How sporangial renewal occurs in watermolds

[DeterminantApices.doc]

David E. Padgett

Distinguishing between primary and secondary zoosporangia in the watermolds is important both for determining ‘valid’ sporangial discharge and for selecting which sporangia are ‘valid’ to measure for length, width, and area. Correct characterization of watermold species requires that only primary (and not secondary) sporangia be used for observing discharge or for measurements. Read the following paragraphs carefully and study the explanatory diagrams so that you can understand how to distinguish between primary and secondary sporangia.

When a hypha is young its growing tip can continue to grow vegetatively or it can produce a reproductive structure (e.g. a sporangium, an oogonium, an antheridium, a gemma). Before it decides what to do we say that it’s tip (apex) is indeterminant (i.e. it has not yet been determined what the tip will do). Figure ‘A’ in the diagram shows a young hypha with its indeterminant apex (IA). If the original apex decides to become a sporangium, its destiny thereafter is determined. Once the sporangium is delimited by a basal septum, the original apex can no longer do anything besides produce and liberate zoospores. The sporangium, thus, is a ‘determinant’ apex of the original hypha and the new IA is the living tip just below the basal
septum of the primary sporangium (figure B). Figure C shows the new IA having decided to grow out to the side. In figure D the sympodial growth of the new IA has resulted in the production of secondary sporangium. When this has occurred the secondary sporangium (the tip of the indeterminant sympodial branch) has become a ‘determinant’ structure (the secondary sporangium) and the living tip just below the septum of the secondary sporangium is now the new IA. This process can be repeated as illustrated in figure E. When you see sympodial renewal in a watermold species you can trace back downward along this hyphal complex and locate the original sporangium (the primary sporangium) in the series.

Figures F-H illustrates internal proliferation-type sporangial renewal. After the primary sporangium has been delimited, the new IA is just below the sporangial septum. Figure G shows the new IA having decided to grow upward filling some of the cavity of the discharged primary sporangium. Figure H shows the proliferated apex having become a secondary sporangium (a determinant structure) and the newest IA is now the living tip below the basal septum of this secondary sporangium.

Understanding this process will enable you to determine which sporangium is the primary one and which others are secondary (i.e. having been produced by some type of renewal process) regardless of the process by which secondary sporangia are produced.