THE OHIO STATE UNIVERSITY

COLLEGE OF FOOD, AGRICULTURAL, AND ENVIRONMENTAL SCIENCES

Antifungal Resistance in Humans and the Environment

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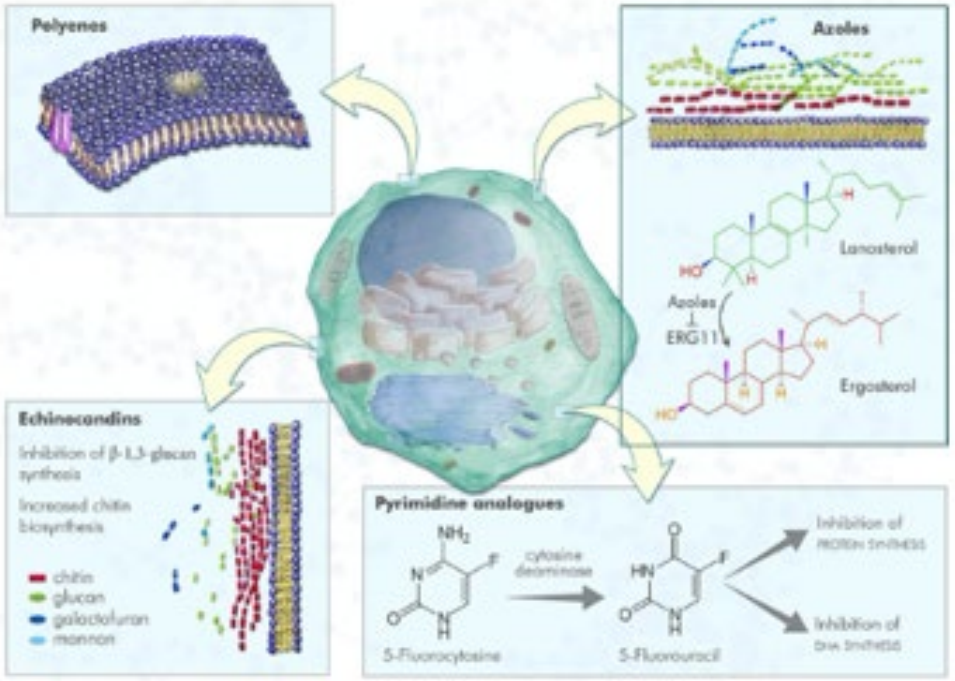
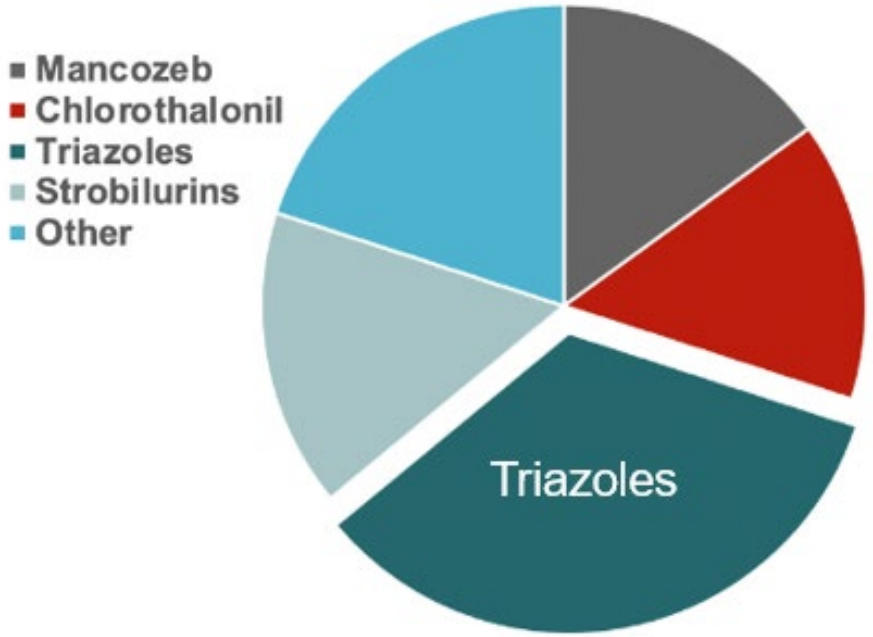
Antifungal Use in Plant, Animals, Humans, and Industry

Fungicide and Clinical Antifungal Use in the United States

Clinical Antifungal Market Segmentation by Product



Fungicide Market Segmentation by Product



Citation: Initiatives for Addressing Antimicrobial Resistance in the Environment: Current Situation and Challenges. 2018.

