

GMO Backgrounder

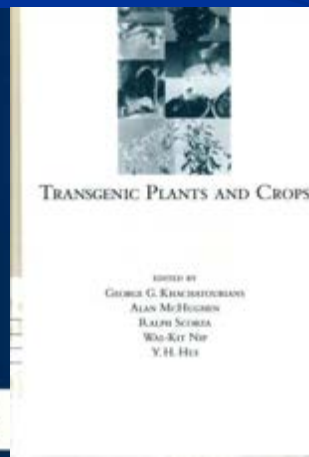
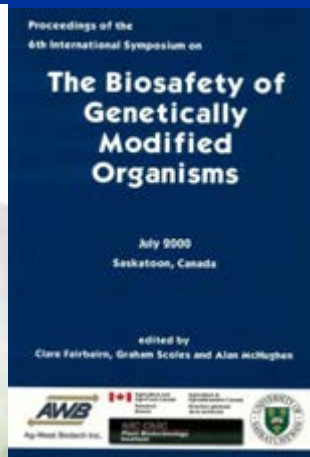
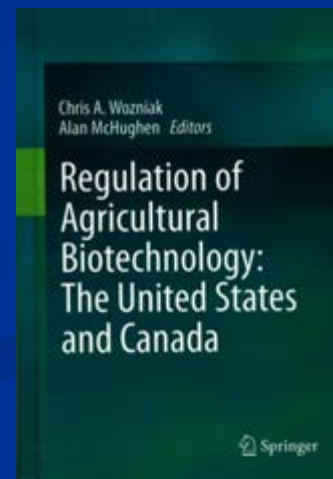
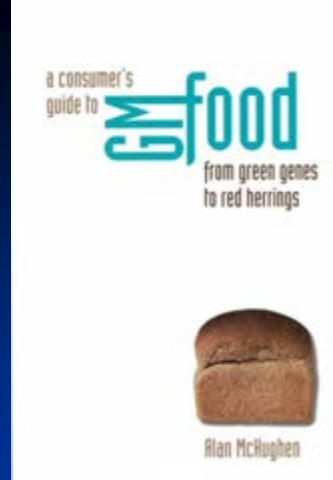
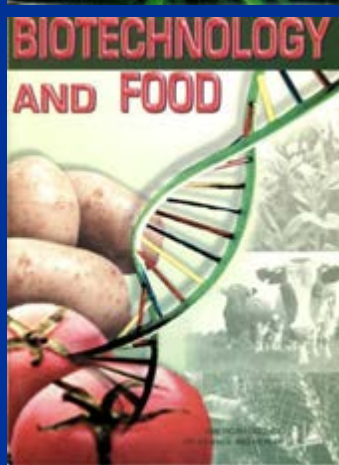
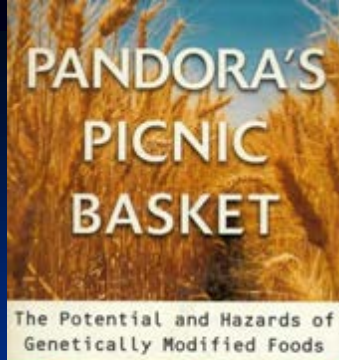
What does the science say?

Alan McHughen

University of California,

Riverside, Ca. 92521

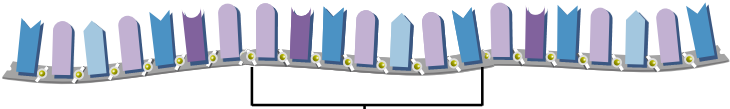
alanmc@ucr.edu



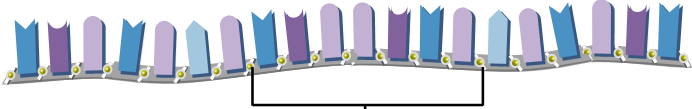
Drought Resistant Plant



Normal Corn



“drought resistance” gene



“drought resistance” gene

What IS a GMO?

Differences in GM Definition

- EU (EFSA):
 - Captures based on *Process* of rDNA (genetic engineering) plus other “in vitro” techniques
 - Derived cultivars (combining GE events) are captured
- USA (FDA, USDA, EPA):
 - Captures based on *Process* of rDNA
 - Derived cultivars (of approved events) are exempt
- Canada (CFIA, Health Canada):
 - Captures based on “Novelty” of the *Product* (PNT).

Scientific Consensus on Safety?

■ Generally positive

- * US National Academies
- * US Institute of Medicine
- * American Medical Association
- * British Royal Society
- * Royal Society of Medicine
- * EFSA
- * EU Economic Commission
- * World Health Organization
- * AAAS
- * American Dietetic Association
- * International Seed Foundation
- Etc, etc...

