THE SCIENCE NEWS-LETTER

A Weekly Summary of Current Science

EDITED BY WATSON DAVIS

ISSUED BY
SCIENCE SERVICE
1115 Connecticut Avenue
WASHINGTON, D. C.

EDWIN E. SLOSSON, Director
WATSON DAVIS, Managing Editor

SUBSCRIPTION: $5 A YEAR, POSTPAID

Vol. IV, No. 153 Saturday, March 15, 1924.

DYE SAVES PATIENTS FROM FATAL BLOOD INFECTION

Injecting dyes into the veins of patients partially given up to death on account of blood infection is a successful life-saving treatment developed by Dr. Hugh H. Young and Miss Justina Hill of Johns Hopkins University, Baltimore. The first complete announcement of the new medical advance and a summary of work to date has just been made to the American Medical Association.

The way in which patients begin to recover under treatment is reported as "almost miraculous", although just after injection they take on the color of the dye with which they are treated.

The method involves the injection directly into the vein of one of two preparations; either mercurochrome-220, which consists of a combination of dye product with mercury, or gentian violet, a well known dye. Before attempts were made to use the method on human beings, its safety was thoroughly demonstrated on animals.

Seven patients were treated by mercurochrome and five by gentian violet. The mercurochrome cases included two patients who were desperately ill with a general infection of the blood and fever reaching to 106 degrees. Following the injection of the drug, patients began to recover rapidly. A patient who was irrational with fever and whose blood contained large numbers of colon bacilli became rational in a few hours, and within six hours had a normal temperature.

In five other cases the infections were localized in the abdomen or around the kidneys. The patients were treated by gentian violet. In all of these, the infecting agent was staphylococcus, a small round organism which appears under the microscope as growing in clusters. After the injection of this drug, patients appear purple for a short time, but the color rapidly disappears.

Commenting on the work, Dr. Young says: "These cases represent a splendid therapeutic achievement, and one is tempted to soar into realms of fancy and see a great variety of infectious processes treated and cured intravenously; but one must be restrained and cautious. There can be no doubt that when blood cultures show a generalized septicemia, mercurochrome and gentian violet can be offered with the hope of preventing an otherwise surely fatal ending".

AUTO BRAKES TESTED BY PORTABLE DEVICE

A new portable device for testing the effectiveness of automobile brakes has been perfected by the U. S. Bureau of Standards. The invention is largely the work of W. S. James, chief of the automotive power section, who had the work in charge. It does away with the need for measured stretches of road, eliminates all of the personal factor of the driver, and gives instantaneous results.

The essential principle of the invention is a suspended weight, which, when the brakes are applied and the car slowed down, swings forward, an effect which everyone who has ridden in a moving vehicle has noticed when the brakes were strongly applied. In the testing device, the swinging weight is immersed in oil so as to slow down its swing and prevent vibration, and it is connected with a recording pen or pointer which measures the extent of the swing. This in turn measures the retarding power of the brakes.

No calculations are necessary to get the results, at least none by the inspector. With the weight of the swinging weight or pendulum known, the pointer may be made to show just the number of feet in which the car may be stopped when travelling at any given speed, such as 20 miles an hour. If this is known, the distance taken to stop at other speeds may be calculated. The efficiency of the device does not depend on the weight of the car, and since it is only about a foot long and less than that in other dimensions it may be carried about and used in any car.

Results obtained so far indicate a close agreement with observed measurements of the actual distance required to stop cars. In order to eliminate all personal factors, a revolver firing a small charge of red lead was connected with the brake pedal in such a way that when the brake was applied the revolver would be discharged toward the road. The distance from the spot of red to a point directly under the revolver when the car was stopped was then measured.

From these results it also seems that present standards for two wheel brake effectiveness for the average carеare set at impossibly high levels, Mr. James says, although they are within the reach of four wheel brakes, and some two wheel brakes in first class condition. Balloon tires are slightly more efficient in braking than those of ordinary size, but this is not because of their increased cross section, but because of their lower inflation pressures. They do not cause the wheels to bump off the ground and being in continuous contact with the surface they have a greater drag.

