

Biotech, What the Heck?

A Quick Lesson on GMOS

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What is a GMO





dreams #gmo

Meet the Tomato-Fish...

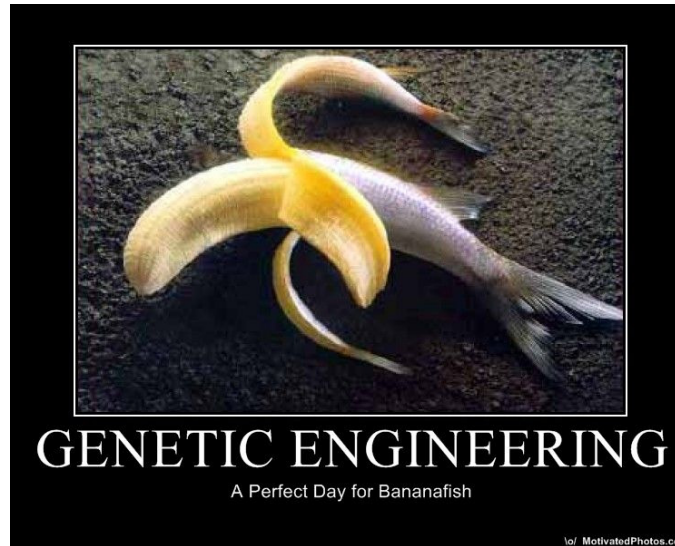


Would you eat it?

Disclaimer: This is not a real fish... yet.



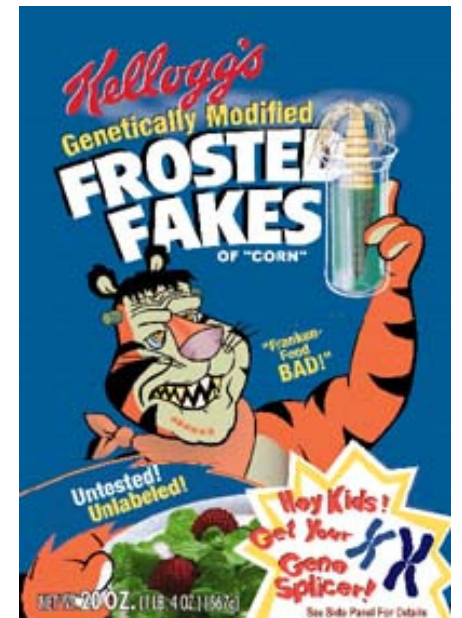
Deesillustration.com



GENETIC ENGINEERING

A Perfect Day for Bananafish

lol/ MotivatedPhotos.com





naturalnews.com



Is it or is it not?



