

glass when heated it is possible to solder the tin can onto the glass without need for a close-fitting gasket. So strong is the glass-to-tin joint that in tests the glass breaks before the tin-glass union.

The development makes it possible to ship cans with glass ends to the canery and pack in the contents just as is

done now for all metal cans. In the food processing it is often necessary to place the filled can in a steam autoclave and then suddenly cool it with water to prevent over-cooking. The special glass resists, satisfactorily, this drastic treatment.

Science News Letter, November 17, 1934

MEDICINE

Artificial Radioactivity Seen As Aid in Cancer Fight

Man-Made Radioactivity May Prove To Be Effective Substitute For Expensive Radium in Medicine

THE STRUGGLE of medical science to combat cancer has been materially aided by the recent discovery of ways to make many common elements radioactive by artificial means, Dr. G. Failla, head of the physical laboratories of Memorial Hospital, New York City, has informed Science Service.

Dr. Failla's encouraging statement was made in reply to a request for interpretation of the announcement by Prof. E. O. Lawrence of the University of California that a way had been found to make sodium radioactive and have it give off penetrating gamma rays and beta rays. (*See SNL, Oct. 27 p. 259*). Gamma rays from man-made radioactive sodium are over twice as piercing as those from the most powerful natural sources, thorium C".

The main difficulty in the treatment of cancerous tissue by radiation, Dr. Failla declares, has been to find some carrier which will distribute itself fairly uniformly throughout the tumor without diffusing into the surrounding normal tissue and through the blood stream. No such selective carrier is available at present although chemists the world over have been searching for it for decades.

Opens New Fields

"The advent of artificial radioactivity opens new fields of cancer research," Dr. Failla declares. "In their search in the past for chemical agents suitable for the treatment of cancer, chemists have concentrated their attention on agents which damage the living cell hoping to find something which would kill cancer cells without harming ir-

reparably normal cells and the patient as a whole.

"With the coming of radioactivity induced by artificial means it is only necessary to look for something which is selectively or even differentially absorbed or temporarily retained by cancer tissue.

"When and if such a substance is found it will then be possible to make one or more of its constituents artificially radioactive. By virtue of its greater concentration in cancer tissue such tissues would be destroyed readily by the radioactive rays while normal tissue would survive.

Need Not Be Gamma

"In this connection," Dr. Failla continued, "it should be noted that radiation emitted by artificially produced radioactive material need not be of the gamma ray type. Any radiation which either directly or indirectly produces ionization is satisfactory for this purpose since the source of the rays would actually permeate the cancer tissue and ionize it intensely."

Prof. Lawrence's discovery of a way to make artificially radioactive sodium, giving off gamma rays with a half life of fifteen hours, has an important bearing, Dr. Failla reports, on the field of cancer therapy for it may develop that it is possible to use it as a substitute for radium and the radioactive gas radon obtained from radium, for the external treatment.

The life of radioactive sodium—based on its half life of fifteen hours—is too short, Dr. Failla believes, to allow its insertion directly into a tumor. Unless very large quantities are available constant replacement would be necessary.

While one immediately thinks of making up a solution or suspension of radioactive sodium, perhaps as salt, and injecting this directly into tumors the problem is fraught with difficulties known for many years, Dr. Failla declares (*See Archives of Radiology and Electrotherapy, June, 1920*).

Fifteen years ago scientists at Memorial Hospital prepared radioactive salt by exposing it to radon for three hours so that the disintegration products—radium A, B and C—were deposited on the salt. By dissolving this special salt in water a radioactive solution was obtained which could be injected directly into tumors, or into the blood stream for special cases where there was a general neoplastic condition throughout the body.

The method was tried extensively on animals and human patients but was finally abandoned. Radioactive oils and suspensions of charcoal containing radon, or its disintegration products, were also tried at Memorial Hospital with little success, Dr. Failla indicated.

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BIOCHEMISTRY

Study Concentration of Viruses as Clue to Nature

TOO SMALL to be seen; too many to count. It sounds like an old riddle but it is merely a rough way of describing the innumerable tiny particles which make up the viruses that cause diseases like infantile paralysis in humans and tobacco mosaic in plants.

For these infective particles are so small they can not be seen even with powerful microscopes. As to counting them, 10 with fourteen ciphers written after it, may represent the number of infective particles in about 20 drops of juice squeezed from a plant infected with tobacco mosaic, Dr. William J. Robbins of the University of Missouri estimates.

