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What are ear rots?

Why should I care?

Common Ear Rots of Corn

Aspergillus

Diplodia

Fusarium

Gibberella

Penicillium

Trichoderma

Nigrospora

Cladosporium

Which molds produce mycotoxins?

Aspergillus

Diplodia

Fusarium

Gibberella

Penicillium

Trichoderma

Nigrospora

Cladosporium

What are mycotoxins?

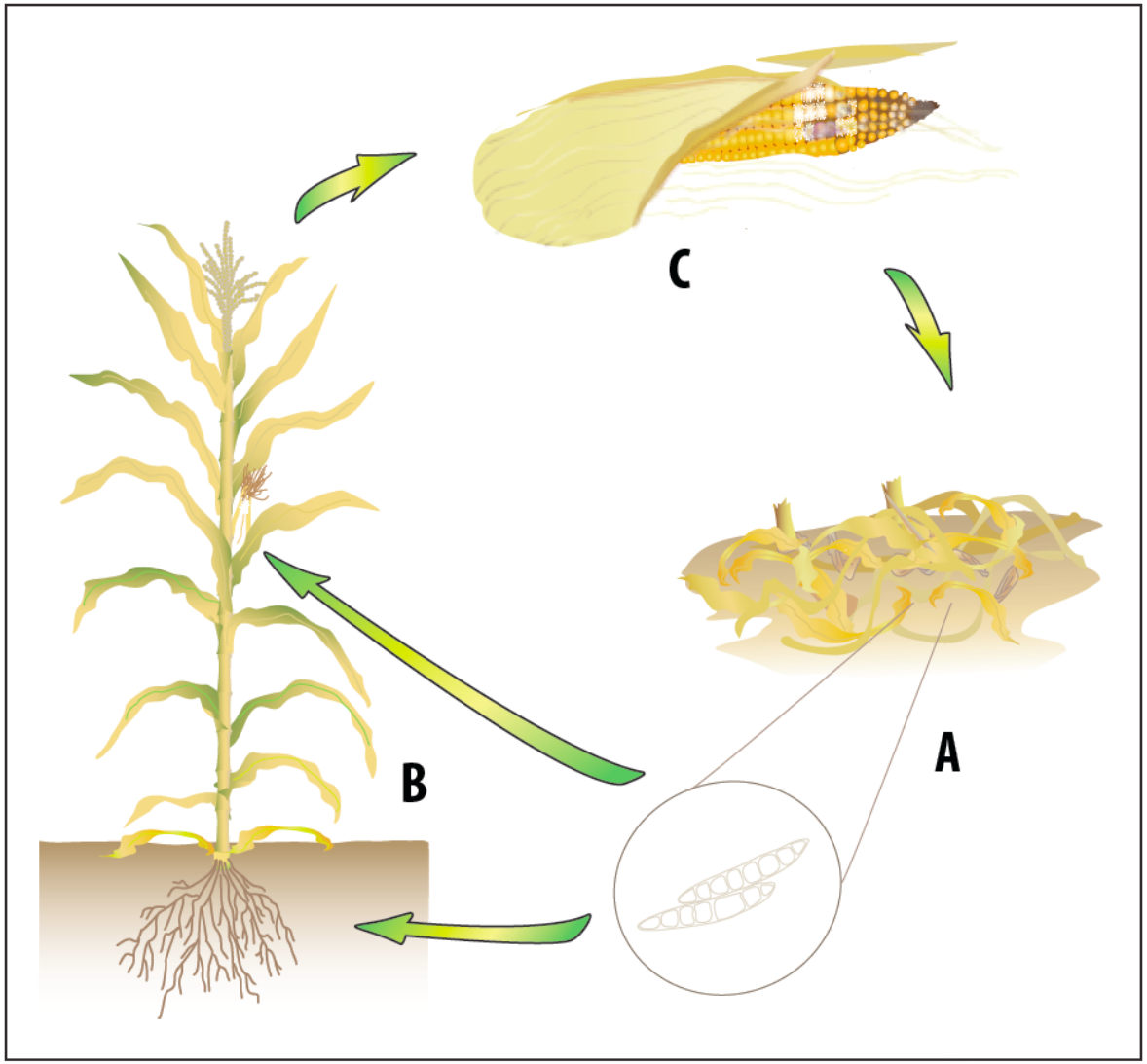
Secondary metabolites produced by some fungi