Tests also showed that the greatest braking power was attained just at the point where the wheels started to slide, but while they were still revolving; when sliding at ordinary car speeds the braking effectiveness is reduced. Service brakes were much more efficient than hand brakes as the latter have been designed primarily only to hold the car stationary when standing on a grade.

The different times required for drivers to obey orders to set their brakes are held by the investigators to make the old-fashioned methods of brake testing quite inaccurate. The average time required was found to be about half a second, or a matter of 15 feet with a car moving at only 20 miles an hour.

AMERICA NOW HAS BEST PROCESS FOR FIXING NITROGEN

America now has the most effective method of fixing nitrogen of the air in such a way that it can be used as plant food in fertilizers or in making explosives.

Through scientific work at the Fixed Nitrogen Research Laboratory of the U. S. Department of Agriculture, a catalytic substance has been developed that brings about the fastest known reactions between hydrogen gas and nitrogen gas toform ammonia.

No formal announcement has yet been made as to the composition of the new catalyst, but Dr. Alfred T. Larson, under whose direction the research work has been carried on, revealed that it is made of iron oxide, aluminum oxide and potassium oxide. Since it is composed largely of iron its cost is very low. Methods for large scale commercial production have been perfected.

The new catalyst is declared to give yields at least twice as high as the best catalysts now known. Through the use of low temperatures and very high pressures, very high percentages of the gases are made to combine by this new catalyst. At a pressure of 1,000 atmospheres, 60 per cent. conversion has been obtained.

The United States nitrate plant No. 1 at Sheffield, Alabama, was designed for a process that can use this new iron catalyst of superior activity.

Shortly before the beginning of the World War, German chemists perfected the Haber process for the fixation of atmospheric nitrogen, which supplied Germany with nitrates when the usual supplies from the great nitrate beds of Chile were cut off by the blockade. The chemical composition of the catalyst used in the German plants has been jealously guarded as a trade and military secret. Even now American chemists do not know what substances are used in German plants to make the molecules of hydrogen and nitrogen gases get together and make ammonia.

The development of the catalyst used here has been an entirely independent achievement, and according to Dr. F. G. Cottrell, former director of the U.S. Bureau of Mines and now director of the Fixed Nitrogen Laboratory, "As far as we have been able to learn, there is no country in the world which has an ammonia catalyst superior to that developed by this laboratory".

Contrary to policy in every other country, no secret is being made of the results of the research work of government fixed nitrogen chemists. Full details are being given to all who are interested.

Large forces of chemists are understood to be at work in Germany, France, and Japan on similar problems and in all cases results are being withheld as trade or military secrets. In Germany, in spite of poor economic conditions, twice as many chemists are at work on this one problem as in the United States. England has a force of 40 to 45 scientists studying atmospheric nitrogen fixation, approximately the same number as at work here, and Japan spends as much on nitrogen researches as this government does.

Although over 36 per cent. of the nitrogen produced in the world is now supplied by fixation of atmospheric nitrogen, less than one per cent. of America's

present requirements are supplied by atmospheric nitrogen fixed within this country. Only one commercial plant, located at Syracuse, N.Y., is operating using the synthetic ammonia process, and the catalyst used there is being kept a secret.

The government plant at Muscle Shoals, now idle, has a capacity only one-fifth of the 200,000 tons consumed in the United States at the present time. This large plant employs the cyanamide process, which if operated would not utilize catalysts perfected for the synthetic ammonia process.

With no large nitrogen fixation industry in this country, and with 3,000,000 to 4,000,000 tons of nitrogen, equivalent to 150,000,000 to 200,000,000 tons of commercial mixed fertilizers, being lost from land under cultivation and not replaced, the need of intensive nitrogen research to assure adequate nitrogen supplies in the future is declared to be imperative.

READING REFERENCE - Slosson, E.E. Creative Chemistry. New York, Century Company, 1920.

