

Alternative Proteins

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Disclosure

No conflict of interest to report

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First Things First

What is alt-protein?

"A protein-rich food that did not come from the slaughter of an animal."

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The Meat of the Talk

- Why do we need Alt Proteins?
- The three basic types of alt-protein



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The Meat of the Talk



- Plant-based meats
- Fermentation
 - Traditional
 - Precision
 - Biomass
- Cultivated Meat

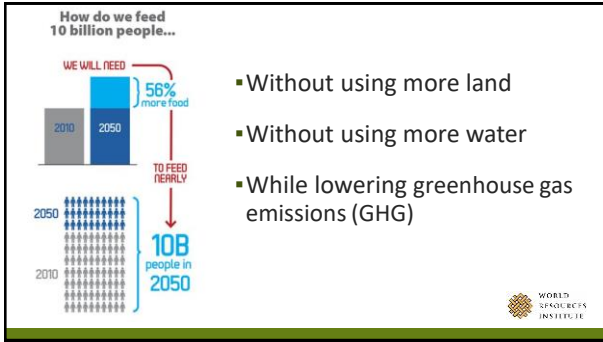
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By 2050, nearly 10 billion people will live on the planet.

How can we sustainably produce enough food for everyone?



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Current Livestock Production Practices are NOT Sustainable

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Alt Proteins...

- are land-efficient
- are water-efficient
- generate far fewer GHGs

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Alt Proteins

Three categories

- Plant Based
- Fermentation
- Cell Cultivated

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Cultivated Meat



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Plant Based

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Ancient Plant-Based Alt Proteins



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Tofu

- Dried soybeans are soaked in water, crushed, and boiled.
- Solids are removed. Coagulants added to the remaining soy milk.
- The watery "whey" is drained off.
- The solid "curds" are collected into molds and pressed into tofu.



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Tempeh



- Soybeans - soaked, de-hulled, partly cooked
- Inoculated with *Rhizopus Oligosporus*
- What's that white stuff??
 - The mycelium of the fungus!
- The mycelium binds the beans together to create an edible "cake"

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Tempeh



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Seitan

...aka Wheat Gluten or Vital Wheat Gluten

- Protein in wheat
- Meaty texture
- Very low fat
- Often used with other plant proteins
- Celiac disease – NO



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Popular Seitan Brands



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Plant-Based Alt-Protein

Mostly made of...

Soy protein

Seitan (wheat gluten)

Pea protein

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Basic Types of Plant Based Meats

1. Crumbles
2. Veggie ground meat
3. Sausage / meatballs etc.
4. Sausage crumbles
5. Breaded chick'n
6. Cuts of meat

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Crumbles

Old school – soy based

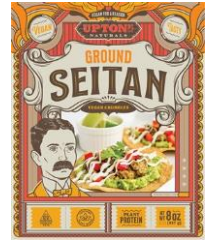


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Beyond Soy



Pea Protein



Wheat Gluten

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Shelf Stable



Pea Protein

Pea Protein

Soy

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Crumbles

Easy to use

Versatile

Very low fat

Na+ usually < 200 mg



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Ground Meat



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Beef Vs Impossible Vs Beyond 4 oz Patty Comparison

	Calories	Protein	Total fat	Saturated Fat
85% Ground Beef	243	21	17	6
Impossible Burger	230	19	13	6
Beyond Burger	230	20	13	5

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Veggie Ground Beef



- Very versatile
- Most soy and pea protein
- Fat much higher than crumbles
- Coconut fat used for texture / flavor
- Usually high in saturated fat

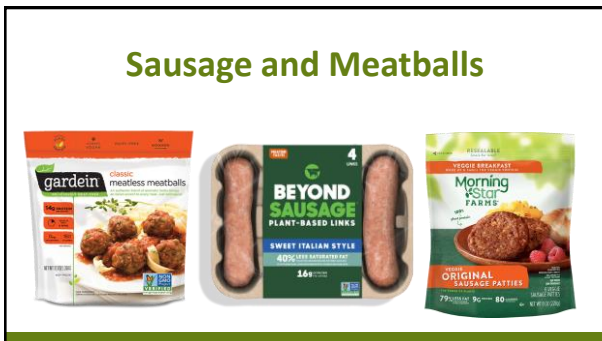
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Veggie Ground Beef Standout

