We eat plants

so you don’t HAVE to!
Disclosure

• None

• I’m an advocate for LCHF and ruminant animal agriculture
• I’ve worked in forage agriculture
• I work for a forage seed company
And wouldn't it be really amazing if...

...there were a way to convert inedible (by humans) materials into high-quality food for humans...

...utilizing that portion of the Earth's surface that cannot produce human-utilizable feedstuffs...

...while improving the environment,...

...improving human health,...

...and increasing human flourishing?

Oh, wait...

Ruminants RULE!
The Products of Forage Agriculture: True Health Food!
“The great enemy of truth is very often not the lie--deliberate, contrived and dishonest--but the myth--persistent, persuasive and unrealistic. Too often we hold fast to the clichés of our forebears. We subject all facts to a prefabricated set of interpretations. We enjoy the comfort of opinion without the discomfort of thought.”

— John F. Kennedy Commencement Address at Yale University, June 11, 1962
“Is there anything more pitiful than a life lost in the service of some unsound belief?”


You can tell when idols are being worshiped, human beings are being sacrificed.
“What is required is less advice and more information.”

- Gerald M. Reaven, 1986

So let’s review…

1. “nutrition research does not support that vegetarian diets are healthier than animal based diets”

2. The hypothesis that natural saturated fats from animal products causes vascular diseases has been refuted.

3. The hypothesis that dietary cholesterol lead to vascular diseases was never supported by research. It was primarily a marketing campaign promoting plant product replacements for animal products.

4. Animal protein is superior to plant protein for human nutrition.

5. Polyunsaturated fatty acids from plants have been shown to produce harm in humans.

6. Diets high in animal products and restricted in carbohydrates (high in natural fats) have been shown to produce greater weight loss, better blood glucose control, and reduced CVD risks than low fat (high carbohydrate) diets.
“For a modern disease to be related to an old-fashioned food [e.g. red meat] is one of the most ludicrous things I have ever heard in my life”

T.L. “Peter” Cleave, 1973

Mounted auroch skeleton in National Museum of Denmark in Copenhagen
https://goo.gl/otXTaE

Image from Lascaux Cave, a section of the "Hall of the Bulls"
http://goo.gl/dfbD7

Which mammals are designed to digest a low fat diet?

From “Homo carnivorous” by Barry Groves, PhD
Photoautotrophic organisms e.g. plants

\[ n \, \text{CO}_2 + n \, \text{H}_2\text{O} \rightarrow (\text{CH}_n\text{O})_m + n\text{O}_2 \]

Heterotrophic organisms e.g. animals

Life on Earth: A cycling of CO₂
Cellulose, β(1→4) linked D-glucose units.

Starch, α (1→4) linked D-glucose units.
Domesticated Species
47 Total
21 Ruminants

- Ruminants, 45%
- Herbivores, [PERCENTAGE]
- Carnivores, 10%
- Omnivores, 15%
- Other Herbivores, 30%

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Ruminants (134 species in total, 21 domestic species)

- Are not competitive to humans
- Convert plant “protein” and low nutrient density organic materials into food for humans via anaerobic microbial fermentation of fibrous plants and plant residues in the rumen
- Provide services and assist in recycling soil nutrients
**Simple stomached**
(pigs, chickens, rats, man, etc)

- Carbohydrates → HCL → Sugars, Amino Acids, Fatty Acids
- Proteins → Pepsin → Intestinal Enzymes
- Fats → Intestinal Enzymes

**Ruminants**
(cows, sheep, goats, deer, etc)

- Carbohydrates → Microbes → HCL → Intestinal Enzymes
- Proteins → Feed → HCL → Amino Acids (mostly from microbial protein)

Very little sugars

“Four Stomachs”

Rumen - “Fermentation Vat”
Reticulum - Additional fermentation
Omasum - Water and salts absorption; return of large feed particles to reticulum
Abomasum - Acid digestion of proteins to amino acids and of carbohydrates
Cows producing 2.4 kg Milk Solids/cow/day from pasture alone
Need 19-20 kg Dry Matter/cow/day
@ 15% DM, fresh weight of pasture consumed = 130 kg/day

The Metabolizable Energy of pasture = 12.5 MJ ME/kg DM
Therefore, 245 MegaJoules ME/day from pasture
(confirmed from back calculations; Cows were weighed every day & weight-stable; MS production must have been eating 240-250 MJ)

NOTE: This pile of grass isn't actually the pasture being consumed. It's the right amount of pasture, but it's too stalky to be 12.5 ME. Not dairy pasture!

