GMO Science
educate to regenerate

GMOs and Geoengineering: What are the Links?

Michelle Perro, MD, DHom

Agenda:

Key Concepts

- GMOs: An Overview
- Geoengineering: An Overview
- Links Between GMOs and Geoengineering
- Solutions/Call to Action

GENETIC TRAITS EXPRESSED IN GMOs IN THE U.S.

APPLE

Genetic Traits
Non-browning
Uses: Food

POTATO

Genetic Traits
Reduced Bruising and Black Spot
Non-browning
Low Acrylamide
Blight Resistance
Uses: Food

FIELD CORN

Genetic Traits
Insect Resistance
Herbicide Tolerance
Drought 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

ALFALFA

Genetic Traits
Herbicide Tolerance
Uses: Animal feed

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

RAINBOW PAPAYA

Genetic Traits
Disease Resistance
Uses: Table fruit

COTTON

Genetic Traits
Insect Resistance
Herbicide Tolerance
Uses: Fiber, Animal feed, Cottonseed oil

SUGAR BEET

Genetic Traits
Herbicide Tolerance
Uses: Sugar, Animal feed

SWEET CORN

Genetic Traits
Insect Resistance
Herbicide Tolerance
Uses: Food

SUMMER SQUASH

Genetic Traits
Disease Resistance
Uses: Food

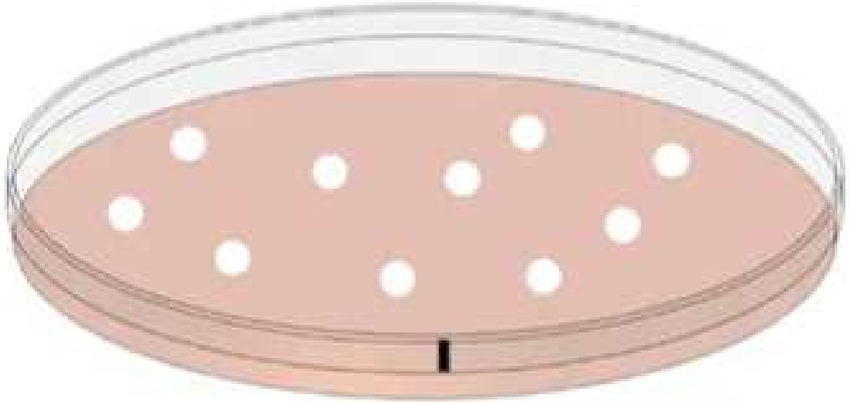
A NEW CONVERSATION, PUBLIC Q&A AND CENTRAL ONLINE RESOURCE FOR INFORMATION ON GMOs.

ASK. LINK. FOLLOW. TWEET.

WWW.GMOANSWERS.COM | @GMOANSWERS

gmo answers

GMO example: Bt Corn



Corn includes DNA of a bacterium

Issues...

