

PHYSIOLOGY

# Energy Transfers Studied

Russian researches on physiology of muscle, conducted while Nazi bombers roared overhead, give useful hint to investigators of disease viruses working in America.

➤ RUSSIANS are aiding American efforts in other fields than those of war.

Basic research in life science, done at the Academy of Sciences in Moscow while Nazi bombers were nightly roaring over the city, has thrown new light on a problem under investigation by a biochemist working in New York. Dr. Kurt G. Stern of the Overly Biochemical Research Foundation told the story at the annual symposium of the Society for the Study of Growth held at North Truro, Mass., when he reviewed present knowledge of how molecules grow and multiply.

Academician W. A. Engelhardt and his Moscow colleagues were trying to find out how muscle fibers used food energy in their contraction. The picture they got was one of a complex phosphorus compound, adenylypyrophosphate, being split by the contractile muscle protein. When they made an artificial model of muscle by spinning threads of muscle protein, much as artificial silk is spun, and immersed it in a solution of the energy rich phosphorus compound, the fibers lengthened. They see a muscle as a spring put under tension in this way. When a suitable stimulus is applied the coil snaps back, the muscle contracts.

This picture, said Dr. Stern, helped him considerably in his efforts to understand the growth and reproduction of the big, protein-like molecules of disease-causing viruses, those ultramicroscopic particles about which there is at present much dispute as to whether or not they are live. Whether they are alive or not, Dr. Stern feels, is of less importance than a determination of the means by which they grow at the expense of their host cells.

One of the things that probably happens when virus particles multiply, Dr. Stern holds, is a piracy of energy from the same kind of phosphorus compound in the host cell by the parasitic virus particles. He suggested therefore that virus growth depends on the appropriation of the host cell's energy supply as well as its building material. This would explain, among other things, why viruses are always parasitic, feeding only on living cells of plants and animals, and

are never found as scavengers, feeding on the dead. Dead things might yield them building materials, but could offer no substances actively engaged in the transfer of life energy.

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## Key to Growth Problems

➤ COLCHICINE, known nowadays primarily for its use in originating new plant varieties, is used by Prof. Edgar Allen and his co-workers at Yale Medical School as a key to new knowledge on animal reproduction, and, incidentally, on the ever-present problem of cancer.

Colchicine is of value in this work, Prof. Allen explained at the meeting of the Society for the Study of Growth, because it "freezes" dividing cells in exactly the condition in which it finds them. Thus he is able to give supplemental doses of sex hormones to female rats and other small laboratory animals, follow that with injections of colchicine, and then kill and dissect his specimens at various time intervals, getting a series of clear pictures of just what has been going on.

One of the things he has found out is that the female sex gland at each reproductive cycle, starts to develop several times as many eggs as it finally discharges. As many as four-fifths of those that start never finish. The colchicine technique shows up the unsuccessful ones, some growing abnormally inside, others developing abnormally outside; the few that are "chosen" maintaining an even developmental balance throughout.

Nobody knows as yet why this happens. If the secret is eventually discovered it will obviously help in giving an understanding of comparative fertility in animals, and thus be of importance in both medicine and farm animal production.

Another discovery made with the aid of colchicine settles the old question of what happens during gestation to the muscles of the uterus, which cradle the young during the pre-birth period. Prof. Allen has definitely demonstrated that

these muscles undergo great cell multiplication and growth. After birth, there must be a great dying off and resorption of this emergency tissue, returning the muscles to their ordinary size.

Warning has often been issued by physicians against too free use of female sex hormones in medicine, lest these highly active growth-promoting compounds run growth out of bounds into the wild, anarchic growth that is cancer. Prof. Allen and his colleague, Dr. William Gardner have found just that, as a result of long-continued stimulation of growth in the sex organs with hormones. He has slides showing the first experimentally induced cases of cervical cancer in animals. Such cancers cannot be induced in all his animals, but they do arise in from 50% to 62% of the mice that survive hormone treatment for more than one year. Susceptibility seems to be partly a matter of heredity.

*Science News Letter, September 5, 1942*

## Vegetable "Guinea Pigs"

➤ WHAT PLANTS want for growth, reduced to simplest possible terms by experimenting with separated bits of plant tissue as a kind of vegetable guinea pigs, was described before the annual symposium of the Society for the Study of Growth by Dr. Philip R. White, of the Rockefeller Institute for Medical Research at Princeton, N. J.