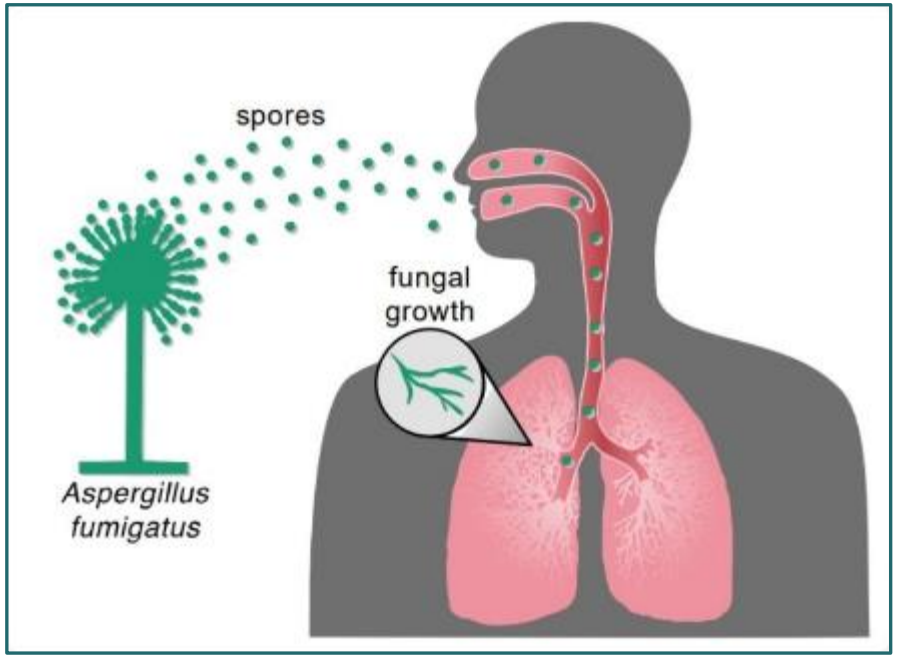
Photos courtesy of: N. Ward, UK; C. Bradley, UK; AgCanada

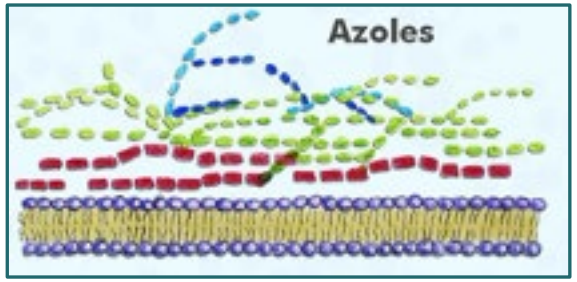
Aspergillus in the Plant Environment

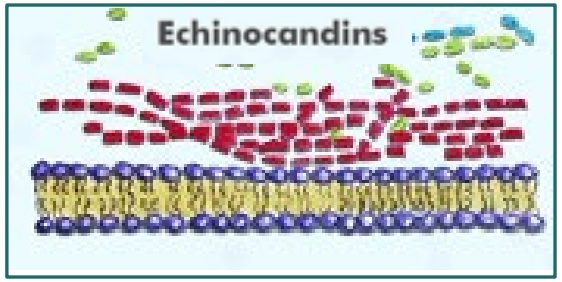
- Vegetation decomposers critical to carbon and nitrogen cycling
- Some are weak but important plant pathogens
- Some are human opportunistic pathogens
- Some produce toxins that affect humans and animals

