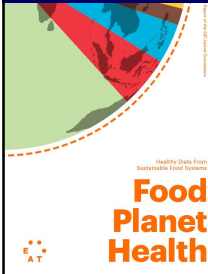


21st CENTURY DIET



Healthy patient, population
and planet
Ascension Health System

Frank Franklin MD MPH PhD
Professor Emeritus of Public Health
Previous: Professor of Pediatrics, Nutrition Sciences and
Maternal and Child Health UAB
9-15-2020

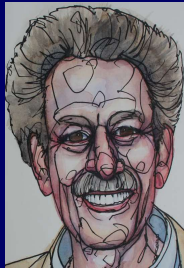
1

CONFLICTS OF INTEREST

Dr. Franklin has no commercial interest in any of
the products or processes discussed in this talk

2

Contact Information

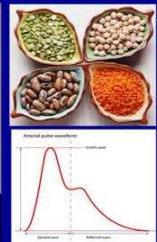


Frank Franklin MD MPH PhD
Professor Emeritus of Public Health
Professor of Pediatrics, Nutrition Sciences,
Maternal and Child Health
205-969-3914
frankln@uab.edu
4831 Bridgewater Road
Birmingham AL 35243

HAPPY TO RESPOND TO YOUR
QUESTIONS AND COMMENTS

3

Frank Thinks about Nutrition and Medicine: A Healthy Pulse



FEEDBACK:

Like a Longhorn cow: A point here and a point there, and a lot of bull in between.

4

TWO POINTS: LONGHORN STORY

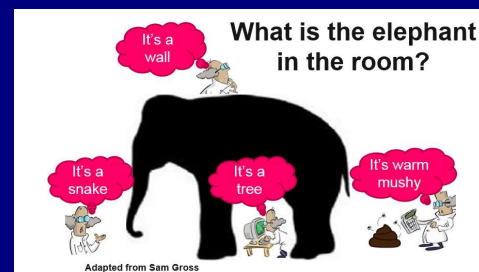
PLANT-BASED
BURGERS ARE
BABY STEPS
ON RIGHT PATH



POLICIES,
PUBLIC-
PRIVATE
PARTNERS
+ INCENTIVES
REQUIRED

5

LET'S LOOK AT THE WHOLE



ENJOY FOOD: STAY SANE, SATIATED AND SAFE – STRAIGHT SCOOP OF POOP
No conflicts of interest

6

OUTLINE: Bull between the horns

1. Collision course: demography and climate change make current diet unsustainable for 10B people in 2050.
2. Case for change: Meat - adverse impact on health of people and planet
3. Change: Diet designed for healthy people and planet
4. Course: Amino acids and dietary protein review
5. Café: Food technology reformats burgers
6. Consumer: Food culture and concerns
7. Clash: Food fight of farmers vs. food technologists
8. Collapse: Disruptive innovations - microbes and flies for our future food
9. Challenge: Changing consumer choices
10. Conclusion: Questions, answers and discussion - Wine down time

7

READINGS

1. Food in the Anthropocene: the EAT-Lancet Commission on healthy diets from sustainable food systems. Walter Willett Harvard Chan School of Public Health Lancet. 2019 Feb 2;393:447-492
2. Meat: The Future Series – Alternative Proteins
World Economic Forum January 2019
3. Alternative Proteins: The race for market share
McKenzie & Company August 2019
4. Can a burger solve climate change
New Yorker September 23, 2019
5. Multiple health and environmental impacts of foods
Proc Natl Acad Sci U S A 116 (46), 23357-23362. 2019

8

READINGS (CONTINUED)

6. America's Cattle Ranchers Are Fighting Back Against Fake Meat
https://www.wsj.com/articles/americas-cattle-ranchers-are-fighting-back-against-fake-meat-11574850603?mod=trending_now_4



DUELING: BURGER FLIPPERS



9

The Problem

DEMOGRAPHY CLIMATE CHANGE



Our current food system and diet cause poor health and ecosystem degradation, thereby compelling changes for sustainability and public health.

10

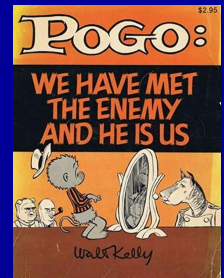
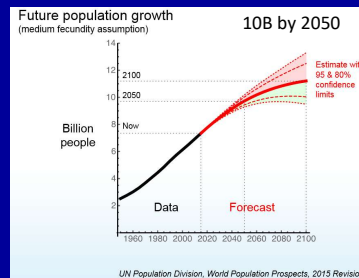
Our diets link human health and environmental sustainability



Global food system must operate within boundaries for human health and food production to ensure healthy diets and sustainable food systems for ~10B people by 2050.