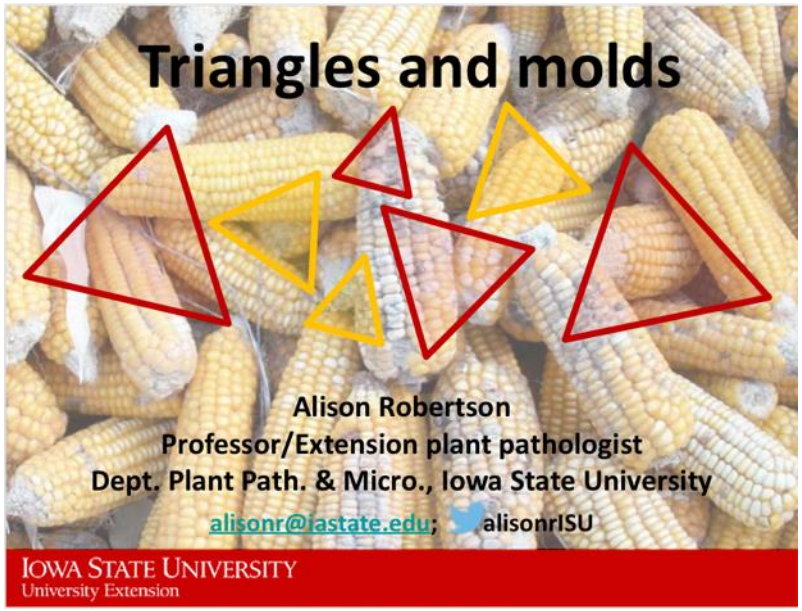
Toxic to farm animals, wildlife and humans, e.g.

- loss of appetite
- lethargy
- incoordination
- difficulty breathing
- reduced weight gain

Where do ear rots come from?

