Measuring the Effects of Glycomacropeptide on Immune Function

Sam Adler
Dallas Lab

Immune Dysfunction

Chronic Inflammation

- Arthritis
- Chron’s Disease

Inflammatory Cytokines

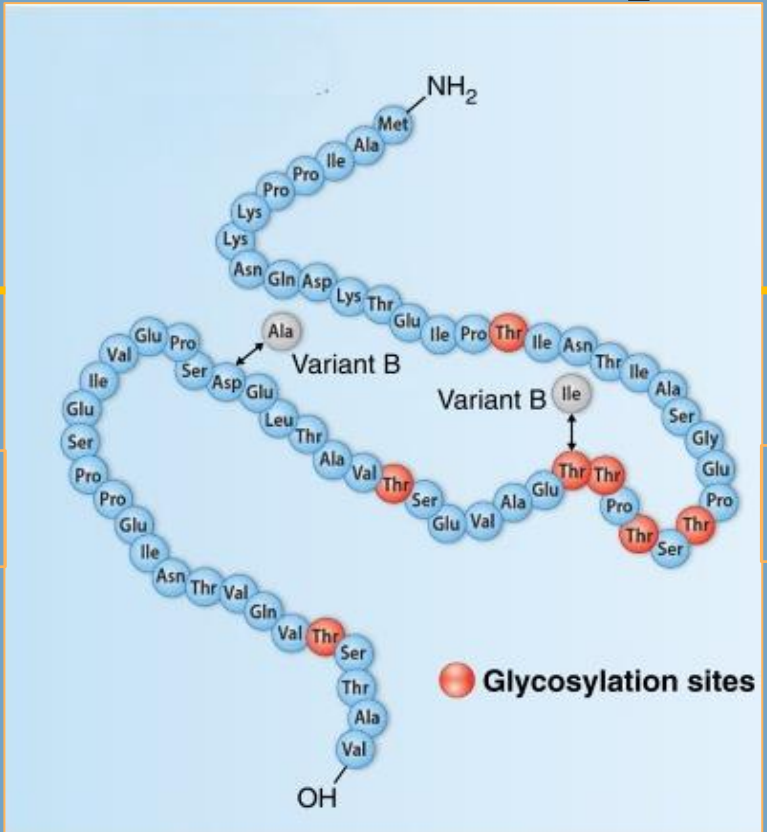
- Messengers
- Inflammatory Markers

TNF-α
(Inflammatory Marker)[2]

Glycomacropeptide

Current Use:

Treating PKU



Potential Future Use:

Treating IBD

Study Design

Feed WPI → Collect Blood → Collect Data → Analyze Data

Take Away:

Glycomacropeptide Can be a Functional Food Ingredient.

...We're working on it.

FD&C Red No. 40 dye degradation in strawberry milk by *Paenibacillus odorifer*

- Student Fellow: Alejandro Torres Beauchamp
- Advisor: Joy Waite-Cusic

- Expected graduation date: Sept. 2022

What questions immediately arise?

What is happening?

- Color change from pink to white due to FD&C red no. 40 color degradation.

Who/What is responsible for this spoilage event?

Paenibacillus odorifer

- Facultative anaerobe
- Spore-forming bacteria
- Frequently isolated from milk

Under what conditions?

- Absence of oxygen
- High cell density
- Refrigerated temperatures
- FD&C Red No. 40 must be present.

Our studies have confirmed that *Paenibacillus odorifer* degrades FD&C Red dye No. 40 in Strawberry Milk

THANK YOU

WESTERN DAIRY CENTER

BUILD DAIRY

Oregon State University

Lactose intolerance and gut bacteria

Gloria Angima
MS Candidate- Food Science
Advisors: Dr. Si Hong Park & Dr. David Dallas

Oregon State University

LACTOSE INTOLERANCE

SYMPTOMS

Abdominal pain

Diarrhea

Bloating

Vomiting

Up to 75% of people globally are lactose intolerant

What is GOS?

- Galactooligosachharides (GOS) is a fiber that is produced from lactose.
- **They stimulate the growth of lactose-digesting bacteria**

Can GOS increase levels of “good” gut bacteria?

