Are Dry Foods Safe Foods?
Food Safety Implications of Low-moisture Foods

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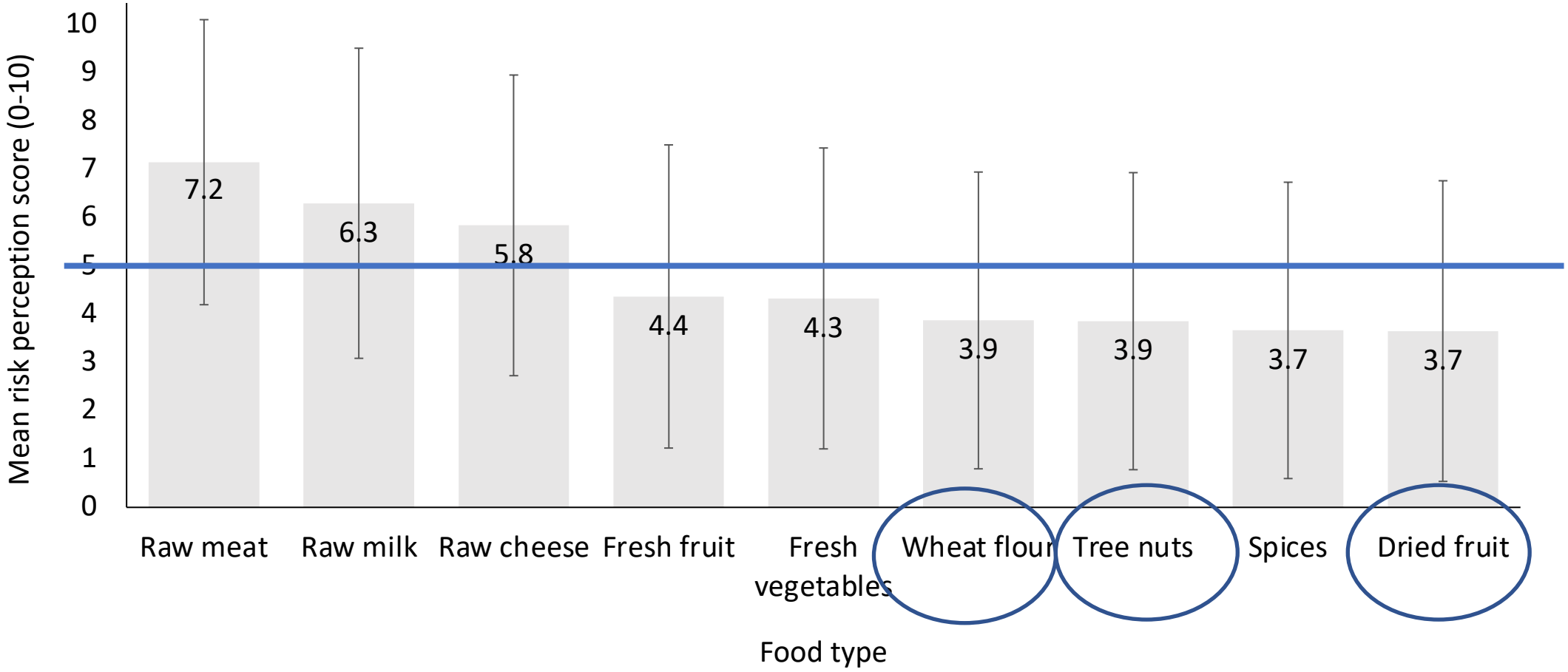
Low-moisture foods are generally perceived as low-risk for foodborne illness.