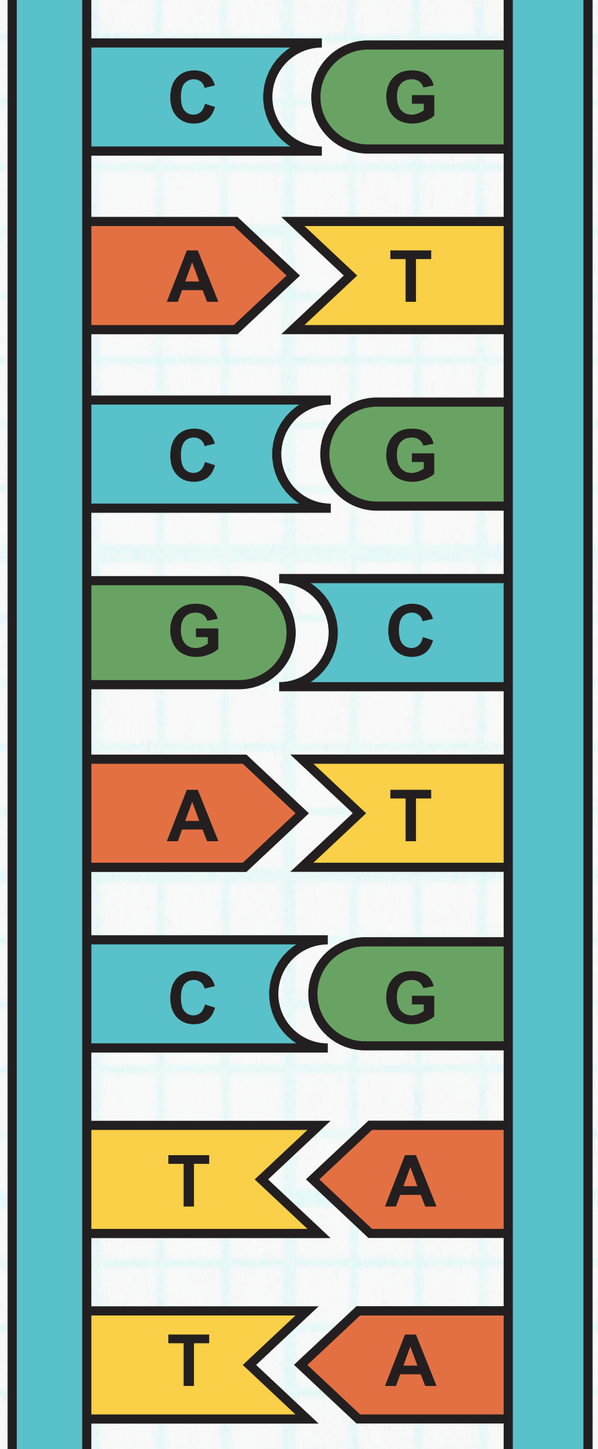
- Process: Mutations and deletions throughout the DNA.
- Increased allergens/new allergens.
- Increased novel toxins.
- Process is random secondary due to collateral damage.
- Chemicals used on GMO crops have created superweeds.
- Chemicals the GMO plants are engineered to tolerated accumulate in the plants which we then consume.

Issues...

- Gene insertion disrupts DNA and can create unpredictable problems.
- Gene insertions create genomic changes in gene expression.
- Promoters: Switch genes on - may accidentally switch on harmful genes and dormant viruses.
- Gene editing can turn off enzymes needed for disease resistance.
- Decreased nutrients.
- Produce unintentional RNA variants.

Issues...

- There are numerous new proteins.
- A growing list and concentration of toxic pesticides within the cells.
- 800 to as many as 1400 codon changes (most with protein associations) that occurred with GE inserts.
- Many differences from one insert to another of supposedly the same material. That is why each GE event has to be analyzed since no two are the same!
- Other aberrations that have never been evaluated or seen in nature: Genes are promiscuous and can be transferred from the GI tract to us (and our babies).