DIET OF DEAD GERMS KILLS LIVE ONES

The possibility of vaccinating against certain diseases by eating the dead germs or rubbing them on the skin is suggested by Prof. A. Besredka, a Russian working on the staff of the Pasteur Institute, Paris, as a result of experiments upon animals and subsequently with human beings. His conclusions are considered revolutionary in their application to the prevention of disease.

Prof. Besredka asserts that immunization is effected by bringing the immunizing substances into contact with the tissues where the disease to be protected against usually first enters the body, rather than by injecting them under the skin.

For example, it was found that guinea-pigs could be protected against anthrax, a disease to which they are especially subject, by applying killed anthrax germs to the surface of the skin, where the active germs usually first find lodgement. This immunity is not associated, Prof. Besredka states, with the presence of antibodies in the blood, usually considered to be necessary to immunity.

Experiments with cholera, typhoid, and dysentery, all diseases which enter the body through the walls of the intestines, have shown that protection may be obtained by administering the vaccines by the mouth, the immunity resulting, according to Prof. Besredka, from the effect of the vaccines on the intestinal cells rather than on the blood.

Data have been collected which may be interpreted as indicating that persons in contact with cases of typhoid or dysentery may be protected by eating tablets containing killedbacteria. An investigation of the possibility of protecting against cholera by this method is to be undertaken in Russia by the health section of the League of Nations.

Another possible application is that of vaccinating the skin against invasions

of the bacteria known as staphylococci, which cause boils. Evidence is accumulating that protection may be effected by applying the vaccines to the skin instead of the usually accepted procedure of inoculating them under the skin.

Professor Besredka's views are considered revolutionary, and if confirmed by further experience, of the highest practical importance in the prevention of disease. Inoculation of vaccines frequently causes considerable local irritation and in some cases actual illness; practically all of which is avoided by eating the vaccines or rubbing them on the skin. For these reasons it is expected that it will be easier to persuade people to be vaccinated than is the case with the present methods of inoculation. The new method of protecting against disease is not yet ready for general public health application.

SECRET OF VITAMIN'S IDENTITY NEAR SOLUTION

One of the vitamins, the mysterious and unisolated food factors, has at last been obtained in a state of such purity that its early identification may be anticipated with certainty.

Dr. Atherton Seidell, chemist at the U.S. Public Health Service Hygienic Laboratory has announced that he has been able to prepare from brewer's yeast a definitely crystalline compound that has the antineuritic properties of vitamin B.

He used fuller's earth to absorb from a solution of yeast the active vitamin principle and after precipitating with picric acid and subjecting this product to many solutions and crystallizations, pale yellow, transparent, crystalline flakes were obtained that in doses as minute as two milligrams a day protect pigeons from the effects that follow lack of vitamin B.

When a chemist obtains a crystalline substance it is usually only a matter of time until its identity can be established and its true chemical structure determined. With this information its synthesis frequently becomes possible.

"There has been a tendency in the past to regard vitamins as substances comparable with enzymes and toxines in their instability and marked activity of infinitesimal doses," said Dr. Seidell. "Acceptation of this view has, no doubt, deterred many from work on this problem, since the possibility of isolating substances of the nature of enzymes is very remote. It is distinctly encouraging, therefore, to obtain evidence that the antineuritic vitamin performs its function in doses of convenient magnitude and withstands ordinary laboratory manipulations. Assuming a satisfactory demonstration of these points, the final solution of the true chemical nature of vitamins may be anticipated with certainty."

READING REFERENCE - McCollum, E.V. The Newer Knowledge of Nutrition. New York, Macmillan Company, 1922.

Ellis, Carleton and Macleod, Annie Louise. Vital Factors of Foods, Vitamins and Nutrition. New York, D . Van Nostrand Company, 1922.

THE FOURTH STATE OF MATTER

By Dr. Edwin E. Slosson.