- Uses canola oil
- 4 oz. calories – 290
- Fat – 17
- Saturated Fat – 1.5



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Sausage and Meatballs



- BIG variety
- Soy, pea and/or seitan
- Fat – coconut or canola / veg oil
- Calories and fat/ sat fat vary
- Higher Na+ most 350+ mg

36

Meatballs Showdown

Saturated Fat for ~4 oz	
7 grams	0.5 grams

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Sausage Crumbles






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Veggie Sausage Crumbles

Soy and wheat gluten
 Most products VERY low fat (3 g or less)
 Most >350 mg sodium



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Sausage Crumble Standout



EASILY MAKE THESE DISHES

Nutrition Facts
 4 servings per container
 Serving size 7 oz (197 g)

Calories	90
% Daily Value*	
Total Fat	10g 20%
Sodium	150mg 30%
Cholesterol	0% 0%
Saturated Fat	0.5g 10%
Total Sugar	1g 2%
Total Fiber	1g 2%
Protein	8g 16%
Total Fat	10g 20%
Sodium	150mg 30%
Cholesterol	0% 0%
Saturated Fat	0.5g 10%
Total Sugar	1g 2%
Total Fiber	1g 2%
Protein	8g 16%

VEGAN FOR A REASON

All Upton's Naturals, except for our soy oil, and every meal is an opportunity to show compassion for animals. Thank you for supporting our mission to make delicious, again, with your respect for ethics.

UPTON'S NATURALS
 100% PLANT-BASED
 100% WHOLE FOODS

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Breaded Chick'n






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Breaded Chick'n

BIG variety
 Soy and seitan and some pea
 Will have carbs
 Saturated fat usually low



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Substitutes for Cuts of Meat Precooked and Raw

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Substitutes for Cuts of Meat Precooked



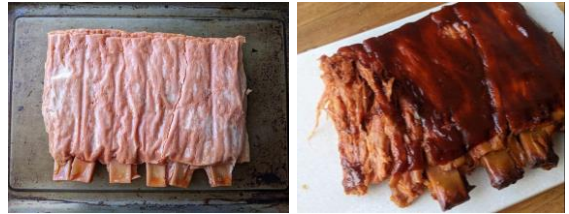
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Substitutes for Cuts of Meat Raw



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JUICY MARBLES



46

chunk



47

chunk



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Plant-Based – Benefits

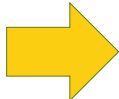
- Environmental
 - Less land and water
 - Less GHG emissions
- Generally healthier than their animal counterparts
- Already publicly accepted

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Plant-Based – Issues

- Cannot be made anywhere
- Halo effect –
 - Plant-based does not always mean healthy

Calories
Sodium
Saturated fat



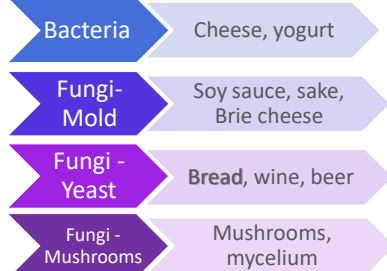
Can be the same or higher

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Fermentation

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Microbes – Can Be A Tough Sell



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Traditional Fermentation

Using microbes to change food to another form

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Traditional Fermentation



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Traditional Fermentation



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Traditional Fermentation

Using microbes to change food to another form

Precision Fermentation

Using microbes to make a specific ingredient

57

Precision Fermentation



58

Precision Fermentation



59

Traditional Fermentation

Using microbes to change food to another form

Precision Fermentation

Using microbes to make a specific ingredient

Biomass Fermentation

Growing microbes into high protein food

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Biomass Fermentation



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What's Coming to Market in Each of the 3 Fermentation Categories

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Traditional Fermentation

63

Traditional Fermentation



64

Precision Fermentation


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Precision Fermentation

Using precision fermentation, we create the super-functional proteins you know and love – all without the animal.




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Egg protein brewed by yeast.

Using precision fermentation to create protein that is equivalent to the key protein found in a hen's egg.

67



Egg protein brewed by yeast.