Codons

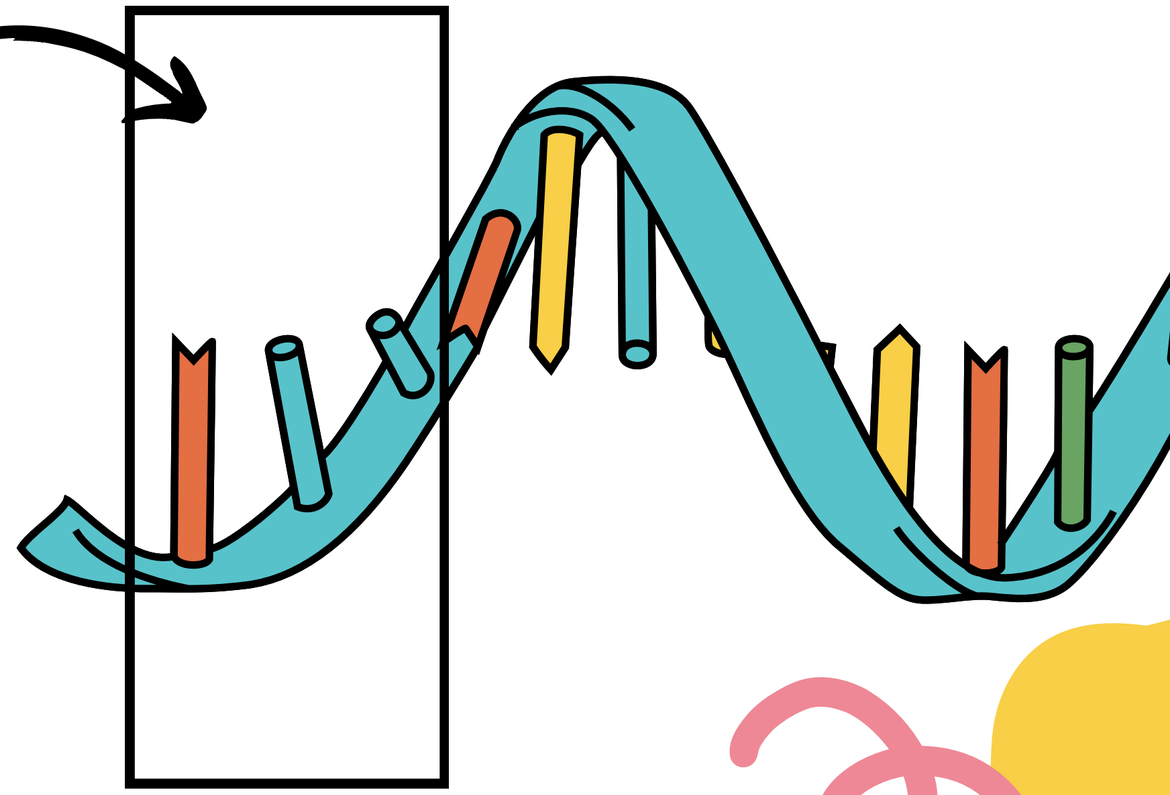
What is a codon?

- A codon is a sequence of three nucleotides in RNA or DNA that corresponds to a specific amino acid or a stop signal during protein synthesis.
- Example: The codon AUG codes for methionine (also the "start" codon).

DNA vs. RNA Nucleotides

Nucleic Acid	Bases Used	Sugar	Unique Base
DNA	A, T, C, G	Deoxyribose	Thymine
RNA	A, U, C, G	Ribose	Uracil

