

# NATURAL AND ORGANIC MOLD INHIBITORS IN CHEESE

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Food Science and Technology



**Oregon State**  
University

# About Me



- Internship Experiences
  - Gallo Wine-making intern
  - Darigold Production Intern
  - Norpac Quality Control Supervisor
- Activities
  - Buttermilk product development competition
  - Undergraduate Chair of the Food Committee
  - OSU Leadership Academy 2016



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**Leadership Academy**

# Creating Clean Labels



- 68% willing to pay more
- 53% believe omitting undesirable ingredients is more important than including beneficial ones
- What makes a label clean?
  - Natural
  - Organic
  - Gluten-Free

(2017) Consumers' Affection for clean label continues. Institute of Food Technologists.

# Current Mold Inhibitors - Natamycin

- Produced by *Streptomyces natalensis*, a soil bacteria
- Functions against fungi and not bacteria
  - Beneficial for ripening cheeses
- Concerns of health impacts
  - Claims of nausea, vomiting and illness at very high doses (Te Welscher et al. 2008)



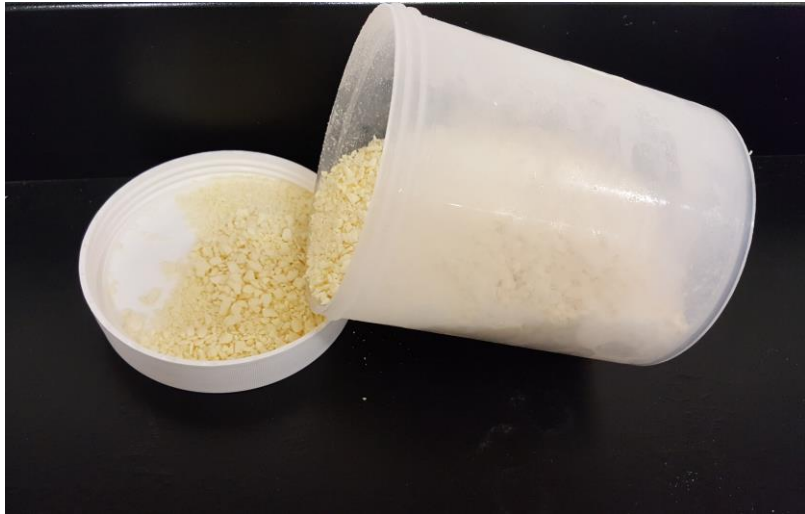
# Current Mold Inhibitors

- Lactic Acid Bacteria (LAB)
  - Used in cheese as a starter culture
  - Added benefit of microbial properties
  - Starter cultures can create inconsistencies
- Use of lysozyme to prevent late blowing in semi hard cheeses (Lucera, Costa, Conte, & Del Nobile, 2012)

