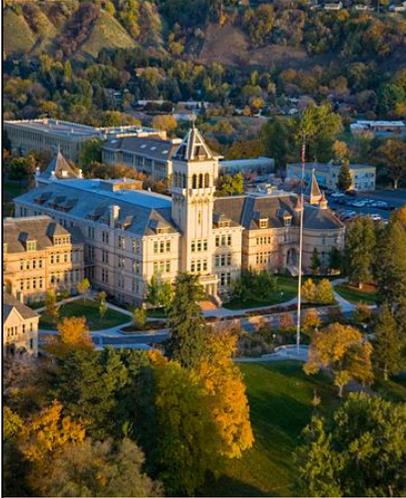


Slide 1



Food Safety of low acid canning in “smart cookers”
(A real spoiler alert)

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Thank audience for coming--Introduce ourselves and the rest of our team—this was a multi-county collaboration plus an on-campus Extension specialist.

Introduction

- “Smart Cookers” (electric programmable pressure cookers) advertise safe low acid pressure canning capabilities, against USDA recommendations. In research using thermal processing datalogging at three altitudes, cookers did not attain 121.1° C to kill botulism toxin spores.

Smart cookers, “Instant Pots,” electric programmable pressure cookers (EPPCs) are the most popular kitchen appliance given at weddings. Pressure cooking is a smart way to cook more quickly, and dubbing one an “Instant Pot” was sheer genius. However, there are problems:

- Manufacturers are also advertising canning capacity for these appliances—even though USDA has refused to condone it due to lack of research
- In spite of USDA stated opposition, many manufacturers’ manuals recommend using USDA and Extension literature for process times—giving us a certain amount of liability
- People don’t follow directions—either the manufacturers’ or Extension’s---they google it or ask their neighbor
- Most people assume “a pressure cooker is a pressure cooker, it doesn’t matter if it is electric or stovetop” –so they don’t question advertisements

	<u>Manual</u>	<u>Top data logger psi temp</u>
• Fagor	9 psi high, 5 low	5 psi
• Cuisinart	none listed	15 psi*
• Deni	10 high, 5 low	5 psi
• Nesco	none listed	7 psi

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Because of a fact sheet done in 2015 on pressure *cooking* done in EPPCs at Utah altitude, we knew that altitude affected the pressure cookers, and if people were using them for pressure *canning*, then it was possible the practice was at a high risk for botulism poisoning.

As explained in a news release from Instant Pot, EPPC's are made to hit their top pressure, then immediately back down to a "working pressure," creating a situation where the manual claims a higher pressure than it actually maintains. In the Instant Pot article it pointed out that even though its unit could reach 15 psi, the working pressure was around 11 or 12 psi.

- The Cuisinart in the study received the lowest rating because of its poor quick release system.

OBJECTIVES

- *Preliminary study:*
 - Do EPPCs get up to 121.1° C?
 - Are EPPCs affected by Utah altitudes?



So we wrote a proposal for a mini-grant about the food safety of low-acid canning in electric programmable pressure cookers—“smart cookers” “Instant Pots”

We meant it to be a PRELIMINARY STUDY, with only two objectives: Do EPPCs get up to 121.1 C (250 F), and (2) are EPPCs affected by Utah altitudes

Impacts on Canning Concerns

- “What matters is temperature, not pressure”
- Temperature in canner must be stable throughout process
- Size of cooker impacts thermal death kill during cool down

There were a few canning concerns we wanted to answer. Although we talk about pressure, what really kills the botulism toxin spore is the time at the correct temperature *at the cold spot in the jar*.

“As much as 30 to 40% of thermal death kill happens during cool down.” Dr. Address, personal conversation

Botulism Cook and Commercial standards

- 1. 121° C (250° F) for 2.5 minutes *at the cold spot*
- 2. Equivalent times at lower temperatures = L value
- 3. Cold spot determination

To can safely, food must reach a particular time and temperature combination at what has been determined to be the coldest point in the container, for the food to be considered as safe—meaning the protein-coated spores that produce the botulism toxin in low acid canned foods have been killed.

The commercial standard of 121.1 C for 2.5 minutes at the “cold spot” is what is called a “Botulism Cook.”

Industry can take this standard and develop an equivalent time and temperature combinations with some logarithmic calculations to figure the thermal death kill, but the point is that the food must reach a particular time and temperature combination, at the coldest point in the container, for food to be considered 99% safe from developing botulism toxin.

