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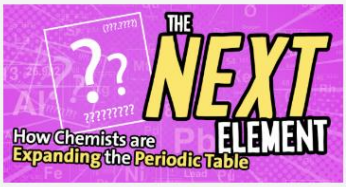
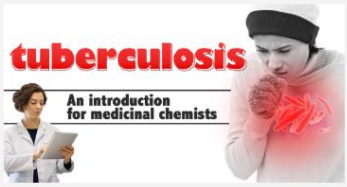


The Next Element: How Chemists are Expanding the Periodic Table

Top Tips for Communicating Your Science: Knowing Your Audience



Tuberculosis: An Introduction for Medicinal Chemists

https://www.acs.org/content/acs/en/acs-webinars/videos.html

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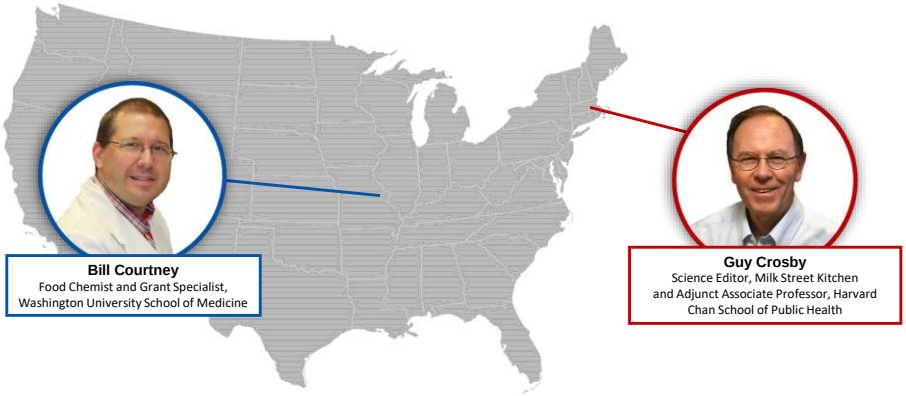
Thanksgiving Culinary Chemistry Rebroadcast



Presentation slides available now under "Handouts" in GTW Control Panel… there will be no Live Q&A as it is a recording!

This was a past Live ACS Webinar that has been edited and rebroadcast to celebrate *Thanksgiving* with a little culinary chemistry

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Thanksgiving Chemistry for Your Family's Feast

Guy Crosby, Ph.D., CFS
Milk Street Kitchen
Harvard School of Public Health

Thanksgiving Chemistry for Your Family's Feast

Three Take-Aways with Recipes

1. *How to cook juicy, flavorful turkey with crispy skin*
2. *How to make great gravy and mashed potatoes*
3. *How to select and cook delicious healthy vegetables*

Audience Survey Question

ANSWER THE QUESTION ON BLUE SCREEN IN ONE MOMENT

Who is responsible for making Thanksgiving an official U.S. Holiday?

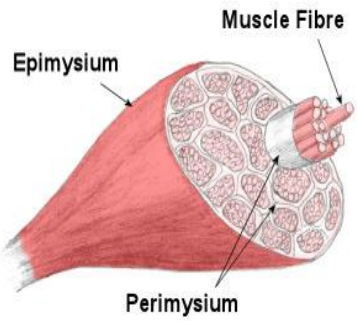
- Benjamin Franklin
- Sarah J. Hale
- Alexander Hamilton
- Susan B. Anthony
- Franklin D. Roosevelt

** You will not be able to respond to this question on screen, but ponder your answer to yourself… ;)*

- Cooking white breast meat and dark drumstick / thigh meat so they both turn out juicy and tender
- Producing crispy brown skin
- Making sure a safe temperature of 165F (74C) is reached throughout

Problems with Cooking Turkey

Cooking shrinks muscle fibers squeezing out moisture



Component	Breast Meat	Drumstick
H_2O	75%	76%
Fat	1.5%	4.0%
Protein	23.7%	20.5%
Collagen	2.4 mg/g	4.0 mg/g
T_o	140F (60C)	142F (61C)

T_o = onset temperature of shrinkage

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Problems with Cooking Turkey

- Muscle fibers shrink about 30% at 150F
- Moisture loss is temperature dependent