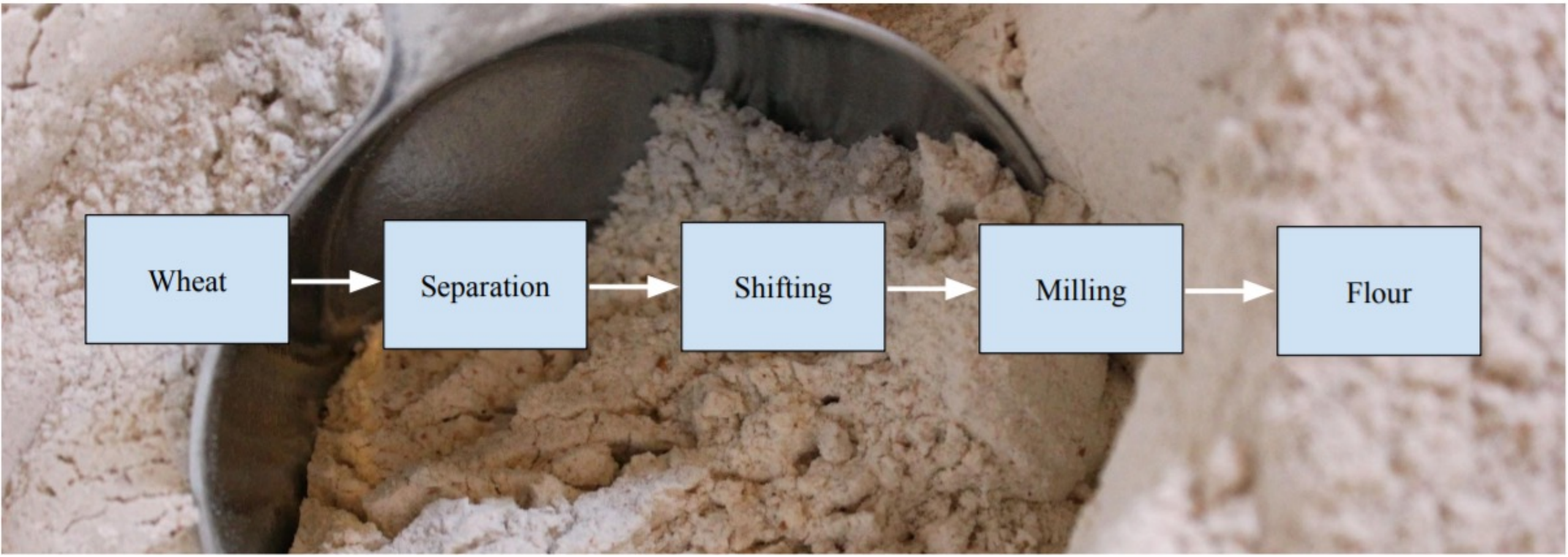


Flour handling has food safety implications

Multiple foodborne outbreaks in the U.S. and Canada, *Salmonella* or *E. Coli,* sicken ~200 people in the past 10 years[1].

E. coli and *Salmonella* in flour could be enumarated for 12 and 16 weeks[2].

U.S. wheat at harvest and found *Salmonella* and *E. coli* in 1.23% and 0.44% of the samples[3].


Wheat
Separation
Shifting
Milling
Flour

85% flour consumers never heard of a flour recall or outbreak.

CDC @CDCgov

MORE FLOUR RECALLED: Check your home for recalled 5 lb. bags of Pillsbury Best Bread Flour; the flour may be contaminated with E. coli. Return recalled flour to the store or throw it away. Info to identify recalled flour: go.usa.gov/xm7YA

10:26 PM · Jun 15, 2019

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CR Consumer Reports | Product Reviews

Health / Two Major Brands Recall Flour Because Of E. Coli Concer

Two Major Brands Recall Flour Because of E. Coli Concerns

Check the labels on your 5-pound bags from King Arthur and Pillsbury

By Catherine Roberts
Last updated: November 01, 2019

Table 2. Recalls of wheat flour and wheat products, 2009 to present

Date of recall mm/dd/yyyy (Reference)	Recall class	Product	Recalling firm	Reason given	Brand
11/27/2019 (34)	I	Organic all-purpose flour, unbleached	UNFI – United Natural Foods, Inc.	*E. coli* isolated in routine testing	Wild Harvest

TODAY ON THE SHOW FOOD AMAZON PRIME DAY HEALTH & WELLNESS PARENTS POP CULTURE TMRW PRIDE TODAY all day

HEALTH & WELLNESS

General Mills recalls Gold Medal Unbleached All Purpose Flour for E. coli contamination

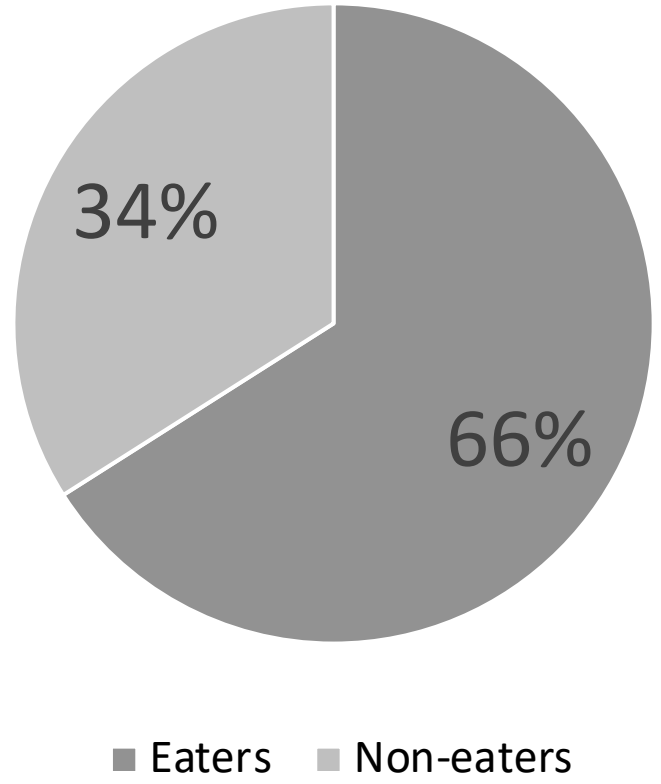
09/16/2019 (29)	I	All-purpose flour, unbleached (5-lb bags)	General Mills (Minneapolis, MN)	*E. coli* O26 isolated in routine testing	Gold Medal (Better if Used by Date 06SEP2020KC)
06/21/2019 (28)	II	Cookie and brownie mixes (25- and 32-oz glass jars)	Brand Castle, LLC (Bedford Heights, OH) & ADM Milling Co. (Buffalo, NY)	Potential *E. coli* contamination; wheat used for flour linked to ongoing outbreak associated with ADM	Brand Castle, Sisters Gourmet, In the Mix
06/14/2019 (27)	II	Bread flour (5-lb bags)	Hometown Food Co. (Chicago, IL) & ADM Milling Co. (Buffalo, NY)	Potential *E. coli* contamination; wheat used for flour linked to ongoing outbreak associated with ADM	Pillsbury Best

Majority of flour consumers admit they have eaten or played with raw dough or batter

Participants who use flour to make dough or batter (n = 999)

Participants eating raw dough or batter

- “Non-eaters” = “never”
- “Eaters” = “rarely,” “sometimes,” and “always”



Popular recipes lack of food safety messages.

