# SCIENCE NEWS

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## LIVER THERAPY FOR PERNICIOUS ANEMIA

BY DR. WILLIAM P. MURPHY



IT gives me great pleasure to have this opportunity to briefly comment upon the work in which Dr. Minot and I have cooperated during the past ten years, and for which we have received the highest honor which it is possible for a physician to receive—awarded by the Nobel Prize Committee of the Caroline Institute of Stockholm, Sweden.

Since our initial work on the treatment of pernicious anemia by the use of liver, as carried out in our office practise and at the Peter Bent Brigham Hospital and the Collis P. Huntington Hospital in Boston, much progress has been made in the direction of improvement and simplification of treatment of the unfortunate victim of this disease.

Although the amount of liver necessary for each patient's needs may vary greatly it is necessary for him to take daily an average of from one fourth to one half pound, or during each month a total of eleven pounds in order to keep well. If instead of taking liver the patient is advised to take a potent liver extract by mouth it will be necessary to use daily three vials or doses and in a month eighty-four vials or doses in order to replace the effect of the liver. The average cost of eleven pounds of liver will be about $5.50, whereas the cost of the eighty-four doses will be approximately $17.00.

Contrast the difficulties and expense of such a regimen with that which is now possible through the development at the Peter Bent Brigham Hospital with the cooperation of Dr. Guy W. Clark, of the Lederle Laboratories, of an extract of liver which may be injected into the muscle and which is so concentrated that it is necessary to use only one injection to replace the eleven pounds of liver or eighty-four doses of liver extract if taken by mouth. And this concentrated extract for intramuscular injection costs but $1.20.

Is not such a saving worth while at a time when each and every one of us feels the need for the greatest economy? If one is to realize that treatment by means of this material costs even less than does the liver, is more effective in controlling the disease and is so much more convenient to take, I am sure that we can all agree that progress in the direction of simplification of treatment for patients with this disease is being made.

Let us consider the evidence that progress is being made in the control of this disease as judged on another basis.

The Metropolitan Life Insurance Company has recently compared the death rate from pernicious anemia for the period since 1926 when liver treatment came into general use with a like interval before 1926 when this treatment was not available. They observed that the death rate in individuals with pernicious anemia between the ages of 30 and 50 years has been only half so great since the use of liver as it was before. Above the age of 50 the death rate has not shown such a striking decrease, no doubt owing to complications which are more likely to occur during the older age period.

I feel sure that the death rate will be further reduced and that there need be no deaths from this disease if each patient will continue to take regularly in some form an adequate amount of liver substance as prescribed by his physician. The amount of liver substance necessary must be determined on the basis of regular determinations of the number of red blood cells and the patient's physical condition. It is our hope that even further progress in this direction will be made as others continue to take up the problem with us.

## SODIUM AS A SOURCE OF GAMMA RAYS

DISCOVERY of a way to make the common element sodium give out the most penetrating gamma rays by artificial means has recently been announced at the University of California. The radiation, it is believed, will have great usefulness in medicine for the treatment of diseases like cancer and in a study of how radiation acts on living tissue. Professor Ernest O. Lawrence who made the discovery, in reporting his results to *The Physical Review*, writes: "In the biological field radio-sodium has interesting possibilities that hardly need be emphasized here."

Sodium is one of the constituents of familiar table salt and occurs in certain of the fluids of the human body. Saline solution, for example, can be injected into the blood stream of the human body without disastrous effects. The new gamma radiation produced in Professor Lawrence's laboratory from sodium is more penetrating than any ever before obtained. Sodium gamma-rays have energies of 5,500,000 electron volts. Most penetrating of the naturally produced gamma-rays are those of thorium C″ (thorium C double prime) having energies corresponding to only 2,600,000 volts. Most powerful and penetrating of the hitherto man-made gamma-rays are those created by Drs. C. C. Lauritsen and H. R. Crane, of the California Institute of Technology, from carbon. The carbon gamma-rays had energies of 3,500,000 volts. Professor Lawrence's radiation, therefore, exceeds the previous records for gamma-rays produced both naturally and artificially.

More important still, from the standpoint of possible medical uses as in cancer therapy, the radio-sodium gives out its rays for a long time. The half life of the substance is fifteen hours, that is the original amount disintegrates to half in this time. Most of the elements with which artificial radioactivity has been produced do not last nearly as long. Two hours has been a long time hitherto; a few minutes of activity is the general rule.

Professor Lawrence creates his artificially radioactive sodium by bombarding sodium with deutons, the charged nuclei of the new, heavy hydrogen. These deutons are shot at the sodium with energies of 1,750,000 electron volts. Besides the very penetrating gamma-rays, beta-rays or electrons come off from the radio-sodium. This

indicates, Professor Lawrence suggests, that the radio-active substance is a form of sodium which distintegrates into magnesium. Chemical tests confirmed this suggestion.