11

THE POPULATION BOMB



- Global food production to feed 10B must increase by 26-68% by 2050
- Increasing global food demands for livestock to emulate the Western diet

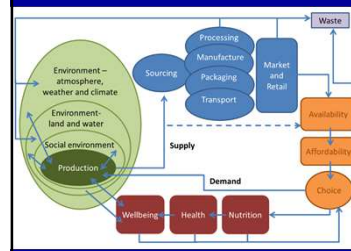
12

CASE FOR CHANGE:

MEAT CONSUMPTION ADVERSELY AFFECTS
HEALTH OF PEOPLE AND PLANET

14

FOOD SYSTEM



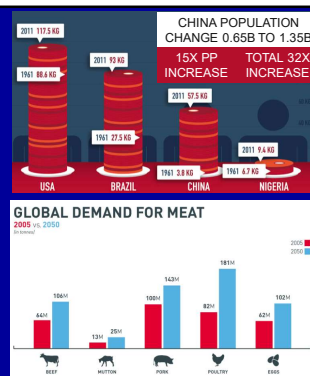
- Definition: All elements and activities for food production, processing, distribution, preparation, and consumption.
- Diets are both the product and driver of the food system.
- **Two goals:** Consumption of healthy diets and sustainable food production.

COMPLEX SYSTEM.
MANY BIRECTIONAL LINKS AND FEEDBACK LOOPS
SMALL CHANGES CAN HAVE MULTIPLE EFFECTS

15

Meat Matters

- Definition: Flesh of a mammal, especially domesticated animals as opposed to fowl or fish
- Convergence of Asia with “Western” levels of consumption is incompatible with keeping global temperatures from rising more than 2 degrees C.



16

SEVERAL BENEFITS OF MEAT

- Meat has a special place in human diets. Innate preference for meat as it is energy-dense and nutrient- and protein-rich as we evolved in an environment where energy and protein were scarce.
- Meat provides high quality protein and micronutrients such as iron, zinc and B-12
- In some low-income countries, meat consumption provides a full and nutritious diet. At present, there are no viable alternatives with comparable energy and nutrient density. Often, livestock production is also central to livelihoods and economic resilience.

www3.weforum.org/docs/WEF_White_Paper_Alternative_Proteins.pdf

17

+/- health and environmental impacts of foods

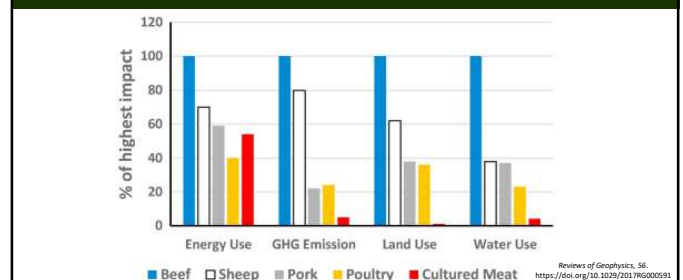
- Increased crop yields and improved production and processing have made food convenient, available, and affordable and reduced famines, poverty, hunger and under age 5 mortality and improved life expectancy.
- However, these health benefits are offset by global shifts to unhealthy diets high in calories and heavily-processed and animal source foods and environmental degradation.
- Poor dietary quality is a major risk factor for global diseases including coronary heart disease, type II diabetes, stroke, and colorectal cancers, accounting for 40% of global mortality.
- Agricultural food production emits ~30% of global greenhouse gasses (GHGs); occupies ~40% of Earth's land; causes nutrient pollution alters ecosystems and water quality; and accounts for ~70% of earth's freshwater withdrawals from rivers, reservoirs, and ground water.

Proc Natl Acad Sci U S A 116 (46), 23357-23362. 2019

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SUSTAINABILITY CHALLENGES:

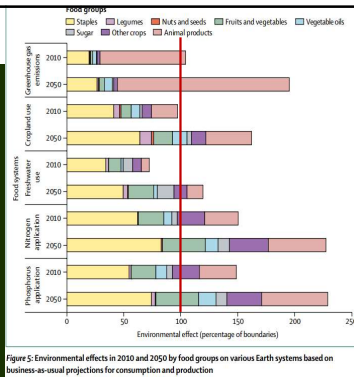
Energy input, greenhouse gas emissions (GHGE), land use, and water use of beef relative to other animal-sources



19

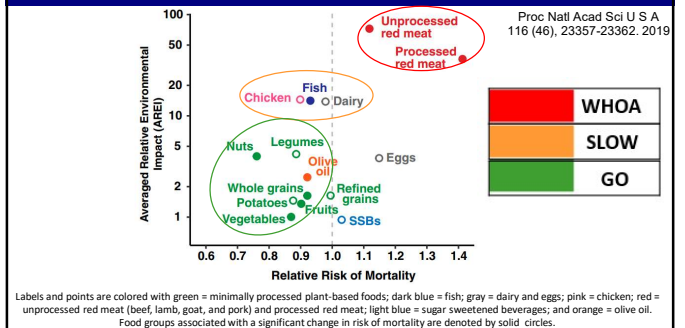
IMPACT OF CONTINUING OUR CURRENT WAY IN 2050

- Increased GHGE, cropland use, freshwater use and nitrogen and phosphorus application by 50–90% from 2010 to 2050.
- A global population of 10B people eating the amount of meat of Western diet would require too much land and water, and lead to unacceptable greenhouse-gas and other pollutant emissions.



