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J.B. Georg W. Fresenius and the Description of the Species *Aspergillus fumigatus*

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The species *Aspergillus fumigatus* was described in 1863 by Johann Baptist Georg Wolfgang Fresenius [1] as cited below

"*Aspergillus fumigatus* Fresenius

Mycelium astig, sparsam septirt, unifarbt. Sporentragende Faden nach oben allmählich keulenförmig verdickt, in ein kugeliges, nach Entfernung der Sporen $\frac{1}{10}$, bis $\frac{1}{5}$; mm dickes Köpfchen ausgehend, unterhalb desselben bei durchfallendem Licht unter Wasser rauchgrau, nicht septirt, nur selten an der Basis oder auch in der Mitte mit einer Querwand. Verdickung der fructificirenden Hyphen, wie es scheint, nur selten; Figur 5, sowie das Figur 8 abgebildete Fragment konnte vielleicht hierher zu ziehen seyn. Fine so beträchtliche Ramification, wie in dem von Virchow mitgetheilten Fall von Bronchienverschimmelung (a. a. O. Fig. 3, d) ist mir bis jetzt noch nicht vorgekommen. Träger der Sporenketten langlich; der von ihnen bedeckte Theil des Köpfchens sepiafarben. Sporen $\frac{1}{10}$, mm gross, rund, einfach, glatt, grünlich. Die Faden mit dem sporenlosen Köpfchen haben eine Länge von $\frac{1}{10}$, - $\frac{1}{5}$, mm. Bei der Form von *Otis tnrdo* fand ich die längsten Hyphen auch $\frac{1}{10}$, - $\frac{1}{5}$, mm messend.

Diese schöne, durch ihr Vorkommen interessante *A. rpergil/us*-Form hatte ich fivher Gelegenheit, in mir zugekommenen Excmplaren aus der menschlichen Lunge. von Virchow und Pagenstecher herriihrend, kennen zu lernen, und vor Kurzem bei einer Trappe (*Otis tordu*) des Frankfurter zoologischen Gartens zu beobachten, in deren Bronchien und andern Lufthöhlen Dr. Weinland sie aufgefunden hatte. Beide Fälle wurden von mir in den Sitzungen des mikroskopischen Vereins dahier besprochen; ich kann mich jedoch hier um so kurzer fassen, als iiber these und eine nahe verwandte *Aspergillus*-Form Virchow im Archiv fupathol. Anat. Bd. IX, Heft 4, und Robin in seiner Hist. nat. des vegetaux parasites bereits ausführlicher gehandelt haben. Die in Rede stehende Art ist dem *A,shergillct.s nigrescen.s* Robin uae verwandt, auch in Beziehung auf den Standort ('sur des productions morbides tapissant les sacs aeriens d'un faisan'), unterscheidet sich aber durch grünliche Sporen (die Sporen

von *A. nigrescens* werden op(tco-fttsecz v. nigrer genanvt), ttnd die Besechaffenheit der sporentragenden Hyphen; letztere werden bei der Robin'schen Art als aus mehreren aneinandergereihten, an den Bervhrungsstellen sogar etwas eingezogenen, articulirten Zellen bestehend beschrieben, wahren die fertilen Hyphen des *A. fumigatu,s* nicht septirt sind, vergl. die Abbildungen, besonders Figur 2, wo ein vollständiger Faden von seinem Ursprung aus dem Mycelium an dargestellt ist. So ist es hier die Regel; nur selten kommt eine Querwand vor, wie in Figur 6, oder in der besonders langen, '/_ mm messenden Hyphe Figur 1, in deren Mitte sich eine Auftreibung findet und wo sich unten in dem verschmalerten Theil eine zweite Querwand zeigt; aber eine Beschaffenheit der Faden, wie bei *A. nigrescens* babe ich hier nie bemerkt. Von *A. glaucus* ist unsere Art so verschieden, dass sie nicht damit verglichen werden ka[n, und auch von den andern beschriebenen Arten stimtnt keine genügend damit uberein." (Fig. 1.)

