Fungal Species Cross-Reactivity in Semen Testing (Immunochromatographic Assays)

Gina Della Santina and Wendy Gruhl, MS
Loyola University Chicago, Forensic Science Program, 1068 W. Sheridan Rd., Chicago, IL 60660
(Presented at the Loyola University Chicago Undergraduate Research and Engagement Symposium, 2023)

Introduction

In forensic case work, enzymatic and immunochromatographic assays are used to indicate the presence of semen. The fastest of these tests is the enzymatic assay for acid phosphatase (AP). AP is found in high levels in semen and is found in low levels in other fluids such as vaginal secretions (Jones). AP is also found in high levels in mushrooms (Jones).Therefore mushrooms can serve as a false positive in the AP test for semen.

Antibody-based assays, including P30 and Semenogelin(Sg) immunochromatographic assays, are more time consuming but have less cross-reactivity with other fluids. This is due to the specificity of antibody-antigen interactions. A review of literature of the cross reactivity of fungal samples and P30 or Semenogelin, no results could be found.

This research evaluated cross-reactivity of edible mushrooms in P30 and Semenogelin immunochromatographic tests.

Objectives

- Collect samples from edible mushrooms and process in the P30 immunochromatographic assay
- Collect samples from edible mushrooms and process in the Semenogelin immunochromatographic assay

Materials and Methods

Mushrooms (9)

- oyster, shiitake, baby bella, chanterelle, trumpet royale, black trumpet, dried porcini, enoki, and dried lobster mushrooms

Sample Collection

- 2mm x 2mm sample collected from interior of cap; skin and gills removed (where possible)

Test performed according to manufacture protocol

- ABAcard p30 test for the forensic identification of semen
- RSID-Semen
- Seratec PSA Semiquant (P30)

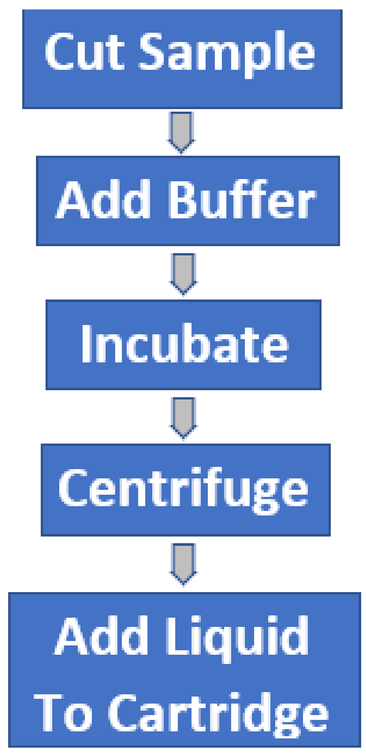

Figure 1: General Steps of Immunochromatographic Assay

Results

- All mushrooms produced negative results across all tests

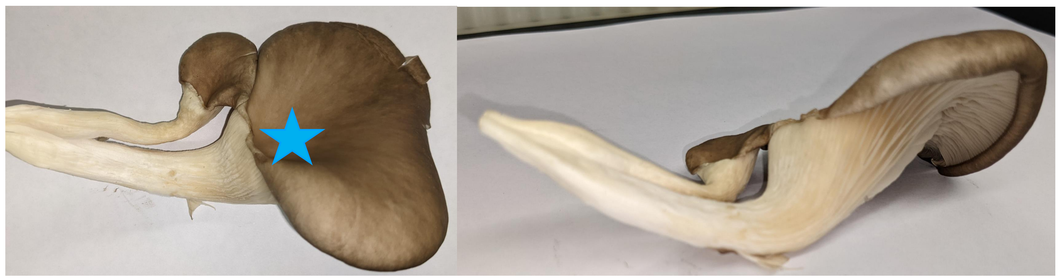

Figure 2. Image of Oyster Mushroom
The sample that was tested on the three immunochromatographic assay tests was cut from the cap area. The gills (right) and skin (dark areas) were removed for testing. Star- approximate sample location.

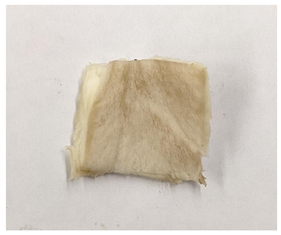

Figure 3. Section of the Oyster mushroom (left)
This is an internal cut of the mushroom with the skin and gills removed. This sample is about 6mm x 7mm.

Sample (mushroom)	ABAcard (P30)	Seratec (P30)	RSID (Sg)
Positive Control	positive	positive	positive
Negative Control	negative	negative	negative
Oyster	negative	negative	negative
Shiitake	negative	negative	negative
Baby bella	negative	negative	negative
Chanterelle	negative	negative	negative
Trumpet Royale	negative	negative	negative
Black Trumpet	negative	negative	negative
Dried Porcini	negative	negative	negative
Enoki	negative	negative	negative
Dried Lobster	negative	negative	negative

Table. Results of Mushrooms tested on the different test kits
Positive and negative controls (middle color) were performed alongside each set of mushrooms that were tested each day. The results were negative for all samples.

Discussion and Future Work

- The research demonstrated no cross-reactivity of mushrooms in immunochromatographic assays for semen
- Additional work may include:
  - Cutting samples from other locations of the mushroom such as stem
  - DNA extraction of precut samples and quantification of human DNA
  - Microscopic examination of fungal samples

References

- Diamandis, Eleftherios P., and He Yu. “NONPROSTATIC SOURCES OF PROSTATE-SPECIFIC ANTIGEN.” *Urologic Clinics of North America*, vol. 24, no. 2, 1997, pp. 275–82, https://doi.org/10.1016/S0094-0143(05)70373-6.
- Li, Richard. *Forensic Biology* Second Edition. CRC Press. 2015
- Jones Jr., Edwin. “The Identification of Semen and Other Body Fluids.” *Forensic Science Handbook*. Second Edition., Prentice Hall, 2002. Chapter 8.