

# Mentoring undergraduate research with the *Epichloë*-tall fescue symbiosis

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A science undergraduate research experience can benefit students in a number of ways—students learn first-hand about the process of science, develop critical thinking skills, and begin to identify as a scientist—which can increase retention in science careers. The actual value of an undergraduate research experience depends on a number of factors including the length of the research, the student's ability to understand the conceptual basis of the project, and the type of mentoring. Faculty-mentored undergraduate research is common at small liberal-arts institutions. These same institutions often have little funding for research, leading to budgetary constraints. The grass fungal endophyte study system between *Epichloë* and tall fescue will be used to assist students to understand research methodology and processes at a small liberal-arts college where all biology undergraduates complete at least one semester of research. Examples will be provided of student projects to illustrate the utility of this study system to provide undergraduates, who have different levels

of preparation and engagement, a successful research experience. The projects have focused on the ecology of the symbiosis and include the use of detection and culturing techniques, feeding assays, field surveys, greenhouse experiments, artificial infections, and the development and application of a novel bioassay. Results of student research, including a recent experiment supporting the ability of a brine shrimp bioassay to detect differences in the mammalian toxicity of wild-type common-toxic and selected commercial *Epichloë* endophytes of tall fescue will be highlighted. Mentored students often publish and/or present their research—providing the opportunity for them to more fully participate in the process of science. This study system works well for undergraduate research because the projects can be conducted relatively inexpensively, the techniques are accessible, and the conceptual framework to understand the basics of this symbiosis is within reach of undergraduate students.