6-week feeding study

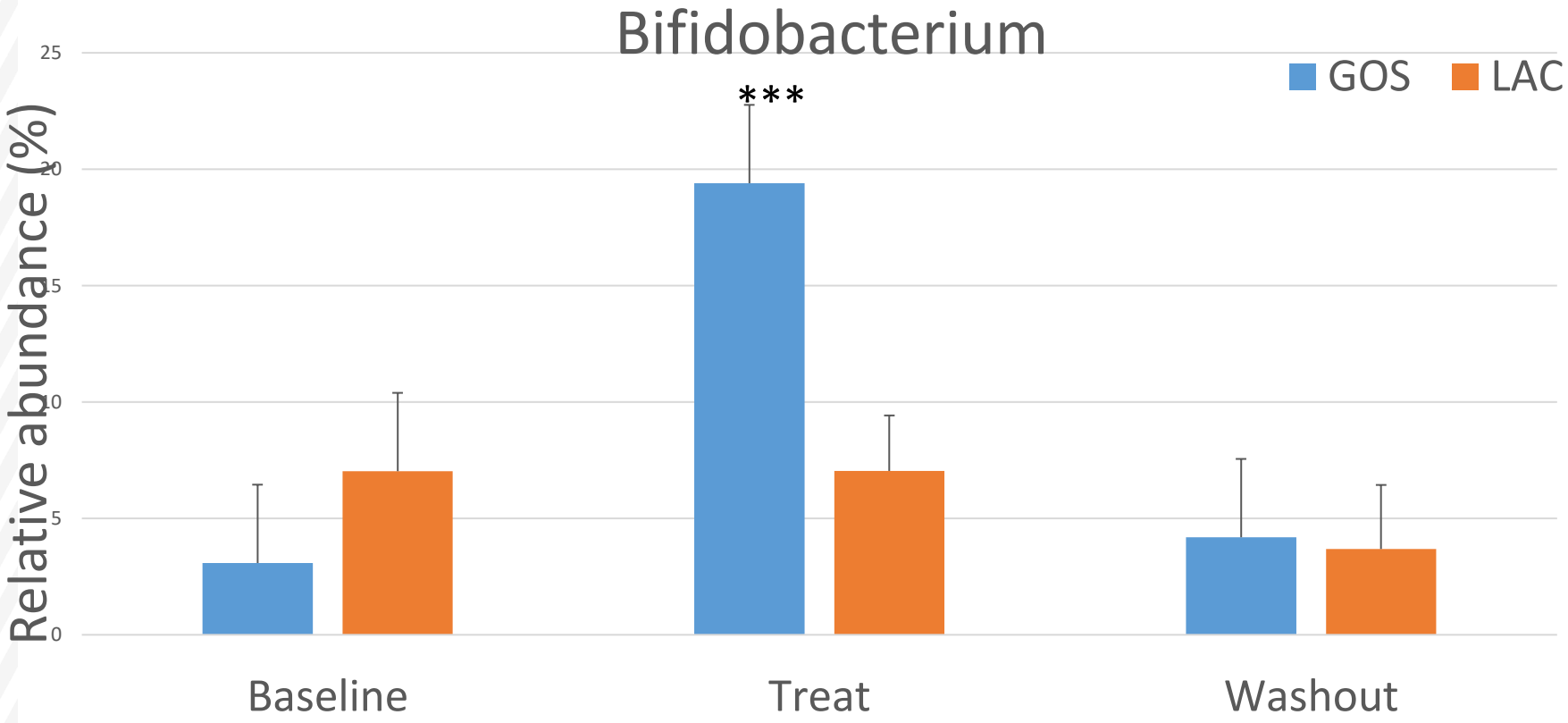
14 volunteers recruited

Daily supplementation with GOS

Fecal sample collection

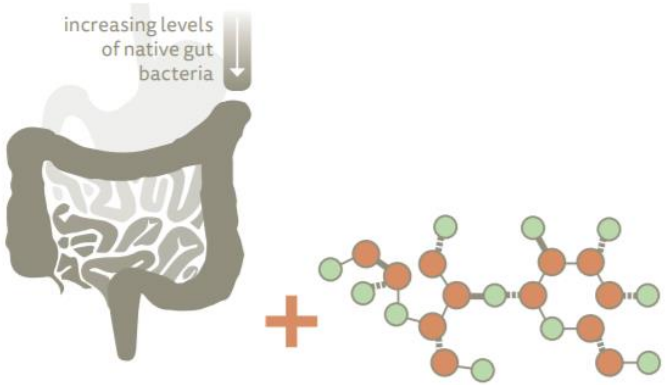
Microbiome analysis

Results


Bifidobacterium
GOS
LAC
***
Relative abundance (%)
25
20
15
10
5
0
Baseline
Treat
Washout

Discussion, Conclusion & Impact

- Supplementation with GOS leads to an increase in “good” gut bacteria
- There is potential use of GOS to facilitate better digestion of dairy products



Thank you!

- Oregon Dairy Nutrition Council(ODNC)
- OSU FST

Screening Mold Inhibitors for Cheese

Kristen Jensen, M.S. Student

Oregon State University

INGREDIENTS: CHEDDAR CHEESE (PASTEURIZED MILK, CHEESE CULTURE, SALT, ENZYMES, ANNATTO COLOR), ANTICAKING AGENT (POTATO STARCH, CORN STARCH, CALCIUM SULFATE), NATAMYCIN (NATURAL MOLD INHIBITOR).