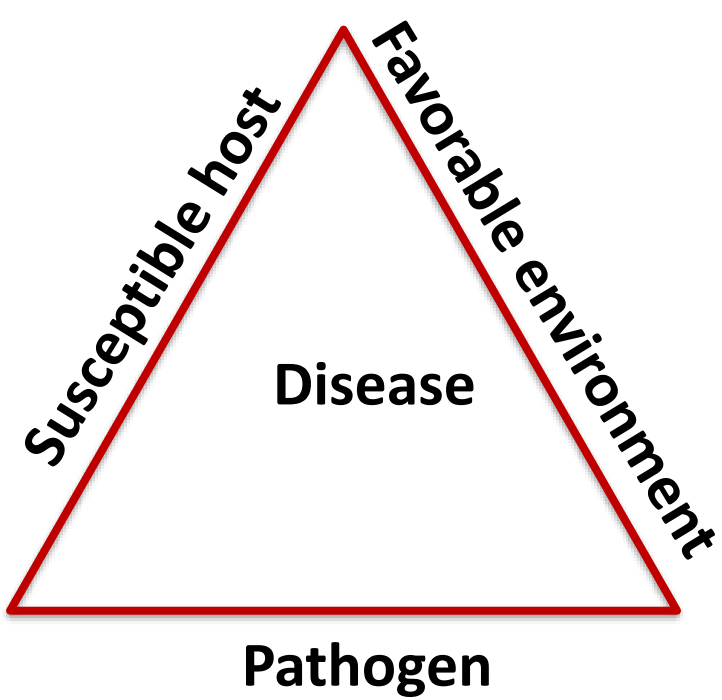
Mold disease cycle

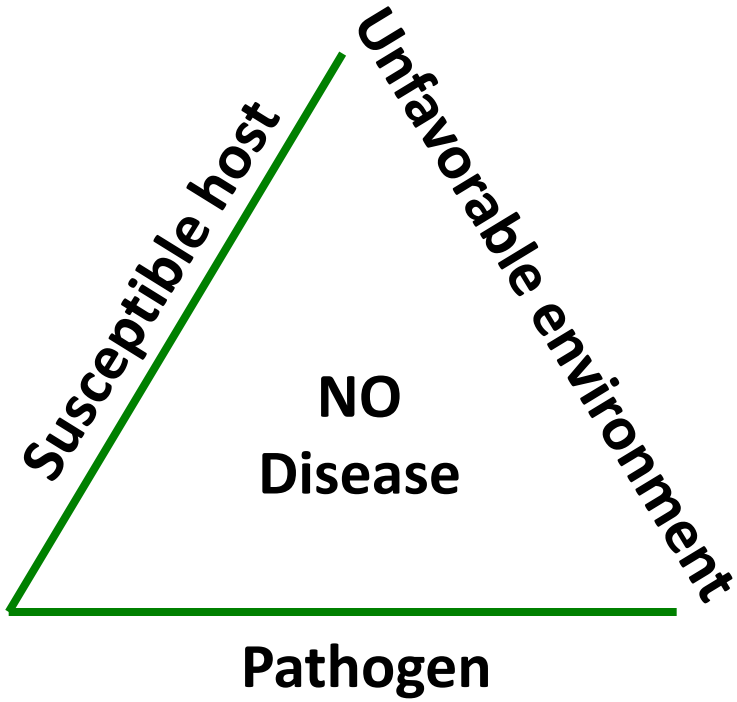




What do triangles have to do with mold?

The Disease Triangle





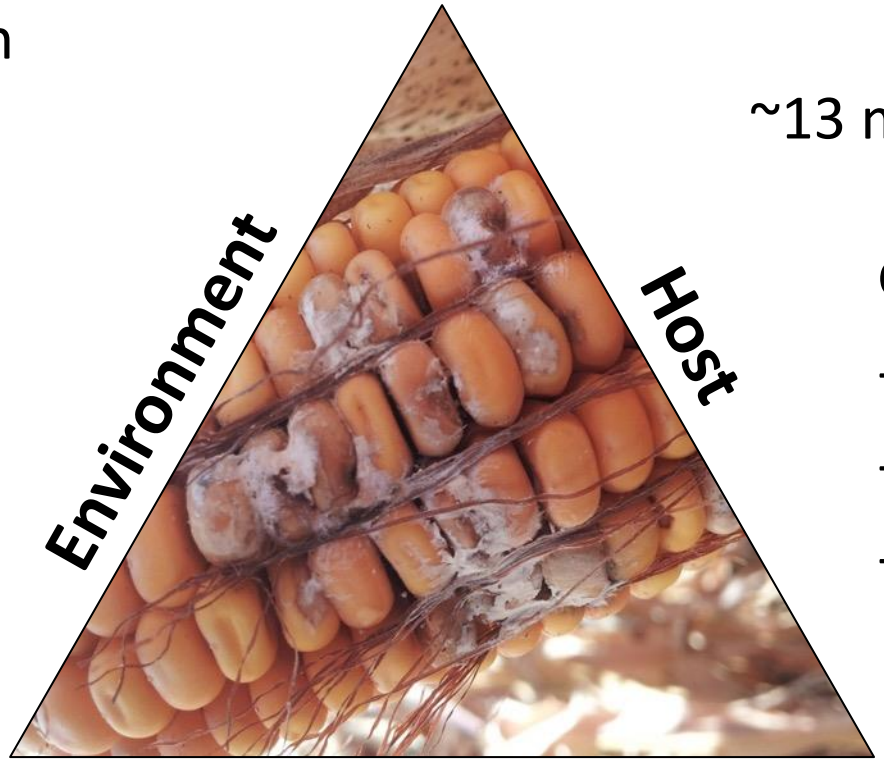
Disease ONLY results when there is a susceptible host, a pathogen present and favorable environmental conditions

Mold disease triangle

Favors infection and disease development

↓

Dictates what ear rots will predominate



~13 million acres!

Genetics vary:

- Tight husks
- Fast dry down
- Upright ears

Survive in crop residue and soil

Favorable conditions for mold development

Aspergillus ear rot
Hot and very dry conditions; prevalent during droughts

Fusarium ear rot
Moderate temperatures (50-86F) ; grain moisture >16%

Gibberella ear rot
Cool, wet conditions during flowering and through grainfill.