Pork Shoulder Breakdown	
140F (60C)	31 hrs
158F (70C)	16 hrs
176F (80C)	7 hrs
194F (90C)	2 hrs

% Weight Loss in Chicken Breast	
140F (60C)	10%
147F (64C)	12%
160F (71C)	24%

- Collagen breakdown starts 140F, fast 160F

Cook's Science, America's Test Kitchen, 2016, page 44

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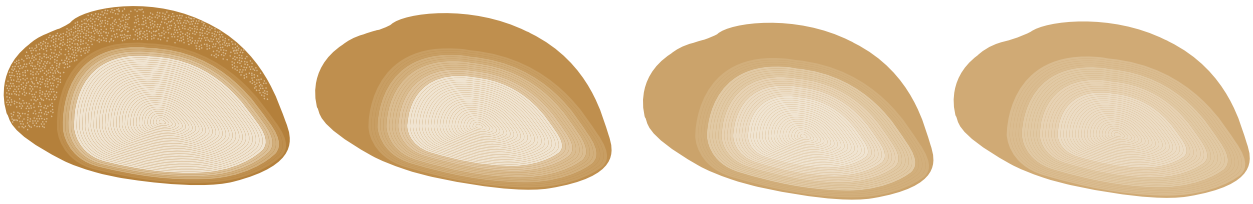
Brining and salting reduce moisture loss



1 hour | 12 hours | 24 hours | 48 hours

Salting Experiment

Salt 0.5%; Sodium 200mg/100g -*Cook's Illustrated* Nov/Dec 2012

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Recipe

- Salt 12 -14 lb turkey under skin, refrigerate for 24 - 48 hrs uncovered, thoroughly dry skin
  - 4 tsp 1:1 salt/sugar for breast
  - 2 tsp 1:1 salt/sugar for each drumstick
- Rub 2 Tbsp oil + 1 tsp baking powder on skin
- Roast at 400F (204C) until inner thigh = 160F (71C)
- Rest for 30 - 45 minutes before carving
- Ensure turkey (and stuffing) reaches 165F (74C)

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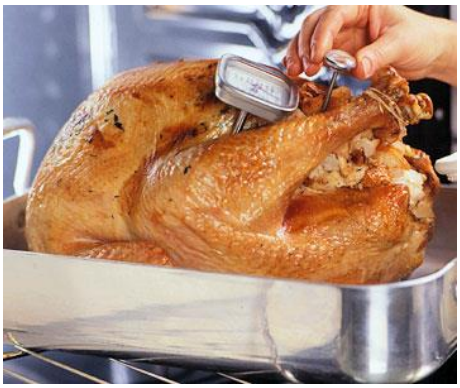

Temperature should reach 165F (74C) in thickest part of the thigh

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Audience Survey Question

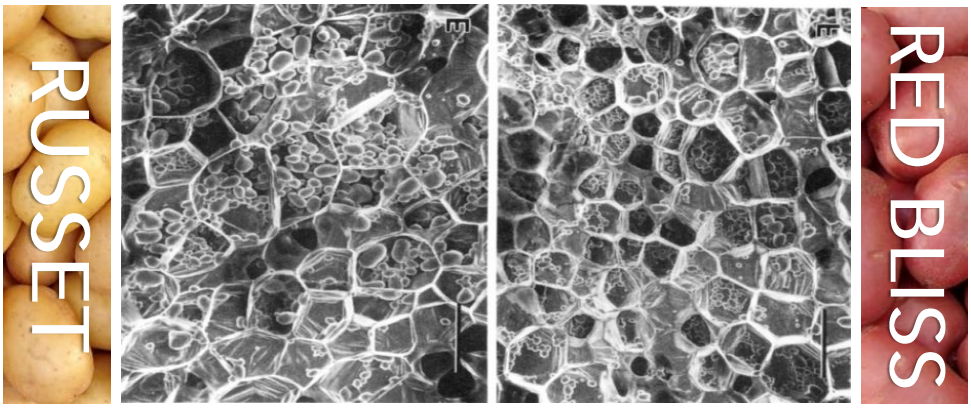
ANSWER THE QUESTION ON BLUE SCREEN IN ONE MOMENT

Approximately how many turkeys are eaten over Thanksgiving in the U.S.?

