BIOCHEMISTRY

Microbe Rodent Killer

New microbe extract, tried on laboratory mice as germ-killer, killed the mice instead; now seen as possible poison for rodent pests.

➤ A TERRIFICALLY deadly poison, extracted from a microbe that lives in the soil, may presently lighten the labors of modern Pied Pipers whose job is the wholesale elimination of the rodent pests that sabotage our food supplies and carry germs of bubonic plague and other diseases.

The poison was discovered in the course of researches by Prof. Selman A. Waksman and his associates at Rutgers University, New Brunswick, N. J., and the Merck Institute of Therapeutic Research at Rahway, N. J. What the scientists were really looking for was a chemical agent produced by microbes that would be valuable as a germ-killer.

They found a germ-killing substance, which they named actinomycin because the microbe that produced it belongs to the genus *Actinomyces*. It is similar to those microbes whose infections cause certain lung diseases, lumpy jaw in cattle, scabbyness in potatoes and a number of other diseases; but this particular species grew in the soil.

When Prof. Waksman and his coworkers tried actinomycin on various bacterial cultures in glass vessels, they found it had very good germ-killing properties. However, when they tried it on laboratory mice and other animals infected with bacteria, it was not as effective against the germs. Worse still, it killed the animals within 15 or 20 hours.

Actinomycin has a fearful potency as a killer of mice, rats and other rodents, producing fatal results in doses as small as one part by weight to a million parts of the animal's body weight. It is effective both when injected into the animal and when administered in food.

The idea of using the stuff for the treatment of human and animal diseases has been given up. It looks much more promising now as a rat poison, if enough can be produced at reasonable cost.

As a step toward possible eventual synthetic manufacture, it has been prepared as crystals, and a partial chemical analysis has been made. Actinomycin separates into two parts, designated as actinomycin A and B, respectively. The "A" portion contains carbon, hydrogen, nitrogen and oxygen; one provisional formula for the molecule reads: $C_{41}H_{56}N_8O_{11}$. It will be necessary, however, to determine the molecular composition more exactly, and to learn the details of its internal structure, before any attempts at synthetic production can be made.

Associated with Prof. Waksman in these researches were Dr. Harry J. Robinson, Dr. H. J. Metzger, Dr. H. Boyd Woodruff and Dr. Max Tishler.

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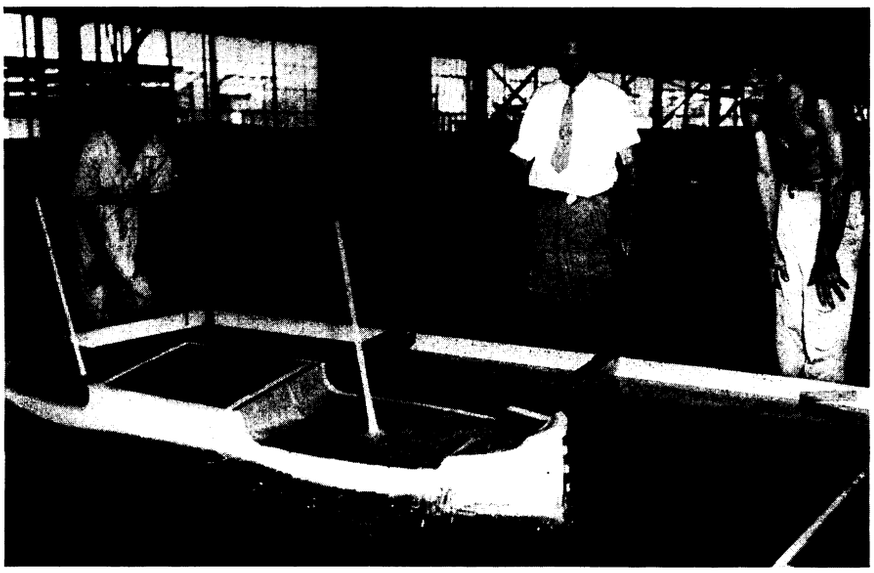

***MODEL LAUNCHING**—The narrowness of the Tennessee River at Decatur, Ala., makes it necessary for the Ingalls Shipbuilding Corp. there to resort to side launchings. While a ship is still in the blue print stage, a six-foot model is constructed and tested out in a tank which approximates, proportionately, the river's width. After it has hit the water, the model is closely observed for heel-over and the distance it floats before coming to rest.*

CHEMISTRY

Synthetic Sapphire Now in Production in U. S.

➤ SYNTHETIC sapphires for bearings in precision instruments essential in the war effort are now being produced commercially in sufficient quantities to meet the principal demands. This commercial production in America is a war development made necessary by the halting of the importation of European products.

Sapphire and ruby are both varieties of the mineral corundum, which is aluminum oxide. They are made by fusing extremely finely powdered aluminum oxide in an oxy-hydrogen flame in a special furnace. The product, unless coloring is added, is colorless.

Sapphire and ruby differ only in color. The coloring is obtained by mixing certain metallic oxides to the corundum powder before it is fused. Colorless sapphire is used usually for bearings. Coloring is added as a rule only when they are wanted for jewelry or for bearings in watches.

The value of the sapphire for bearings is its hardness. It ranks next to diamond. The average sapphire boule weighs about 200 carats. The term "rod corundum" is applied to synthetic sapphires of a long crystal form.