Now that the kids on roller skates are talking familiarly about vacuum tubes and electron streams, and not merely talking about them but playing with them, it is interesting to turn back the pages of history to the time when these things were new and nobody in the world perceived their significance but one man and he but dimly.

We do not have to turn back very far, only 45 years, when William Crookes exhibited the vacuum tubes that were afterwards known by his name. He found that when he exhausted the air as completely as possible from a glass tube and then passed an electric current into it by platinum poles stuck through the glass that there proceeded from the negative pole or cathode a curious kind of a ray. Where the ray started from the cathode disk it was for a space dark and invisible, further on it became a beam of bluish light, and where this struck the opposite side of the tube it made a greenish glowing spot on the glass. That this ray was not ordinary light he proved by holding a magnet up to the tube, for the cathode ray was curved out of its course by the magnetic force and could be turned in any direction, instead of going obstinately straight ahead as a common light ray does in a vacuum.

Such experiments with the "Crookes' tubes" amused the public and amazed the scientists. Everybody admired Crookes' skill as a glass blower and wondered how he got a little windmill inside a sealed tube, even as the King of England wondered how the apple got into the dumpling. But when Crookes claimed that he had in his tubes "a fourth state of matter" and a new kind of radiation and a connecting link between matter and energy his scientific colleagues were skeptical. They felt that he had gone too far, had become a monomaniac on the subject, had, in short, got vacuum on the brain. There were only three states of matter, as everybody knew, solid, liquid, and gaseous. To have a fourth state the atom must be split and the very name of "atom" meant something that could not be split. This man Crookes never had a university education anyhow, and he was the son of a tailor, and he said he had seen spirits in the seance room, and altogether it was a bit cheeky of him to bring forward such upsetting ideas on such empty evidence as a vacuum tube.

But Crookes always had the courage of his convictions and in this case proved himself a true prophet. Two passages quoted from his 1879 addresses in the "Life of Sir William Crookes" by Fournier d'Albe, just published, will show how astonishingly he anticipated the views of the twentieth century.

"The phenomena in those exhausted tubes reveal to physical science a new world - a world where matter exists in a fourth state, where the corpuscular theory of light holds good, and where light does not always move in a straight line; but where we can never enter, and in which we must be content to observe and experiment from the outside."

"In studying this Fourth State of Matter we seem at length to have within our grasp and obedient to our control the little indivisible particles which with good warrant are supposed to constitute the physical basis of the universe.

We have seen that in some of its properties Radiant Matter is as material as this table, whilst in other properties it almost assumes the character of Radiant Energy We have actually touched the border land where Matter and Force seem to merge into one another, the shadowy realm between Known and Unknown, which for me has always had peculiar temptations. I venture to think that the greatest scientific problems of the future will find their solution in this Border Land, and even beyond; here, it seems to me, lie Ultimate Realities, suotle, far-reaching, wonderful.

"Yet all these were, when no Man did them know,
Yet have from wisest Ages hidden beene;
And later Times things more unknown shall show,
Why then should witlesse Man so much misweene,
That nothing is, but that which he hath seene."

We now know that the cathode ray of Crookes is, as he said, corpuscular and not vibratory, for it consists of a stream of electrons, which are "the little indivisible particles" that "constitute the physical basis of the universe," and they do indeed belong to the borderland of matter and energy. They are atoms of electricity and sub-atoms of matter. They change their mass when they change their motion, and where free-flying electrons strike solid matter they start a stream of energy in the form of waves, what we call the "X-rays". If Crookes had only happened to lay a photographic plate holder opposite the green spot where his cathode ray struck the glass he would have anticipated Roentgen in the discovery of the X-rays be some seventeen years.

But it was glory enough for one man to have revealed the cathod rays inside the sealed tube even though he failed to follow their course outside. Thanks to Sir William Crookes, Londoners can now listen in on Pittsburg concerts and he foretold the means and method of wireless telegraphy as early as 1892, five years before Marconi sent his first messages by radib.