Codon Change

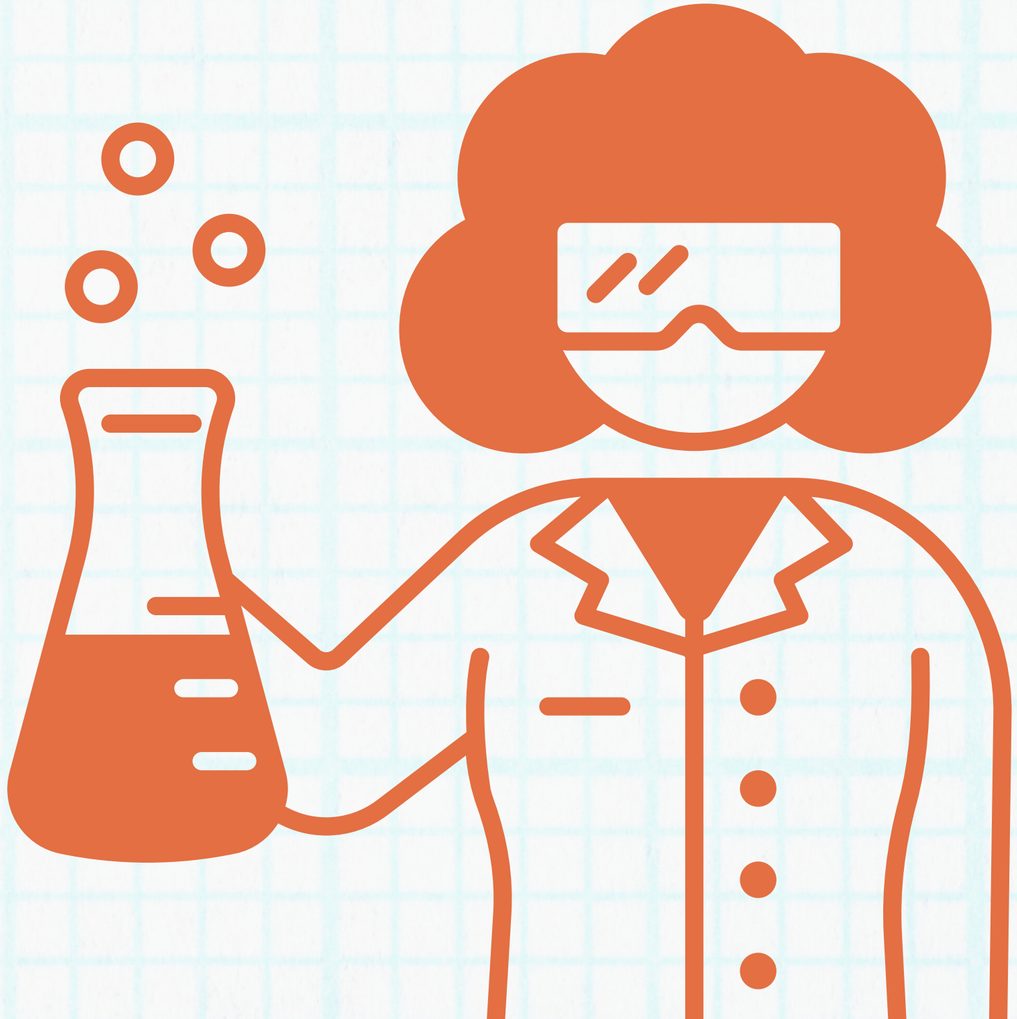


Codon changes refer to alterations in the sequence of DNA or RNA that affect the codons which are three-letter "words" made of nucleotides (A, T/U, C, G) that instruct the cell which amino acids to use when building proteins.

What's the Problem?

A codon change occurs when a mutation or genetic editing alters the original three-nucleotide sequence. This can happen through:

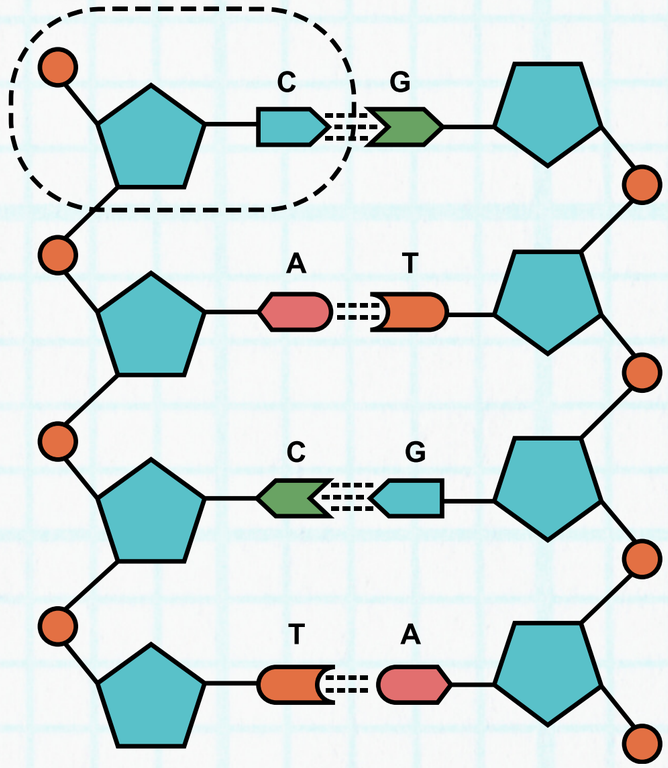
1. Point mutations (a single nucleotide is changed)
2. Insertions or deletions (which can shift the reading frame called a frameshift mutation)