CONTAINS: MILK

Objective

Potential mold inhibitors:

essential oils

bio-active peptides (Lactoferrin)

bio-protective cultures (LAB)

edible films (Chitosan)

fermentation extracts (cultured milk powder/dextrose)

Potential mold inhibitors x different concentrations x combinations thereof x replication x relevant spoilage fungi = **4000+ tests**

Screening Methods for Mold Inhibitors

Fluorescent Staining Screening

96
tests/plate

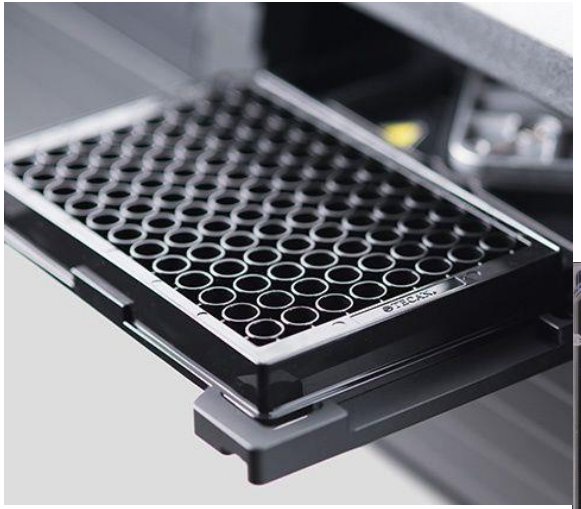
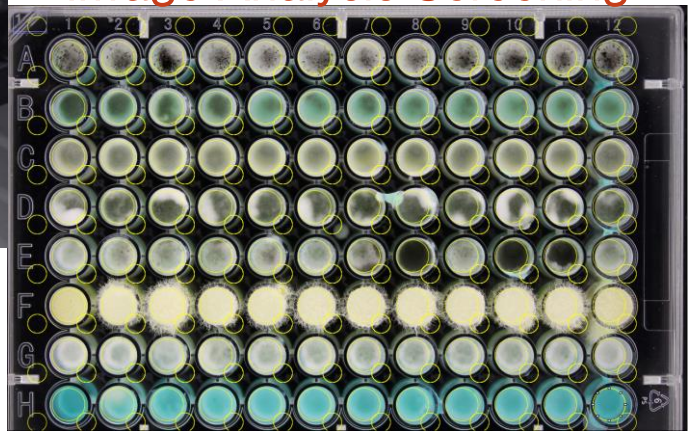


Image Analysis Screening



84
tests/plate

Results

Fluorescent staining and image analysis screening methods are effective at finding Natamycin alternatives

Essential oils show efficacy against cheese spoilage molds

Enhanced efficacy with edible films

UTILIZING PROTECTIVE CULTURES AGAINST *LISTERIA MONOCYTOGENES*

Taylor Johnson

April 13, 2022

ODI 110th Conference

Oregon State University

About Me

- Transferred to OSU in 2018 from Tacoma, WA for Food Science and Technology
- Worked in the Arbuthnot Creamery for three years
- Graduated with my Bachelor’s in June 2021
- Started graduate school in September
  - Focus: Dairy safety and microbiology

My Research

Screen ~1000 native non-pathogenic dairy isolates for antibacterial activity against *Listeria monocytogenes*

↓

Narrow down the top 24 candidates

↓

Test isolates in milk and dairy co-product streams

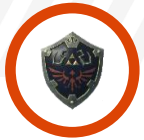
↓

Whole genome sequence the candidates

↓

identify and purify antilisterial peptides

Why is this important?



Protect your consumers

- Prevent foodborne illness
- Between 2011-2021, 45% of Listeriosis outbreaks were from dairy products (CDC, 2021)
  - Numbers are likely underdiagnosed

Protect your product

- Maintain a good reputation
- Prevent food and energy waste
- Save $$$

Keep a clean label

- Utilize a capability that bacteria have always had
- Currently, nisin is the only bacteriocin that is considered GRAS
  - We need more!

https://www.cdc.gov/listeria/outbreaks/index.html

THANK YOU!

Oregon State University

EFFECT OF DAILY CONSUMPTION OF GLYCOMACROPEPTIDE ON GUT HEALTH OF PEOPLE WITH IBS

Yuki Qu Ph.D. Candidate

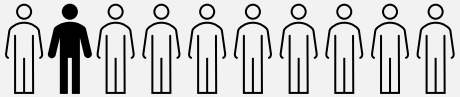
Advisor: Dr. David Dallas & Dr. Si Hong Park

Oregon State University

4/13/2022

IRRITABLE BOWEL SYNDROME (IBS)

10% PREVALENCE OR 1 IN 10



IBS is **common** – Around 10% of people in the United States have it.