Aspergillus in the Clinical Environment

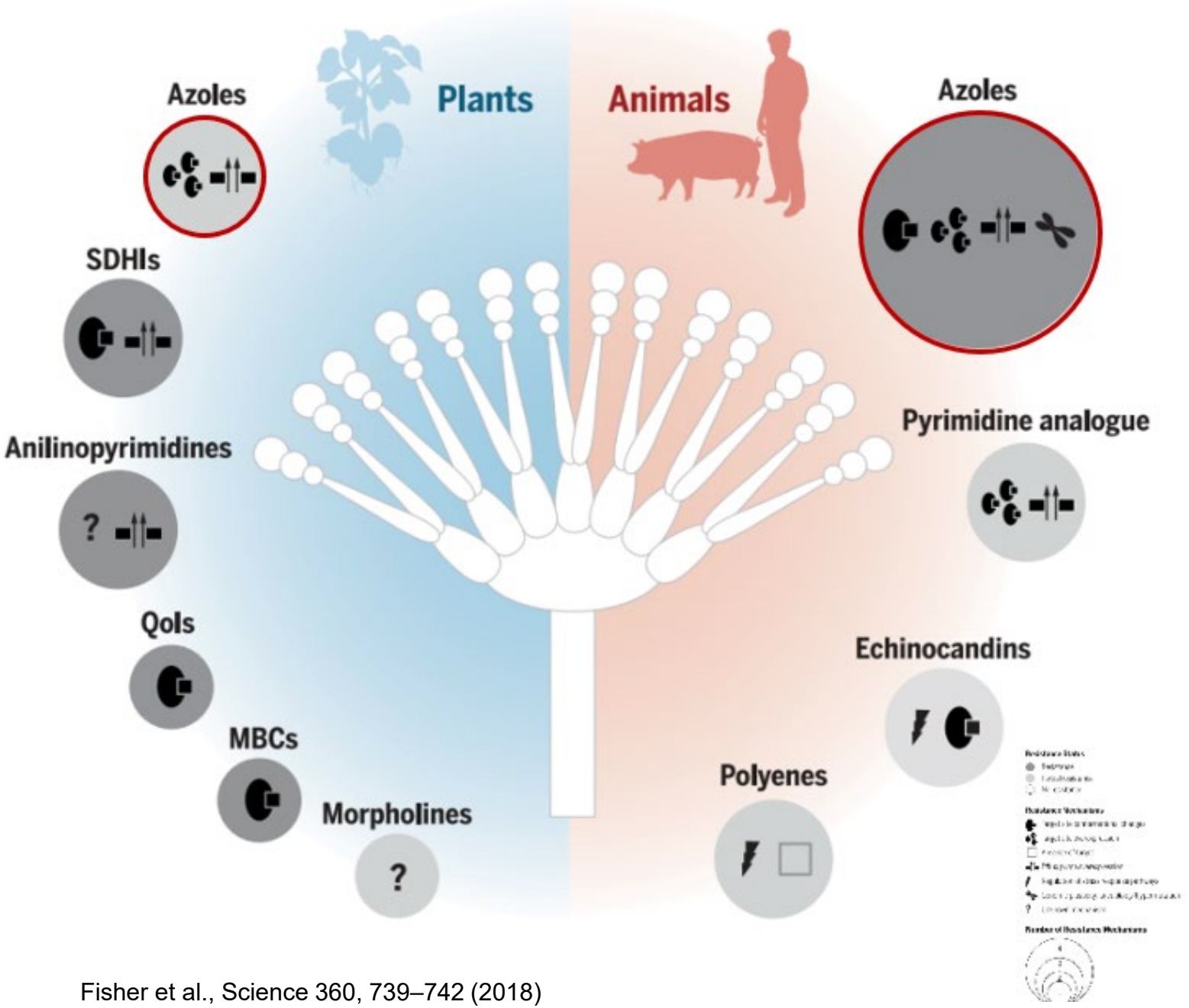
- Causes acute and chronic aspergillosis
- *A. fumigatus* is responsible for the majority of cases
- Airborne and waterborne
- **Azoles** and echinocandins are the primary antifungals used to treat aspergillosis
  - Resistance to azoles is a global health concern