■ Generally negative



Sodium free?



Diet Water?



“Truthful and not misleading”?



#059 **MAD Cow Burger & Chips** **\$5.90**

#058 **MAD Cow Burger Only** **\$3.90**

MAD Cow patty mixed with lots of good ingredients like herbs, onion, oat & carrot to make this burger taste better & healthier than others.

to you.  MAD Chef Recommendation  Spicy 

Extreme Genetic Engineering?



When Grape-Nuts went GMO-free



NonGMO

Amount Per Serving	Cereal	Cereal with 1/2 cup Fat Free Milk
Calories	210	250
Calories from Fat	10	10
Total Fat 1g*	2%	2%
Saturated Fat 0g	0%	0%
Trans Fat 0g		
Polyunsaturated Fat 0.5g		
Monounsaturated Fat 0g		
Cholesterol 0mg	0%	0%
Sodium 290mg	12%	15%
Potassium 220mg	6%	12%
Total Carbohydrate 45g	15%	17%
Dietary Fiber 7g	28%	28%
Sugars 5g		
Other Carbohydrate 33g		
Protein 8g	11%	19%
Vitamin A	0%	4%
Vitamin C	0%	0%
Calcium	2%	15%
Iron	25%	90%
Thiamin	4%	30%
Riboflavin	25%	25%
Niacin	25%	25%
Vitamin B6	50%	50%
Folic Acid	20%	30%
Phosphorus	20%	25%
Magnesium	8%	10%
Zinc	10%	10%
Copper		

*Amount in Cereal. One half cup fat free milk contributes an additional 40 calories, 65mg sodium, 200mg potassium, 6g total carbohydrate (6g sugars), and 4g protein.
 **Percent Daily Values are based on a diet of 2,000 calories per day. Your daily values may be higher or lower depending on your calorie needs:

	Calories	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	30g	35g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Potassium	Less than	3,500mg	3,500mg
Total Carbohydrate	Less than	300g	375g
Dietary Fiber	Less than	50g	65g

Original

Amount Per Serving	Cereal	Cereal with 1/2 cup Fat Free Milk
Calories	210	250
Calories from Fat	10	10
Total Fat 1g*	2%	2%
Saturated Fat 0g	0%	0%
Trans Fat 0g		
Polyunsaturated Fat 0.5g		
Monounsaturated Fat 0g		
Cholesterol 0mg	0%	0%
Sodium 290mg	12%	15%
Potassium 220mg	6%	12%
Total Carbohydrate 44g	15%	17%
Dietary Fiber 7g	28%	28%
Sugars 5g		
Other Carbohydrate 32g		
Protein 8g	11%	19%
Vitamin A	15%	20%
Vitamin C	0%	0%
Calcium	2%	15%
Iron	90%	90%
Vitamin D	10%	30%
Thiamin	25%	35%
Riboflavin	25%	25%
Niacin	25%	25%
Vitamin B6	50%	50%
Folic Acid	25%	30%
Vitamin B12	20%	25%
Phosphorus	20%	25%
Magnesium	8%	10%
Zinc	10%	10%
Copper		

*Amount in Cereal. One half cup fat free milk contributes an additional 40 calories, 65mg sodium, 200mg potassium, 6g total carbohydrate (6g sugars), and 4g protein.
 **Percent Daily Values are based on a diet of 2,000 calories per day. Your daily values may be higher or lower depending on your calorie needs:

	Calories	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	30g	35g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Potassium	Less than	3,500mg	3,500mg
Total Carbohydrate	Less than	300g	375g
Dietary Fiber	Less than	50g	65g

Mandatory Process-based Labels

- Manufacturers reformulate to rid GE content
 - *E.g.*, Cheerios, Grape Nuts
- Remove products from shelves
 - GM tomato paste in UK
- Label everything “*May contain GMO*”
- Paradox: some foods have labels, but no GM content; others have GM content but no label
- Liability insurance drives up costs to all
 - Especially non-GE foods
 - Liability for mistaken non-label is large.

Points to Ponder

- Non-standard definition/regulation of GMO
 - Impacts on Trade
 - Regulatory uncertainty:
 - Insulin? Vitamins? Cheese? Cisgenic? New techniques?
- Mandatory *Process-based* labeling
 - Undermines current product + safety based labels
 - Opens door to mandatory labels for other processes
 - Radiation mutagenesis, Pesticides, Organic, Union-made, etc.
 - Increase costs of all foods (not just GE)
 - Probably won't satisfy *anyone*
 - **Not the best way to convey info to consumers.**