20

Health and environmental impacts of our food intake correlate

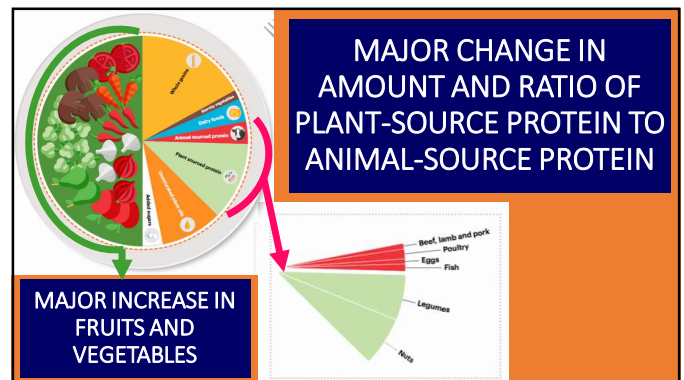


21

CHANGE OUR CONSUMPTION

Scientific Targets for Healthy Diets from Sustainable Food Production

22



23

PLANETARY DIET @2500 KCAL/DAY

Planetary diet nutrient adequacy: Adequate micronutrients (iron, zinc, folate, vitamin A) and calcium; increases in low income countries. Vitamin B12 low in plant-based diets may require supplements or fortification.

* 60-80g = 1 serving ** 4 gm = 1 tsp 1 oz = 30 g

	Macronutrient intake grams per day (possible range)	Caloric intake kcal per day
Whole grains Rice, wheat, corn and other	232	811
Tubers or starchy vegetables Potatoes and cassava	50 (0-100)	39
Vegetables * All vegetables	300 (200-600)	78
Fruits * All fruits	200 (100-300)	126
Dairy foods Whole milk or equivalents	280 (0-500)	153
Protein sources Beef, lamb and pork	14 (0-28)	30
Chicken and other poultry	29 (0-58)	62
Eggs	13 (0-25)	19
Fish	28 (0-100)	40
Legumes	75 (0-100)	284
Nuts	50 (0-75)	291
Added fats Unsaturated oils	40 (20-80)	354
Saturated oils	11.8 (0-11.8)	96
Added sugars ** All sugars	31 (0-31)	120

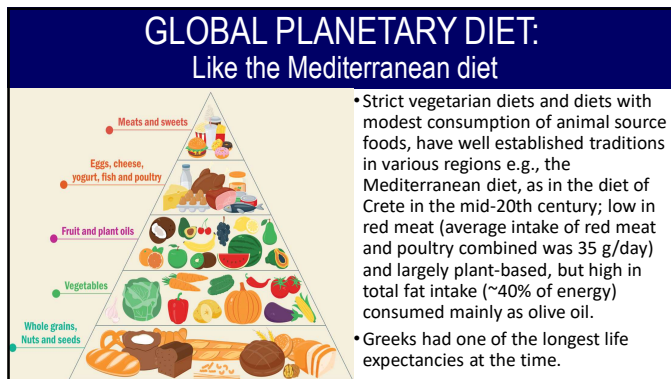
24

CURRENT NORTH AMERICAN INTAKES VS. PLANETARY HEALTH DIET

US ADULT AVERAGE ANNUAL NON-POTATO VEGETABLE INTAKE IS 52% OF PLANETARY DIET RECOMMENDATION NO CHANGE IN LAST 25 YEARS



25



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ESTIMATED AVOIDED PREMATURE DEATHS AMONG ADULTS IN 2030 BY GLOBAL ADOPTION OF THE PLANETARY DIET

Approach 1 Comparative Risk	19%	or	11.1 million adult deaths per year
Approach 2 Global Burden of Disease	22.4%	or	10.8 million adult deaths per year
Approach 3 Empirical Disease Risk	23.6%	or	11.6 million adult deaths per year

The risk factors included high consumption of red meat (including beef, lamb, and pork), low consumption of fruits, vegetables, legumes, nuts, and fish, and being underweight, overweight, or obese. The disease endpoints included coronary heart disease, stroke, type-2 diabetes, site-specific cancers, and an aggregate of other diseases.

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AMINO ACIDS AND PROTEINS

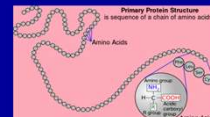
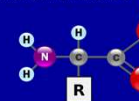
PROTEIN: FROM GREEK MEANING FIRST

28

Amino Acids and Proteins

- 20 different amino acids are building blocks of protein - 9 amino acids are essential.
- All living organisms contain protein as a major component of all cells. Essential for growth and maintenance of muscle, bone, and skin.
- Recommended Dietary Allowance (RDA) (meets the requirements of 98% of people) for protein: 0.8 grams of protein per Kg body weight. For 70Kg (154Lb) adult = 56 gm = 224 kCal = 11% of daily energy intake. Americans protein intake is > 16% of daily energy intake.