READING REFERENCE - D'Albe, E. E. Fournier. The Life of Sir William Crookes. New York, D. Appleton and Company, 1924.

DRUG ADDICTION PROBLEM FOR POLICE, NOT DOCTORS

Drug addiction is a police problem rather than a medical one in the opinion of Dr. Carleton Simon, special deputy police commissioner in charge of the narcotic division of the New York City police department, who has submitted a report to the American Medical Association. The report is based upon replies to a questionnaire on the subject sent to all physicians and dentists in the state of New York.

Addiction has decidedly decreased in New York during the past three years, Dr. Simon states, the smaller number of beginners among addicts recently apprehended being considered as evidence. Constant vigilance is necessary, however, as any police relaxation would result in an influx of addicts from other sections who would teach the habit to new victims.

The number of addicts who became victims to the habit as the result of medical

causes is stated to be only two per cent. of the total number, the remaining cases having had their origin in criminal associations or environment. The quantity of narcotic drugs bought by doctors and dentists is reported to be well within legitimate requirements and to represent but a small fraction of the amount of drugs traded in illicitly through underground channels.

Heroin and cocain are the drugs most favored by criminals and other denizens of the underworld, the report continues. Heroin addiction is rapidly replacing morphin addiction throughout the United States, the spread being more noticeable from seaport cities.

Heroin was considered a needless drug by four out of five of the more than 7,500 doctors and dentists answering the questionnaire. More than 5,300 of them stated they had prescribed none during the year 1922.

Although cocain is useful as a local anesthetic in many cases, 83 per cent. of the doctors and 94 per cent. of the dentists believed that its use could be dispensed with in favor of synthetic drugs which are not habit-forming.

Dr. Simon believes the number of drug addicts to be much less than is popularly supposed, although he states that "the extent of narcotic drug addiction in the underworld is appalling". Estimates as high as half a million addicts in New York state he believes to be greatly exaggerated.

After stating that there is a relatively small class of medical addicts who require the drugs because of physical ailments, and that physicians should not be embarrassed in their handling of such cases, the report declares:

"The far greater number, however, are the criminal drug addicts, whose addiction in its inception and in its continuance is due to vice, vicious environment, and criminal associations. The consideration of this class constitutes a distinct police problem. "

Two Chicago physicians, Drs. Charles E. Sceleth and Sydney Kuh, who have experience in the treatment of drug addiction cases, concur in Dr. Simon's belief that treatment by physicians is a minor cause of the drug habit and that the great majority of cases result from association with other addicts. Their report holds that narcotic addiction is the result of mental inferiority or weak-mindedness; they find that 75 per cent. of addicts who do not belong to the vicious type are inadequate personalities.

"The addict", they says, "does not require a narcotic to maintain a physical or mental equilibrium to accomplish his work. A man who does good work under the influence of a narcotic will do better work without it.

"The large majority of addicts take drugs because of nervous instability, and with them the probability of a permanent cure under existing conditions is very slight. There is only one measure that will prevent a relapse, and that consists in making the drug unobtainable."

Chicago has never had more than 5,000 addicts at one time, Drs. Sceleth and Kuh believe. Opium smoking and the taking of opium by mouth have almost disappeared. Cocain and heroin are pleasure habits, and such patients do not suffer withdrawal symptoms. They find paregoric habitues fairly numerous,

some using as much as a quart a day.

The most available drug in a locality determines the nature of addictions. In the South, most of the negro addicts use cocain. In New York, out of 7,464 cases, 96.5 per cent. used heroin. In Chicago less than 4 per cent. used heroin.

PSYCHOLOGIST DISCOVERS WHY PROOFREADERS MISS ERRORS

A proofreader overlooks a greater number of mistakes on the right of a proof sheet than he does on the left, according to Dr. H. R. Crosland, assistant professor of psychology at the University of Oregon, who has just completed a two years' investigation into the causes of errors in proofreading. This is claimed to be the first thorough-going scientific investigation of its kind.