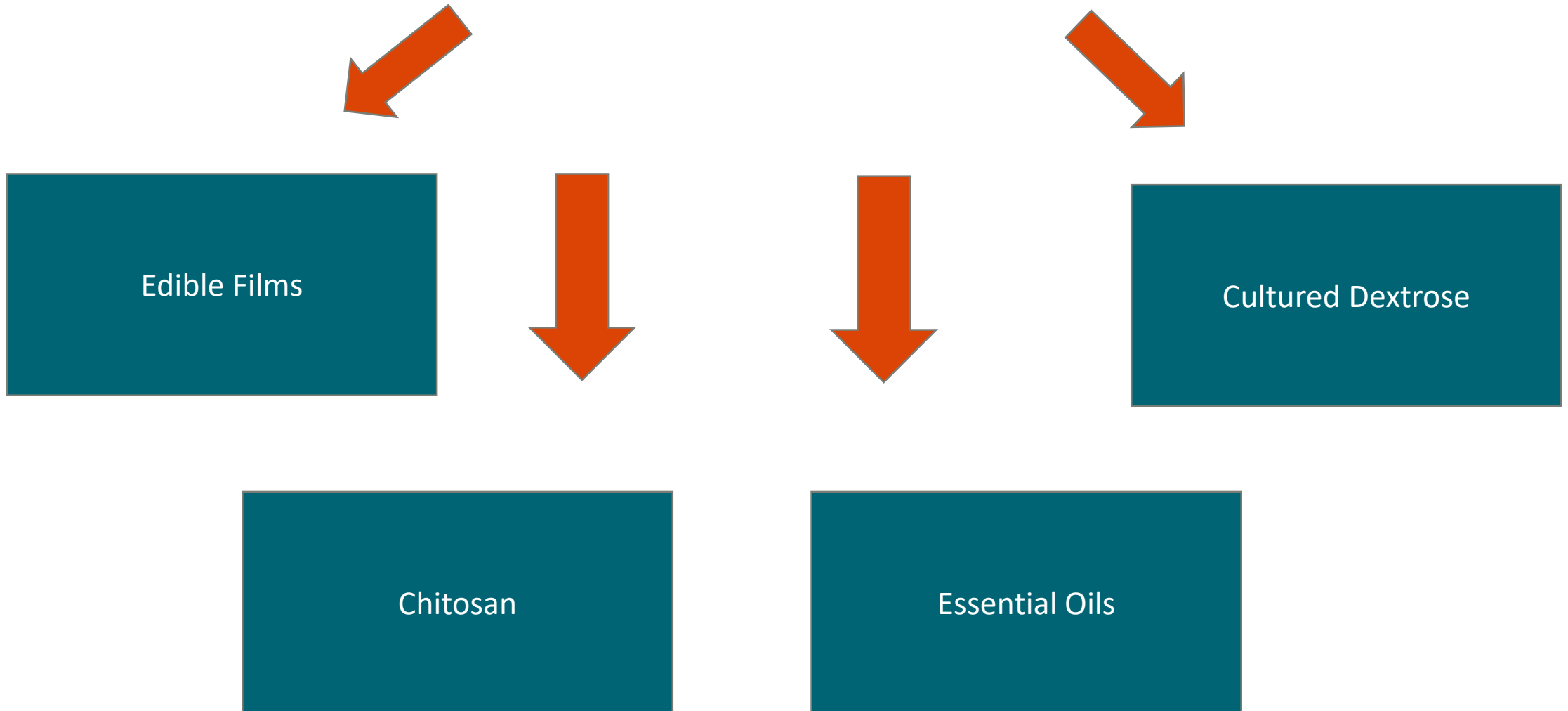


# Making It Happen

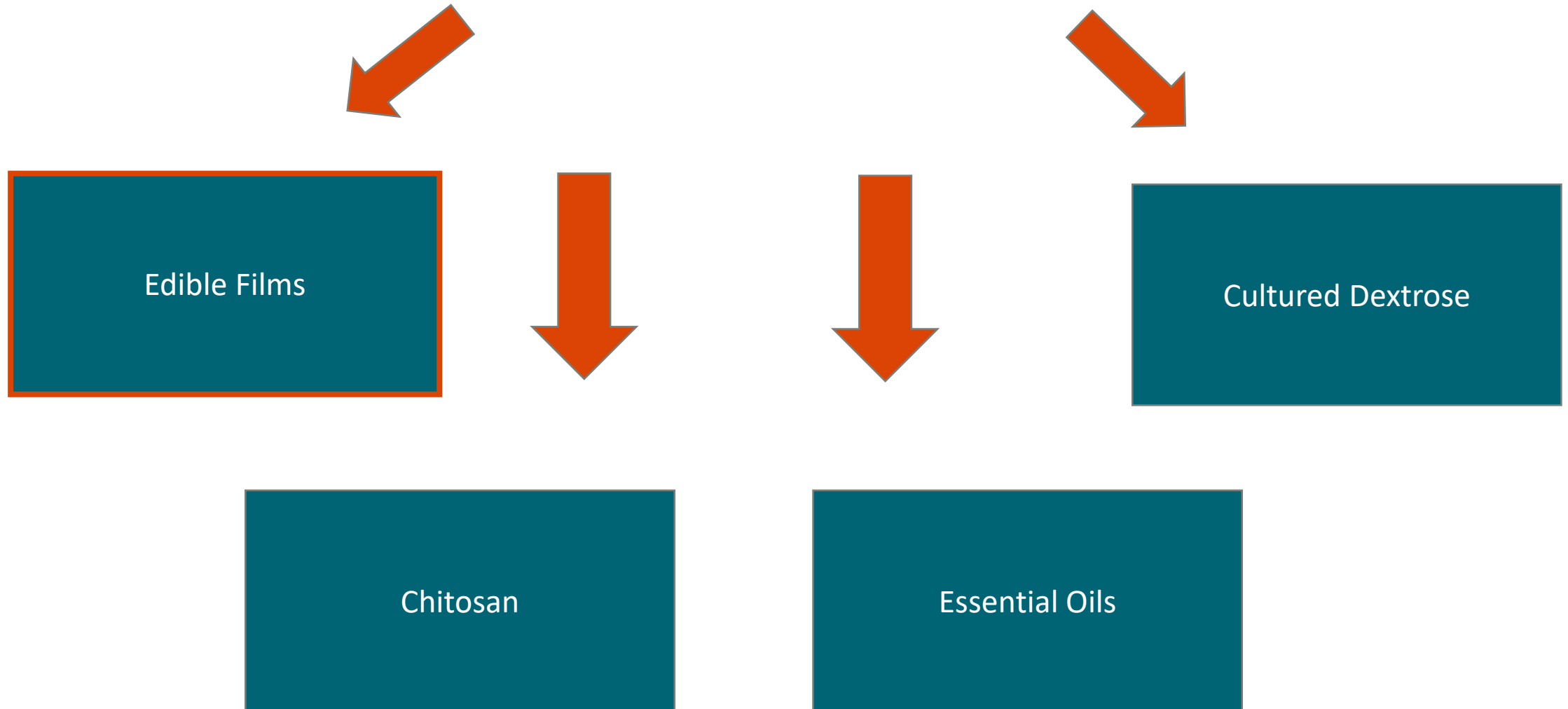
- Freeze dried cheese agar (Wolfe et. al. 2014)
- Focus on *Mucor racemosus*, *penicillium commune*, *Galactomyces geotrichum*, and *Yarrowia lipolytica*
- Shredded Cheese and Blue Cheese