These figures are highly speculative, Dr. Robbins pointed out (*Science, Sept. 21*.) They are based on the assumption that one-tenth of a gram or about two grains of infective material having a molecular weight of 100,000 exists in a little over six quarts of plant juice.

Here again the scientist is assuming: first, that one molecule of infective material weighs 100,000 times as much as one molecule of hydrogen; and second, that the yield of infective principle from the plant juice is 100 per cent.

Dr. Robbins' calculations are based on

experiments of several other scientists. Some of these investigators have estimated the size of virus particles from the size of the holes in a filter that they pass through. Others have estimated the concentration of virus in infected plant juice. One found that one part of infected tobacco plant juice diluted in ten thousand parts of water still contains infective material.

The layman's interest in these impressive figures is largely a matter of curiosity and wonder over the size and concentration of the substances that can cause him so much personal harm or financial loss.

The scientist's interest is related to the

isolation of the infective principle of viruses. One as yet unsettled question about viruses is whether or not they actually are living organisms.

As Dr. Robbins explains it, if the tobacco mosaic virus, for example, is non-living, attempts now being made to isolate it as a definite chemical compound will eventually succeed, provided a sufficient number of infective particles are present in a cubic centimeter of juice.

Put in another way, if scientists can finally isolate a virus as a definite chemical compound, they will know that viruses are not living substances at all.

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ultraviolet astronomical front from 3,400 down to 2,300 Angstroms.

Now, at one stroke, astrophysicists can jump the gap caused by ozone absorption and reach still shorter wavelength regions of the solar spectrum. Another important contact with sunlight is thus established.

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ANIMAL HUSBANDRY

Sheep Reared Successfully On a Synthetic Diet

THE first two sheep ever reared upon synthetic diets have just been slaughtered in a Cornell University scientific experiment. They never tasted grass or grain but thrived on purified food elements. Scientists foresee the possibility of more rigorous nutrition experiments upon cows, goats, sheep, rabbits and other herbivorous animals as the result.

Reared by Dr. L. L. Madsen of Cornell's Animal Nutrition Laboratory, they were beautiful, mature animals although they never received a blade of grass nor a kernel of grain from the time they were weaned from their mothers. Each day for over a year they were fed a "synthetic" mixture of casein, cellulose, starch, vitamin concentrates and salts. They grew to maturity rapidly and were about a year and a half old at the time of slaughter.

This success in raising "synthetic" sheep ends seven years of trials to perfect a diet of purified foodstuffs for plant-eating, herbivorous, animals. Such

PHYSICS

New Band of Ultraviolet Found in Sun's Rays

A WHOLE new band of ultraviolet light rays in the radiation the earth receives from the sun has been detected by the Swiss scientists Edgar Meyer, M. Schein and B. Stoll. The discovery is believed to have an important bearing on future astronomical research.

In their report (*Nature*, Oct. 6), it is disclosed that sunlight is not completely cut off at about 2,800 Angstrom units of wavelength as previous research indicated.

An Angstrom is a unit of length equal to a bit less than four billionths of an inch. The ultraviolet region from 2,900 to 3,100 Angstroms consists of rays which have an actinic effect and cause sunburn.

It had always been supposed, as far as proof was concerned, that the ozone in the earth's atmosphere absorbed sunlight of wavelength shorter than those of the 2,800 to 2,900 Angstrom region. Theory predicted otherwise but careful searches to find sunlight of shorter wavelength were unsuccessful in the past.

Using special apparatus which counts individual photons of light energy instead of employing a photographic plate, the Swiss scientists were able to jump the gap caused by ozone absorption from 2,800 to 2,400 Angstroms and detect the new ultraviolet peak having a maximum of 2,100 Angstroms. The new-found rays started to come through at 2,400 Angstroms. So deli-

cate was the method that the intensity was traced to nearly 1,900 Angstroms. The oxygen in the earth's atmosphere should cut off solar radiation less than 1,800 Angstroms of wavelength.

The research was carried out in a laboratory atop the Jungfrauoch in the Swiss Alps, at an altitude of 3460 meters—over two miles.

The new findings have important possibilities for high-altitude measurements of radiation from the sun and stars. Mirrors using aluminum instead of silver coatings have recently extended the



CAN YOU PICK THE "SYNTHETIC" SHEEP?

The two beautiful animals on the ends of the line have never tasted a blade of grass or a kernel of grain, but have thrived on purified food elements. A conventional grass-fed sheep is shown in the center for comparison.