- 750,000 turkeys
- 1 million turkeys
- 10 million turkeys
- 45 million turkeys
- 100 million turkeys

** You will not be able to respond to this question on screen, but ponder your answer to yourself… ;)*

Problems with Mashed Potatoes

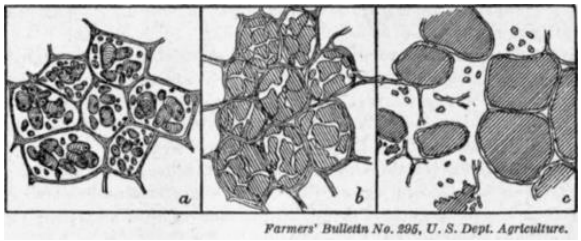


Mealy Waxy

Potatoes turn out "gluey"

Problems with Mashed Potatoes

- Mealy potatoes like Russets have more starch forcing cells to separate on cooking (baking)
- Waxy potatoes like Red Bliss have less starch and remain intact (potato salad)
- Use intermediate starch **Yukon gold potatoes**
- Mix with butter and cream or milk if desired; season



Mealy potatoes form clumps of cells

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Audience Survey Question

ANSWER THE QUESTION ON BLUE SCREEN IN ONE MOMENT

What product owes its existence to Thanksgiving?

- La-Z-Boy Chair
- TV Dinner
- Hula-hoop
- Pepto-Bismol
- Sweatpants

** You will not be able to respond to this question on screen, but ponder your answer to yourself… ;)*

- Prepare stock with neck, giblets, finely chopped onion, carrot, celery, salt
- Cooking onion slowly produces savory *3-mercapto-2-methylpentan-1-ol* (MMP)
- Remove drippings from roasting pan and separate most fat
- Return drippings to pan with fond
- Strain stock, add to pan plus roux (flour butter mixture)
- Cook slowly to thicken and season

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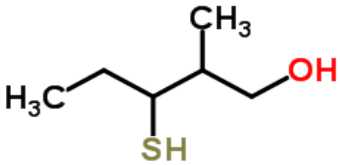
Making Great Gravy

- 3-Mercapto-2-methylpentan-1-ol (MMP)
- Intense savory, onion, gravy-like aroma
- Highest "odor activity value" in gravy
- Detected at concentration of 7.7 µg/liter
- - Odor threshold 1.6 ppt (0.0016 µg/liter)



Journal of Agricultural and Food Chemistry 2000; 48: 418-423
Journal of Agricultural and Food Chemistry 2011; 59: 13122-13130

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Making Great Gravy

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Audience Survey Question

ANSWER THE QUESTION ON BLUE SCREEN IN ONE MOMENT

Approximately how many calories does the typical Thanksgiving meal have?

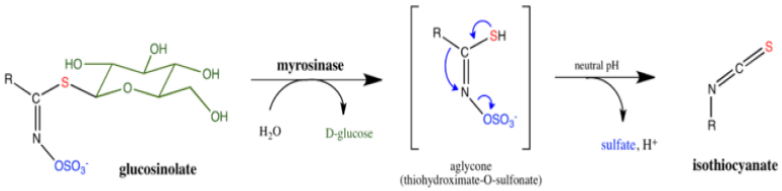
(ex. appetizers, main dishes, sides, and your obligatory slice of pecan pie)

- 750 calories
- 1,500 calories
- 2,500 calories
- 3,000 calories
- Who's counting…it's about giving thanks to great food and family

** You will not be able to respond to this question on screen, but ponder your answer to yourself… ;)*

Choose Healthy Cruciferous Vegetables

Flavor is only created when vegetables are chopped



Examples include: broccoli, cauliflower, cabbage, kale, bok choy, arugula, Brussels sprouts, collards, watercress, and radishes

- Cut medium to small Brussels sprouts in half
- Coat with olive oil, roast in 400F oven 18 min
- Fry bacon and dry on paper towels
- Mix bacon bits + a little fat with sprouts
- Squeeze on lemon juice, salt and pepper