# The Inhibitors



# The Inhibitors



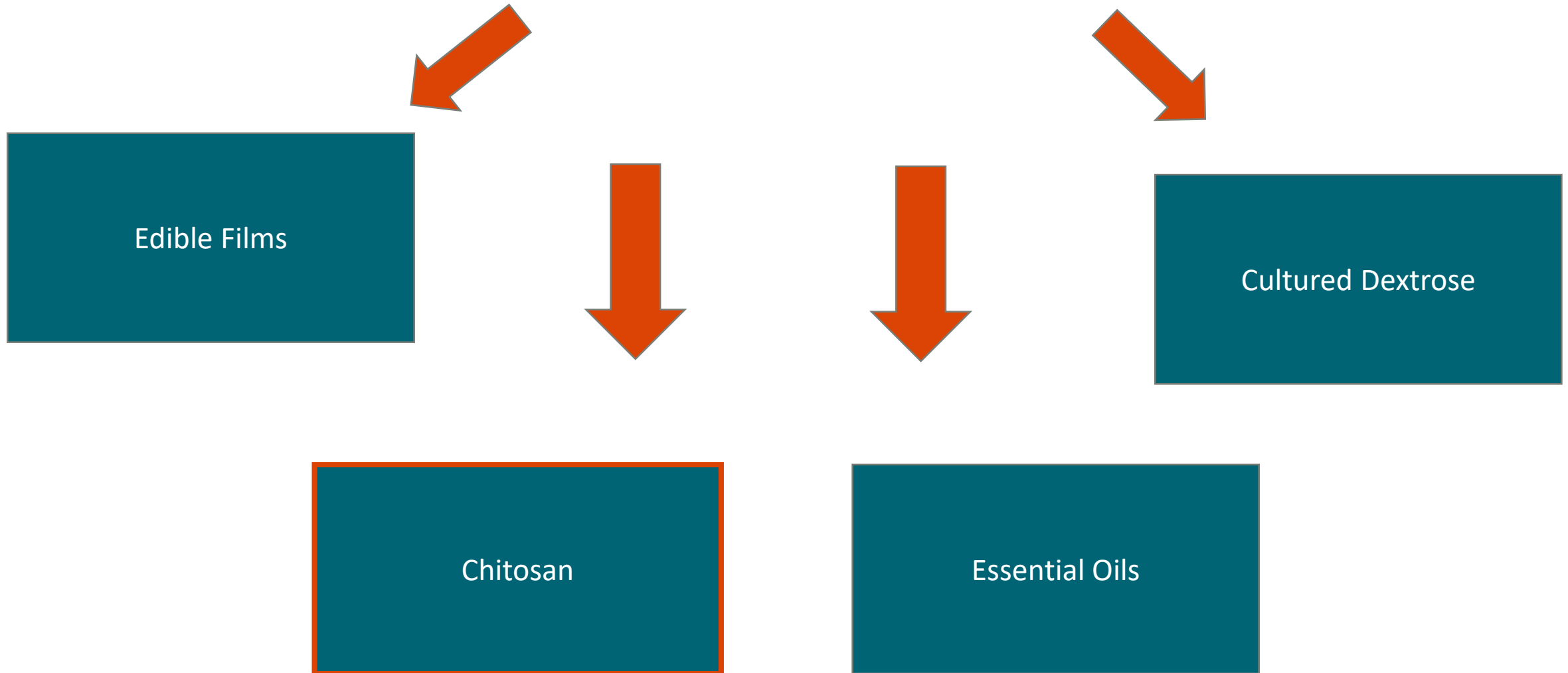


# The Inhibitors - Films

- Ideal due to their edible, biodegradable nature
- Simple application
- Using films as a medium to hold inhibitor
  - Challenges with mold inhibitors leeching from films
- Typically used in combination with pectin, gelatin, cellulose, or whey protein



