sap of the dahlias is acid and that of the cornflowers is alkaline; and this makes all the difference. Intermediate shades depend on the degrees of acidity or alkalinity.

The name of this versatile plant pigment or dye is "anthocyanin," according to Professor R. Robinson, well-known English physiological chemist, who told of investigations in this branch of plant physiology before the Royal Institution of Great Britain. This strange-looking word is made up of two simple Greek roots, which translate into "flower-blue," which is exactly descriptive of one of its phases.

There are really many distinct anthocyanins, Professor Robinson explained, though chemically they are practically identical. By analysis they can all be shown to be derived from three fundamental substances, which are closely related to each other.

There appears also to be a fourth member of this group of basic flower dyestuffs, which has long been exploited by tropical Indian tribes as material for rouge, which, however, is used among them by men only.

"The Indians of South America in the vicinity of the Orinoco prepare a red plant pigment called 'carajura' or 'chica.' It is so valuable a commodity that it is said of a poorer native, 'he can only paint half his face.' The chemical examination of carajura by Professor A. G. Perkin has resulted in the isolation of a red crystalline constituent called carajurin. The molecules of the salts of carajurin with acids have been proved to contain the characteristic nucleus of the anthocyanidins and apparently carajura proclaims a fourth anthocyanidin. It is unique both as a cosmetic and as an object of scientific research."

ITEMS

A SECRET process that allows the metallurgist to detect marks on steel that a theief or wrongdoer thinks he has entirely obliterated has been developed here as a result of research by metallurgists of the U. S. Bureau of Standards. The method originated when the experts were asked to study an army pistol with identification number badly mutilated. Through their efforts the weapon was turned into a valuable piece of criminal evidence. The method used has since been employed extensively by police officials. Details of the process will not be revealed for reasons of public safety, but it is explained that it rests upon the fact that metals, generally regarded as dead and inert, are actually alive in the sense that they retain in their internal structure evidence of their past history and experience.

DIABETES can be cured by a new treatment, according to an Austrian physician, Dr. Gustav Singer, who recently reported the results of his researches before the Vienna Association of Physicians, after several years of investigation on animals followed by a number of clinical cases. The new method consists simply in the injection of certain proteins into either the body tissues or the blood stream. The effect is more lasting than that of insulin, having persisted for six months or more in more than twenty cases. Dr. Singer states that in the clinical cases thus far treated 55 per cent. of the patients have shown substantial improvement and are able to go about their daily occupations without inconvenience while they are undergoing treatment.

THE fossil of a fish which lived about 400 million years ago and had wing-like scales, as its generic Greek name Pterolepis indicates, is one of three fossils presented to the Princeton Geological Museum by Dr. Johann Kiaer, of the University of Oslo in Norway. These fossils, which arrived here this week, are, to the ordinary observer, only faint impressions about an inch and a half long in bits of rock about three inches square, but to the scientist they mean that 400 million years ago there were fish having external skeletons which served as armor to protect the head and body.