Why It Matters

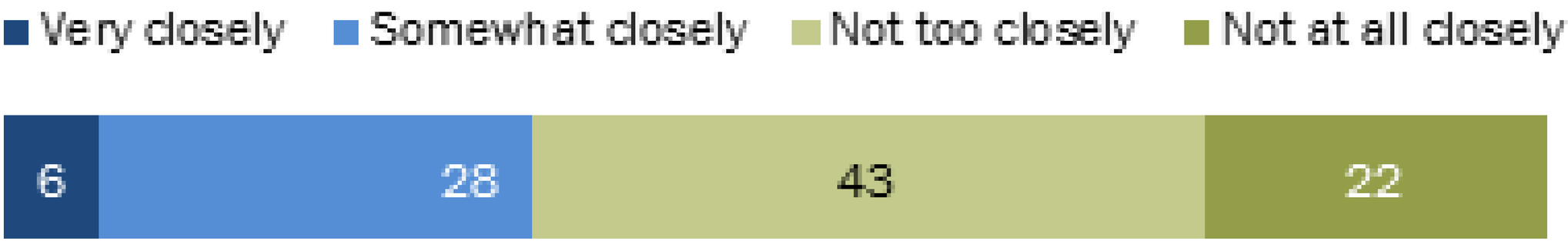
Codon changes can:

- Alter the structure or function of a protein, or create new proteins
- Lead to genetic diseases (e.g., sickle cell anemia results from a codon change),
- Be intentionally introduced in genetic engineering (mRNA vaccine) designed to optimize expression and/or avoid immune detection.



Few Americans follow news about genetically modified foods very closely

% of U.S. adults who say they follow news about GM foods ...



Note: Respondents who did not give an answer are not shown.
Source: Survey conducted May 10-June 6, 2016.
"The New Food Fights: U.S. Public Divides Over Food Science"

PEW RESEARCH CENTER

My biggest concerns...

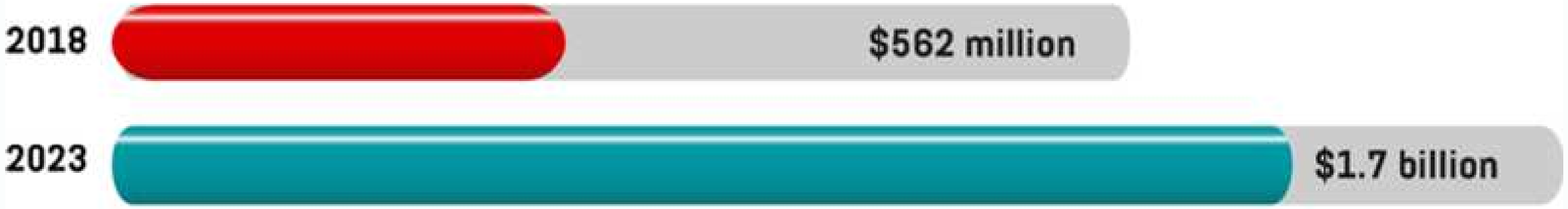
- GMOs can survive an acidic digestion.
- GM crops unlike normal plant genes can transfer between species.
- 1 human feeding study: Genetic material from RR soy was transferred into the gut bacteria of 3 of 7 human volunteers.
- GM crops increase antibiotic resistance.
- If Bt genes transfer, they can turn our gut bacteria into living pesticide factories.
- GM crops may concentrate toxicants - heavy metals and herbicides.

Gene

Editing?

The global CRISPR technology market

A recent report published by MarketsandMarkets reveals that the value of the CRISPR technology market will grow from $562 million in 2018 to $1.7 billion by 2023.



Source: "CRISPR Technology Market by Product, Service, Application, End user - Global forecast to 2023", *MarketsAndMarkets*, 2018

CRISPR

CLUSTERED REGULARLY INTERSPACED SHORT PALINDROMIC REPEATS

How scientists unlock and edit genes with controversial precision

CRISPR

C CLUSTERED

A sequence pattern in bacterial DNA

R REGULARLY

I INTERSPACED

S SHORT

PR PALINDROMIC REPEATS

CRISPR is a sequence in bacterial DNA

USES A GUIDE RNA AND CAS ENZYME (E.G., CAS9)

A widely used unregulated gene-editing tool used to cut and modify DNA in agriculture and medicine.

A DNA sequence pattern found in the genomes of bacteria and archaea when paired with the Cas (CRISPR-associated) enzymes, forms the basis of a powerful gene-editing tool.

Issues with CRISPR...