The way gamma-rays from sodium are absorbed in lead suggests, that the radiation emitted is probably all of one wave-length, or monochromatic, which would make the new radiation extremely useful in physical experiments.

Professor Lawrence points out "that many uses of radio-sodium will probably be found. In the physical laboratory it provides a presumably monochromatic source of high energy gamma-radiation of great intensity. In the biological field radio-sodium has interesting possibilities that hardly need be emphasized here."

Drs. Edwin McMillan and Malcolm C. Henderson collaborated with Professor Lawrence in the radio-sodium experiments.

## THE TEMPERATURE OF THE STRATOSPHERE

FURTHER proof that the layers of ionized atmosphere of the earth from 62 to 124 miles above sea-level have a fairly constant temperature regardless of the time of day, night or season is presented in a report to *The Physical Review* prepared by Dr. E. O. Hulburt, of the Naval Research Laboratory.

Moreover, new data taken by many investigators scattered all over the world indicate that the temperature of the high altitude layer may be as great as that of an average summer's day at the earth's surface, about 80 degrees Fahrenheit.

"Best agreement between the radio facts and the theoretical calculations is found," Dr. Hulburt reports, "if the temperatures of these levels is taken to be rather warm, above 300 degrees Kelvin." A degree Kelvin is the unit on the absolute temperature scale. A figure of 300 degrees Kelvin corresponds to 80.6 degrees Fahrenheit.

Dr. Hulburt's preliminary report was prepared from data forwarded to him by investigators working at the Department of Terrestrial Magnetism of the Carnegie Institution and the National Bureau of Standards, both of Washington. Observations were obtained in such widely scattered places as Watheroo, Western Australia; Huancayo, Peru; Washington; Fairbanks, Alaska; and in New England and Nova Scotia during the solar eclipse.

Taking advantage of the reflection of radio signals from the ionized layers scientists have further investigated the characteristics of the layer known as F2. This layer of the ionosphere begins about 145 miles above sea-level and continues up to 220 miles. Layer F2 is above the layers E and F1 whose temperature varies within 86 degrees Fahrenheit no matter what the time of day or season.

Radio studies of the ionization in the F2 regions for different times of day, Dr. Hulburt indicates, fit in with the belief that great waves of ionized atmosphere move about in this region. As the ionized air spreads out from a point directly below the sun in all directions, part of it moves with the rotation of the earth and part against the rotation. Eastward the ionized wave moves with the earth and should be like the case for water waves—of a smooth form, perhaps like ground swells. The part of the wave going westward moves against the earth's rotation and, Dr. Hulbert postulates, "is checked and is caused to whitecap, as in a tide rip." That is, the top spills over the bottom of the wave.

Observations made on the magnetic equator substantiate this view and record a greatly disturbed and erratic layer of ionization in the morning hours with a maximum at 10 A. M. A minimum occurs at noon and then there is a smoother, less disturbed ionization in the afternoon with a broad maximum at from 6 to 8 P. M.

## NEW REFINING PROCESS FOR LUBRICATING OIL

A NEW method of oil production which is claimed to make it possible to obtain standard, even quality oil from many types of crude petroleum, either high or low grade, was demonstrated by engineers of the Socony-Vacuum Oil Company on October 31 at their new refineries at Paulsboro, N. J.

At a private showing of the new plant for automotive engineers and scientists from New York, Philadelphia and Washington it was demonstrated that the new process is based on physical happening rather than the older chemical method of using sulphuric acid. Impurities in the crude petroleum are separated from the desired products as one would separate sand from sugar in a mixture. Water poured on the sand and sugar would dissolve out the sugar leaving behind the sand.

In the new oil refining process solvents act in somewhat the same way. One type of solvent acts by excluding from the oil those substances which tend to form carbon in the gasoline engine. Another type of solvent has comparatively little effect on the carbonizing characteristics of the oil, but is effective in removing those substances which break down at high temperatures developed within gasoline engines.

Engineers of the company maintain that hundreds of thousands of miles of actual road tests show the oil made by the new method will last twenty-five per cent. longer than the best of present-day oils. Formation of carbon in the engine is likewise prevented together with the removal of fear of sticky valves and piston rings.

The new method allows the often dangerous use of sulphuric acid in oil refining to be completely eliminated. So rigid is the control of the solvent process that crude oils from cheap Texas types to the superior Pennsylvania oils can be used with equal success. When the quantity of solvents is "adjusted" to the particular crude oils available a standard high-grade product can be obtained. So mechanized is the plant that three engineers alone can control the production of 2,000 barrels of the new oil a day.

Tests on the viscosity, or flowing qualities, of the new oil reveal that it flows more freely at far below freezing temperatures and yet keeps its body at the high temperatures encountered within the engine.

