

New RNA Chemical Found

A substance that affects life processes by stimulating cell division and differentiation has been identified in nucleic acid of yeast

➤ A SIGNIFICANT discovery in understanding the growth and development of plants and animals has been made by scientists at Roswell Park Memorial Institute, Buffalo, N.Y.

Dr. Ross Hall and his co-workers at Roswell Park have found a substance that greatly stimulates cell division and differentiation. The substance, reported in the *Journal of the American Chemical Society*, 88:2614, 1966, is an integral part of the nucleic acid of yeast cells. It is called IPA, short for its chemical name N-6-(isopentenyl) adenosine.

IPA is found in the soluble ribonucleic acid of yeast cells, which is called s-RNA. The discovery is significant because nucleic acids are known to be a key controlling the life processes of a cell, of which division and differentiation are an integral part.

The research relates to two basic questions:

1. Why and how is the first single germ cell stimulated to divide into two new cells, a process that then continues until the organism is fully grown?

2. How are cells instructed to change from nonspecialized, general function cells to more specialized ones that perform specific tasks, such as in the eye or heart? This process is known as differentiation.

Together with cell division, differentiation results in a mature plant or animal in a way not yet understood, but with such infallibility that it is the subject of intense research.

Each cell in an immature organism contains all the genetic information needed for differentiation into any kind of specialized cell. This information is "locked up" until a "key" comes along to release it, thereby permitting differentiation to proceed in the specified direction.

The Roswell scientists find it easy to demonstrate the "startling effects" of IPA. As an example, pith cells taken from the cut stem of a tobacco plant are placed in two different test tubes containing agar growth medium. Both test tubes are then incubated at 82.4 degrees F. for a month, with IPA added only to one.

When the cultures are examined at the end of four weeks, the control tube has a small mass of pith cells, all of which are identical to the original ones. In the tube containing IPA, however, not only is much more growth evident, but leaves and stems have formed—showing that the original cells have divided and differentiated into a complete young tobacco plant.

IPA is the first naturally occurring

compound of its type to be found as an integral part of a nucleic acid, Dr. Hall said. He does not yet know whether or not there is any relationship between the ability of the substance to promote cell division and differentiation in plants and its presence in RNA.

However, Dr. Hall noted, it is "of considerable interest" that IPA contains

a particular chemical group, called an isoprene, that is known to be a basic building block for several important body substances, such as vitamins.

The way in which this group reacts chemically may influence the biochemical function of the s-RNA molecules in which it is located.

Dr. H. G. Zachau and his colleagues in Cologne, West Germany, have identified and located IPA right next to an area in the s-RNA molecule that is critical to the genetic coding properties of the molecules. This could be of importance in making certain proteins active in growth and development.

The isolation of a specific substance, called kinetin, that promotes cell division and differentiation was accomplished in 1955 by Dr. C. O. Miller at the University of Wisconsin.

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Roswell Park Memorial Institute

PLANT GROWTH ACTIVATED—The effect of N-6-(isopentenyl)adenosine on tobacco pith tissue are shown in the results obtained by Dr. B. I. Sahai Srivastava of the Roswell Park staff. The test tube on the left, the control, contains a small piece of tobacco pith tissue placed on agar containing salts and a few vitamins. The test tube on the right is pith tissue incubated under the same conditions except for the addition of five parts per million of IPA. The roots in the plant in the tube on the right clearly show how the added chemical induced differentiation in cell growth.