Consumers consult web-based content for meal preparation

Consumers follow food handling behaviors they see on cooking shows.

Evaluate the food safety messages and behaviors related to flour-handling conveyed in 85 blog recipes and 146 YouTube videos.

Barrett and Feng, Brit. Food J. 123, no. 3 (2020): 1024-1041.

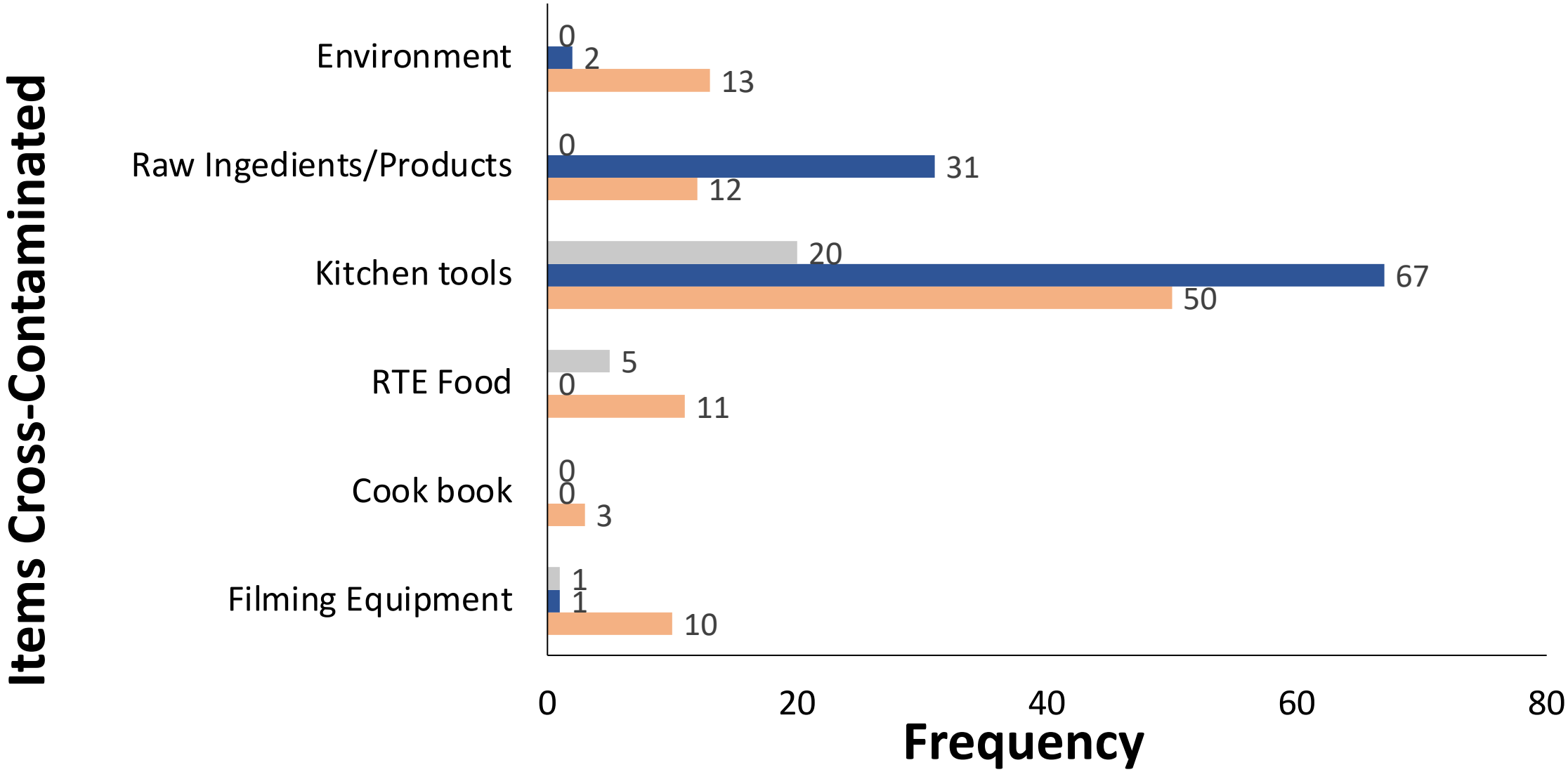


Figure 1. Observed cross-contamination events in videos. Light blue corresponds to cookie dough recipes. Dark blue corresponds to cookie recipes. Medium blue corresponds to egg noodle recipes.

Table 4. Negative food safety messages in cookie dough blog and videos

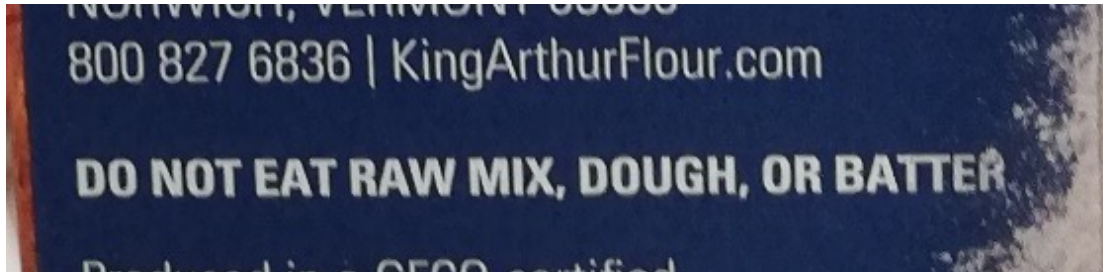
Cooking: Heat treatment		Blogs N=17 % (#)	Videos N=50 % (#)
Recommended in		24 (4)	18 (9)
Recommended by Nonprofessionals		75 (3)	100 (9)
Heat treatment methods			
	Oven	50 (2)	56 (5)
	Microwave	50 (2)	33 (3)
Heat treatment range		165°F - 180°F	160°F