Favorable conditions for mycotoxin production

Aflatoxin

High temperatures (78-90F); **night time temp > 80F**; grain moisture >17%

Fumonisin

Moderate temperatures (50-86F) ; grain moisture >16%

DON (vomitoxin)

Alternating cool (70-82F) and warm temperatures; wet period during flowering

ZEN (zearalenone)

High moisture content (> 22%); alternating high and low temperatures during maturing and harvesting stage (45-70^{o}F)

How can I recognize these molds?

Aspergillus ear rot

Olive-green or yellow green powdery mold

Usually develops around injuries

Aflatoxins

Gibberella ear rot

- Bright pink to red mold
- Usually begins at the ear tip (infection occurs via silks (green))
- Can cause reddish discoloration of kernels and butt
- May develop around injuries

Vomitoxin (DON) and **Zearalenone (ZEN)**

Fusarium ear rot



White-pale pink mold, tan or brown colored kernels, or star-burst streaks

Infection via insects, wind blown spores onto silks or systemically through root infection

Fumonisins

Diplodia ear rot

Dense white mold

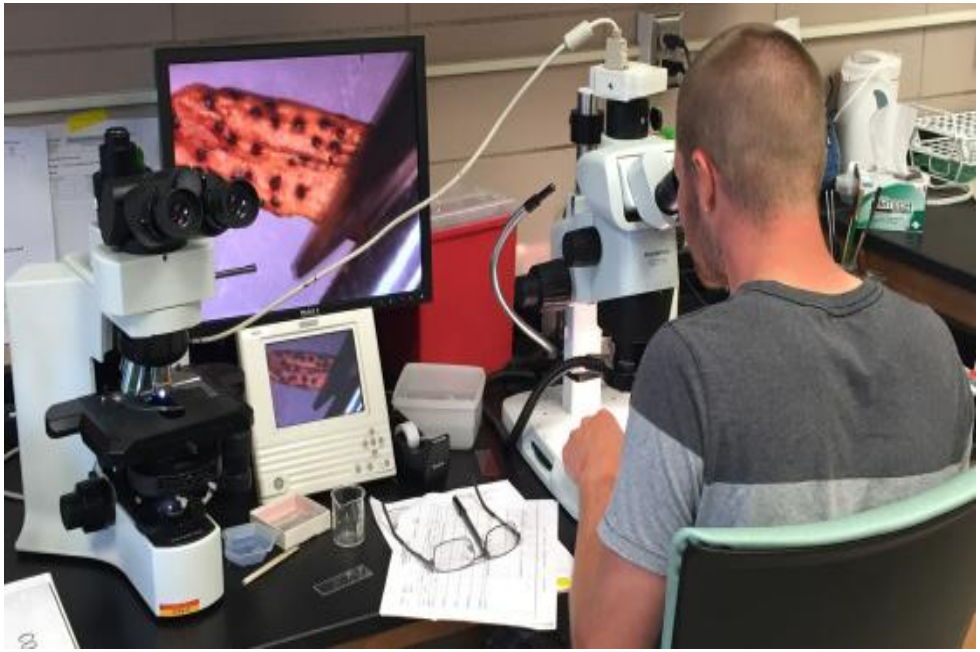
Begins at the base of the base

Favored by cool, wet weather

Scouting tip: look for a dead ear leaf

No mycotoxins in U.S.

Plant and Insect Diagnostic Clinic



Clinic.ipm.iastate.edu

- We diagnose plant problems, identify insects and provide management advice
- Confirm common problems
- Investigate less common problems when they arise

Mold and mycotoxin management

Hybrid – resistance; tight husks; suitability

Crop rotation and residue management

Minimize stress – planting population, fertilization, etc.

Insect management – Bt; or scout + insecticides

What about foliar fungicides?

Plant Health Progress ◆ 2017 ◆ 18:186–191 https://doi.org/10.1094/PHP-01-17-0010-RS

Research

Impact of Foliar Fungicides on Gibberella Ear Rot and Deoxynivalenol Levels in Indiana Corn

N. R. Anderson, M. P. Romero Luna, J. D. Ravellette, and **K. A. Wise,**† Department of Botany and Plant Pathology, Purdue University, West Lafayette, IN 47907

Accepted for publication 8 August 2017.