WHO: French Scientist Seralini

CLAIM: Transgenic organisms cause cancer in lab rats

STUDY: Created uproar in the scientific community

Poorly conducted study

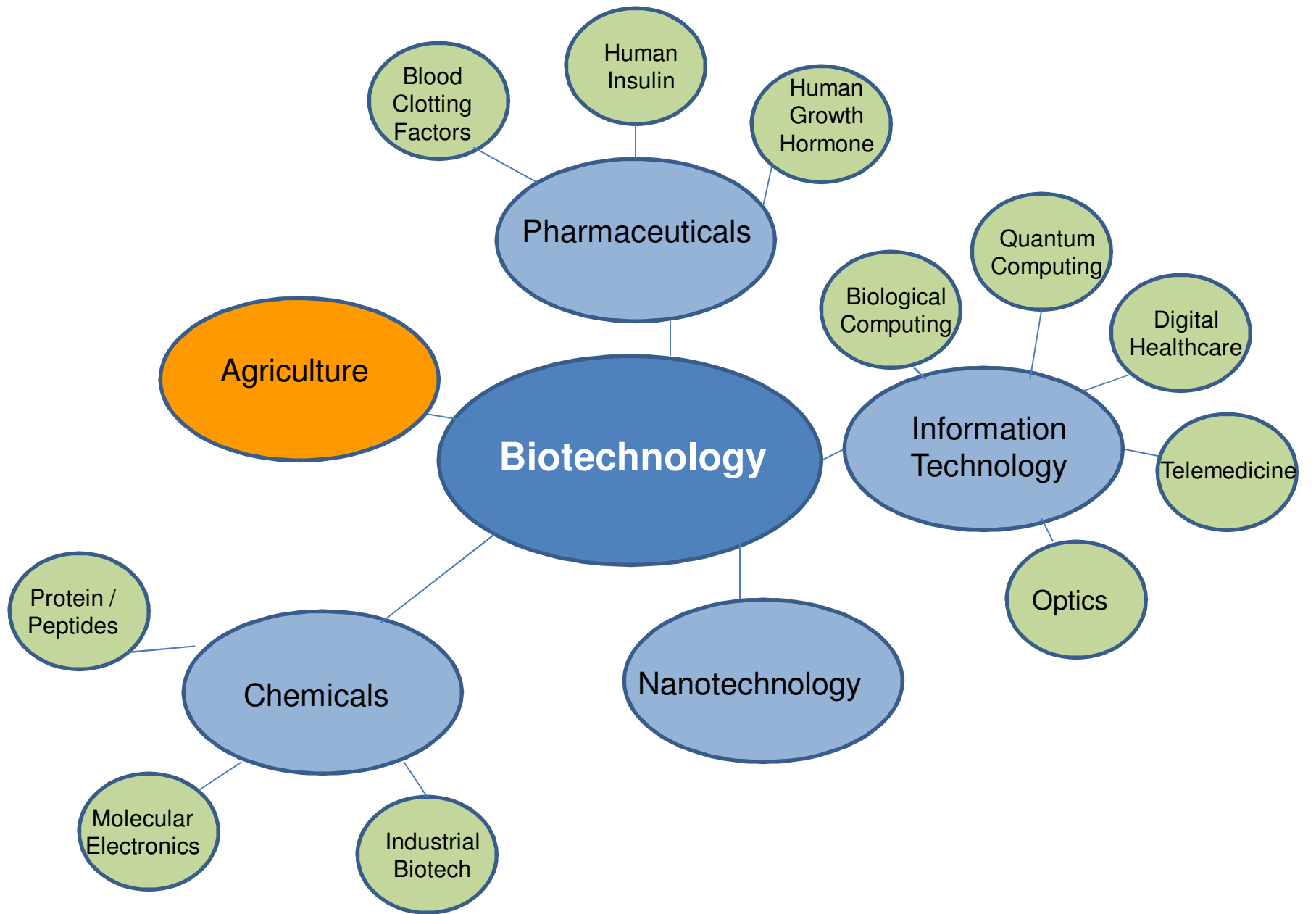
Small sample size

No dose-response

Suspicious Conclusion

What is Biotechnology?

Any technological application that uses biological systems to make or modify products or processes for specific use.



GMOs

**Genetically Modified
Organisms**

Show What YOU Know

When did humans first start modifying crops?

5,000 years ago

200 years ago

10,000 years ago

40 years ago

Submit



THE HISTORY OF GENETIC MODIFICATION IN CROPS

**10,000
years ago**

Humans begin crop domestication using selective breeding.

1700s

Farmers and scientists begin cross-breeding plants within a species.

1940s and 1950s

Breeders and researchers seek out additional means to introduce genetic variation into the gene pool of plants.

1980s

Researchers develop the more precise and controllable methods of genetic engineering to create plants with desirable traits.

1990s

The first GMOs are introduced to the marketplace.

