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This Week's Citation Classic

Tjio J-H & Levan A. The use of oxyquinoline in chromosome analysis. *Anales Estacion Exper. Aula Dei* (Spain) **2:**21-64, 1950.

Treatment of live root-tips with 8-oxyquinoline improves the visibility of chromosomes in subsequent cytological preparations. The chromosomes contract and spread in the equatorial plate of squashed metaphase cells. Contraction induced during prophase also facilitates recognition of heterochromatin. The technique was tested successfully in about 40 plant species. [The *SCI*® indicates that this paper has been cited 192 times since 1961.]

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"In the late 1930s I read in a popular journal about the high incidence of scrotal carcinoma in 18th century English chimney sweeps and the dramatic reduction of such cancers in Denmark after the Chimney Sweeps' Guild instituted daily baths among its members. From this story I, like others, concluded that coal tar might induce carcinoma. As a cytogeneticist, I also learned from earlier publications that in malignant cells the chromosomes show aberrations of number and form. These ideas led me in 1947, while on a Dutch East Indies research fellowship, to test a variety of tar substances on dividing cells in onion root tips at A. Levan's laboratory in Sweden.

"The first substance, phenol, produced a low frequency of chromosome breaks. Compounds with additional hydroxyl groups on the benzene ring, such as hydroquinone and pyrogallol, were more potent, as were several complicated derivatives.

"The following winter in Spain, I tested other simple coal-tar constituents and their derivatives, pyridine, quinoline, and acridine. After using 8-oxyquinoline, I noticed that the metaphase preparations were unusually good, and that the prophase chromosomes showed clear differentiation of the so-called heterochromatin and euchromatin segments. Upon visiting Sweden again in the summer of 1949, I extended the observations to 44 plant species, delighted with the new details I was observing.

"I published this paper while working at the Estacion Experimental de Aula Dei in Spain. It described the technique, speculated on the mechanisms, presented descriptions and photographs of the findings in each species, and illustrated the measurements and detailed morphological descriptions that were made possible by the new method. At that period, soon after World War II, interest in genetics and cytogenetics was intense. The significant advances made possible by the use of 8-oxyquinoline started, or at least gave a big push to, a landslide of research that rapidly accumulated technical refinements and cytological discoveries.

"It is perhaps also relevant that the paper reported not only a new pre-treatment, but a simple cytological technique that was subsequently used by many workers, at first with little or no modification. The agent had several distinct effects, each of which has been a subject of further study. Finally, since it contained the first detailed karyotypes or chromosomal descriptions of 44 plants, many of them familiar objects of study, our report become almost a standard botanical reference work."