MAKES 24 COOKIES
SAFE TO EAT RAW
eat or bake
Cookie Dough
Chocolate Chip
Pillsbury
KEEP DOUGH REFRIGERATED
NET WT 16 OZ (1 LB) 453g
PER 2 COOKIES
170
3g SAT FAT
135mg SODIUM
15g TOTAL SUGARS


SAFE TO EAT RAW
eat or bake
CHOCOLATE BROWNIE ROUNDS
MAKES 12 BROWNIES
Pillsbury
BROWNIE DOUGH
CHOCOLATE FUDGE
BAKE IN LINER & TIN
(LINER & TIN NOT INCLUDED)
NET WT 16 OZ (1 LB) 453g
KEEP DOUGH REFRIGERATED
PER 1 BROWNIE
160
2.5g SAT FAT
65mg SODIUM
15g TOTAL SUGARS

MATERIALS AND METHODS

(MESSAGE 1)

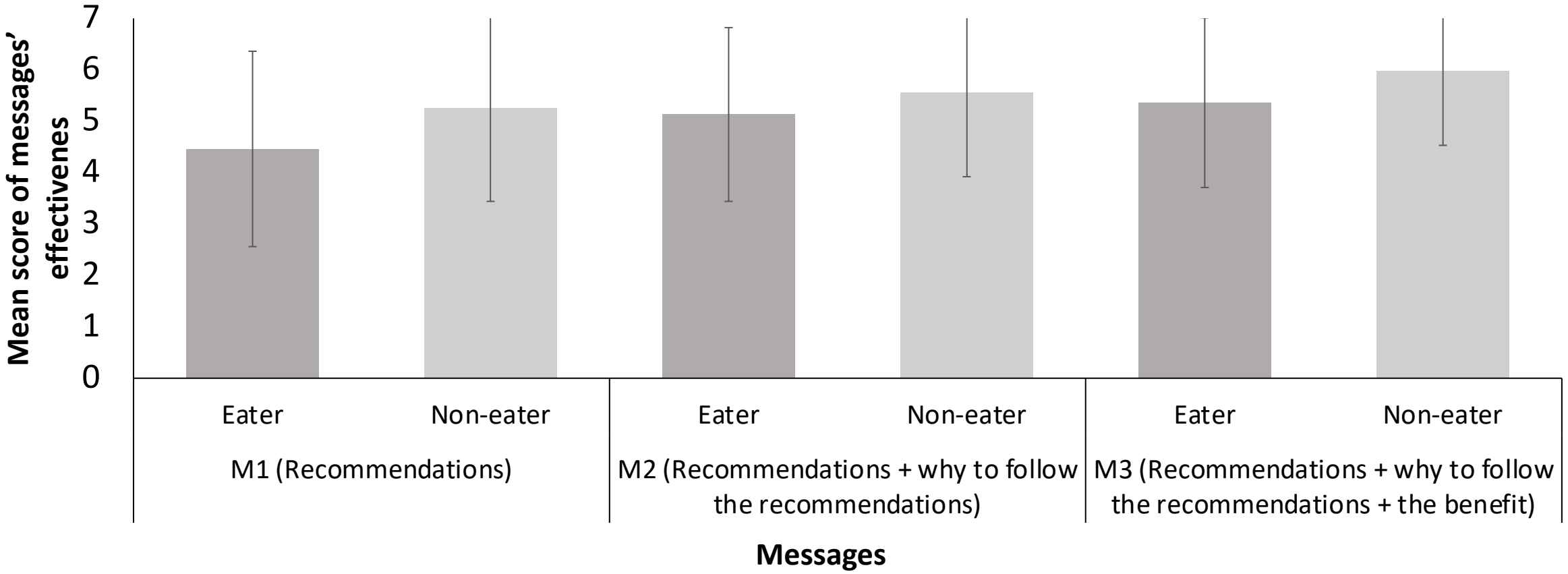


(MESSAGE 2)

Participants attention to different messages on flour packages

Food safety message

- The older adults, 65 years
- “Non-eaters”