Using precision fermentation to create protein that is equivalent to the key protein found in a hen's egg.


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EVERY Egg White™



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**Precision Fermentation
Perfect Day**



- There are 6 major proteins in milk (4 casein and 2 whey)
- Perfect Day – one of the whey proteins

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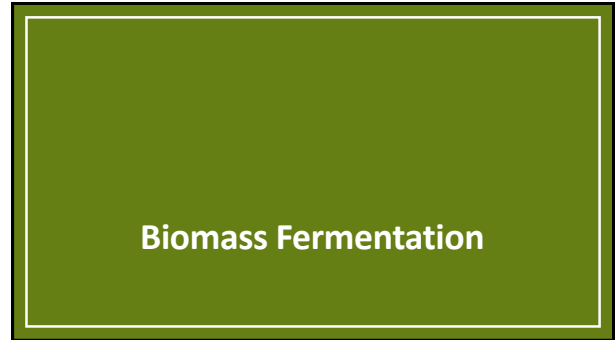
**Precision Fermentation
Leghemoglobin in Impossible Foods Burger**



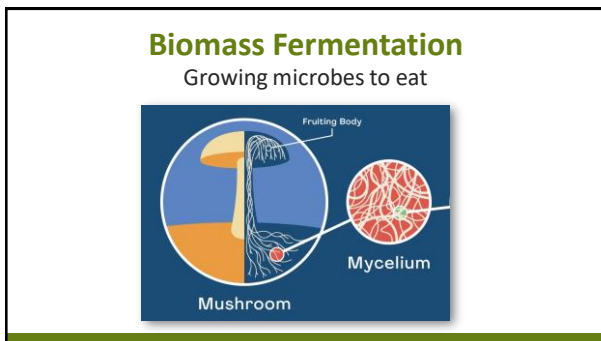
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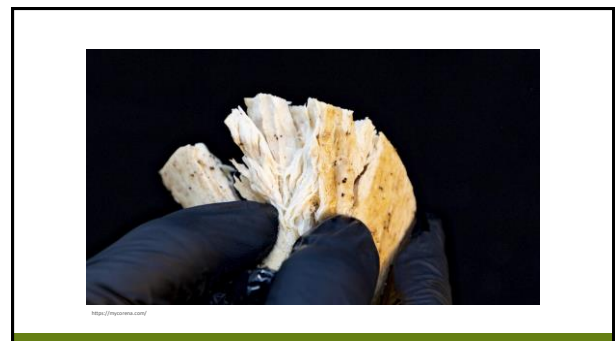
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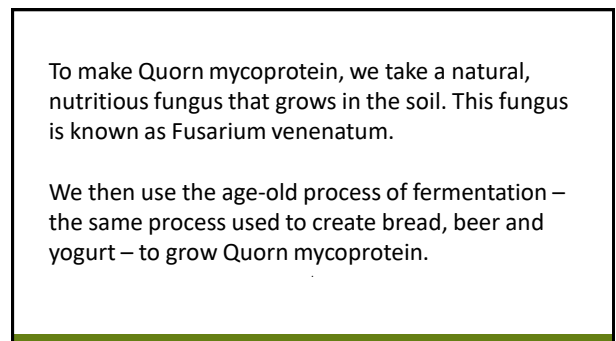
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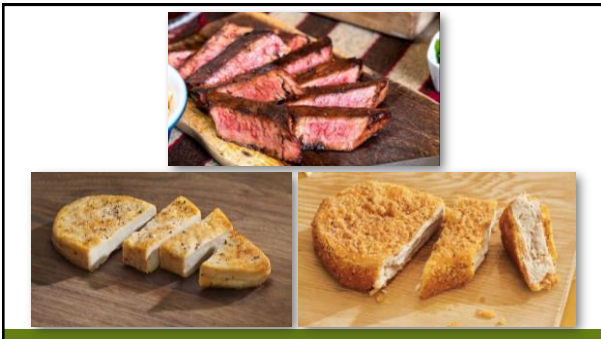
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Nutrition Facts

2 servings per container
 Serving size **one steak (120g)**

	Per Serving	% Daily Value*
Calories	120	240
	% Daily Value*	% Daily Value*
Total Fat	1g	1%
Saturated Fat	0g	0%
Trans Fat	0g	0%
Cholesterol	0mg	0%
Sodium	240mg	10%
Total Carbohydrate	10g	4%
Dietary Fiber	8g	28%
Total Sugars	0g	0%
Includes Added Sugars	0g	0%
Protein	17g	34%

Avoid if sensitive to Fungi such as Mushroom, Mold, or Yeast.