Fungicide applications at R1

- reduced (or increased) Gibberella ear rot
- no effect on [DON]

No economic benefit

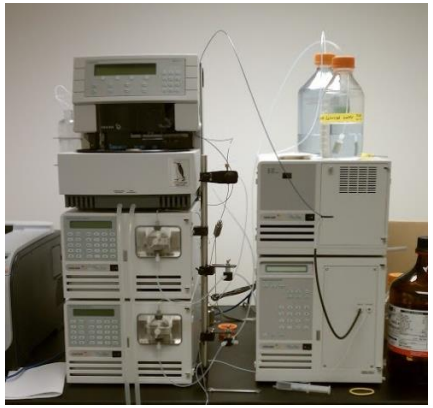
Storage

- **Reduce fungal growth**
  - **Cool, dry grain ASAP**
- **Drying:**
  - **High temps to quickly dry preferred over low heat**
  - **Cool below 55 F (slows fungi growth/inhibits insect activity)**
  - **Minimize stress cracks due to drying *(maintain kernel temps <110 F)***
  - ***Short-term storage* (over winter)→ 15 to 15.5% moisture**
  - ***Long-term storage* (over summer) → <13%**
  - **Maintain low/uniform moisture throughout storage**
  - **WHY IMPORTANT = Actively growing fungi produce mycotoxins and levels can ↑ rapidly**
    - **e.g., 25% moisture corn = 77% ↑ in fumonisins after 7 days**
  - **Mycotoxin levels do not decrease in storage**
    - **Proper storage ensures mycotoxins do not increase**

Blandino et al. 2004 Proc. Int. Quality Grains Conference pp.19-22

Testing grain at receiving aids decision-making

- Awareness
  - What is the potential risk based on weather, crop, location
- Testing
  - UV light for aflatoxin
  - TLC, ELISA, lateral flow or immunochromatographic assays
    - GIPSA performance-verified mycotoxin test kits
  - High Performance Liquid Chromatography



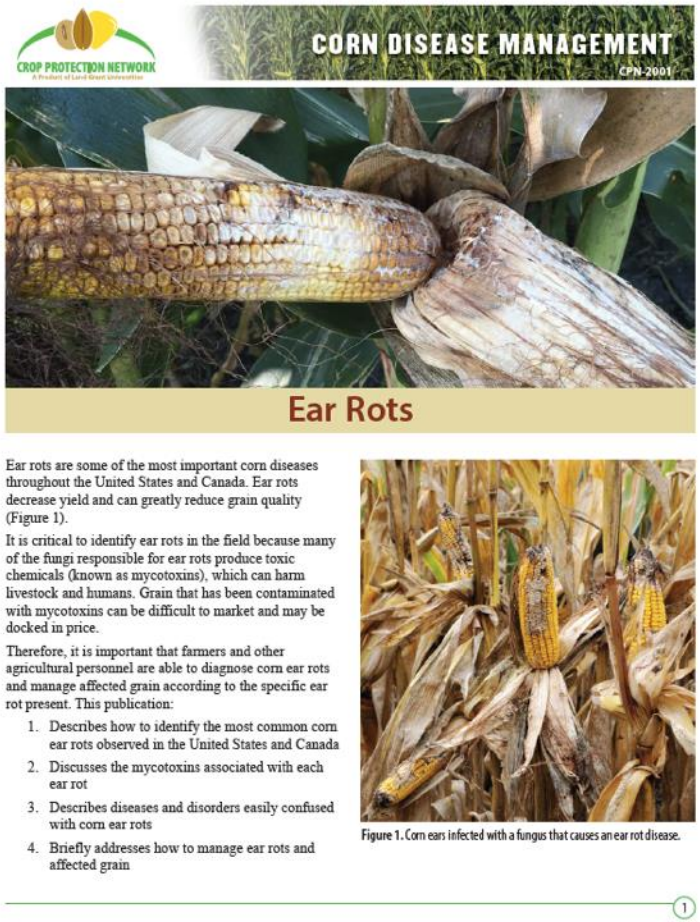
Mycotoxins are not distributed uniformly

- Fields, bins and transportation
- Hot spots of contamination
- High variability among individual kernels

→ Example of variability with aflatoxin:

- Single kernel can contain 207,000 ppb
  (Shotwell, et al. 1974. Cereal Chem 51:492-499.)
- 8 kernels/bushel exceeds 20 ppb FDA action level

Useful resources



CROP PROTECTION NETWORK

CORN DISEASE MANAGEMENT

CPN-2001

Ear Rots

Ear rots are some of the most important corn diseases throughout the United States and Canada. Ear rots decrease yield and can greatly reduce grain quality (Figure 1).

