Self-Penetration by the Mycoparasite *Dimargaris cristalligena*

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Summary

Ultrastructural evidence is presented for self-penetration by hyphae of the mycoparasite *Dimargaris cristalligena*. Plasmalemmal invagination occurs in a manner similar to that observed during penetration of a conventional host, and is accompanied by the synthesis of a penetration jacket. During self-penetration, however, there is little collar formation and the invading hypha fails to differentiate into a haustorial body.

Keywords: Fungi; Mycoparasitism; *Dimargaris*.

*Dimargaris cristalligena* Benjamin is a haustorial mycoparasite with a host range restricted to certain members of the *Mucorales*. The ultrastructural details of the infection process have been reported previously (JEFFRIES and YOUNG 1981) and in the same paper brief reference was also made to the phenomenon of "self-penetration". Since this earlier report, several more cases have been observed ultrastructurally and in this paper further details are given for comparison with conventional infection of a compatible host.

The observations have all been made using material prepared for studies of the infection process of *Dimargaris cristalligena* on the reference host *Cokeromyces recurvatus* Poitras, and the methods have been described previously (JEFFRIES and YOUNG 1981). The hyphal wall of *C. recurvatus* is relatively thick (100–200 nm), except at the apex, and is homogeneously fibrillar in appearance. It does not show any stratification of staining density when thin sections are stained in a conventional manner. The vegetative hyphae of *D. cristalligena*, however, possess a thinner, structurally amorphous wall region, which consistently appears with two layers of different staining characteristics (JEFFRIES and YOUNG 1979). In other cases, self-penetration takes place into the swollen, germinating spores of the mycoparasite, and these can again be recognized by their typical wall structure (JEFFRIES and YOUNG 1982). In addition to the two layers of different electron density similar to those of the vegetative hyphae, the germinating spore also retains remnants of the original outer spore wall as fragments scattered over the surface of the cell (Fig. 1).

Germinating spores of *C. recurvatus* are quite different in ultrastructural appearance from those of *D. cristalligena* (JEFFRIES and YOUNG 1982). We are quite satisfied that the interactions described represent true cases of self-penetration rather than aberrant examples of the conventional host/mycoparasite interaction. Self-penetration is a relatively rare phenomenon and represents less than 1% of the total number of infection sites examined in the dual interaction.

Self-penetration occurs from an appressorial-like swelling (Fig. 1) and is usually accomplished in the absence of the formation of a collar of papilla material by the invaded hypha (Fig. 1) as is usual in a compatible host-mycoparasite interaction (JEFFRIES and YOUNG 1981). The plasmalemma of the self-penetrated cell is invaginated by the penetrative hypha and surrounds the infection peg, from which it is separated by a layer of electron-lucent material, possibly derived from the inner layer of the vegetative hyphal wall (Figs. 1–3). Additionally, an electron-dense deposit may be laid...
Fig. 1. Longitudinal section through an appressorium (ap) and a penetration hypha in an example of advanced self-penetration. The wall of both invaded and invasive hyphae have the ultrastructural appearance of that of *D. cristalligena*. × 22,400

Fig. 2. Serial section of the infection site shown in Fig. 1. × 50,000

Fig. 3. Terminal region of infection structure shown in Fig. 2 showing deposition of electron-dense material on both sides of the interfacial matrix. × 80,000