Methodology

- Hi-temp data loggers inside of product jars
 - USDA process times
- Three EPPCs
 - the Carey Smart Canner (14 qt)
 - the Duo80 Instant Pot (8 qt)
 - the Power Pressure Cooker XL (10 qt)
- Three altitudes
 - St. George/Hurricane-2917 ft.
 - Provo-4500 ft.
 - Monticello-7070 ft.
- Three foods
 - Hot-Pack Chicken Strips
 - Hot-Pack Pinto Beans
 - Raw-Pack Green Beans



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Hi-temp data logger

Three popular smart cookers

Three Utah altitudes—the lowest we go, the middle, and the highest typically inhabited

STATISTICS

- ANOVA with $\alpha = 0.05$
- N = 81 observations
- Maximum temperature
- Used USDA process times

The Data analysis --

Findings



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This is what we found. The press release says “not consistently safe for low acid canning.”

FINDINGS

- **One EPPC (the Carey) reached 121.1° C**
 - No brand sustained its maximum temperature for recommended processing time
- **All EPPCs affected by altitudes**
 - The higher the altitude the lower the maximum temperature reached
- **Carey maximum temperature significantly different (<0.0001) than other brands**
 - Instant Pot max = 115.77 C; Power Pressure XL max = 116.38 C

Instant Pot steam release handle is marked for 105 – 135 kPa According to the article, 105 is 15.23 pounds of pressure—but says it only touches that briefly then goes to working pressure of 10.15 -11.6 psi

According to Power Pressure XL user's manual, p. 23: "The CANNING button sets the pressure at 80 kPa (11.6 psi). Up to 2000 ft. above sea level, the Power Pressure Cooker XL produces sufficient pressure and heat to safely process all foods for canning." There is no kPa number on the base of the XL pressure release.

Impacts on Canning Concerns

- “What matters is temperature, not pressure”
 - Temperature significantly affected by altitude
- Temperature in canner must be stable throughout process
 - Temperatures were not volatile, but did not sustain max temp through duration of process
- Size of cooker?
 - At Amazon: over 1,000 choices “electric pressure cooker”

This is a **preliminary** study tracking internal jar temperatures
121.1° C was target temperature for data—Carey achieved this

One EPPC has a venting mechanism—the Carey

Sometimes did not work and trial had to be redone

Temperatures were not volatile, but did not sustain max temp through duration of process

One EPPC claims to fit 4 quart jars

THE NEXT STEP

- Inform the public
 - Press release
 - County FCS faculty
 - Social Media
 - Journal articles
- Grants
 - Microbial challenge studies
 - Developing EPPC high acid small batch canning protocol
 - Developing EPPC *safe* low acid small batch canning protocol

USU had done the preliminary study. We knew that for Utah, the units were unsafe and/or inconsistent. We needed to take the next step:

- Inform the public
- Look at ways to go deeper into research

Press Release May 16, 2019

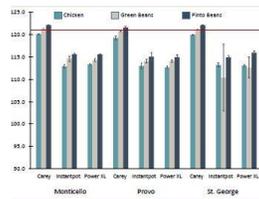
<ul style="list-style-type: none"> • Press Release <i>Study finds electric pressure cookers not consistently safe for canning</i>, written by Shelby Ruud, USU Extension Marketing. 	Sent to Statewide media outlets and Extension faculty
<ul style="list-style-type: none"> • <i>Food Safety Network</i> quotes press release in <i>Trends</i> and advertising claims don't mean countertop cookers are safe, by Coral Beach, May 20, 2019 	website claims over 4 million unique viewers in 2017
<ul style="list-style-type: none"> • <i>KUSU Utah Public Radio</i> radio show with Shalayne Needham--2 minute clip by Cathy Merrill about EPPC research findings included with Teresa Hunsaker's canning show https://www.upr.org/post/electric-pressure-cookers-are-not-canning 	
<ul style="list-style-type: none"> • Whiteh, J. interview with Merrill, C. (2019, July 19). <i>USU Extension research turns up concerning results for electric pressure cooker canning</i>. <i>The Herald Journal</i>, Logan, Utah. 	Daily circulation of 10,000
<ul style="list-style-type: none"> • Ruud, S., (2019, May 18). <i>Study finds electric pressure cookers not consistently safe for canning</i>. <i>St. George News</i>, St. George, Utah. 	
<ul style="list-style-type: none"> • <i>Deseret News</i> ran the press release by Shelby Ruidd 	40,000 weekday
<ul style="list-style-type: none"> • <i>The Pyramid</i> (Sanpete County News) July 4, 2019, ran press release as part of the <i>Daily Herald Extra</i> from Provo 	20,000 weekday
<ul style="list-style-type: none"> • <i>Journal of Extension Research-in-brief</i> article submitted detailing EPPC research, August 2, 2019 	Official refereed journal of Extension professionals
<ul style="list-style-type: none"> • Presentation of EPPC findings to Utah Extension Association of Family & Consumer Sciences 2019 Annual In-service 	22 FCS state professionals
<ul style="list-style-type: none"> • Upcoming National presentation of EPPC findings at National Extension Association of Family & Consumer Sciences' 2019 Annual Session, October 2019, Hershey, PA 	
<ul style="list-style-type: none"> • <i>Media reach totals resulting from EPPC research</i> 	Over 4 million
<ul style="list-style-type: none"> • Seth Edmunds, National botulism epidemiologist for the CDC emails for a preliminary draft copy of the study. "Looks quite interesting." 	