Spinel, another synthetic mineral, a red variety of which is called spinel ruby, is made from magnesium aluminum oxide. It is not as hard as sapphire but is harder than glass or steel. It also is used for bearings but is not yet being produced in commercial quantities.

Colorless sapphire was first formed in England about 40 years ago by means of what is called the Verneuil inverted

blowpipe method. Before then synthetic sapphire was opaque. Verneuil dropped finely powdered aluminum oxide through the flame of an oxy-hydrogen inverted blowpipe. The powder melted in the flame and small droplets fell on a fireclay rod placed below.

Several crystals formed, but soon one began to grow at the expense of the others. As more powdered corundum was added this larger crystal became an inverted, clear, pear-shaped mass or boule. Commercial methods were developed later from Verneuil's earlier work.

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CHEMISTRY

Army Insecticide

New aerosol dispensers for protection of the Army overseas from malaria mosquitoes use Freon and pyrethrum, a concentrated flower extract.

➤ MOST of the pyrethrum supply arriving in the United States is now going into the new aerosol dispensers for protection of the Army from malaria mosquitoes in critical overseas areas.

Little pyrethrum will be available, the Agricultural Insecticide and Fungicide Association told its membership, for agricultural use and almost none for the familiar household insect sprays. Other materials must be substituted for these purposes.

The supply of Freon, a non-poisonous gas used for refrigerating systems, is also used for the dispensers and can now be released only for essential refrigeration systems. The number of aerosol dispensers sent to the fighting fronts is very large, according to OWI reports.

The aerosol dispenser for control of insects is a new product. According to reports from the Agricultural Insecticide and Fungicide Association, the dispenser is a hand-size steel cylinder containing highly compressed Freon gas, a highly purified and concentrated pyrethrum extract and some sesame oil. The soldier unscrews a valve. Immediately a fine jet of gas and pyrethrum extract shoots out, resembling light smoke or fog, which kills mosquitoes. The finely-divided, fog-like particles are what is called "aerosol."

It takes only an instantaneous "shot" from the dispenser to get rid of mosquitoes inside a pup tent. A somewhat longer time will serve inside a bomber or transport plane. The one-pound dispenser can discharge the aerosol for almost 15 minutes and meanwhile treat a space 200 by 100 by 10 feet.

Of the chemicals shot from the dispenser and combining to make the aerosol, the most familiar ingredient is the pyrethrum. The pyrethrum flower is one of the oldest insecticides known. For several thousand years, the dried and powdered flowers of the plant, *Chrysanthemum cinerariaefolium,* have been used for insect control. Modern insecticides used in household sprays have been based largely on a concentrated extract from the flower, and such a concentrate is used for the aerosol.

The other major element in the aerosol dispenser, Freon, is the chemical dichloro-difluoro-methane. Used in peace time as a safe refrigerant, this chemical is non-poisonous and non-inflammable Since the pryethrum extract is also not irritating to humans, although fatal to many insects, it is possible for soldiers to remain inside the tent or native hut or wherever the aerosol is being used. This is important in malarial war zones.

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GEOLOGY

Hot-Water Mining Method For Potash Salt Invented

➤ POTASH for war supplies and fertilizer can be more completely and efficiently extracted from the depths of the earth by hot-water "mining" than by the present shaft-mining system, is the claim of Dr. Roy Cross, Kansas City chemical engineer, who has just been granted U. S. patent 2,331,890 on his new method.

The potash mining industry is relatively new in this country. At the time of World War I, we were completely dependent on the German potash mines, so that American industry and agriculture were hard hit until emergency sources could be developed. Since then, great potash deposits have been opened up in the Southwest, and we are completely self-sufficient in this important chemical.

Potash ores are at present extracted from underground beds in essentially the same way as coal, which involves the loss of great quantities of the mineral by leaving it in pillars to hold up the roof.

Dr. Cross' method is adapted for the extraction of one kind of potash mineral, sylvinite, which is mainly potassium chloride. It consists in driving a shaft into the bed, running a superheated solution of the chloride down through a pipe, collecting the saturated brine that rises in the return flow, and crystallizing out the potash salt. Common salt, or sodium chloride, which is present as an impurity in the mineral, is eliminated from the final product by suitable manipulation of the crystallizing temperature and concentration.

The method can also be modified for use in beds that have already been partly exploited by the old room-and-pillar mining.

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METEOROLOGY

Infra-Red Rays Penetrate Smoke in the Atmosphere

➤ WHEN THE AIR is full of smoke, much more infra-red radiation reaches us than visible or ultraviolet. In fact, infra-red rays penetrate a smoky atmosphere much better than formerly realized, it appears from a report made by Irving F. Hand of Blue Hill Observatory to the American Meteorological Society.

Calculations were made of the relative amounts of radiation that should be received of sunlight and light composed of only the longer wavelengths. These checked closely in the case of a smoke-free atmosphere, but differed noticeably when there was smoke, Mr. Hand stated.

"The range between the maximum and minimum values of total radiation during a ten-minute period in the presence of smoke was 2.3 times as great as the range between the maximum and minimum values of infra-red radiation," Mr. Hand pointed out.

Local forest fires which raged 20 miles or so west of the observatory furnished an excellent opportunity to study the change in radiation reaching the earth. Simultaneous measurements were made immediately before and during the passage of the smoke cloud.

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