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Interrogating Plant Cell Culture Library for Novel Antimicrobial Agents

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The Plant Cell Culture Library (PCCL) at UMass Amherst contains more than 2,200 live plant cell cultures, representing diverse plant species from around the world. The availability of this collection offers a rich resource for us to discover bioactive phytochemicals and uncover their mechanisms of action. Using data-mining surveys of bioactive plant extracts, I have organized subsets of PCCL cell lines that are likely to possess antifungal, antibacterial, antiviral, anthelmintic, anti-trypanosomal, or anticancer properties, which prove to be useful when deciding which species to screen first against a specific pathogen. Another distinct advantage of using the live plant cells in this research is the ability to stimulate the biosynthesis of pathogen-specific phytochemicals upon simulation of an attack (elicitation) by the microorganism in question. This could be accomplished by pathogen homogenates or plant hormones responsible for mounting defenses to infection.

Over the past six months, I have been working to optimize elicitation, lysis, and extraction conditions for obtaining high-throughput screening materials to be used against variable pathogens. Equipped with crude extracts from appropriately elicited cells, I am collaborating with a multidisciplinary team of UMass scientists to develop and implement high-throughput screening protocols for profiling a large number of plant-derived materials against various pathogens. Recently, I have screened a small pool (40) of extracts derived from cell lines with predicted anti-fungal properties against the highly resistant strain of fungus *Fusarium oxysporum,* one of the causal agents of an opportunistic infection often seen in immunocompromised patients known as fusariosis. Gratifyingly, I have found several plant species that produced specialized metabolites with better antifungal activity than the leading antibiotic against *F. oxysporum*, Amphotericin B, validating this line of antimicrobial research. We are also actively reaching out to other academic labs partners to form partnerships in diverse antimicrobial research venues.

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