SYMPTOMS

Constipation and Diarrhea

Colon Pain

Boating

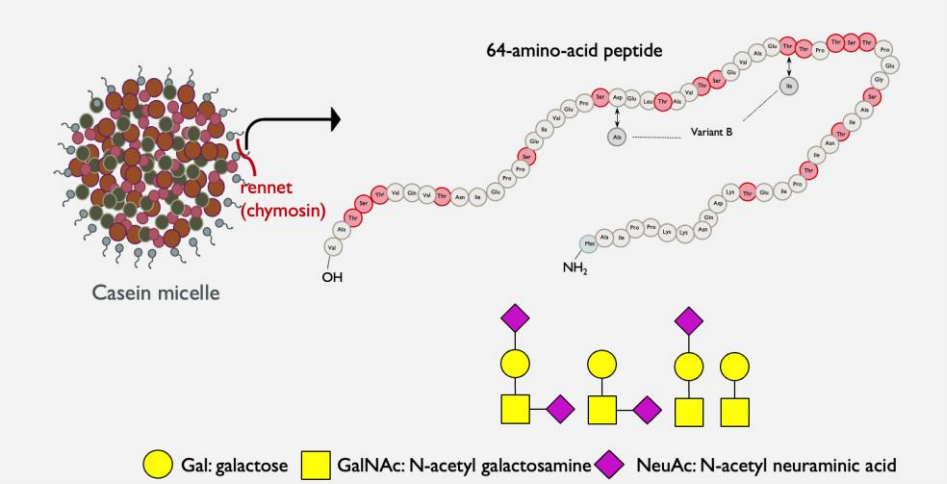
Mucus in the stool

GUT MICROBIOME AND BIOMARKERS

Higher inflammatory cytokines

Lower diversity and stability of the gut microbiome

GLYCOMACROPEPTIDE RELEASED FROM KAPPA-CASEIN



In vitro assays and animal study show that

- GMP promotes growth of beneficial bacteria
- GMP has potential for reduced systemic inflammation
- GMP modulates the inflammatory response of key gut immune cells

FEEDING STUDY

STUDY DESIGN

9 subjects, age 18-30 with IBS

3 weeks **with** GMP supplementation
3 weeks **without** GMP supplementation

SAMPLING

Stool samples

Blood samples

IBS-Symptom Questionnaire

ANALYSIS

BIOMARKERS OF INFLAMMATION

- Fecal and blood samples will be analyzed for inflammatory markers using multiplex ELISA

FECAL MICROBIOME

- DNA will be extracted from the fecal samples followed by 16S rRNA microbial sequencing to identify the microbial composition of the samples.

THANK YOU

THE 60 DAY RULE

Title 21 C.F.R. §133 - April 22 1949

Based on the best evidence available now, it is reasonable to require that when the milk used in manufacturing cheese is not pasteurized the cheese be held after it is manufactured for not less than 60 days at temperatures of not less than 35° F. (R. 140–146, 159, 165–166, 180, 198,

YES, it works!

"Based on the results obtained from these 41 raw milk cheeses, the 60-day aging rule for unpasteurized milk cheeses appears adequate for producing microbiologically safe products."(Brooks et al. 2012)

"potentially pathogenic bacteria do not survive fabrication of Swiss hard cheese varieties produced under good manufacturing practices"(Bachmann et al. 1995)

NO, it does not!

"a 60-day ripening process alone may not be sufficient for elimination of contaminating pathogens" (Chon et al. 2020)

"Populations of E. coli O157:H7 in cheese aged for 60 and 120 days at 7°C were reduced by less than 1 and 2 log, respectively" (Schlesser, et al. 2006)

"such a requirement is unlikely to result in elimination of *E. coli* (some of which could be pathogenic), as in some cases *E. coli* actually grew during

Raw Milk Cheese Safety Factors

- pH
- Salt content
- Moisture content
- LAB and other inhibitory cultures
- Inhibitory compounds
- Anionic peptides
- Nisin
- Aging temperature

Project Objectives

Meta-Analysis

Comprehensive, review of past work on cheese safety.

Fill in Gaps

Inoculate and age cheeses and brines.

Determine survival rates at different salt levels.

Decision Tree

Develop a decision tree guide cheese making decisions.

Artisan Guidance

Help guide future legislation or aging requirements.

EXPERIMENTAL DESIGN

- Cheddar, Gouda and Brine
- Inoculation: *E. coli, L. mono*
- Forming and Pressing
- Salt at 2% and 4%
- Age at 4°C, 10°C and 15°C
- Track survival of pathogens


UMPQUA
Oregon State
University


Beaver
Classic Cheese

THANK YOU