## THE EFFECT OF DIFFERENT WAVE-LENGTHS OF LIGHT UPON THE GROWTH OF PLANTS

WHEN plants in a window-box, or potato sprouts in a dark cellar bend toward the light as they grow, they are not responding equally to all the colors in that great mixture of lights we call white light. Toward red light they will not bend at all, while on the other hand there are certain wave-lengths in the blue region of the spectrum, toward which they are especially sensitive.

Recent researches at the Smithsonian Institution, reported before a Washington botanical audience by Dr. Earl S. Johnson, have picked out very sharply the particular wave-lengths that are most potent in stimulating plant bending. The most effective of all light wave-lengths is a very narrow band in the neighborhood of 4,400 Ångstrom units, which is in the blue part of the spectrum. From this point the effectiveness of light in producing bending falls off rapidly to a point near 4,600 Ångstrom units, which is still in the blue region. Then it rises again to a secondary peak at about 4,750 Ångstrom units, a slightly greenish blue, and then drops to an "almost-no-effect" point beyond 5,000 Ångstroms, in the red.

In carrying out his experiments, Dr. Johnson used plants themselves—young oat seedlings—as pointers. At one end of a long, darkened box was a standard lamp. At the opposite end was another lamp, with suitable filters to permit only light of the desired wave-lengths to pass through. The seedlings were placed between these lights, and permitted to "choose," indicating the light having the greater effect by bending toward it.

The standard lamp was moved back and forth, until one of the seedlings indicated "no choice," showing that the two light sources were in balance. Then a sensitive light-measuring instrument was substituted for the seedling, to obtain the relative amounts of energy put forth by the two lights. In this way a sensitivity curve for the effectiveness of all parts of the spectrum was built up, based on the "choices" of many hundreds of seedlings—for any given seedling could be used for only one exposure.

Full details of these experiments, with their background of earlier researches by other workers, will be published at an early date by the Smithsonian Institution.

## ITEMS

BALUCHITHERIUM, a giant rhinoceros and the largest land mammal that has been discovered thus far, is being assembled for exhibition at the American Museum of Natural History. Professor W. K. Gregory and Dr. Walter Granger, of the museum, in a report to the American Society of Mammalogists, described their work on the restoration of this great creature of more than 30,000,000 years ago, which stood over thirteen feet high at the shoulder. Parts of over twenty-five individuals, collected on the museum expedition to Mongolia, are being sorted and pieced together to make a restoration that will look very different from the only other in existence which is in a Russian museum in Leningrad.

A NEW process which makes possible durable photographs on metallic plates of aluminum and its alloys has been culminated by the firm of Simens and Halske A.-G. in Berlin. For many years it has been known that aluminum and its alloys would attain oxide films which would absorb with avidity solutions of pigments and thus attain brilliant color effects. The new method takes advantage of the porosity of such oxide films by having them absorb light sensitive substances instead of pigments. The aluminum sheets are dipped successively in solutions of aluminum chloride and silver nitrate and dried after each immersion. Other silver salts, iron salts and diazo bodies can also be used to make the metal plate light sensitive. Finished photographs made on metallic films are characterized by great durability because the film of oxide protects the underlying aluminum from chemical and mechanical influences. Such photographs, therefore, will resist the effects of light, water and weather.

"PROTIUM OXIDE," purest water yet prepared, practically free from "deuterium oxide" which contains the double-weight hydrogen variety, is lighter than the common drinking water by about 12 parts per million. Ordinary water contains about one part in 9,000 of heavy water, according to the investigators who carried out the extensive purification in connection with the work here described. E. H. and Professor C. K. Ingold, at University College, London, and H. Whitaker and Professor R. Whytlaw-Gray, at the University of Leeds, purified London and Leeds tap water by fractional distillation, electrolysis and decomposition with metals, until it contained at the most a few units per cent. of the original heavy water.

X-RAY motion pictures have dispelled a recent scare of thymus deaths among new-born infants, according to a report by Dr. Robert F. James, research physician of the Westinghouse Electric Company, on October 30, to the Society of Motion Picture Engineers meeting in New York. "X-ray photographs," Dr. James states, "disclosed a large shadow in the vicinity of the thymus, a ductless gland in the upper section of the chest. But none of these infants showed typical symptoms of the disease and subsequent x-ray pictures failed to show the shadow. The attending physicians who observed the shadow concluded that the penetrating x-radiation used in making the photographs checked the thymus enlargement. When continuous x-ray motion pictures were made, however, the shadow taken to be an enlarged thymus was found to be merely the shadow of the infant heart, coming and going with the pulse."

HALF a billion years ago, a series of ripples played over the shallow water at the beach-edge of a lake, in what is now the state of Arizona. One of the ripple-marks left by the water in the soft sand that day has just been identified as such, hardened into rock through long burial and pressure. The discovery of this well preserved water ripple mark in the Archean sediments of the Grand Canyon, a section of the world's oldest sedimentary rocks, has been announced by Drs. J. H. Maxson and Ian Campbell, of the California Institute of Technology. It has the distinction of being the oldest recorded fossil of its type in North America.