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Nutrition Facts

Approx. 5 serving per container
 Serving size **2 slices (15g)**

	Amount per serving	% Daily Value*
Calories	50	
		% Daily Value*
Total Fat	3g	4%
Saturated Fat	2g	10%
Trans Fat	0g	
Cholesterol	0mg	0%
Sodium	340mg	15%
Total Carbohydrate	4g	1%
Dietary Fiber	2g	7%
Total Sugars	1g	
Includes 1g Added Sugars		2%
Protein	3g	

Vit. D 0mg 0% • Calcium 3mg 0%
 Iron 0mg 0% • Potassium 77mg 2%

*The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. A 2,000 calorie a day is used for general nutrition advice.

Ingredients:
 Organic mushroom mycelium, organic coconut oil, organic sugar, natural flavor, salt

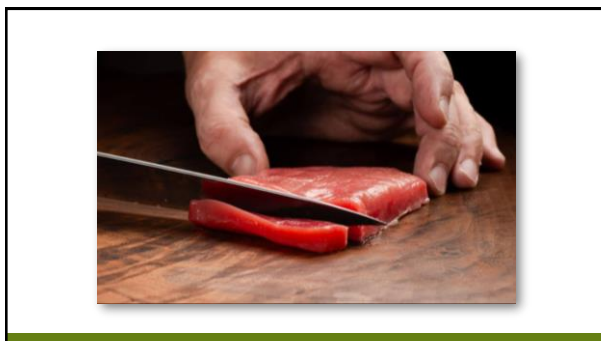
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Fermentation – Benefits

- Environmentally superior than livestock
- Uses a fraction of land and water
- Far less GHG emissions
- Many can be made anywhere

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Fermentation – Benefits

- Many uses
 - Enhancing other alt proteins across the spectrum
 - Stand alone protein
- Untapped resource

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Fermentation – Issues

- Allergies
- Unknown caveats –
 - Pregnant women?
 - Immunocompromised?
- Public acceptance
- Nomenclature needs work!

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Cultivated Meat

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Cultivated Meat – What Is It?

Cultivated meat is the same as conventional meat but, instead of slaughtering a whole animal, the meat is produced by growing animal cells.

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Cultivated Meat

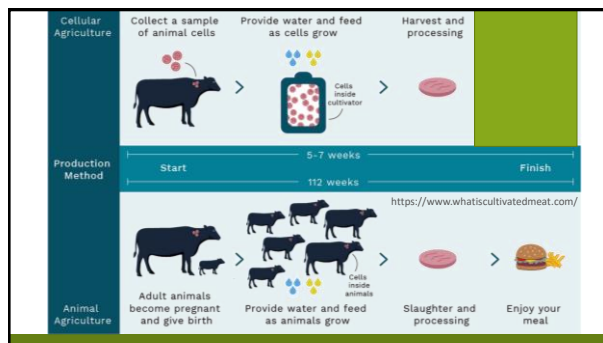
Cultured Meat

Cell-Cultured Meat

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How Is It Made??

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Poll Question

Is cultivated meat vegan?

- a) Yes
- b) No

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Cultivated meat is NOT vegan

Cultivated meat is not made from plants
It is cellularly IDENTICAL to animal meat
and thus is NOT vegan or vegetarian.

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Cultivated meat is NOT vegan

Allergic to tuna - allergic to cultivated tuna

Terminology for a different classifications
of vegan / vegetarian may emerge.

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Let's check out what's coming
from cultivated meat!

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The very first
cultivated meat
product – 2013!

Created by Prof.
Mark Post

100



Cost?
\$330,000

101



First cultivated meatball 2016

102



Only \$1000

103

**First cultivated meat approval?
Singapore 2020**

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In 2023, FDA gives approval two cultivated meat companies!