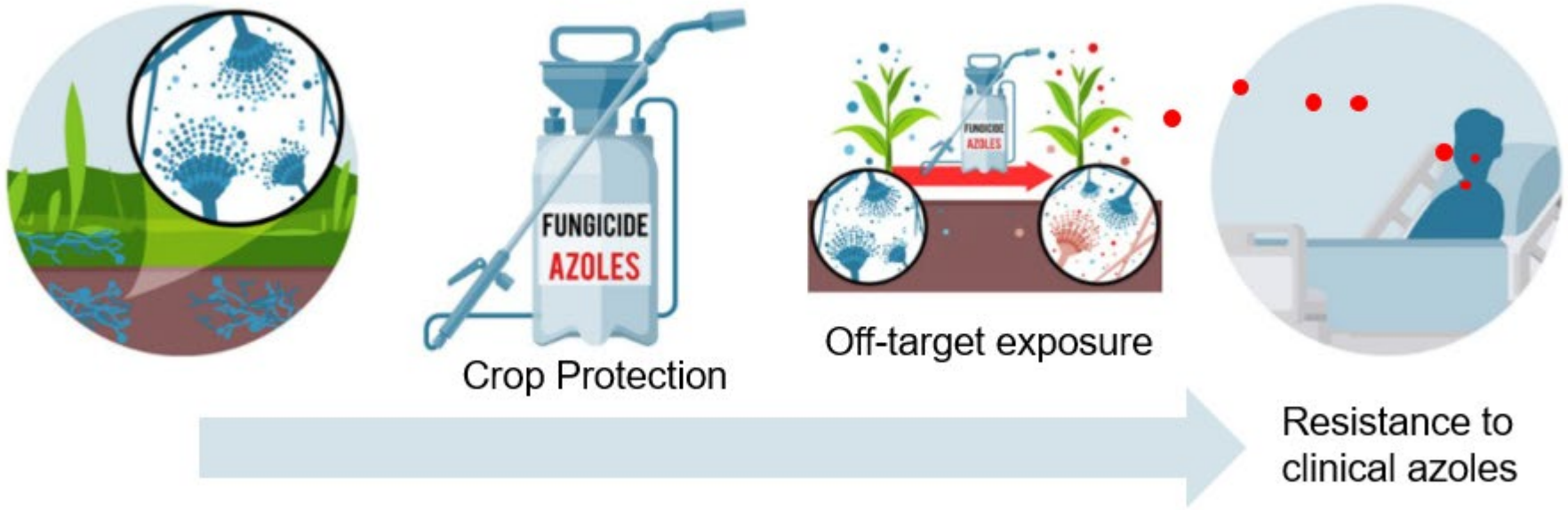
Dual Use of Azoles in the Field and Clinic



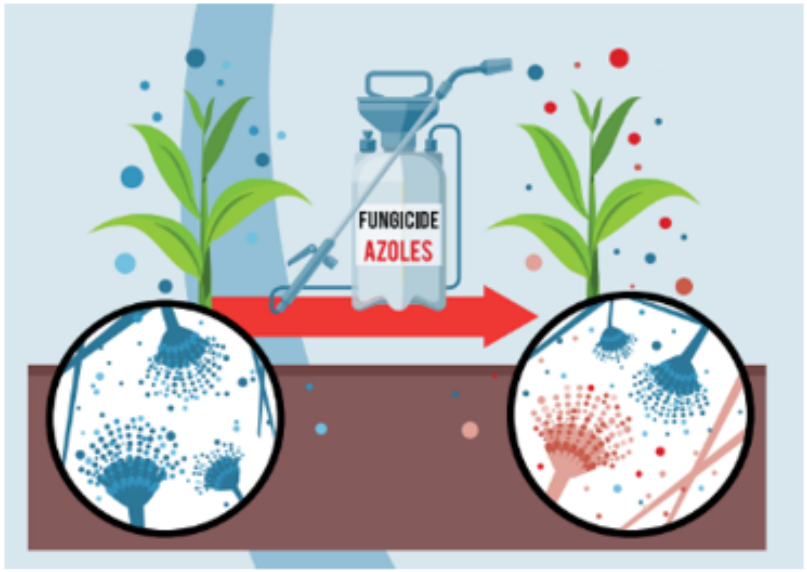
Fisher et al., Science 360, 739–742 (2018)

From Field to Clinic: Azoles Resistance in *Aspergillus fumigatus*

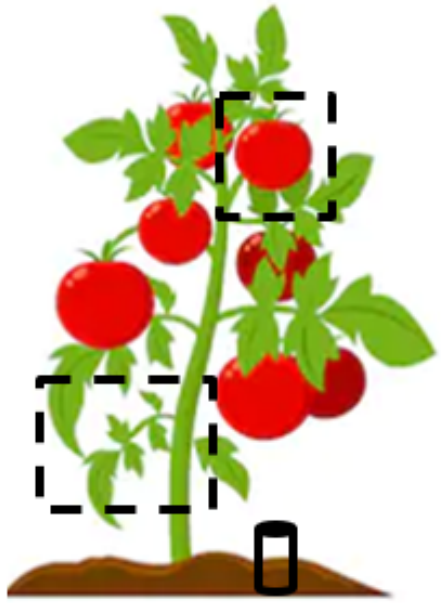
- Azole fungicides used for crop protection have activity against off-target fungi including *A. fumigatus,* leading to isolates with resistance to clinical azoles