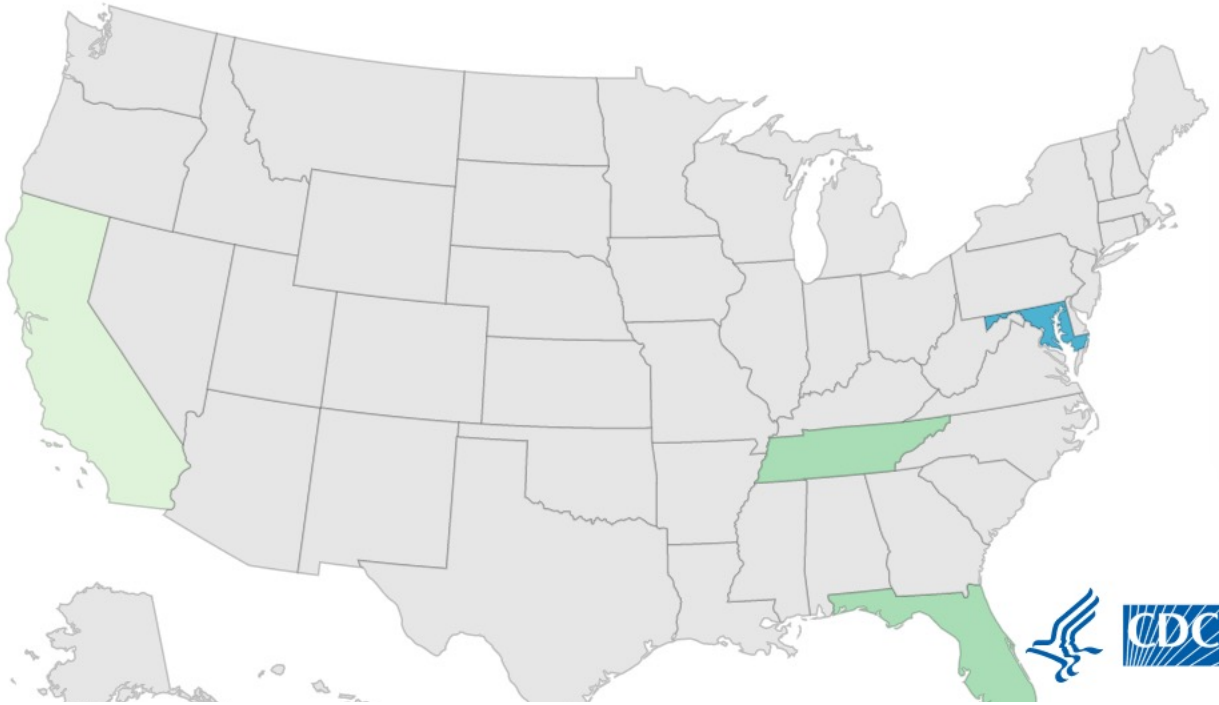


Upcoming Extension Publication

What should I do if there is a flour recall?

My lesson plan includes a dough that contains raw flour. What should I do?

Tree nuts were involved in recalls and outbreaks.



FOOD

Jule's Foods recalls cashew brie, other vegan and plant-based

Why Soaked Almonds are Better Than Raw Almonds

Gargi Sharma , Weight Management Expert | Updated: November 24, 2017 12:12 IST

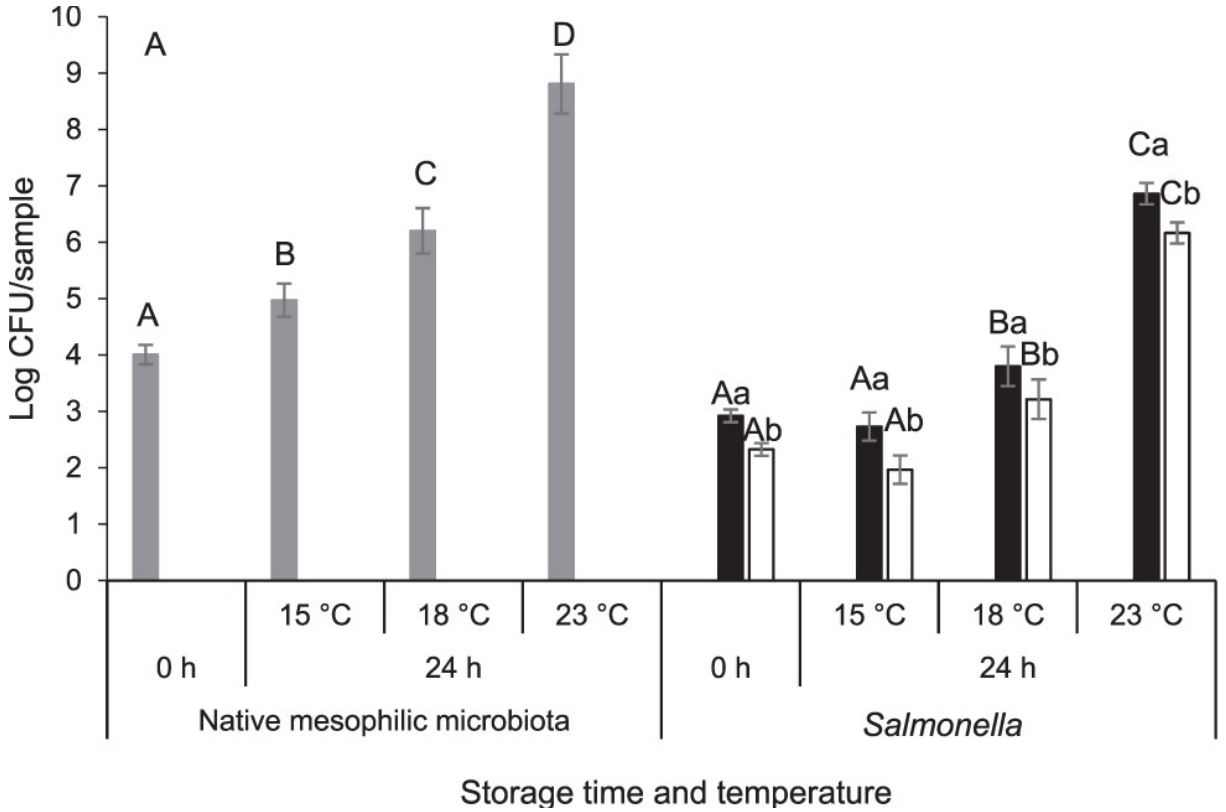
Highlights

- Almonds are rich in nutrients like Vitamin E and Omega 3
- Some believe that almonds have been around for almost 19,000 years

Rich, crunchy and gorgeous - Brown cased almo. (*badaam*) are not just rich in vitamins and nutrients, they're also a real joy to cook with. Shred them over some **creamy kheer**, toast them to make a soft and **air-light souffle** or grind them to make some luscious **Badaami Korma** - they're one of the most commonly

Trendy nut recipes can have food safety implications.