WILD
CABBAGE



NATURE

VS DOMESTICATED CABBAGE

BRUSSELS
SPROUTS



SAVOY
CABBAGE



BROCCOLI



KALE



BOK
CHOY



0

READ COMMENTS

Share

LEARN MORE



NEXT: Corn over time



watermelon



corn



banana



aubergine / eggplant



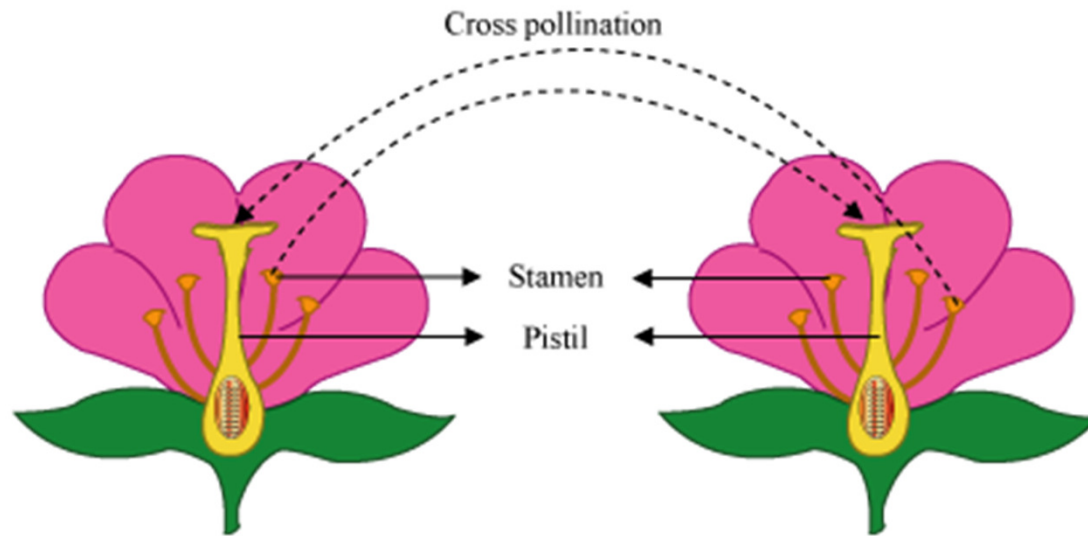
carrot



cabbage, kale, broccoli, etc.

How do they do it?