2.4 kg (5.3 lb) of milk solids per day from grass!
(That's a LOT of tongue work!!)

Average Components of Milk Solids, New Zealand

- Milkfat: 34%
- Lactose: 34%
- Protein: 26%
- Vitamins: 1%
- Minerals: 5%
- Vitamins: 1%
<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Cow’s milk, whole, fresh</td>
<td>$183,583,111</td>
<td>614,578,723</td>
<td>$27.6 billion (United States)</td>
</tr>
<tr>
<td>3</td>
<td>Cattle, meat</td>
<td>$170,272,001</td>
<td>63,031,582</td>
<td>$30.6 billion (United States)</td>
</tr>
<tr>
<td>15</td>
<td>Water Buffalo milk</td>
<td>$37,673,032</td>
<td>95,888,113</td>
<td>$26.0 billion (India)</td>
</tr>
<tr>
<td>21</td>
<td>Sheep, meat</td>
<td>$22,406,097</td>
<td>8,229,068</td>
<td>$5.6 billion (Mainland China)</td>
</tr>
<tr>
<td>38</td>
<td>Goat, meat</td>
<td>$9,970,000</td>
<td></td>
<td>$4.5 billion (Mainland China)</td>
</tr>
<tr>
<td>42</td>
<td>Buffalo, meat</td>
<td>$9,410,000</td>
<td></td>
<td>$4.0 billion (India)</td>
</tr>
</tbody>
</table>

$433,314,241

World meat supply


- Poultry: 35%
- Swine: 36%
- Ruminants: 27%
- Other: 2%
The challenge ahead

- UN projects world population will reach 9+ billion by mid-century
- UN has called for a 100 percent increase in world food production by 2050
- FAO predicts a 60% increase in demand for meat, milk and eggs by 2050
- Must come from virtually the same land area as today.
Earth's Surface

- Ocean: 66%
- Rangeland: 14%
- Forest: 10%
- Non-Productive: 5%
- Cultivation: 4%
- Urban / Industrial: 1%

All figures are % of total.

I can turn grass into heavy whipping cream.

What’s YOUR super power?
## Ruminants RULE!
Increasing the human-utilizable food supply!

<table>
<thead>
<tr>
<th></th>
<th>Proportion of ration (%)</th>
<th>Proportion of total concentrate (%)</th>
<th>Proportion of total feed (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Concentrate</td>
<td>Forages</td>
<td></td>
</tr>
<tr>
<td>All livestock and poultry</td>
<td>36</td>
<td>63</td>
<td>100.0</td>
</tr>
<tr>
<td>All dairy cattle</td>
<td>39</td>
<td>61</td>
<td>16.6</td>
</tr>
<tr>
<td>All beef cattle</td>
<td>17</td>
<td>83</td>
<td>25.8</td>
</tr>
<tr>
<td>Beef cattle on feed</td>
<td>72</td>
<td>28</td>
<td>20.7</td>
</tr>
<tr>
<td>Other beef cattle</td>
<td>4</td>
<td>96</td>
<td>5.1</td>
</tr>
<tr>
<td>Sheep and goats</td>
<td>9</td>
<td>91</td>
<td>0.4</td>
</tr>
<tr>
<td>Hens and pullets</td>
<td>100</td>
<td>0</td>
<td>12.4</td>
</tr>
<tr>
<td>Turkeys</td>
<td>100</td>
<td>0</td>
<td>3.3</td>
</tr>
<tr>
<td>Broilers</td>
<td>100</td>
<td>0</td>
<td>9.3</td>
</tr>
<tr>
<td>Swine</td>
<td>85</td>
<td>15</td>
<td>30.0</td>
</tr>
<tr>
<td>Horses and mules</td>
<td>28</td>
<td>72</td>
<td>2.9</td>
</tr>
</tbody>
</table>

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Ruminants RULE!!
Conversion rates of feed grain to human food, developed and developing world
(lb grain/lb product)

Ruminants RULE!!

The ratio of human-edible protein input to the human-edible protein output for US systems: 0.48, 0.84, 3.4, and 1.6 (for milk, beef, pigs, and poultry systems, respectively).

Over 40% of Americans don’t get enough protein

Most females over age 8 don’t get enough protein

@ahhite eathropology.com
“The concept that all proteins are of comparable nutritional value is flawed and should be rejected by anyone interested in planning healthful diets.”

All protein is NOT created equal!