PROTOTYPE AMINO ACID



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Complementary foods provide complete protein

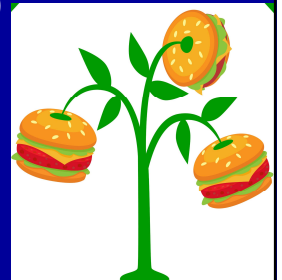
- Two ways to obtain all 9 essential amino acids:
- 1. Complete protein - single food contains all essential amino acids e.g., egg
- 2. Complementary proteins – combine beans and grains

Beans and other legumes	Isoleucine Lysine Valine Histidine Threonine Phenylalanine Leucine
B	Tryptophan Methionine
	Corn and other grains

30

INNOVATIVE FOOD TECHNOLOGY

IMPOSSIBLE FOODS AND BEYOND MEAT:
Propagating plants for progress



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NUTRIENT COMPOSITION OF PLANT-BASED MEAT SUBSTITUTES 8-20

- **Smithfield Pure Farmland Burger (4oz - latest version):** 16g protein, 7g sat fat, 3g fiber, 430mg sodium, 220 calories. Key ingredient: Soy protein concentrate
- **Nestlé's Sweet Earth Awesome Burger (4oz - latest version):** 25g protein, 8g sat fat, 2g fiber, 360mg sodium, 280 calories. Key ingredient: Textured pea protein
- **Beyond Burger (4oz):** 20g protein, 5g sat fat, 2g fiber, 350mg sodium, 260 calories. Key ingredient: Pea protein
- **Impossible Burger (4oz):** 19g protein, 8g sat fat, 3g fiber, 370mg sodium, 240 calories. Key ingredient: Soy protein concentrate
- **McDonald's Quarter Pounder 100% Beef Patty:** 20g protein, 18g fat, 8g sat fat, 0g fiber, 190mg sodium, 240 calories. Key ingredient: Beef

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BURGERS ARE US: 154 burgers per person per year



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IMPOSSIBLE FOODS: 4OZ BURGER

• INGREDIENTS

Water, Soy Protein Concentrate, Coconut Oil, Sunflower Oil, Natural Flavors, 2% or less of: Potato Protein, Methylcellulose, Yeast Extract, Cultured Dextrose, Food Starch Modified, Soy Leghemoglobin, Salt, Soy Protein Isolate, Mixed Tocopherols (Vitamin E), Zinc Gluconate, Thiamine Hydrochloride (Vitamin B1), Sodium Ascorbate (Vitamin C), Niacin, Pyridoxine Hydrochloride (Vitamin B6), Riboflavin (Vitamin B2), Vitamin B12.

Impossible burger alone
-- not buns, sauces

ADVERSE
NUTRIENTS

HIGHLY
PROCESSED

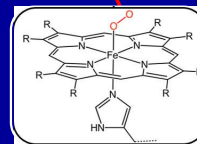
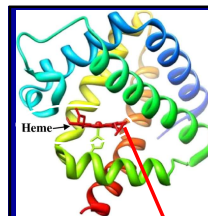
GMO

Nutrition Facts	
Serving size	4 oz (113g)
Amount per serving	
Calories	240
Total Fat 14g	28%
Saturated Fat 6g	12%
Trans Fat 5g	10%
Cholesterol 5mg	10%
Sodium 370mg	18%
Total Carbohydrate 9g	3%
Dietary Fiber 3g	11%
Total Sugars <1g	
Includes <1g Added Sugars	1%
Protein 19g	31%
Vitamin D 0mg	0%
Calcium 170mg	15%
Iron 4.2mg	25%
Potassium 610mg	15%
Thiamin 28.3mg	2360%
Riboflavin 0.4mg	30%
Niacin 5.3mg	35%
Vitamin B6 0.4mg	25%
Folate 115mg DFE	30%
Vitamin B12 3mcg	130%
Phosphorus 180mg	15%
Zinc 5.6mg	50%

<https://impossiblefoods.com/burger/> ACCESSED 12-3-2019

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LEGHEMOGLOBIN MOLECULE: Why Impossible burger bleeds



- **Leghemoglobin:** hemoprotein carries oxygen and found in the nitrogen-fixing root nodules of legumes.
- Leghemoglobin: chemical and structural similarities to hemoglobin and red in color.
- Gene isolated, then expressed in yeast to increase production and lower cost.
- This GMO product may conflict with their consumer base of environmentally oriented consumers. While Halal and Kosher, it not organic.
- Heme is a potential carcinogen.