It is critical to identify ear rots in the field because many of the fungi responsible for ear rots produce toxic chemicals (known as mycotoxins), which can harm livestock and humans. Grain that has been contaminated with mycotoxins can be difficult to market and may be docked in price.

Therefore, it is important that farmers and other agricultural personnel are able to diagnose corn ear rots and manage affected grain according to the specific ear rot present. This publication:

1. Describes how to identify the most common corn ear rots observed in the United States and Canada
2. Discusses the mycotoxins associated with each ear rot
3. Describes diseases and disorders easily confused with corn ear rots
4. Briefly addresses how to manage ear rots and affected grain

Figure 1. Corn ears infected with a fungus that causes an ear rot disease.

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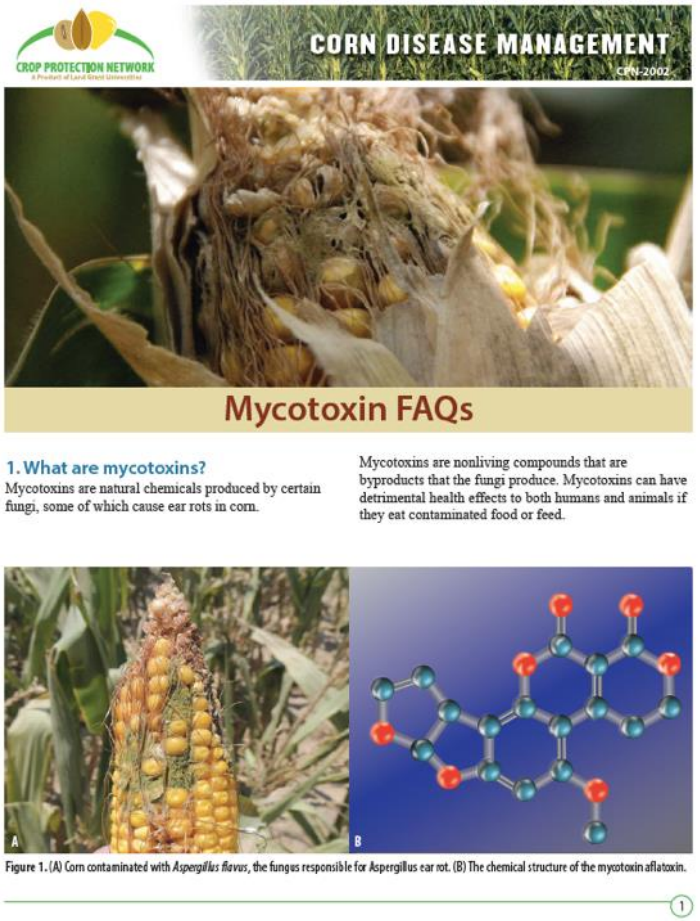

CROP PROTECTION NETWORK

CORN DISEASE MANAGEMENT

CPN-2002

Mycotoxin FAQs

1. What are mycotoxins?

Mycotoxins are natural chemicals produced by certain fungi, some of which cause ear rots in corn.

Mycotoxins are nonliving compounds that are byproducts that the fungi produce. Mycotoxins can have detrimental health effects to both humans and animals if they eat contaminated food or feed.

Figure 1. (A) Corn contaminated with *Aspergillus flavus*, the fungus responsible for Aspergillus ear rot. (B) The chemical structure of the mycotoxin aflatoxin.

1

www.cropprotectionnetwork.org

Summary

1. Corn is susceptible to numerous molds
2. Some fungi that cause ear mold also produce mycotoxins
3. Mold development depends on the disease triangle

I See Dead Plants Podcast

w/ Ed Zaworski

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SCAN ME

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Thanks for having me!

What other questions do you have?