

This Week's Citation Classic

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Letham D S. Chemistry and physiology of kinetin-like compounds. *Annu. Rev. Plant Physiol.* **18**:349-64, 1967. [Fruit Res. Div., Dept. Scientific and Industrial Res., Auckland, New Zealand]

The article reviewed significant work on kinetin-like compounds (cytokinins) for the period 1960-1966. It discussed bioassays, occurrence and identity of natural compounds, synthetic cytokinins, effects of cytokinins on growth of microorganisms and plants, responses to cytokinins at the biochemical level, and translocation, metabolism, and possible mechanism of action of cytokinins. [The *SCI*[®] indicates that this paper has been cited over 120 times since 1967.]

D. S. Letham
Research School of Biological Sciences
Australian National University
Canberra City, ACT 2601
Australia

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"A degradation product of DNA termed kinetin, which induced cell division in plant tissue cultures, was isolated by Skoog and co-workers in 1955 and was identified as 6-furfurylamino-purine.¹ Although compounds with similar activity were known to occur in plants about 1950,² it was not until 1964 that the first of these (zeatin) was purified and identified as 6-(4-hydroxy-3-methylbut-*trans*-2-enylamino)purine.³ Kinetin-like compounds are now termed cytokinins. Today, naturally occurring cytokinins are known to be an important group of plant hormones involved in the regulation of many aspects of plant development. Leaf senescence in plants also appears to be at least partly controlled by cytokinins. Over 20 naturally occurring cytokinins have now been identified, and all are adenine derivatives. Cytokinins occur in a free form in plants and microorganisms and also as bases in tRNA species recognizing codons beginning with U. Cytokinins also evoke responses from animal cells. Hence interest

in these compounds now extends far beyond the boundaries of developmental botany. For a recent discussion of the biochemistry of cytokinins and their role in plant development, the reader is referred to *Phytohormones and Related Compounds — A Comprehensive Treatise*.⁴

"The review in question covered the years 1960-1966, during which important advances were made in our knowledge of cytokinins—the identification and synthesis of the first naturally occurring cytokinins, the development of numerous cytokinin bioassays, the recognition of many growth and biochemical responses which are characteristic of cytokinins, and the isolation of cytokinins from tRNA hydrolysates. Because of this, many workers have presumably found the review a useful source of information.

"The review was written when I worked in Mew Zealand in a small laboratory with very limited resources. There were no workers there with interests similar to my own for discussion of the literature. If there had been, a few publications mentioned in the review might have evoked more criticism than they did!

"The King's English was always my worst subject at school. Fortunately during my PhD course at Birmingham University, my professor (M. Stacey) and supervisor (A.S. Jones) both emphasized that good expression, meticulous practical work, and novel ideas are all equally important in chemistry research. They also stressed that the pure chemist should not be afraid to enter the hybrid area between chemistry and biology. These views were also promoted by my section leader (E.G. Bollard) in DSIR in New Zealand. The above three people endeavoured to improve my style of writing and stimulated my interest in biochemical and physiological problems. Hence, this page is dedicated to them, for without their help and influence, the review on cytokinins would never have been written."

1. Miller C O, Skoog F, Okumura F, von Saltza M H & Strong F M. Isolation, structure and synthesis of kinetin, a substance promoting cell division. *J. Amer. Chem. Soc.* **78**:1375-80, 1956.
2. Jablonski J R & Skoog F. Cell enlargement and cell division in excised tobacco pith tissue. *Physiol. Plant.* **7**:16-24, 1954.
3. Letham D S, Shannon J S & McDonald I R C. The structure of zeatin, a factor inducing cell division. *Proc. Chem. Soc. (Lond.)* **1964**:230-1, 1964.
4. Letham D S, Goodwin P B & Higgins T J V, eds. *Phytohormones and related compounds—a comprehensive treatise*. Amsterdam: Elsevier/North Holland, 1978. 2 vols.