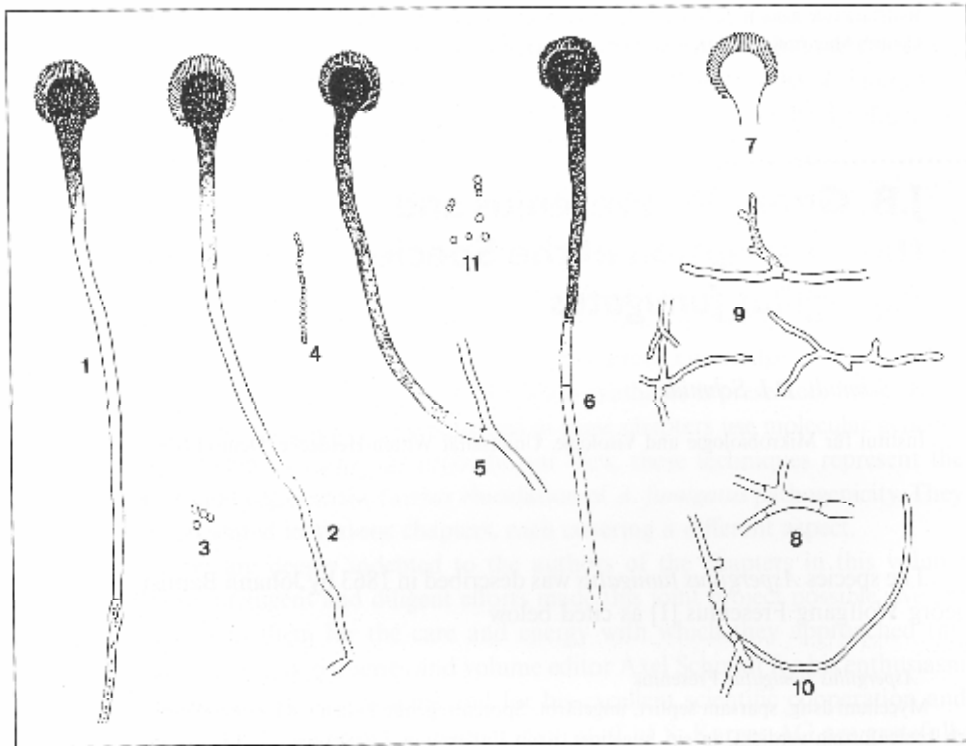


Fig. 1. "Tafel X Figur 1-4 aus den Bronchien und Lufthohlen der Trappe, 1-3 nach 350mal. Vergrosserung. 4 eine Sporenkette. Figur 5-11 aus der menschlichen Lunge; 9 u. 10 Theile vom Mycelium; sammtliche Figuren 350mal vergrossert."

`Mycelia branched, sparsely septated and colorless. Spore-bearing chains (=conidiophores) somewhat broader and club-shaped at the end, after removal of the spores ending in a thick head with a size of 0.015-0.03 mm (in diameter). Below the head (the conidiophore is) a smoky grey color if observed in a wet mount, not septated and only rarely having a septation at the base or in the middle. Hyphae which show fructification (=conidiophores) seem to be only rarely branched as shown in figure 5, and figure 8 where fragments of the fungus are shown. I could never observe an extensive branching as published by Virchow from an isolate obtained from a case of a (human) bronchial mould infection (fig. 3, d).

Spore-bearing elements (=conidiophores) elongated; the part of the head bearing the spores is somewhat sepia-brown in color. Spores are 2.5 µm in size (diameter), globose, single celled, smooth, with a green color. The chains together with the sporeless head (=conidiophores) have a length of 0.15-0.3 mm. In an isolate which I found in an infection of the bustard species *Otis tarda* I could observe the longest hyphae with a size of 0.25-0.3 mm (in length).