Evidently USU was the first specific study on temperature and altitudes. Great response!! The press release, written by Shelby Ruud in the USU Extension Marketing Department, was picked up by **Food Safety News** (4 million unique viewers as of 2017) one of the major media organs for food safety information in the United States, Canada, and the UK. In addition to questions by local Extension agents, I was interviewed by *KSL.com*, the *Provo Daily Herald*, *The Herald Journal* in Logan, Utah, *KLO Radio*, and *KUSU Utah Public Radio*. Other newspapers also printed the press release, *The Deseret News*, with a circulation of 40,000, being the largest Utah paper to print the release.

The National Botulism Surveillance Epidemiologist with the Centers for Disease Control emailed me asking for a preliminary copy of our study. He said it "looked interesting." *The CDC wanted my research*. I can't bronze an email, but I may try.

Presentations and Article

- Poster presented at USU Extension Annual Conference Poster Session
- UEAFCs –April 2019
- NEAFCS—October 2019
- Article submitted for *Journal of Extension Research-in-brief*
- Idaho, Colorado and Utah—High altitude collaboration



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In trying to get the news out to Extension, we've done a poster, and now two presentations, and submitted an article for JOE. Idaho and Colorado emailed and we're trying to get together to do a high altitude collaboration going beyond this preliminary study.

Implications

- Manufacturer vs. Extension

Manufacturers	Issues	Extension
Claim safety	Research-based	We haven't seen research
Programmed times	Botulism Cook Equivalents	Microbial studies?
Fine print—not over 2,000	Altitude adjustments	Significant temp drop
Claim 15 lb. pressure	Pressure vs. temperature	Working pressure?
Use USDA process times	Use USDA process times	Not what we've researched

From an industry standpoint,

- Manufacturers don't want to share their proprietary creations.
- The lethality calculations can be made—maybe it would be safe.
- NO MICROBIAL STUDIES HAVE BEEN RUN at least that we know of. Did the manufacturer run it? Do we trust what they say without seeing the data?

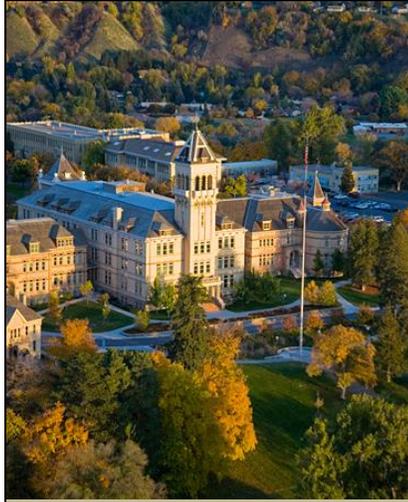
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Green Beans, Raw Pack				
Time at 200F (110.0C)				
		Ave time	Std Dev	Adequate? (≥ 12.21 min)
TC Genes	C	52.17	4.18	Y
	P	46.80	0.86	Y
	NL	16.14	0.86	
PhoA	C	47.94	2.13	Y
	P	21.69	11.00	*
	NL	16.42	0.86	
Microbial	C	41.67	2.97	Y
	P	27.88	10.20	*
	NL	11.22	3.23	
Time at 200F (110.0C)				
		Ave	Std Dev	Adequate? (≥ 9.95 min)
TC Genes	C	32.30	11.12	Y
	P	4.67	0.08	*
	NL	0.00	0.00	
PhoA	C	27.69	0.86	Y
	P	0.00	0.00	
	NL	0.00	0.00	
Microbial	C	23.11	2.95	Y
	P	0.00	0.00	
	NL	0.00	0.00	
Time at 200F (110.0C)				
		Ave	Std Dev	Adequate? (≥ 2.50 min)
TC Genes	C	6.72	2.54	Y
	P	0.00	0.00	
	NL	0.00	0.00	
PhoA	C	0.00	0.00	
	P	0.00	0.00	
	NL	0.00	0.00	
Microbial	C	0.00	0.00	
	P	0.00	0.00	
	NL	0.00	0.00	

Process Equivalent times—might work, might be safe, but until microbial studies are done, we can't say they're safe.

ACKNOWLEDGEMENTS

- Thank you for the collaboration of a great team!
 - Project Lead: Cathy Merrill, Utah County
 - Susan Haws, Summit County
 - Teresa Hunsaker, Weber County
 - Patricia Mathis, Wasatch County
 - Ellen Serfustini, Carbon County (retired)
 - Paige Wray, San Juan County
 - Karin Allen, USU Extension Specialist
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