<https://en.wikipedia.org/wiki/Leghemoglobin>

35

ARE IMPOSSIBLE BURGERS HEALTHIER THAN BEEF? NO! "Vegan Junk Food"

BURGER KING	IMPOSSIBLE WHOPPER	WHOPPER
Price	PRICE \$5.19*	\$4.19
Calories	630	660
Fat	34 grams	40 grams
Saturated fat	11 grams	12 grams
Sodium	RECOMMENDED < 2300 Mg/D 1,240 milligrams	980 milligrams
Protein	25 grams	28 grams
WHITE CASTLE	IMPOSSIBLE SLIDER	ORIGINAL SLIDER
Price	\$1.99	\$0.72
Calories	210	140
Fat	11 grams	7 grams
Saturated fat	4 grams	2.5 grams
Sodium	550 milligrams	380 milligrams
Protein	11 grams	6 grams

www.marketwatch.com/story/meatless-fast-food-burgers-probably-arent-any-healthier-but-theyre-definitely-more-expensive-2019-06-12

36

IMPOSSIBLE FOODS: GROWTH AND FUTURE

- Impossible Foods has raised \$1.5B in the private market; \$700M in 2020. Big increase in the company's valuation indicates venture capital investors remain willing to bankroll big valuations in private fundraisings. The fundraising could set the stage for an initial public offering (IPO) for Impossible Foods as early as next year.
- Now on the menus at over 300 restaurants. Early in 2019, it opened a new large-scale production facility in Oakland, California—where 1M pounds of meat can be produced a month. The site has the capacity to make 250X more Impossible Burgers than its past smaller facilities.
- Facing increasing competition from traditional meat producers and packaged food companies such as Tyson Foods Raised & Rooted, Conagra Gardein and Nestle Awesome Burger

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BEYOND MEAT: 4 OZ. BURGER

Beyond burger alone - not buns, sauces

• INGREDIENTS

Water, Pea Protein Isolate (PPI)*, Expeller-Pressed Canola Oil, Refined Coconut Oil, Rice Protein, Natural Flavors, Cocoa Butter, Mung Bean Protein, Methylcellulose, Potato Starch, Apple Extract, Salt, Potassium Chloride, Vinegar, Lemon Juice Concentrate, Sunflower Lecithin, Pomegranate Fruit Powder, Beet Juice Extract (for color)

*Peas are legumes. People with severe allergies to legumes like peanuts should be cautious when introducing pea protein into their diet because of possibility of a pea allergy.

NUTRITION FACTS

Serving Size: 1 Patty, US Retail 4 oz (113g)
Servings Per Container: 2

Amount per serving
Calories 250

Calories from fat 100
% Daily Value

Total Fat 10g	20%
Saturated Fat 5g	10%
Trans Fat 0g	0%
Cholesterol 0mg	0%
Sodium 500mg	10%
Potassium 500mg	10%
Total Carbohydrate 3g	1%
Dietary Fiber 2g	8%
Sugars 0g	0%
Protein 20g	40%
Vitamin A	0%
Vitamin C	0%
Calcium	0%
Iron	20%

HIGHLY PROCESSED

www.beyondmeat.com/products/the-beyond-burger/ACCESSED 12-3-2019

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Pea Protein

- Common pea, *Pisum sativum*, (20-25% protein, dry weight) includes field pea and garden pea, one of the oldest domesticated crops for food and feed. Pea protein has neutral taste and low cost. Protein quality of pea protein is lower than soy protein. Combined with a grain yields a high protein quality score.
- Gallons of water needed for proteins: pea protein isolate 43 gal/lb VS. pork 756 gal/lb
- Consumers familiarity with legumes lends confidence to feed family pea protein products.
- Pea protein production has increased 70% to meet growing consumer demand.

Well, they're not really MAGIC beans. They're just a heck of a lot better for you than meat or dairy.

BEANS BEANS THE MAGICAL FRUIT
NITROGEN NODULES AT ITS ROOT
THE MORE YOU EAT, THE BETTER YOU FEEL
SO, LET'S HAVE BEANS AT EVERY MEAL.
Bean Diddy updated by F Diddy food wrapper

Z. X. Lu, J. F. Hu, Y. C. Zhang & D. J. Bing (2019). Composition, physicochemical properties of pea protein and its application in functional foods. *Critical Reviews in Food Science and Nutrition*

39

BEYOND MEAT: Jump to the top – then rebound

Market Summary > Beyond Meat Inc
NASDAQ: BYND

73.60 USD 0.00 (0.00%)
Closed: Sep 17, 8:41 AM EDT - Disclaimer
Pre-market: 73.42 -0.18 (0.24%)

1 day 5 days 1 month 6 months YTD 1 year 5 years Max

102.60 USD, Wed, Jun 5

Chart showing stock price from Jun 2019 to Dec 2019.

SPORTS ILLUSTRATED SEP 24, 2019

BEYOND ENDORSING: Sell beyond burgers as new Gatorade — performance boosters that taste great?

ALL HAT AND NO CATTLE

INITIAL HYPE OF BEYOND MEAT IPO WAS BEYOND SENSE

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FUNGUS FOR US: DON'T SCORN QUORN

- Made from the soil fungus, grown in continually oxygenated water in large, sterile, fermentation tanks with glucose, fixed nitrogen, vitamins and minerals.
- Mycoprotein is extracted, heat-treated to remove excess RNA (risk of gout), dried and bound with egg albumen or vegan substitute.
- Textured to yield grained character of meat and pressed into a mince resembling ground beef and chicken chunks with color and mild flavor resembling the imitated meat product.
- Good-sized market in the UK

QUORN MINCE Nutritional value per 100 g (3.5 oz)