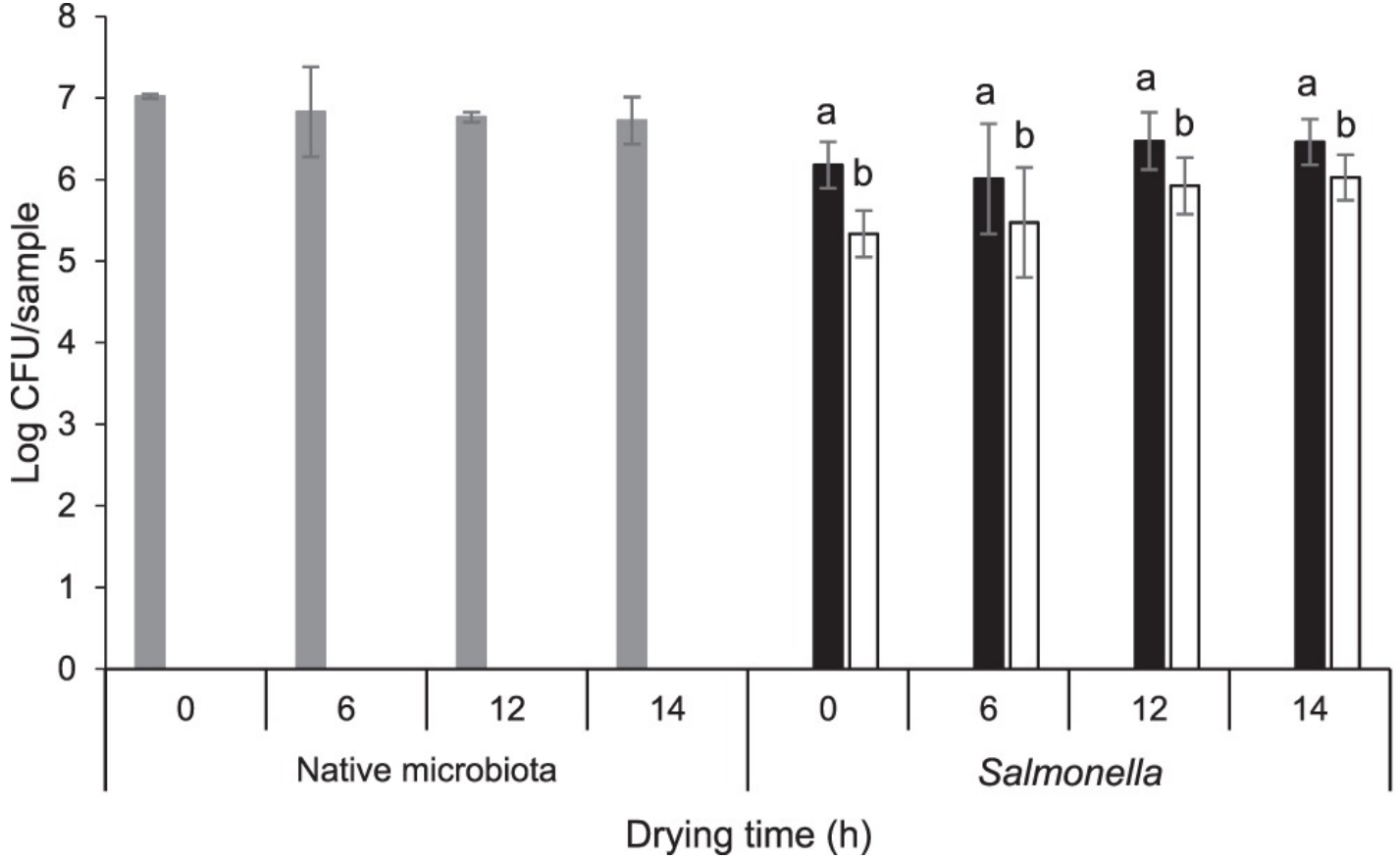
Bacteria can grow while soaking nuts in the room temperature.



Growth of native mesophilic microbiota (A, B; n = 4), (A) Salmonella (n = 6) on almonds that were soaked 1:1 (w/v) in ultrapure water and held at 15, 18, or 23°C for 24 h. Inoculation was done using the direct (almonds) method only. Counts were determined on TSA (gray bars) for native mesophilic microbiota in uninoculated samples, and on TSAR supplemented with 50 µg/mL cycloheximide (black bars) or on selective media CHROMSR, CHROMOR, and CHROMLR (white bars) for Salmonella. Values represent averages, and error bars indicate standard deviations. Within media type, different uppercase letters indicate significant differences in values among temperatures; within temperature for each organism, different lowercase letters indicate significant differences in values among media types ($P < 0.05$).