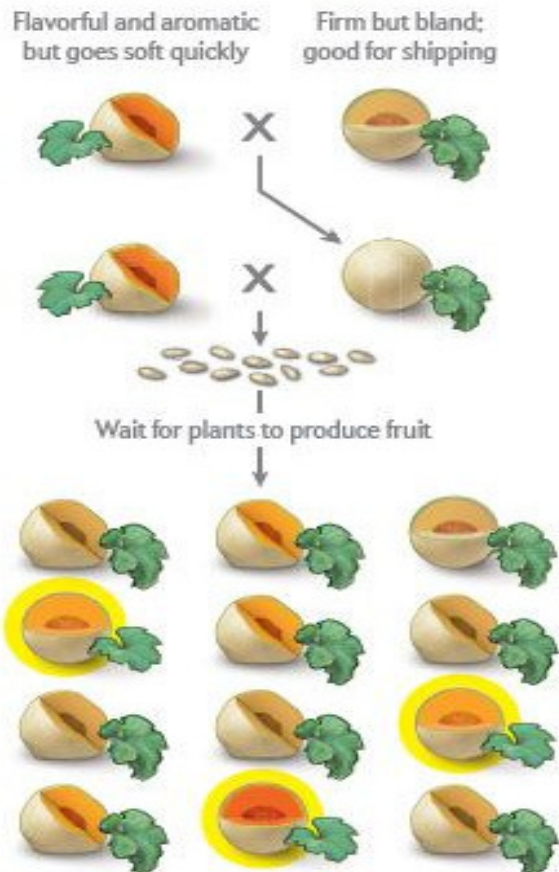
Cross Pollination



Marker-Assisted Breeding

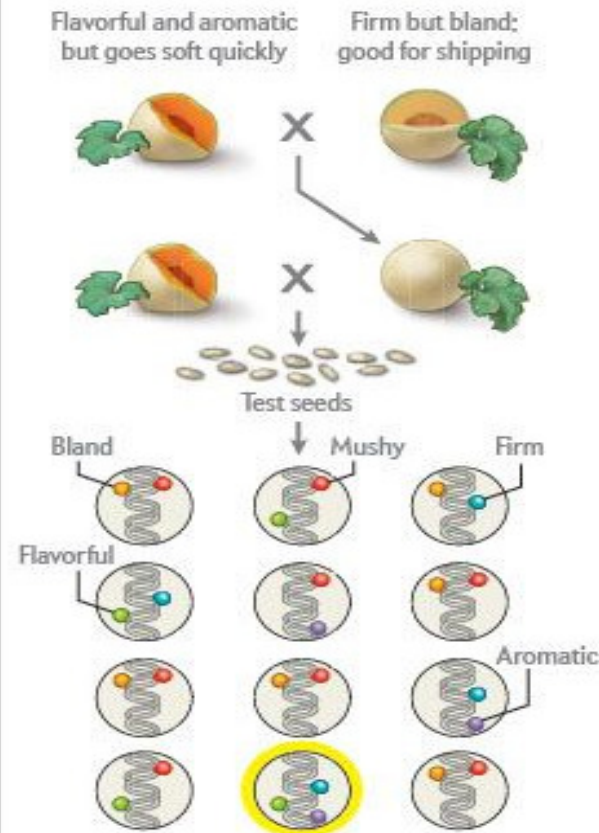
To improve a single crop, plant breeders usually have to play botanical matchmaker for many years, laboriously weeding out unwanted traits without losing desirable ones. Identifying the genes underlying those traits opens up the possibility of a much more efficient and precise process known as marker-assisted breeding.