# The Inhibitors

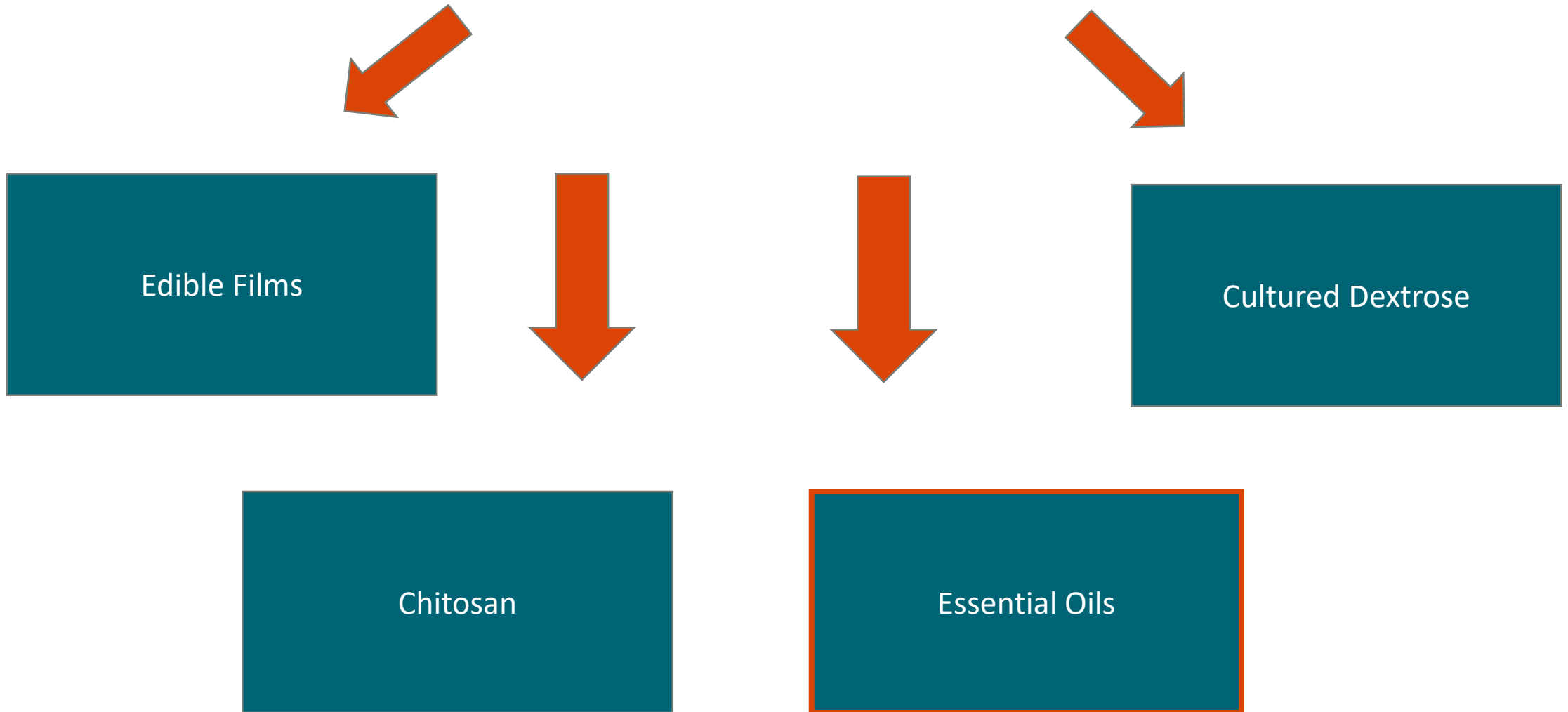


# The Inhibitors - Chitosan



- Polysaccharide from shrimp shells and other crustaceans
- Functions by interrupting the negatively charged macromolecules on fungi surface
- Success with ricotta cheese films (Di Pierro, Sorrentino, Mariniello, Giosafatto, & Porta 2011)
- Fior di Latte Cheese and MAP (Del Nobile, Gammariello, Conte, & Attanasio 2009)
- Chitosan-Lysozyme films in mozzarella (Duan, Park, Daeschel, & Zhao 2007)

# The Inhibitors



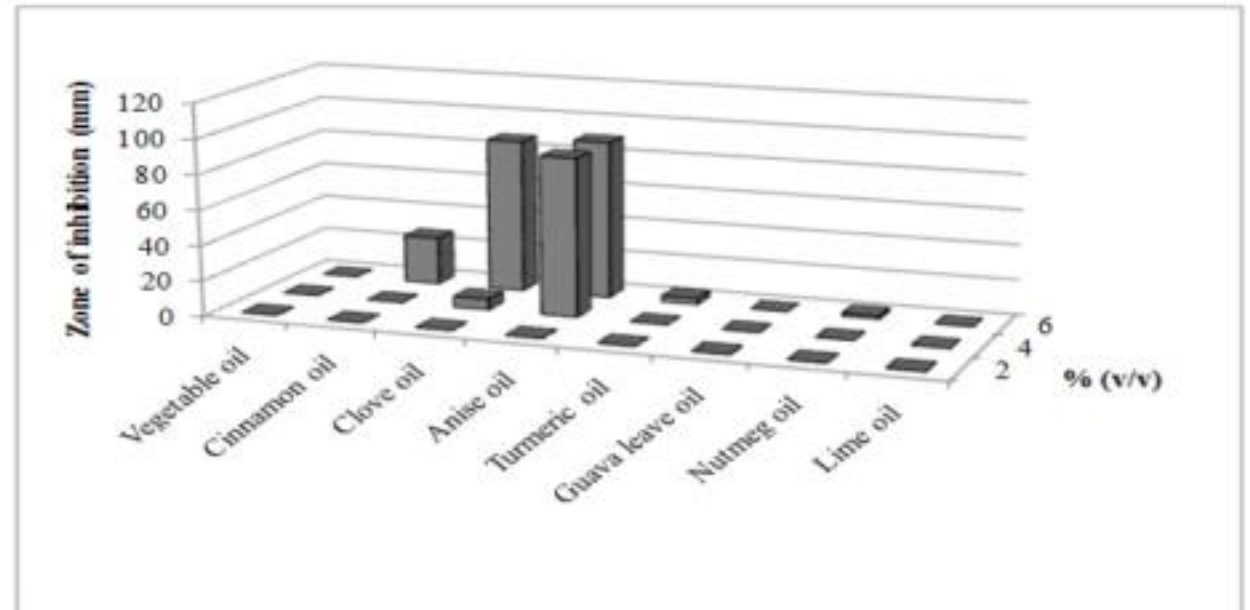
# The Inhibitors – Essential Oils

- History of essential oils as an inhibitor in breads, sausages, and cheeses
- Use as naturopathic medicine
- Used prior to refrigeration technologies to inhibit mold growth during summer months
- Secondary metabolites inhibit mold growth/fungi/bacteria
- Challenges with volatility and sensory impact
- Can be combined with other inhibitors to improve impact