Feng, et al. J Food Prot. 2020;83(12):2122-2133. doi:10.4315/JFP-20-169

Low temperature drying does not kill *Salmonella.*



Survival of native mesophilic microbiota (n = 4) and Salmonella (n = 8 [except for time zero where n = 6]) on almonds soaked 1:3 (w/v) in sterile ultrapure water for 24 h and then dried at 66°C. Counts were determined on TSA (gray bars) for native mesophilic microbiota, and on TSAR supplemented with 50 µg/mL cycloheximide (black bars) or CHROMSR (white bars) for Salmonella. Values represent averages, and error bars indicate standard deviations. There was no statistical difference in survival for drying time. Different lowercase letters indicate significant differences in values between media types at each time point ($P < 0.05$).

Feng, et al. J Food Prot. 2020;83(12):2122-2133. doi:10.4315/JFP-20-169

Take-home Messages

- Use **clean** water and **clean** utensils
- Source **pasteurized** nuts
- **Soak at low** temperatures (15ºC / 59ºF or less).
- Soak for **no more than** 8 h
- Drying soaked almonds **does not** kill *Salmonella* or lower your risk for foodborne illness.

Apple drying has food safety implications

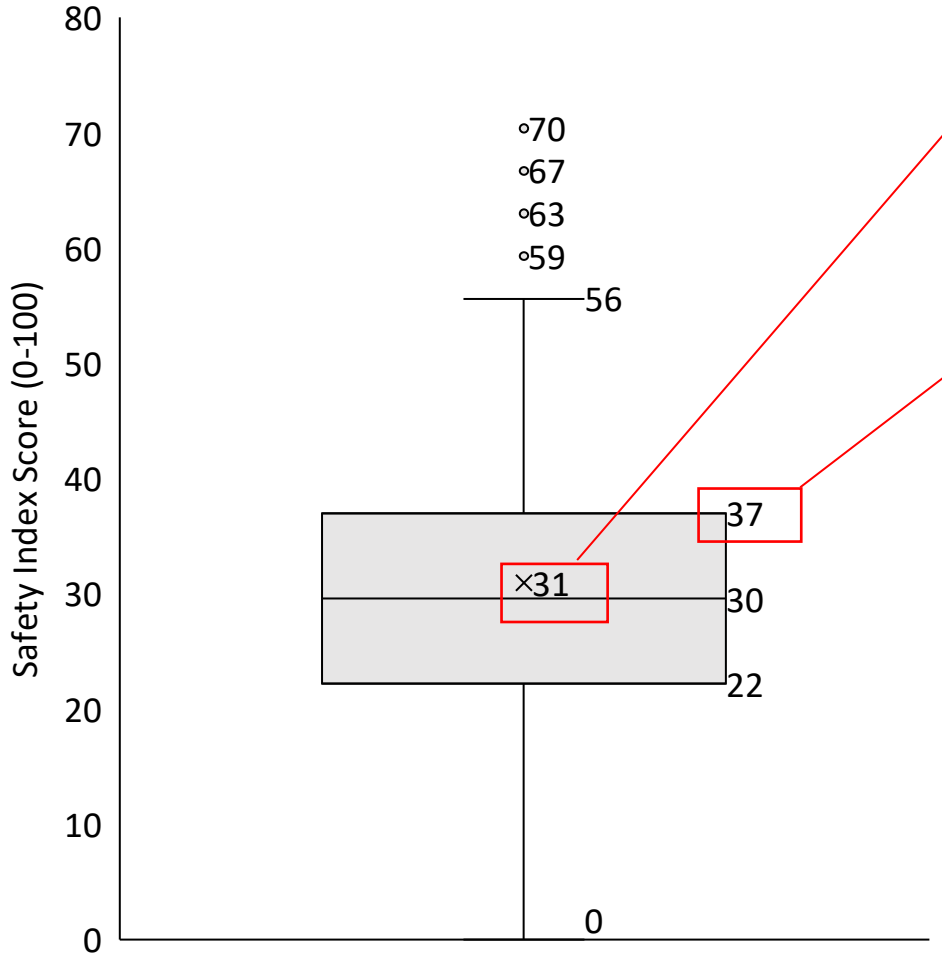
1. Low-moisture foods have been **involved in outbreaks and recalls** [5,6,7,9]

2020	Cinnamon apple chips recall	*Salmonella*
2017	Dried coconut outbreak	*Salmonella Typhimurium*
2014	Freeze-dried cranberries recall	*E. coli*
2013	Freeze-dried apples recall	*Salmonella*

2. *Salmonella* and *Listeria monocytogenes* **persist in low a_w** and **have increased thermal resistance** [4,8]

3. **Kill step validation** for dried nuts, spices & flour[1,3] → Not extended to dried fruit

Low levels of safe practices are adopted during drying



1

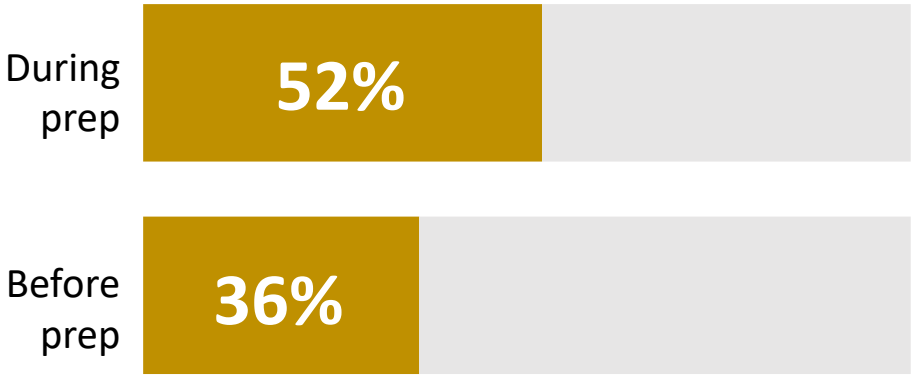
On average, home apple dryers scored poorly on the Safety Index.