Survey of Azole Resistant *A. fumigatus* in a Tomato Production Field

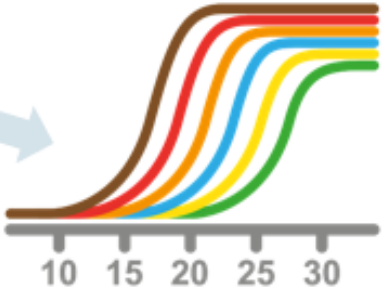


Weekly applications of propiconazole



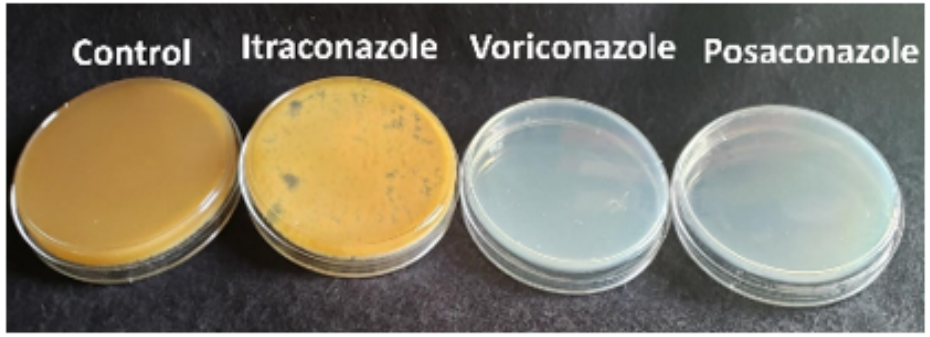
Soil, foliar and fruit sampling

Bioassays
N=695



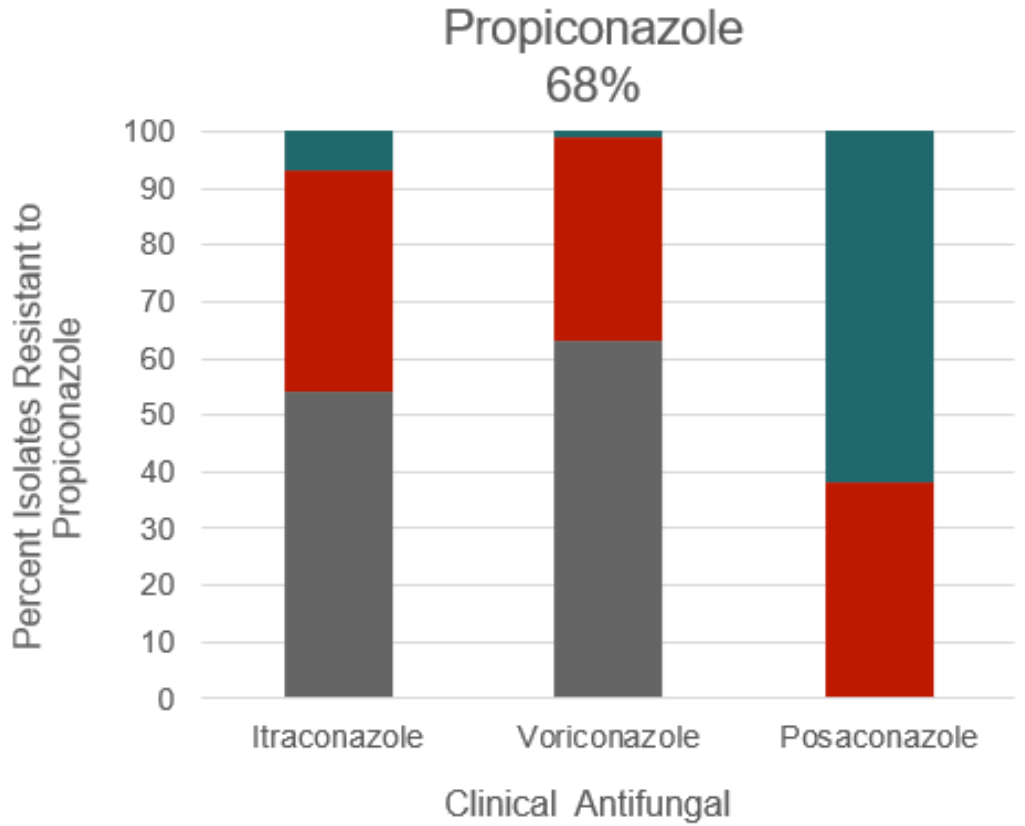
Real-time PCI
& HRM Curve
Analysis
N=109