From my studies of isolates obtained from human lung infections by Virchow and Pagenstecher I had the chance to learn more about this fascinating species of *Aspergillus* which is also attractive because of its distribution. Recently, Weinland also isolated a strain from the bronchi and lung of a bustard which died at the zoological garden in Frankfurt. I discussed all these cases during meetings of the microscopy association (?). To make it short, I want to refer to this species and a closely related species of *Aspergillus* as already described by Virchow in *Arch Pathol Anat'*, vol IX, No. 4 and by Robin in '*Hist Nat Vegetaux Parasites*'. The species I describe is closely related to *Aspergillus nigrescens* Robin also as far as its distribution is concerned ('sur des productions morbides tapissant les sacs aeriens d'un faisan'). It differs from this species because of its green pigmentation of the spores [the spores of *A. nigrescens* are called (*A. ?*) *opaco* Jusca v. *nigra* (?)]. Further, the species as described by Robin shows septated spore-bearing hyphae (=conidiophores) with constrictions at the septation site. In contrast, *A. fumigatus* has no septated fertile hyphae (=conidiophores) as is shown especially in figure 2 which shows a whole hyphae beginning at the (basal) mycelium. This occurs regularly in *A. fumigatus*; only rarely can septation be observed as shown in figure 6. Septation can also be seen in the extremely long hyphae with a length of 1 mm as shown in figure 1. In this case the hyphae was thickened in the middle, and in the thinner part towards its base a second septum could be observed. I could never observe (frequent) septations (evident) in *A. nigrescens*. The species we describe here is very different to

A. glaucus and also from all other (*Aspergillus*) species which have been described so far.'

'Tafel X'. Figures 1-4 show isolates obtained from the bronchi and the lung of a bustard, figures 1-3: 350 x magnification. Figure 4: Single spore chain. Figures 5-11 show isolates obtained from human lung tissue; figure 9 and 10: parts from the mycelium. All figures x 350 magnification.

(The translation was performed as strictly as possible in accordance with the German text.)

J.B. Georg W Fresenius [2] was born in Frankfurt a.M., Germany, on 25.9.1808 and also died there on 1.12.1866 of pneumonia. He studied medicine in Heidelberg, Wurzburg and Giessen (all Germany) and finished his doctorate thesis (MD) in Giessen in 1829. Fresenius started his career as a physician and surgeon in Frankfurt a.M. in the same year. He became a university lecturer for botany at the 'Senckenbergischen medicinischen Institut' (this institute specialized in botany-especially research on medicinal herbs-though astronomical research was also performed) in Frankfurt a.M. in 1831 and became the director of the botanical gardens of Frankfurt a.M. in the same year. He was awarded a professorship in botany in 1863.

The monograph 'Beitrage zur Mykologie' (Contributions to Mycology) was published by Fresenitts as a dedication for the centennial celebrations of the Senckenberg foundation ('Senckenbergische Stiftung') on 18.8.1863 in Frankfurt a.M. It has 132 pages and further contains 13 excellent lithographic figures (camera lucida) and is divided into three parts which were published together as a monograph. The three parts are identical concerning their structure and are a list of descriptions of fungal species. Part 1 (pp. 1-38) was already published in 1850 and part 2 (pp. 39-80) in 1852 on its own. The whole monograph, including the third part (pp. 81-132; this part also contains the description of the species *A. fumigatus* on pp. 81-82 and lithographic 'Tafel X') was published in 1863 and contains an overall description of 132, mostly new or revised fungal species and/or genera.

References

- 1 Fresenius G: Beitrage zur Mykologie. Frankfurt a.M.. Bronner. 1863, pp 81 -82.

2 Kalluorigen W: Siebenhundert Jahre Heilkunde in Frankfurt am Main.
Frankfurt a.M., Diesterweg Verlag_ 1936. pp 268-269.

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