Pan-Cancer Mycobiome Analysis Platform to Predict Survival and Treatment Response

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Background & Unmet Need

• The tumor microenvironment (TME) is a complex ecosystem of immune cells, extracellular matrix, blood vessels, and other cell types.
• While the microbiome (bacteria) has been shown to participate in the TME and influence response to cancer treatments, the role of the mycobiome (fungi) is poorly understood.
• For instance, the gut microbiome plays a significant role in whether patients respond to anti-PDL1 treatment.
• An improved understanding of the TME and the role of bacteria and fungi may lead to the development of improved diagnostics and treatments.
• Unmet Need: Improved platform for analyzing the tumor microbiome and mycobiome.

Technology Overview

• The Technology: A computational platform to extract fungal sequences from sequencing data of human tumor samples.
• The Discovery: Candida-to-S.Cerevisae ratio were predictive of metastatic colon cancer.
• Fungal species, specifically C. albicans and S. Cerevisae species, are prognostic markers of disease progression and worse clinical outcomes of GI cancers.
• PoC Data: Fungal species associate with primary tumor samples and with different stages of disease, specifically in GI tumors.
• The technology provides a novel method of screening and stratifying cancer patients who may be candidates for antifungal therapy.

Inventors: Iliyan Iliev, Anders Dohlman, Xiling Shen

Patents: PCT Application Filed

Publications: Dohlman et al., Cell. 2022.

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## Technology Applications

- Computational platform to identify tumor-associated fungal species
- Development of a prognostic resource specifically for GI cancers where the technology has identified Candida ssp. as markers for disease progression and outcome
- Identification of potentially druggable fungal species to improve patient outcome

## Technology Advantages

- The technology offers a unique framework to detect tumor associated fungal species
- The insights gained through the application of the technology could identify new prognostic markers and inform new treatment strategies such as antifungal therapies
- Future advances in detection of fungal DNA in blood samples could allow non-invasive diagnostics

### Supporting Data / Figures

**Figure 1:** Fungi are present in human tumor samples. A rigorous multistep analysis is used to remove signal from spurious contamination. LGG, derived from brain tumors, serves as a negative control.

**Figure 2:** Candida levels associate with late-stage colon tumors (COAD) and metastasis, but not in head and neck (HNSC) and stomach cancer (STAD).
Supporting Data / Figures

Figure 3: The presence of specific fungi are associated with overall survival. *C. albicans* levels are significantly associated with reduced survival in head and neck cancer. *C. tropicalis* levels are significantly associated with decreased survival in stomach and head and neck cancers. *Saccharomyces* spp. were associated with decreased survival in stomach cancer. No significant associations between fungi and survival were found for colon cancers.

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