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This Week's Citation Classic®

Scott D B. Toxigenic fungi isolated from cereal and legume products.
Mycopath. Mycol. Appl. 25:213-22, 1965.
[Microbiology Research Group, South African Council for Scientific and Industrial Research, Pretoria, South Africa]

The paper describes toxigenicity of moulds recovered from domestic cereal and legume crops. Two hundred and twenty-eight mould strains, representing 59 species, were tested by feeding Pekin ducklings on maize meal infected with pure cultures. Forty-six strains, representing 22 species, caused death within 14 days. Thirteen of these species caused death or less severe toxic effects in weaned white mice or rats, while the remaining nine did not cause acute poisoning in the animals. [The *SCI*® indicates that this paper has been cited in over 125 publications, making it the most-cited paper for this journal.]

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The paper reported results of research on toxigenic fungi performed in the early 1960s. The work was initiated in 1961 when I was appointed research mycologist at the National Food and Nutrition Research Institute in Pretoria, South Africa. I am much indebted to Johannes van der Walt for his advice and encouragement during this work.

Since 1940 many papers have been published on the toxicity of "yellow rice" in Japan. For a long time fungi were suspected as the cause of the yellow rice, and in 1960[1] *Penicillium islandicum* was established as the principal cause of mouldiness. It was also discovered that this fungus produced at least two metabolites that caused marked degeneration of the liver and cirrhosis in white mice. At about the same time K. Sargeant and colleagues[2] revealed that a group of hepatotoxins, collectively called aflatoxin, are produced by *Aspergillus flavus*, a fungus that commonly occurs in groundnuts and maize products. These discoveries led to considerable concern among nutritionists and caused much speculation on the possible relationship between mouldy foodstuffs and the high incidence of primary carcinoma in Africa.[3]

Cereals and legumes may be infested by a wide variety of fungi; only a few were known to be toxigenic at the time of this paper. Before the discovery of aflatoxin, no systematic thought was given to the existence of mycotoxins in basic foods. My paper provided some information in this area and contributed much to the discovery of other important mycotoxins such as ochratoxin A, patulin, and the cyclopiazonic acids. I believe, however, that the success of this work cannot simply be attributed to the application of its screening tests for toxigenic fungi, but it is also due to the correct identification of these fungi down to the species level.

Later in my career I devoted my research efforts principally to identification and taxonomy of fungi. A sound taxonomic system for identification and classification of fungi is of great importance to many of the applied life sciences. In fact, I believe applied sciences such as mycotoxicology and plant pathology cannot be properly conducted without the participation of taxonomists. Unfortunately, taxonomists do not always receive proper recognition for their work. Therefore, selection of this article as "one of the most frequently cited works in its field" also gives credit to taxonomy.

Another reason this paper may have been widely cited is because it also contains a critical review of previously published information on toxigenic fungi. After the discovery of aflatoxin, specialists in various subjects such as microbiology, pathology, and organic chemistry became interested in mycotoxins. Numerous reports subsequently appeared in the literature, and many contributions came from South Africa. Papers on mycotoxins were published so frequently that journals like *Phytopathology* now provide a special heading for papers in this category. Sessions on mycotoxins also figured prominently at the last two International Congresses of Plant Pathology. A full-fledged symposium under the auspices of the International Union of Pure and Applied Chemistry is held regularly in different countries. During 1985 the Sixth International Symposium on Mycotoxins and Phycotoxins took place in Pretoria. At this meeting more than 250 delegates from 24 countries participated in 14 sessions of oral presentations. During this symposium 44 invited papers were delivered on topics such as detection, structure, biosynthesis, decontamination, and pathology of mycotoxins in human and animal foods.[4] The *Classic* paper and others published at that time have opened up many new avenues in the applied sciences.

1. **Miyake M, Saito M, Enomoto M, Shikato T & Ishiko T.** Toxic liver injuries and liver cirrhosis induced in mice and rats through long term feeding with *Penicillium islandicum* Sopp-growing rice. *Acta Pathol. Jpn.* 10:75-123, 1960.
2. **Sargeant K, Sheridan A, O'Kelly J & Carnaghan R B A.** Toxicity associated with certain samples of groundnuts. *Nature* 192:1096-7, 1961. (Cited 250 times.)
3. **Kraybill H F & Shimkin M B.** Carcinogenesis related to foods contaminated by processing and fungal metabolites. *Advan. Cancer Res.* 8:191-284, 1964. (Cited 95 times.)
4. **Steyn P S & Vleggaar R,** eds. *Mycotoxins and phycotoxins: collection of invited papers presented at the 6th IUPAC Symposium on Mycotoxins and Phycotoxins, CSIR, Pretoria.* Amsterdam: Elsevier, 1986. 545 p.

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