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In April 2024, Singapore approves cultivated quail.

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Vow Forged Parfait



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What's Coming?

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Beef!

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MOSA
Meat



113

Seafood!

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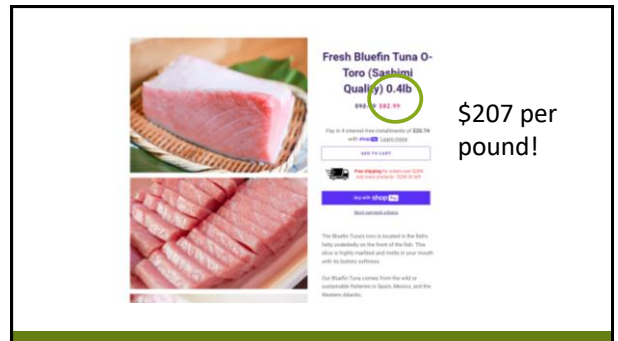
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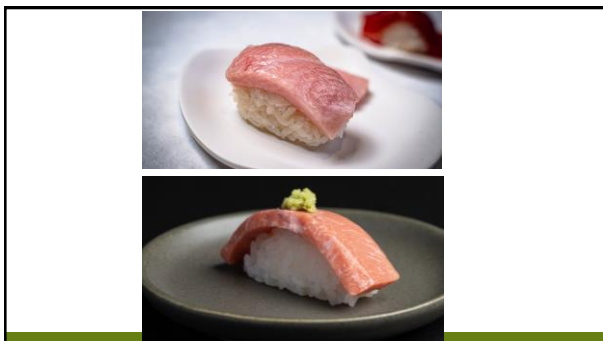
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Ground or Cuts

Ground meat products will be easier to produce – they'll be the first to market

Growing a cut of meat is more involved

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Scaffolding

Used to encourage cells to grow and organize in a certain way.

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What's Being Used for Scaffolding?

Cellulose
Collagen
Mycelium

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Approved for sale in Israel January 2024

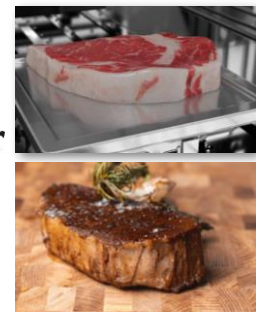
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Scaffolding used with.....
3D printing

(no joke)

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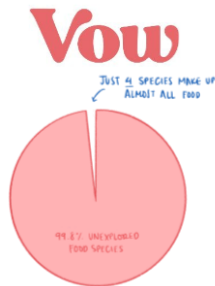
Steakholder
FOODS



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What are the odds that animals we eat today are the best of **two million** species available?

Odds are there's a multitude of factors we can use to make meat better.



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Cultivated Meat – Benefits

- Environmentally superior to livestock
 - Uses a fraction of land and water
 - Far less GHG emissions
 - Most can be made anywhere

129

Cultivated Meat – Benefits

- No cruelty to animals
- No pathogens
 - Prevents e-coli, salmonella, etc.
 - Doesn't contribute to antibiotic resistance
- Avoids issues with animal health
 - Avian flu, mad cow disease

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Cultivated Meat – Benefits

- Cultivated seafood benefits
 - Environmentally superior
 - Healthier for the ocean and waters
 - Helps fish
 - Bycatch - overfishing

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Cultivated Meat – Issues

- Possible dysregulation of cells?
- Cost
 - Disruption to the livestock production economy
- Public acceptance

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Let's Summarize

- Alt Proteins are necessary to feed the planet sustainably
- The alt-protein arena is vast with great overlap
 - Plant-Based
 - Fermentation
 - Cultivated

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We must change our practices of producing food if we expect to feed the ~10 billion people who be living by 2050.

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Alt Proteins will have a big part in feeding our growing population.

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This is a watershed moment with many new options for eating more sustainably.

The public will need help learning about and deciphering the manufacturing and nutritional differences of these produces.

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As dietitians, we have a vital and exiting role to play in this revolutionizing change to our food supply.

It is our privilege and obligation to become educated, stay informed, and help our clients navigate these future changes.

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THANKS FOR JOINING US!

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Thanks for joining us!

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