2

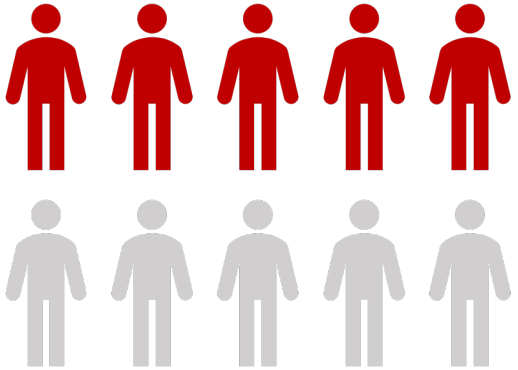
The distribution weighted towards a lower score. Three quarters practiced less than half of the identified safe practices.

There is inadequate personal and equipment hygiene

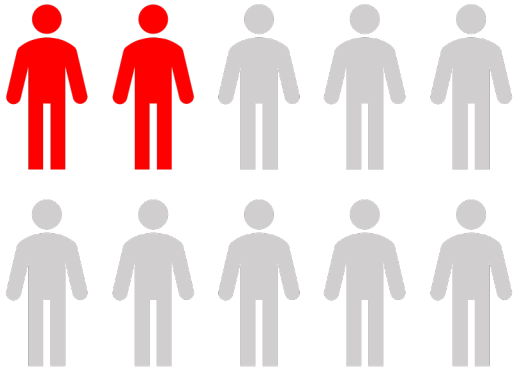
Do not **always** wash hands



Almost half do not wash all their kitchen tools adequately*

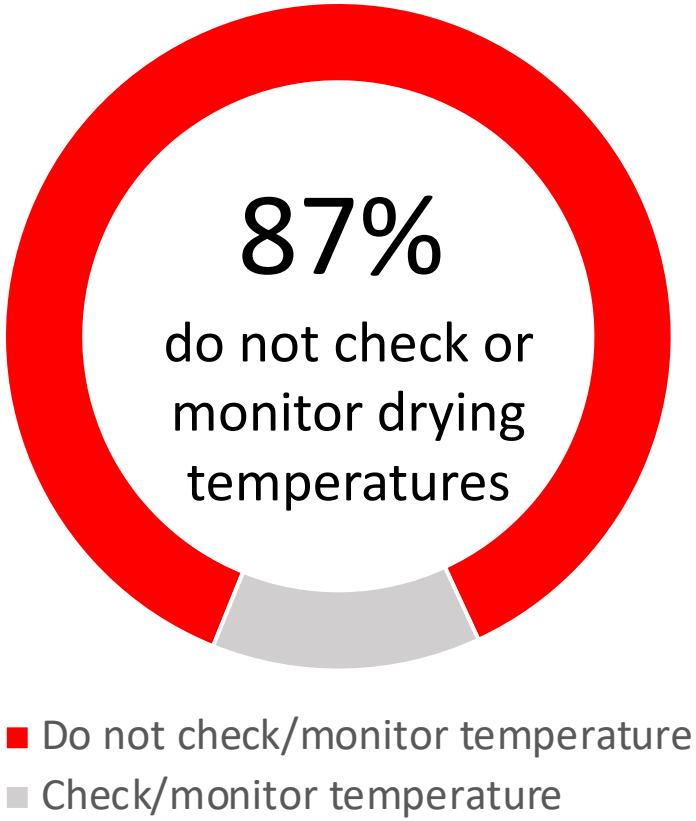


More than 2 in 10 who dry meat in the same device do not wash it adequately*



*Put in the dishwasher or scrub with soap and water

Home apple dryers rely on subjective indicators



*moisture content, water activity or pH

Home apple dryers may not consider food safety in processing choices

Reason for pre-treatment	%	n
It improves the flavor	63	445
It preserves color	54	378
It improves the texture	51	360
It slows down growth of germs	41	287
My recipe instructs me to	23	163
Other	2	15

Take-home Messages

- Awareness of the limited bacteria reduction in the drying process.
- Temperature and moisture monitoring in the drying process.
- Treatment and pre-processing techniques that reduce the risk.
- Safe food handling practices during drying.

Acknowledgement

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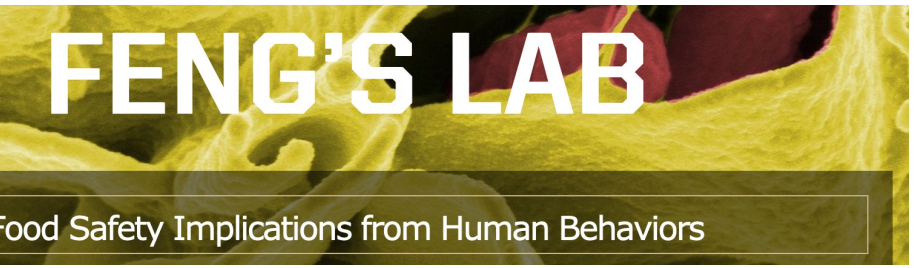

https://ag.purdue.edu/foodsci/Fenglab/

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