Dr. White used three kinds of plant tissue cultures, similar to the chick heart and other animal tissue cultures made famous by the classic studies of Dr. Alexis Carrel. They were detached root-pieces of tomato and other plants, fragments of abnormal tumor-like growths produced by a hybrid tobacco whose parent strains "disagreed with each other" and pieces of crown-gall growth provoked on sunflower stems by bacterial attack.

Plant tissues, it was found, need 11 mineral salts (containing 16 elements), a supply of carbohydrate, three vitamins and one amino acid. Omission of some, like magnesium, calcium or sugar, causes immediate stopping of growth. Lack of others results in slowed-down or abnormal growth.

In the case of the masses of tissue from the tumor-like formations Dr. White found that the oxygen supply had a great deal to do with the kind of growth that would occur. As long as there was plenty of oxygen, they kept on producing cells that were practically all alike growing in no (*Turn to page 156*)

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supply the United Nations, and eventually much of the civilized world—if we are to keep it civilized.

All foods and supplies will need to be conserved. Garbage must consist only of completely unusable material. Former waste is now put to good use if placed in the proper hands.

Victory gardens next year may increase production as plant breeders develop improved varieties of vegetables and experiment with hormones and other strange chemicals, such as colchicine, which so change the plant's heredity as sometimes to produce a super-plant. Animal geneticists are conducting similar research.

With the growing shortage of farm labor, these methods of increasing yield from the same outlay may eventually be of real importance when put on a national scale.

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particular direction. But when any of these irregular lumps happened to sink beneath the surface of the nutrient fluid, thus reducing the oxygen supply, it would begin to develop stems and leaves. Brought up to the air again, it would revert to its original formless condition.

Dr. White expressed the belief that there must be other kinds of plant material that would lend themselves equally well to experiments on growth control, leading eventually to information of value in such widely separated fields of research as the growth of diseased tissue and the growth of crops.

*Science News Letter, September 5, 1942*

### Effects of Plant Germs

➤ DISRUPTING and deadly things done by one kind of germ that invades plant tissues, grimly suggestive of larger-scale invasions with which the world has recently become too familiar, were described by Prof. A. J. Riker, University of Wisconsin plant pathologist, at the symposium of the Society for the Study of Growth.

The germ is known to scientists as *Phytophthora tumefaciens*, and the gnarled and knotty swellings it causes are called crown galls. Crown galls damage any plant on which they occur, and kill many, so that they are one of the really serious sources of loss to agriculture.

When these germs invade plant tissues they do several things. They give off a number of substances, some of which are poisonous or irritating to the host

cells. The bacteria are also very greedy of oxygen, leaving the invaded tissues starved for that vitally necessary element. They produce changes in osmotic pressure and thereby cause the cells to swell. In some way they bring about abnormal production of growth-promoting substances such as hormones and vitamins, and they also provoke the concentration of large quantities of foodstuffs at the invaded spots.

Any of these factors could provoke rapid multiplication and growth of cells, Prof. Riker pointed out; it is therefore no wonder that all of them working together bring about wild growth and an anarchic breakdown in the plant's internal economy. The analogy with the invasion of a peaceful and orderly country by a robber horde is uncomfortably suggestive to even an ordinary imagination.

Laboratory experiments with the same bacteria gave dramatic illustration of the old adage, "What's one man's meat is another man's poison." The germs were robbed of their strength by contact with various amino acids, which are the vital building-blocks of proteins needed in the formation of ordinary, healthy cells. This discovery has no practical possibilities as yet, Prof. Riker explained; it is just an interesting bit of information about the enemy, which may at some future date be turned against him.

*Science News Letter, September 5, 1942*

#### RESOURCES

### Shortages Put New Oils In Home Medicine Chest

➤ A VOLATILE oil obtained from cedar leaves has recently been included in the U. S. Pharmacopoeia to replace imported oil of lavender, a perfume which is no longer available. Persic oil obtained from either peach or apricot kernels, likewise relieves the shortage of expressed oil of almond.

*Science News Letter, September 5, 1942*

### ● RADIO

Saturday, September 12, 1:30 p.m., EWT  
"Adventures in Science," with Watson Davis, director of Science Service, over Columbia Broadcasting System.

Dr. E. F. Kelly, secretary of the American Pharmaceutical Association, will discuss "Pharmacy and the War Effort."

Tuesday, September 8, 7:30 p.m., EWT

Science Clubs of America programs over WRUL, Boston, on 6.04, 9.70 and 11.73 megacycles.

One in a series of regular periods over this short wave station to serve science clubs, particularly in the high schools, throughout the Americas. Have your science group listen in at this time.