Energy	94 kcal
Carbohydrates	4.5 g
Sugars	0.6 g
Dietary fiber	6.0 g
Fat	2 g
Saturated	0.5 g
Protein	14.5 g
Sodium	245mg

www.foodnavigator-usa.com/Article/2019/10/01/Quorn-5-ways-meat-alternatives-can-sustain-their-rapid-rise
www.3.weforum.org/docs/WEF_White_Paper_Alternative_Proteins.pdf

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THE ALTERNATIVE PROTEIN CONSUMER MARKET FOR ALTERNATIVE PROTEINS

THE NEW FOOD ECONOMY

CONSUMERS SEE HEALTH BENEFITS IN PLANT-BASED PROTEINS
% who strongly or somewhat agree

	US	CANADA
PLANT-BASED PROTEIN IS ASSOCIATED WITH POSITIVE HEALTH EFFECTS	38%	46%
PLANT-BASED PROTEIN OFFERS SUPERIOR NUTRITIONAL VALUE COMPARED TO ANIMAL PROTEIN	17%	17%
THERE IS NO NEED TO EAT MEAT IN TODAY'S DIET AND AGE	14%	19%

CONSUMERS STILL NEED CONVINCING

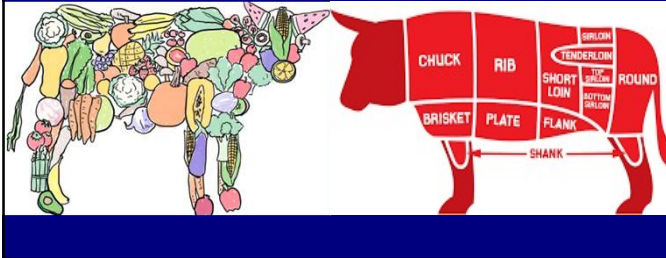
42

PLANT-BASED PROTEIN CONSUMERS:
Factors contributing to evolving interest in alternative protein sources

- CONSUMER DESIRES AND BEHAVIORS (MORE BI-BUY THAN TRANS)**
 - 60% want more protein
 - 18% trying to get more plant-based foods into their diets
 - 50% want to substitute plant-based proteins for animal proteins sometimes
 - 14% regularly use plant-based alternatives (e.g. almond milk, veggie burgers, tofu) yet 86% of these consumers are not vegetarians
 - 95% of plant-burger buyers have purchased a beef burger in past year
- MOTIVATION:** Healthier food choices popular among older consumers, whereas social, ethical and environmental factors are more important to younger consumers.
- FLAVOR FIRST AND FOREMOST:** Impossible and Beyond mirror "Burger experience" more than traditional veggie burgers. It's red and it bled. Consumers can indulge while addressing personal and planetary health and animal welfare concerns.

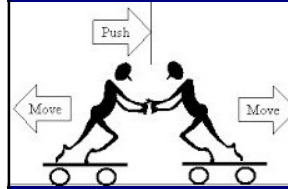
43

FOOD FIGHT: GOING HEAD TO HEAD



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Adult Food Fight – Meat vs. Beat the Meat Push and Push Back



Food application of Newton's Third Law
"For every action, there is an equal and opposite reaction"

BIG MEAT: Tysons, Conagra, Nestle, Hormel producing meat substitutes

www.wsj.com/articles/americas-cattle-ranchers-are-fighting-back-against-fake-meat-11574850603?mod=trending_now_4

- The Fake Meat War (2019): 25 states attempting to pass legislation making it illegal for plant-based food to be called meat - do not want vegetarian food items called burgers, steaks or dogs.
- "I want my rib-eye steak to have been walking around on four feet at one time or another." David Hillman (R) Arkansas
- A federal court blocked Arkansas from enforcing a law restricting the use of 'meaty' terms to products derived from slaughtered animals while a legal challenge proceeds through the courts. (Dec 12, 2019)

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DISTRUPTIVE INNOVATIONS: Investment opportunities



Requirements for successful launch of a novel protein food: Ingredient incorporation into foods, taste and nutrition, environmental impact, safety, and consumer trust

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Focus of an investor in a start-up: Bet on the disruption and the team

DIRTY DOZEN

1. Problem to be solved
2. Unique vision and mission
3. Disruption – Game changer
4. Solution is novel idea – not simple improvement
5. Pitch - A story worth telling
6. Execution - Feasible, scalable and cost efficient
7. BEM: Big Enough Market Insight market - metrics matter
8. Strong team with prehistory of working well together
9. Passionate, committed and driven team
10. Balanced egos
11. Able to innovate and iterate
12. Resilient

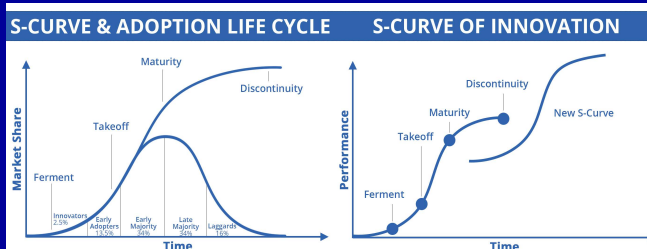
Company with a killer culture,
Not culture that kills a company