Dr. Crosland also discovered that there will be a greater number of errors overlooked in the lower half of the sheet than in the upper half. This is caused, he explained, by the tendency of the proofreader to become absorbed in what he is reading as he nears the end of the proof sheet, and also by fatigue.

Proofreaders show no appreciable improvement in accuracy as the result of practice and experience, according to the investigator. This was attributed by him to the fact that in reading a line of type the eye passes from one fixation pause to another and does not directly focus on every character in that line. The length of fixation pauses, the number of letter spaces taken in by the eye during each pause, and the number of pauses per line, are all the result of heredity and very early environment. Therefore it follows that practice has little to do with the proofreader's ability to catch mistakes in printed matter.

Dr. Crosland found that it is not necessary to spend an undue length of time on a proof. "In fact, little kinship exists between the length of time spent in reading a proof sheet and the accuracy obtained by the reader", continued Dr. Crosland. "Indeed, there is evidence to show that the practiced proofreader takes too long to do his work."

The investigator believes the use of his tests will be of practical vocational value. In the course of his investigations he found he was able to predict with a high degree of accuracy the competitive rating which a given subject would make in a given series of the test by considering his record in the series already taken.

Thirty persons, consisting of journalism teachers, all of whom had previous newspaper experience, printers, and laymen were engaged in the experiment. Twenty proof sheets were read by each person, an interval of approximately one week elapsing between the reading of each sheet. The proof sheets were grouped in four series and each of the four series was read with a certain purpose in mind. Readers were instructed to read for (1) accuracy, (2) for speed, (3) for meaning, and (4) with a stated time limit.

Thirty em proof sheets, the usual newspaper column, were employed in the tests.

TABLOID BOOK REVIEW

Supplement to "The New World", Yonkers-on-Hudson. World Book Co., 50¢.

Dr. Isaiah Bowman, Director of American Geographical Society, whose valuable volume, "The New World", is the best compendium of the changes in political geography resulting from the war, has issued a supplement of 100 pages, dealing chiefly with the new map of Turkey and with the changed relations of the United States and foreign countries.

GIVING LUMBER A TURKISH BATH

Railway construction engineers have discovered that railway ties, even when air-dried for a considerable time, still contain 15 per cent. or more moisture, and therefore are susceptible to decay, since bacterial growth requires moisture. In recent experiments an effort has been made to drive out moisture by using the same process that nature does, and dissolve, neutralize and wash out the sap and other liquids which obstruct and close the pores. Warm air saturated with moisture is circulated among the ties. This opens and cleans the pores of the wood just as a Turkish bath does the pores of a man. The saps and resins filling the vesicles themselves, expand with the heat and force their way out, to be diluted and carried away by the warm vapor. After some hours of this treatment, the amount of moisture in the lumber is reduced by very slow degrees, until, at the end, it is practically dry, and the wood is removed from the kiln with not more than five per cent of moisture left in it. Lumber so treated, engineers assert, is immune to decay as long as it is kept dry. So the ties, after their Turkish bath, are given a water-proof coating by dipping into a hot bath of heavy asphalt.

MEASURING SOIL MOISTURE

Everyone has noticed that wooden doors and drawers stick in wet weather. This property of wood of absorbing water and swelling up in the process has been made use of by the U. S. Forest Service for measuring soil moisture. Blocks of cypress wood are carefully air-dried and then measured. They are then put into the ground and left a short time. The amount of the swelling of the block is definitely related to the amount of water absorbed, and it is believed that a corresponding relation can be worked out with the amount of soil moisture.

TEA OR COFFEE?

The choice between tea and coffee is analogous to that between chocolate creams and chocolate caramels, says the Journal of the American Medical Association. A great many people who hesitate to drink coffee believe that tea is the milder drink and does not have the effects of coffee. Investigation by Drs. L.B. Lahmann and H. Weil of Wurzburg, Germany, shows, however, that the wakefulness or other manifestations which follow either drink are due to the amount of the drug, caffeine, that is contained in the quantity of fluid taken.