Relative Proportion of Antifungal Resistant or Moderately Resistant *A. fumigatus* Isolates



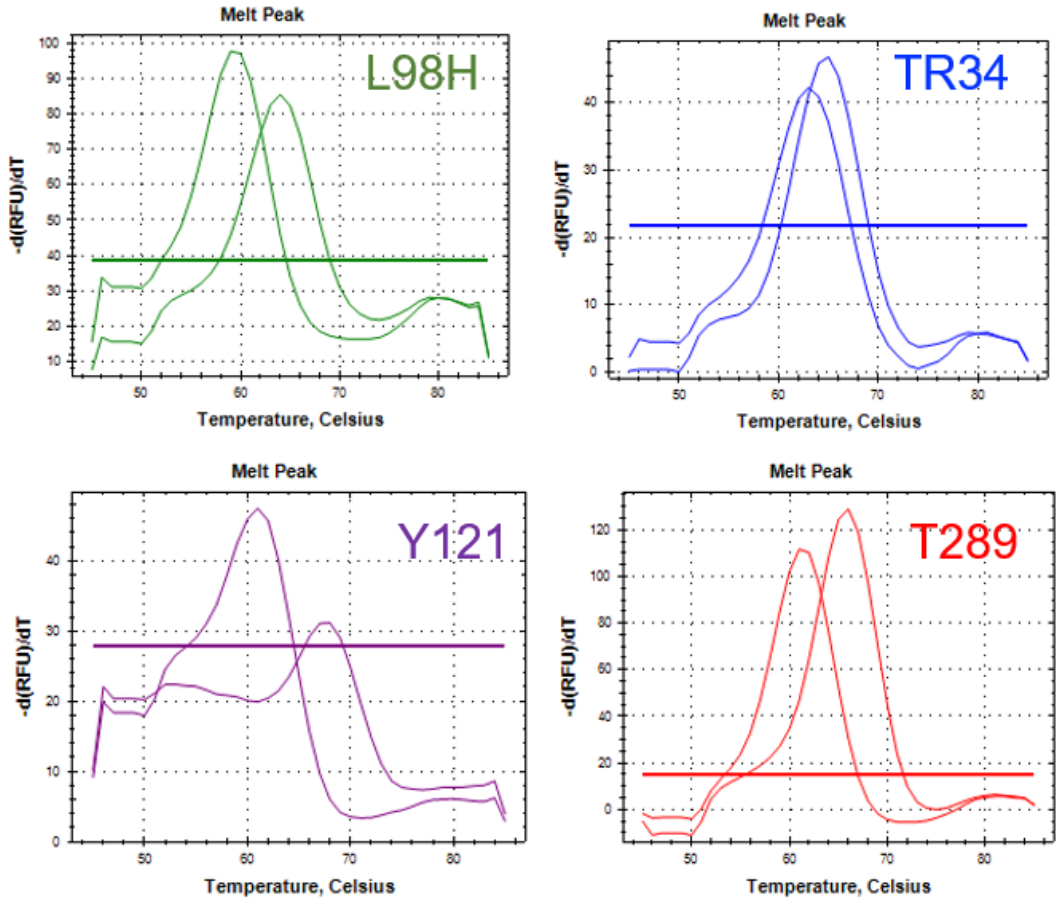
N=109

Resistant | Moderately Resistant | Sensitive



Mechanism of Resistance of Ohio Isolates is Still Unknown

- Tandem repeat mutations were not detected in any of the isolates with the resistant phenotype
- CYP51 gene sequencing and/or whole genome sequencing will be necessary to decipher the genetic basis of resistance



Acknowledgements

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CDC