THE ASPERGILLI AS PATHOGENS OF CULTURED FISHES

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1. HISTORICAL BACKGROUND

2. CLASSIFICATION

3. THE PATHOGENIC ASPERGILLI

4. ASPERGILLUS INDUCED DISEASES

5. MYCOTOXINS
   5.1 Aflatoxins
   5.2 Aflatoxin Induced Hepatoma in Rainbow Trout

6. ASPERGILLOMYCOSIS
   6.1 Problems Associated with Studies on Mycotic Diseases in Fish
   6.2 Aspergillumycosis in Tilapias
   6.3 Isolation Methods
   6.4 Pathogenicity
   6.5 Microscopical Diagnosis

7. POSSIBLE CONTROL METHODS

8. CONCLUSIONS

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REFERENCES

1. Historical Background

The genus of moulds known as *Aspergillus* has always been a factor in man's environment. Even before the development of the microscope, *Aspergillus* colonies were well known as the white, yellow, green, red or black moulds seen on foods and rotting vegetation, although of course attempts at proper interpretation of the cause of such growths were not feasible.

Micheli (1729) was the first to distinguish the stalks and spore heads peculiar to the genus. He noted that the spore chains radiated from a central structure to produce a pattern that suggested the 'aspergillum' with which he, as a priest, was familiar. He therefore applied the name *Aspergillus* to the moulds he observed because of the similarity in appearance between the fruiting head of the mould and the brush (*aspergillum* L. = rough head) used for sprinkling of holy water.
Considerable interest had developed by the middle of the nineteenth century when the Aspergilli began to be recognised as active agents in processes of decay, as fermenting agents capable of producing valuable metabolic products, and significantly as causes of human and animal disease. With such cognisance came the first adequately described and illustrated species in the works of Fresenius, Van Tieghem, and De Bary, although Link (1809) had earlier introduced a few species names that are still recognised. The genus began to take definite form with the work of Wehmer (1901).

In 1926, Thom and Church attempted to put together all available material in the now obsolete monograph, *The Aspergilli*. Continued study of the aspergilli showed some of their groupings to be inadequate and considerable new information became available as the genus became increasingly investigated. In 1945, Thom and Raper published *A Manual of the Aspergilli* based on comparative study of thousands of strains of aspergilli in laboratory culture together with a few species recognised from published descriptions alone. In the years since 1945, many new species of *Aspergillus* have been described. Altogether, more than 132 species and 18 varieties are now recognised, in contrast to 77 species, and 8 varieties in the Manual of 1945 (Raper and Fennell, 1965).

Parallel with the dramatic increase in the size of the genus has been an even greater proliferation of the published literature relating to the aspergilli as agents of decomposition, as tools for physiological and genetic studies, as agents responsible for the production of a variety of products in industry, and significantly, as primary or secondary pathogens of animals and man.

2. Classification

For many years, considerable confusion existed as to the names which should be applied to members of the genus and even in modern times, not all mycologists agree with the current principles used in its classification. As originally used by Micheli (1729), the name was applied to the sexual stage of certain common species. Eighty years later, Link (1809) introduced the name *Aspergillus glaucus* for the conidial heads of a fungus he found on herbarium specimens, and not realising their common origin, applied the name *Eurotium herbariorum* to the yellow cleistothecia formed by the same fungus. The common mycelial origin of the structures to which these names were given was clearly demonstrated by De Bary in 1854. Thom and Church (1926) and Thom and Raper (1945) suggested that the generic name *Aspergillus* should be applied whether or not an ascosporic (sexual) stage was produced. Their suggestion was based on two principles, viz: that finding and describing the sexual stage merely completed the