Conventional Backcross Breeding



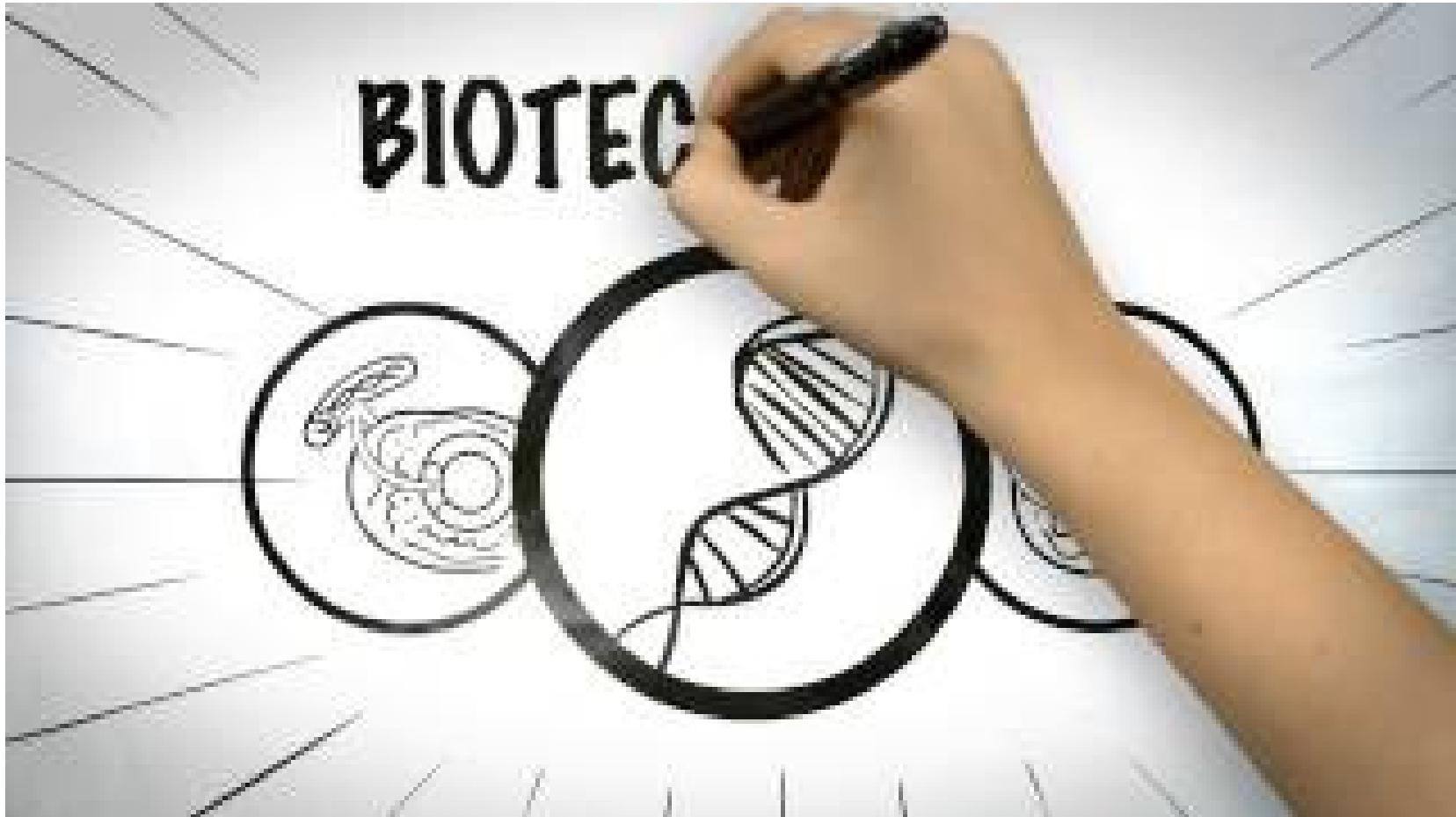
Breeders typically have to wait a full season for experimental crops to mature before they can assess the quality of the produce and select the top contenders for continued breeding (*yellow highlighting*).

Marker-Assisted Backcrossing



Once scientists establish genetic "markers" for different traits—such as flavor and firmness—they can analyze DNA extracted from seeds or the leaves of young plants and reveal ideal candidates (*yellow highlighting*) for breeding experiments long before harvesttime.

Biotechnology



Transgenic Organisms

A transgenic organism contains a gene or genes which have been artificially inserted instead of the organism acquiring them through reproduction - *Biology Dictionary*

Biotech Companies

- Monsanto
- DuPont Pioneer
- Syngenta Seeds, Inc
- Groupe Limagrain

- Calgene Inc
- Cornell University
- Dekalb Genetics Corp
- DNA Plant Technology Corp

MONSANTO

- Sakata
- Takii
- DLF-Trifolium
- Agritope
- Aventis CropScience
- Bejo Zaden BV

- Pioneer Hi-Bred International Inc
- Scotts Seeds
- Seminis Vegetable Inc
- University of Florida
- University of Saskatchewan
- Upjohn
- USDA - ARS
- Zeneca Seeds

GMO RESEARCH, REVIEW AND REGULATION | How Does a GMO Get to Market?

On average, GMOs take **13 years** and **\$130 million** of R&D **BEFORE** coming to market

The **regulatory process** alone can take **5 to 7 years**

REGULATORY SCIENCE

75+ different studies¹ are conducted to demonstrate each new GMO is:



Safe to grow
• Crop grows the same as non-GM varieties
• Crop exhibits expected characteristics (e.g., insect resistance)



