What’s up with Roundup™?
(glyphosate)

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Disclaimer:

• This presentation is intended to summarize common misunderstandings related to glyphosate use and describe the latest news related to ongoing controversies.
• This presentation is not intended to make any claims or conclusions relating to unresolved health and safety concerns or environmental impacts.
• US EPA considers glyphosate safe to use as directed by the product label.
RUMORS, MYTHS, FACTS?

- Claims:
  - “Glyphosate causes gluten intolerance”
  - “Wheat is drenched in glyphosate”
  - “Glyphosate is in our food”
  - “Glyphosate is in children's vaccines”
  - “Glyphosate causes autism”
  - “ Glyphosate causes cancer”
<table>
<thead>
<tr>
<th>Substance</th>
<th>Toxicity</th>
<th>LD$_{50}$ (mg/Kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>Practically non-toxic</td>
<td>&gt;90000</td>
</tr>
<tr>
<td>Sucrose</td>
<td>Practically non-toxic</td>
<td>29,700</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>Slightly</td>
<td>11,900</td>
</tr>
<tr>
<td>Ethanol</td>
<td>Slightly</td>
<td>7,080</td>
</tr>
<tr>
<td>Glyphosate</td>
<td>Slightly</td>
<td>5,600</td>
</tr>
<tr>
<td>Sodium Choride</td>
<td>Slightly</td>
<td>3,000</td>
</tr>
<tr>
<td>Aspirin</td>
<td>Moderately</td>
<td>200</td>
</tr>
<tr>
<td>Caffeine</td>
<td>Moderately</td>
<td>192</td>
</tr>
<tr>
<td>DDT</td>
<td>Moderately</td>
<td>135</td>
</tr>
<tr>
<td>Paraquat</td>
<td>Highly</td>
<td>35</td>
</tr>
<tr>
<td>Nicotine</td>
<td>Highly</td>
<td>6.5-13.0</td>
</tr>
</tbody>
</table>

**GLYPHOSATE: A REVIEW**

- 1970 – Re-discovered by Monsanto
- 1974 – Roundup released
  - Broad spectrum systemic herbicide
  - Low residual activity
  - Low to very low mammalian toxicity
1990’s – “Roundup Ready” Soybeans, Corn, Canola, Cotton

2000 – Monsanto patent expires

2010 – labeled in 130 countries

2013-2015 – countries start banning/limiting glyphosate access
  • (El Salvador, Netherlands, Sri Lanka, Bermuda)
  • Efforts to limit use in western nations
GLYPHOSATE IN FOOD?

- US EPA sets US “tolerances” (MRL’s)
  - USDA enforces meat, poultry, & eggs
  - FDA enforces other foods
  - Varies by crop/meat product (0.1-30 ppm)
  - Can differ from other international standards
  - 2006 – latest reassessment of all tolerances

<table>
<thead>
<tr>
<th>MRL</th>
<th>USEPA</th>
<th>CODEX</th>
<th>EU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banana</td>
<td>0.2</td>
<td>0.05</td>
<td>0.1</td>
</tr>
<tr>
<td>Sugar Beet Root</td>
<td>10</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Cereal Grains*</td>
<td>30</td>
<td>30</td>
<td>10-20</td>
</tr>
<tr>
<td>Eggs</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
</tr>
</tbody>
</table>

*except popcorn, sweetcorn, wild rice, EU splits wheat & barley
Allegation – Glyphosate causes celiac disease/autism

• Source: Glyphosate, pathways to modern diseases – Samsel & Seneff
  • Interdisciplinary Toxicology
  • Surgical Neurology International
  • Journal of Biological Physics and Chemistry

• Effect:
  • Connected Celiacs, NHL, infertility, miscarriages, autism & birth defects
  • often cited by bloggers as scientific authority

• Reality: conclusions widely disputed & journals questionable
MYTH – FARMERS “DRENCH” WHEAT

Source: *The Healthy Home Economist*
- BA Economics, MS Gov. Admin. & Public Financial Information Technology

Effect of myth
- Suggests non-organic wheat is dangerous
- Implies majority of wheat farmers apply chemicals illegally (off label)

Reality
- Pre-harvest application on roughly 5% of US Wheat acreage
- Typically used in Dakotas
- Practice is legal and strictly defined on label
ALLEGATION: GLYPHOSATE IN VACCINES

• Source: Moms Across America
• Claim: Glyphosate found in 5 children's vax
• Facts: Methods disputed, results unpublished/not independently verified
• Effects: fuels anti-vax/anti-gmo/anti-pesticide causes
Carcinogenic?

2015 WHO Int. Agency Research on Cancer
"Probably Carcinogenic in Humans"

2015 European Food Safety Authority
"unlikely genotoxic or carcinogenic threat to humans"

2016 UN Food & Agriculture Organization, WHO Core Assessment Group on Pesticide Residues
"unlikely to pose a carcinogenic risk to humans from exposure through the diet"

2016 US EPA
"not likely to be carcinogenic to humans*"

2017 EU re-registers glyphosate for 5 years

2017 EU European Chemicals Agency
Evidence did not meet criteria to classify as carcinogen, mutagen, toxic for reproduction"
LEGAL WRANGLING

• May 2017 – NHL cancer patients sue Monsanto
  • WHO IARC cited
• June 2017 - California adds glyphosate to list of known carcinogens
  • WHO IARC cited
  • Monsanto sues to remove, California Supreme Court rejects request, case is being appealed
  • Nov 15th new lawsuit vs CA
• December 2017 – Lawsuits ongoing…
Bermuda triangle of mistrust
Science is replicable
Weak, specious, speculative, 
**shocking** info loves the internet
  - Relies on mistrust of institutions
  - Relies on inability to fact check or if facts don’t fit, see above
  - Food & Health concerns are motivators
Who do you trust?