Protein profile from 100 grams of beef vs beans

<table>
<thead>
<tr>
<th></th>
<th>Protein (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beef Muscle, cooked</td>
<td>21.3</td>
</tr>
<tr>
<td>Navy Beans, cooked</td>
<td>22.5</td>
</tr>
</tbody>
</table>

“Most of the naturally occurring chemicals [i.e. alkaloids, hydrazines, isothiocyanates, aromatic carboxylic acids, alkyl phenols, various glycosides, and catechols] in foods that are foreign for humans are of plant origin.”

“The digestive and metabolic systems of animals used as food selectively eliminate from their digestive systems many of the foreign chemicals in their plant feed with the result that their flesh is free of these nonnutrients.”

“Cows [and all other ruminants] are nature’s carbon capture technology as well as a cheap source of protein [and fat!] for the world.”

Geoff Maynard Australian cattleman & Director of MLA (Meat and Livestock Australia).

See: “Carbon Cows” on Youtube https://youtu.be/q_BD5FApHKc
Impact of Pasture-Based Livestock on Soil Carbon (Soil OM)

How much impact can this really make?

- There are ~ 9 million ha (or 22.2 million acres) of degraded (i.e., low OM) row crop ground in the Southeastern U.S.
  - What if just 10% of this land was converted to pasture-based MIG systems?

How much impact can this really make?

• We could accumulate ~4.5 Tg of C per year!

For perspective, that equals annual emissions of:

- 3.47 billion cars
- 38.4 billion barrels of oil
- 4,332 coal fired power plants
  ➢ 1,308 in the U.S. at the end of 2012

Focus on the water cycle instead of the carbon cycle

Slake Test: Peds from long-term grassland (left) and conventional tillage fields (right) suspended in water column.


Improved Grazing, Improved Soils, Better Water Quality
# Variation in Ratios

<table>
<thead>
<tr>
<th>Study, type of cattle</th>
<th>( n\text{-}6:n\text{-}3 ) ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n-Grass</td>
</tr>
<tr>
<td>Realini, et al., 2004, Hereford steers</td>
<td>1.44 : 1 *</td>
</tr>
<tr>
<td>Ponnampalam, et al., 2006, Angus steers</td>
<td>1.96 : 1 *</td>
</tr>
<tr>
<td>Duckett, et al., 2009, Angus-cross</td>
<td>1.65 : 1 *</td>
</tr>
<tr>
<td>Descalzo, et al., 2005, Crossbred steers</td>
<td>3.72 : 1 *</td>
</tr>
<tr>
<td>Nuernberg, et al., 2005, Simmental bulls</td>
<td>2.04 : 1 *</td>
</tr>
<tr>
<td>Alfaia, et al., 2009, Crossbred steers</td>
<td>1.77 : 1 *</td>
</tr>
<tr>
<td>Garcia, et al., 2008, Angus steers</td>
<td>1.72 : 1 *</td>
</tr>
<tr>
<td>Leheska, et al., 2008, Mixed cattle</td>
<td>2.78 : 1 *</td>
</tr>
</tbody>
</table>

* Indicates a significant difference (at least \( p<0.05 \)) between feeding regimens within each respective study.
Omega-6 to Omega-3 Fatty Acid Ratio

<table>
<thead>
<tr>
<th>Food Type</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grass-fed beef</td>
<td>1.65</td>
</tr>
<tr>
<td>Grain-fed beef</td>
<td>4.84</td>
</tr>
<tr>
<td>Ribeye steak (store)</td>
<td>6.68</td>
</tr>
<tr>
<td>Soybean oil *</td>
<td>7.78</td>
</tr>
<tr>
<td>Chicken breast, skinless, natural</td>
<td>10.54</td>
</tr>
<tr>
<td>Chicken breast, skinless</td>
<td>16.59</td>
</tr>
<tr>
<td>Chicken thigh</td>
<td>18.54</td>
</tr>
<tr>
<td>Pork chop</td>
<td>27.45</td>
</tr>
</tbody>
</table>

Data from Duckett, Clemson Univ, and Hite (*)

Figure from Hite
Serving size:
85.5 g (3 oz), cooked, for all except Soybean oil
Soybean oil = 1 Tablespoon (15 grams)

Figure from Hite
Data from Duckett, Clemson Univ, and Hite (*)

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What about hormones?
Other Concerns

• Nitrates
• Pesticide and antibiotic residues
• Antibiotic resistance
• Animal welfare
• Others?
The problem isn’t the grain-fed cattle, it’s the grain-fed people!
The Secret of the Ruminati:
We’ve All Been Fed a Load of Bull@#$&

Peter J. Ballerstedt, Ph.D.

Coming soon?
Meat Cove

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