Safe for the environment and beneficial insects

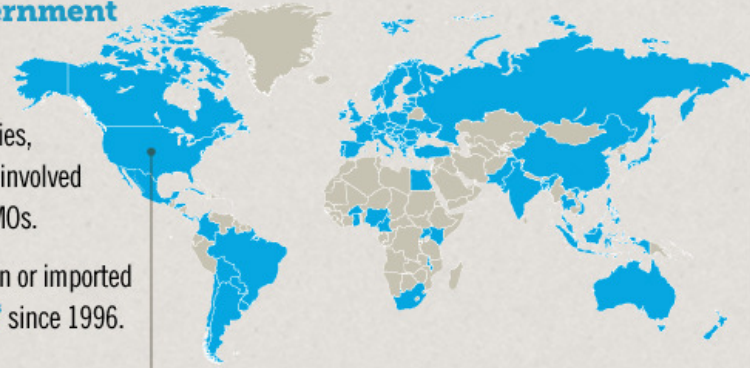


Safe to eat
• Same nutrients as non-GM crops
• No new dietary allergens



REGULATORY REVIEW

More than **90 government bodies²** globally review and approve GMOs. In many countries, multiple agencies are involved in the regulation of GMOs.



GMOs have been grown or imported by **70 countries³** since 1996.

U.S. REGULATORY AGENCY REVIEWS

USDA
Safe to grow



EPA
Safe for the environment



FDA
Safe to eat



¹Estimated numbers from DuPont Pioneer based on studies from recent biotech applications. ²Includes agencies reviewing new biotechnology applications from 62 individual countries and 28 EU member countries. ³Country count cited from ISAAA.org

What is on the Market?



Soybeans



Alfalfa



Canola



Corn (Sweet and Field)



Cotton



Papaya



Squash



Sugar Beets



Carnations



Roses



GloFish



GENETIC TRAITS EXPRESSED IN GMOS IN THE U.S.

FIELD CORN



Genetic Traits
Insect Resistance
Herbicide Tolerance

Uses

- Livestock and poultry feed
- Fuel ethanol
- High-fructose corn syrup and other sweeteners
- Corn oil
- Starch
- Cereal and other food ingredients
- Alcohol
- Industrial uses

CANOLA

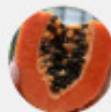


Genetic Traits
Herbicide Tolerance

Uses

- Cooking oil
- Animal feed

RAINBOW PAPAYA

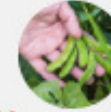


Genetic Traits
Disease resistance

Uses

- Table fruit

SOYBEAN



Genetic Traits
Insect Resistance
Herbicide Tolerance

Uses

- Livestock and poultry feed
- Aquaculture
- Soybean oil (vegetable oil)
- High oleic acid (monounsaturated fatty acid)
- Biodiesel fuel
- Soymilk, soy sauce, tofu, other food uses
- Lecithin
- Pet food
- Adhesives and building materials
- Printing ink
- Other industrial uses