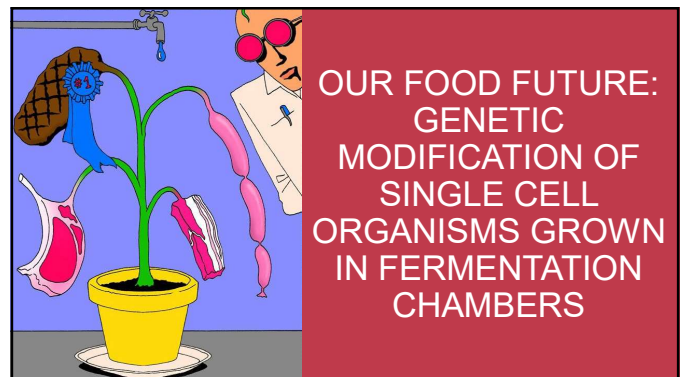
Requirements for successful launch of a novel protein food: Ingredient incorporation into foods, taste and nutrition, environmental impact, safety, and consumer trust.

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INNOVATION CURVES: Pick the right time

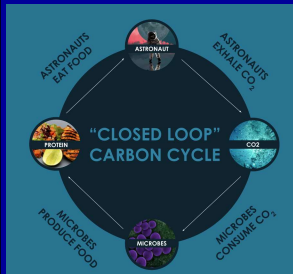


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AIR PROTEIN CLOSES THE SPACE LOOP



<https://www.theguardian.com/food/shortcuts/2019/nov/13/the-vegan-revolution-why-the-latest-meat-is-made-entirely-from-thin-air>

- Inspiration for Air Protein from NASA's 1960's attempt to produce food for a year-long mission.
- Hydrogenotrophs, single cell microbes, convert CO2 into food like plants.
- Can produce an 80% protein ingredient by cultivating these microbes inside fermentation tanks and feeding CO2 and nutrients.
- End-product is a pale brown powder with neutral flavor.

<https://www.airprotein.com/science>
https://microbewiki.kenyon.edu/index.php/Gut_hydrogenotrophs

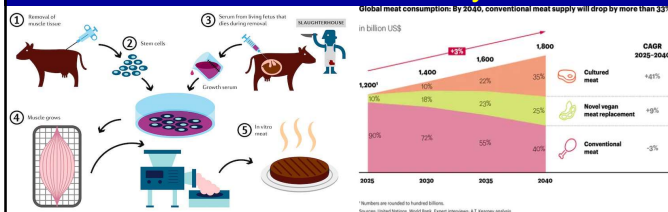
50

Single Cell Algal Protein

- Algae are easily cultivated, rapid growth with great economic potential for use in functional, processed foods.
- Blue-green and green microalgae grown in photo-bioreactors or fermenters are 40-60% protein dry weight, high amino acid quality and nutritional acceptability.
- Functional food technology properties: Gelation, foaming and capacity for water and fat absorption and emulsification are comparable to terrestrial plants.
- Key to successful market uptake of microalgae is finding ways to integrate these ingredients into attractive food products.

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CULTURED MEAT: How, Why and When

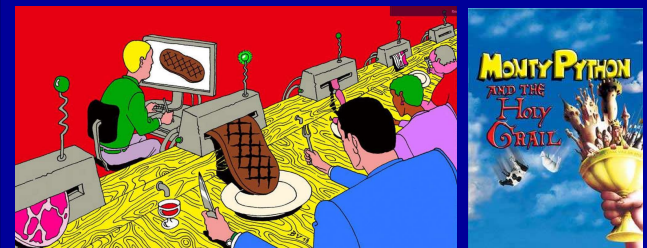


Lab grown meat could beat plant-based meats. Cultured meat could reduce greenhouse gas emissions by 74-87 % vs. traditional beef.

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3 D PRINTING A STEAK

"A beefsteak is the holy grail of plant-based meat."
 Giuseppe Scionti, founder of Novameat Tech SL



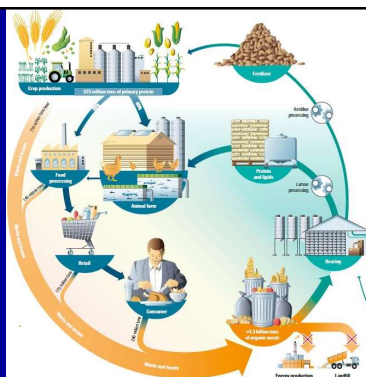
<https://medium.com/bloomberg-businessweek/a-realistic-steak-is-fake-meats-holy-grail-818afa6be316>