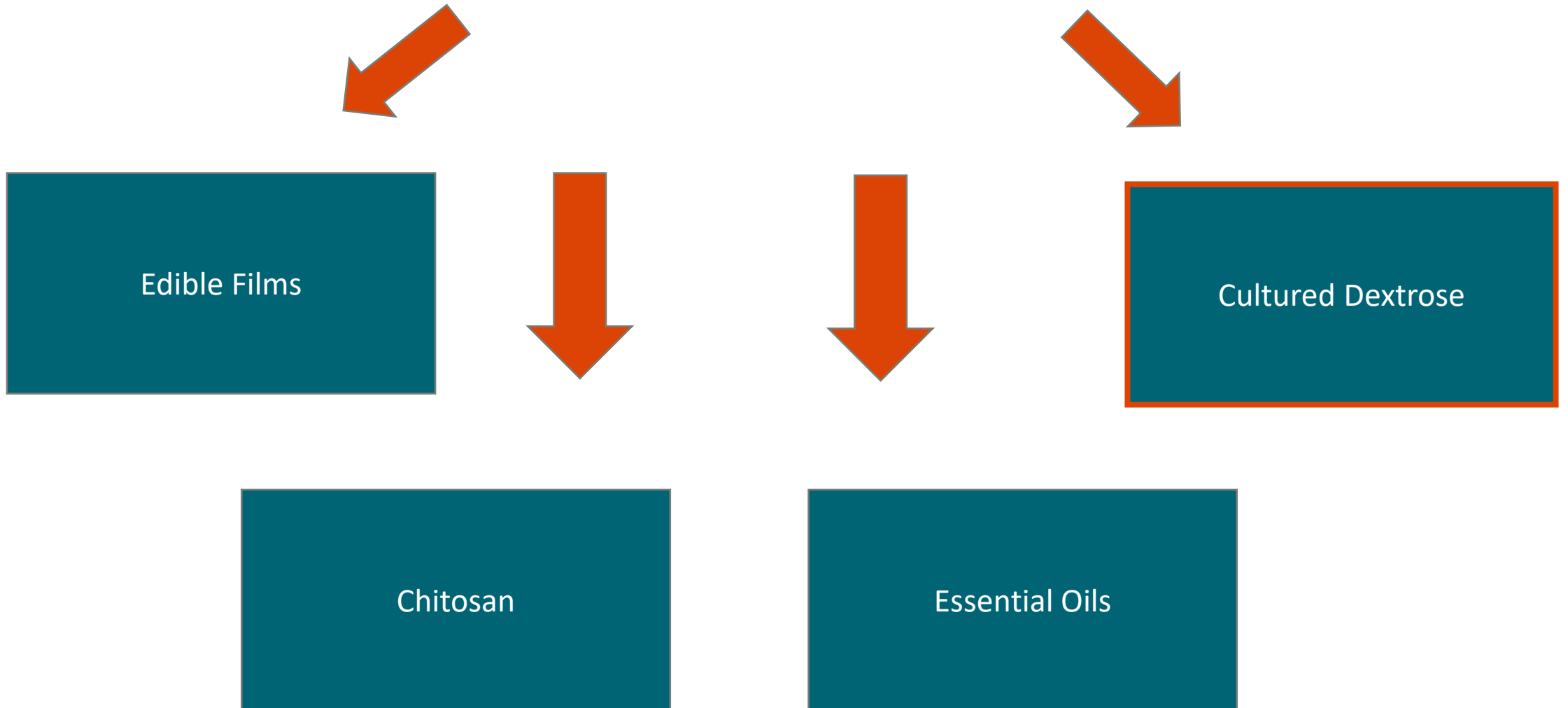


# The Inhibitors – Essential Oils

- Eugenol (clove oil) and thymol (thyme)
  - Complete inhibition by eugenol in Spanish style cheese matrix (Vásconez et al., 2000).
- Addition of lemon in mozzarella brine (Conte, Scrocco, Sinigaglia, & Del Nobile, 2007).
- Shredded mozzarella and a microcellular foam starch satchet infused with rosemary oil, thyme oil, or both (Han et al., 2014)
- Reduction in microbial loads and oxidation in fish (Seydim & Sarikus, 2006)



# The Inhibitors





# Cultured Dextrose

- Fermentation of dextrose with *Propionbacterium fredenreichii*
- Used successfully to replace nisin in cheese sauce (Patent #:0186129)
- Used successfully in the pet food industry (Patent#: 20090311390A1)
- Commonly used is salad dressings, humus, and other spreads



# Industry Impact

- Help creameries meet consumer demands
- Market to a wide audience
- Create clean labels for producers



# QUESTIONS?



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