ALFALFA



Genetic Traits
Herbicide Tolerance

Uses

- Animal feed

COTTON



Genetic Traits
Insect Resistance
Herbicide Tolerance

Uses

- Fiber
- Animal feed
- Cottonseed oil

SUGAR BEETS

Genetic Traits
Herbicide Tolerance

Uses

- Sugar
- Animal feed



SWEET CORN



Genetic Traits
Herbicide Tolerance
Insect Resistance

Uses

- Food

SUMMER SQUASH



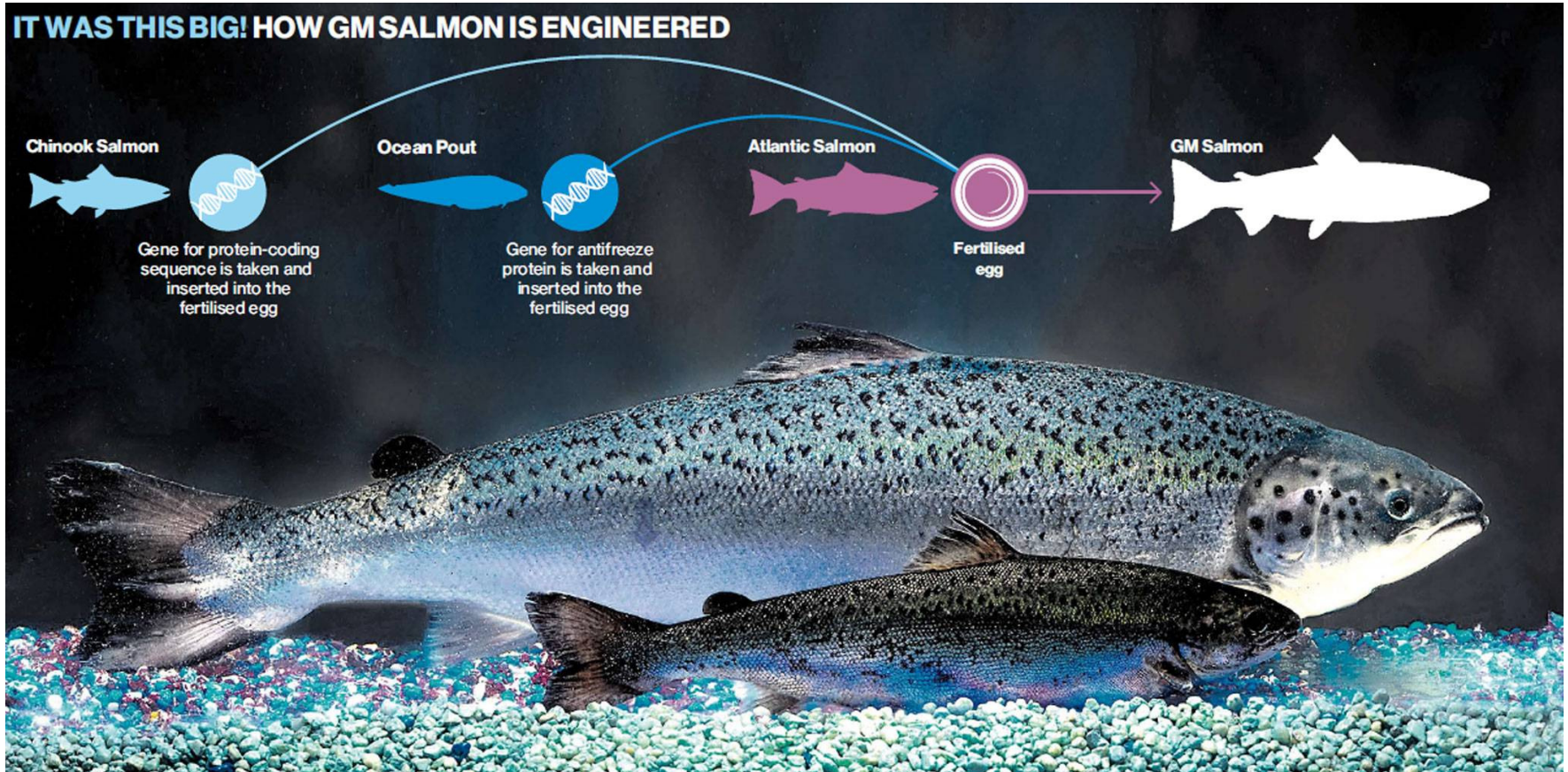
Genetic Traits
Disease resistance

Uses

- Food

What is next?

AquAdvantage Salmon



In the Works

GE Crops



- Drought Resistant Sugarcane
- Golden Rice
- Arctic Apples
- High-lysine Corn
- Omega-3 Soybeans
- Fungus-resistant Wheat
- Bt Rice
- Virus resistant Plums
- Round-up Ready Bentgrass

GE Animals

- Pigs with increased Omega -3 fatty acids
- EnviroPig with 75% less phosphorus in manure
- Pigs that produce human blood coagulant



So, what is the deal?

What are we seeing/hearing?

The Science

Bioengineered foods have been consumed for close to 20 years, and during that time, no overt consequences on human health have been reported and or/substantiated in peer-review literature.