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INSECTS

WASTE RECYCLER

SOLVES PROBLEMS FOR MAN AND MAN-URE



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CATERPILLAR VS. COW

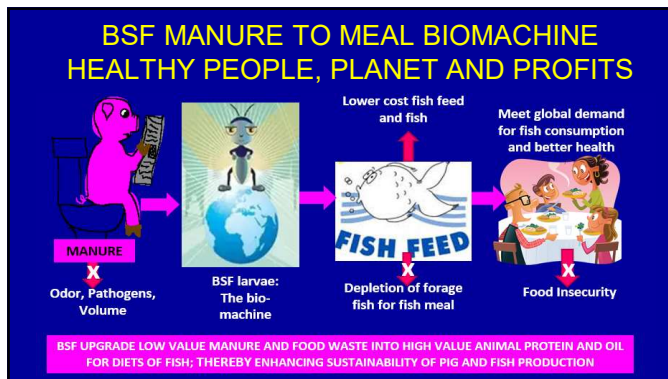
Compare



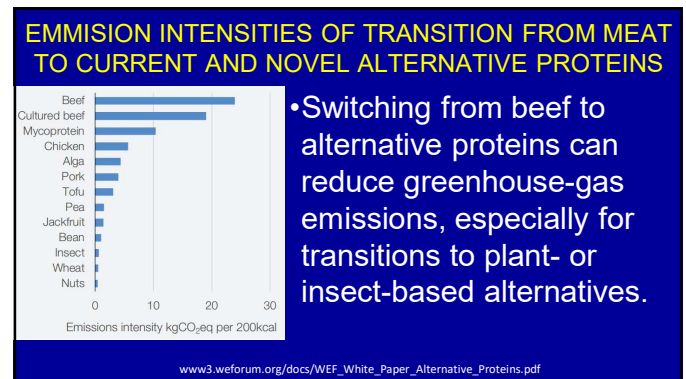
FIGHT RESULTS

EDIBLE FOOD PRODUCT AND HEALTH VALUE		X
ECOLOGICAL IMPACT		X
FEED EFFICIENCY AND YIELD OF EDIBLE PRODUCT		X
REPRODUCTION: RATE AND POPULATION EXPANSION		X
OVERALL WINNER FOR 2050		X

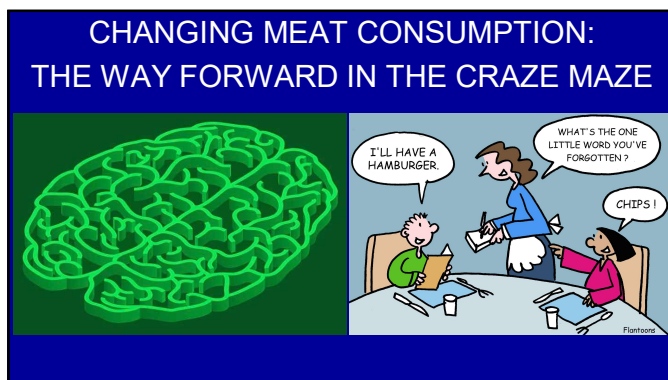
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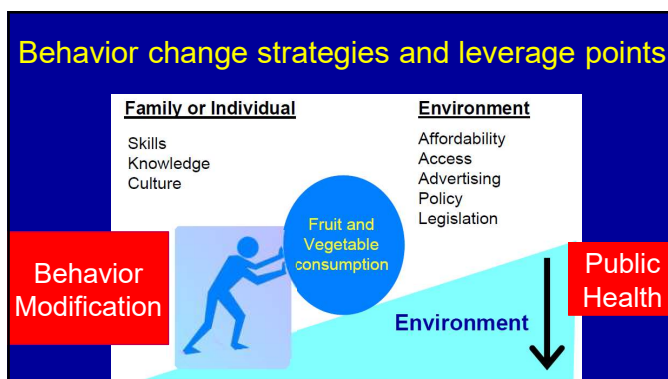
57



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- ### How we choose food – More reflexive than rational
- Hedonics: Taste, smell, texture, mouth feel, juicy
 - Logistics: Cost, convenience, availability
 - Emotions: Treat and reward, comfort, familiarity, virtue signaling/show off
 - Safety and trust
 - Inspirational –Values: Culture, religion, sustainability, health
 - Aspirational: Market health halo, greenwashing, power, appearance
- www3.weforum.org/docs/WEF_White_Paper_Alternative_Proteins.pdf

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- ### FOOD-NUTRIENT DISPLACEMENT THE STRESS SEE (C) FOOD DIET
- **DEFINITION**: Displacement of nutrient-rich foods by processed, low-nutrient foods given constant calorie consumption.
 - Due to time demands, highly processed, fast, convenience foods lacking key nutrients displace healthy foods.
 - Context counts – In sight, onto plate, into mouth
Fast Foods = French Fries
 - Comfort foods: Stress (chaos, crisis, crush, crash, confusion) response – not fight or flight but food.
-

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REASONS FOR OPTIMISM: SYSTEM ACTIONS AND CHANGES NEEDED

- HIV/AIDS ,tobacco ,trans fatty acids, and teen pregnancy
- LESSON LEARNED:
 - A full range and sequence of policy levers needed:
 - Soft policy interventions e.g., consumer advice, information, education, and food labelling.
 - Hard policy interventions e.g., laws, fiscal measures, subsidies and penalties, trade reconfiguration, joint public-private investment and incentives and disincentives along food chain.
- CONCLUSION:
 - Major changes to our diet beyond burgers are required for a healthy population and planet starting now.

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Questions and discussion



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