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- Intense savory umami taste & aroma
- Peel small pearl onions and gently sauté in butter-oil until evenly brown
- Slowly braised in beef stock and wine
- Season with thyme, salt, pepper

- Complex flavors developed: Maillard, caramelization, MMP, dialkyl disulfides and trisulfides, thiophenes, thymol

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Cooking with Ria: *Mastering the Art of French Cooking*, Alfred Knoff, 1961

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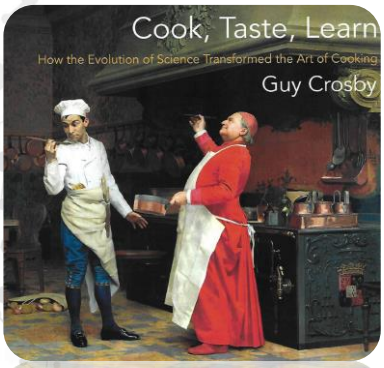
Cooking Science Notes

- To Market to Market
- The Fascinating Science of Taste, Smell and Flavor
- Making Stock of Things
- Righting a Wrong, or What You Don't Know Can't Hurt You
- Does Braising Meat Really make it Juicier?
- Starch in Food: What Makes Rice Sticky, Why Does Bread Stale, and Eat Your Beans!
- A taste of Place
- The Science of Onion Flavor
- Copper's Influence on the Formation of Egg White Foams
  Guilherme C. Meira, Guy Crosby, Ph.D., Sarah Pilkenton, Ph.D.
  Presented at American Chemical Society meeting, San Diego, CA March 26, 2012
- Macaron Science
- Food Science-Macaron by Annie and Connie Wu, Brown University
- The Science of Cooking with Wine
- What Is Temperature, And How does It Differ From Heat
- Thomas Keller and the Science of Butter-Poached Lobster
- Who Ever Heard of the Maillard-Hodge Reaction
- The Many Lives (and Uses) of Baking Soda
- A Common Misconception About Frying Food
- Emulsions and Emulsifiers
- Explaining Gluten
- A Molecular Gastronomer's Dream Come True
- What Is So Special About Water In Food
- The Difference Between Waxy and Mealy Potatoes



www.cookingscienceguy.com

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Who is responsible for making Thanksgiving an official U.S. Holiday?

- Benjamin Franklin
- **Sarah J. Hale**
- Alexander Hamilton
- Susan B. Anthony
- Franklin D. Roosevelt

*After petitioning the U.S. Government for 17 years, **Sarah Josepha Hale** finally convinced Abraham Lincoln in **1863** to make it a national holiday to take place every year on the fourth Thursday of November. Ms. Hale is also known as the author of the children's poem "Mary Had a Little Lamb."*

http://www.history.com/news/abraham-lincoln-and-the-mother-of-thanksgiving

** You will not be able to respond to this question on screen, but ponder your answer to yourself… ;)*

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- **45 million turkeys**
- 100 million turkeys

NWTF
Conserve, Hunt, Share

*In 2017, Americans ate 45 million turkeys over Thanksgiving, according to an estimate by the **National Wild Turkey Federation**, an advocacy organization for turkey farmers.*

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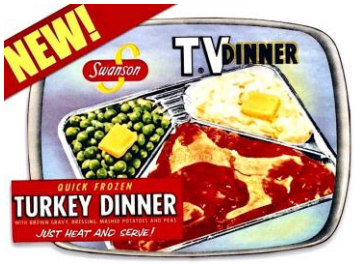
- **TV Dinner**
- Hula-hoop
- Pepto-Bismol
- Sweatpants



In 1953, the Swanson company misjudged the number of frozen turkeys it would sell for Thanksgiving by **260 tons**. So with some quick creative thinking they repackaged the meat with a few sides and created a new category in the food industry, the first TV Dinner!

https://www.smithsonianmag.com/history/tray-bon-96872641/

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Calorie Control Council
HEALTHY EATING & EXERCISE FOR LIFE®

*A typical Thanksgiving meal with appetizers, main dishes, side dishes and a slice of pecan pie has **3,150 calories and 159 grams of fat**, according to the **Calorie Control Council**, an association representing the low- and reduced-calorie food and beverage industries.*

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