Transgenic foods are nutritionally indistinguishable from their non-transgenic counterparts, and in fact, they can be used to enhance nutrition in poorer parts of the world.

The scientific world is split on whether transgenes can spread to other species.

Science consistently shows that transgenic products pose no threat to our health.

Alleged Danger of GMOs

- Certain inserted genes may be allergens
- unintended harm to wildlife & beneficial insects
- Harmful to the environment
- Insects may develop resistance to crops
- Cross pollinating might occur creating “superweeds”



ACTIONS SPEAK LOUDER

Than Words

THE TRUTH
ABOUT BIOTECHNOLOGY

THE TALK



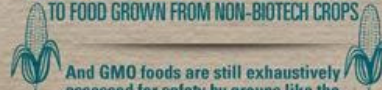
THE TRUTH

GMO FOOD IS DANGEROUS AND UNHEALTHY



GMO FOODS ARE NUTRITIONALLY AND CHEMICALLY IDENTICAL

TO FOOD GROWN FROM NON-BIOTECH CROPS



And GMO foods are still exhaustively assessed for safety by groups like the FDA and the USDA.

BIOTECHNOLOGY IS BAD FOR THE ENVIRONMENT



IN 2009, BIOTECHNOLOGY HELPED FARMERS REDUCE CO2 EMISSIONS BY 39 BILLION POUNDS

That's the same as removing 8 MILLION CARS FROM THE ROAD FOR THE ENTIRE YEAR



BIOTECHNOLOGY IS A NEW AND UNPROVEN SCIENCE



FOR ROUGHLY 10,000 YEARS, OUR ANCESTORS HAVE BEEN GENETICALLY ALTERING PLANTS AND SEEDS TO DEVELOP THINGS LIKE:



CHEESE BREAD WINE BEER

Modern biotechnology simply offers a quicker, more efficient path to accomplishing the same goals.

- **BEST FOOD FACTS** features information from university-based experts (PhDs and RDs) on many facets of food production, preparation, and consumption: WWW.BESTFOODFACTS.ORG
- **BIOLOGY FORTIFIED** provides information and fosters discussion about issues in biology with an emphasis on plant genetics and GMOs: WWW.BIOFORTIFIED.ORG
- **COMMON GROUND** promotes conversation between women who grow food and women who buy it: WWW.FINDOURCOMMONGROUND.COM
- **CROPLIFE INTERNATIONAL DATABASE** includes nearly 500 scientific studies chronicling the safety and benefits of agricultural biotechnology: WWW.BIOTECHBENEFITS.CROPLIFE.ORG
- **U.S. FARMERS & RANCHERS ALLIANCE** focuses on creating dialogue around current topics related to food production: WWW.FOODDIALOGUES.COM
- **FOOD INSIGHT FROM THE INTERNATIONAL FOOD INFORMATION COUNCIL** provides numerous resources on GM foods: WWW.FOODINSIGHT.ORG/FOODBIOGUIDE.ASPX
- **GENERA DATABASE** (also by Biology Fortified) makes studies on GM food easy to find: WWW.BIOFORTIFIED.ORG/GENERA/GUIDE/
- **GMO ANSWERS** enables consumers to ask questions about GMOs and get answers from independent and industry experts: WWW.GMOANSWERS.COM
- **GROCERY MANUFACTURERS ASSOCIATION** provides facts and the latest news on GMOs including the food industry's position on mandatory GMO labeling: WWW.FACTSABOUTGMOs.ORG
- **THE INTERNATIONAL SERVICE FOR THE ACQUISITION OF AGRICULTURAL BIOTECH APPLICATIONS** provides communication materials and annual updates on the global status of GM crops: WWW.ISAAA.ORG

JOIN US. ASK TOUGH QUESTIONS. BE SKEPTICAL. BE OPEN. WE LOOK FORWARD TO SHARING ANSWERS.

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