- Genetic scissors can cut in the wrong place
- CRISPR introduces the genetic scissors, cuts DNA and a guide tells the scissor where to cut
- Damage off-target areas
- Sloppy repair
- Mixing genes
- Mutant proteins
- Insertional damage
- Mutations from the process
- Epigenetic changes which can affect inheritance

> And stay tuned. Pretty soon, almost anyone will be able to give CRISPR a try. IGI is hoping to package the course for other colleges and turn the red-to-green CRISPR experiment into a teaching kit for high schools, science centers and other educational institutions.

www.innovativegenomics.org

Advancing genomics research for a better world

Founded by Nobel Laureate Jennifer Doudna, the Innovative Genomics Institute is using genome engineering to solve humanity's greatest problems in health, climate, and sustainable agriculture.

Only at Cal: New class teaches undergrads how to 'CRISPR'

Where better to learn about CRISPR gene editing than the place where it was born? UC Berkeley.

By Robert Sanders

Do-It-Yourself Biology (DIYbio)

- A global movement expanding biotechnology and synthetic biology tools beyond universities and industry.
- Participants include citizen scientists, hobbyists, students, artists, and trained researchers.
- Activities range from creating art, exploring biology, learning genetic engineering, or launching small biotech startups.
- The idea of “amateur biotechnologists” emerged around 2000, after the Human Genome Project’s draft sequence was completed.
- “The movement democratizes biology by making tools, knowledge, and lab access available to the public.”
- Source: Congress: https://www.congress.gov/crs-product/R47265

J Law Biosci. 2019 Aug 13;6(1):111–183. doi: 10.1093/jlb/lsz010

CRISPR'd babies: human germline genome editing in the 'He Jiankui affair'*

Henry T Greely [1,∞,3]

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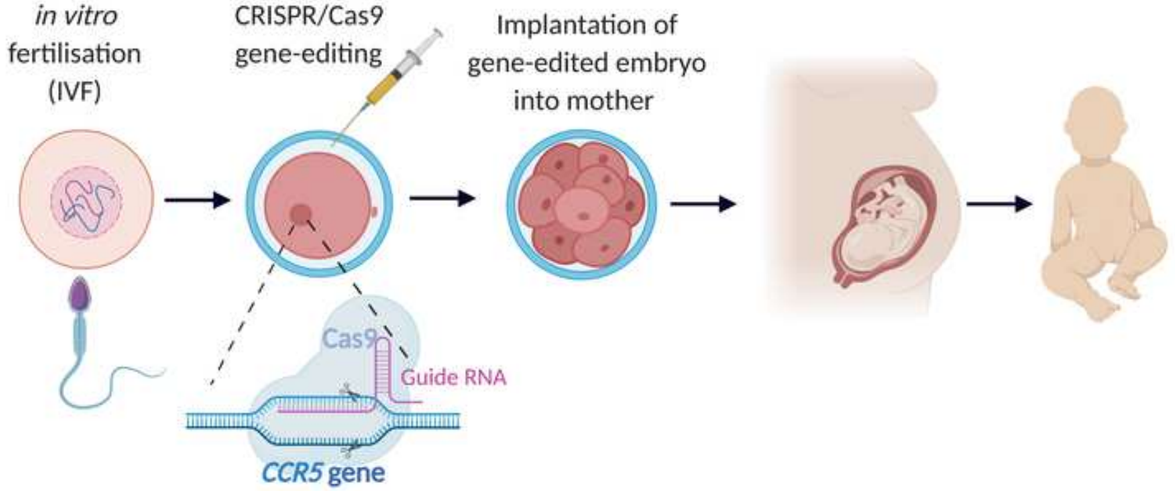
PMCID: PMC6813942 PMID: 31666967

Abstract

The world was shocked in Nov. 25, 2018 by the revelation that He Jiankui had used clustered regularly interspaced short palindromic repeats ('CRISPR') to edit embryos—two of which had, sometime in October, become living babies. This article is an effort to provide some deep context for the He Jiankui affair and to begin analyzing it. It focuses on He's experiment, without delving into the broader ethical issues around 'human germline genome editing' in the abstract. It begins by carefully defining 'human germline genome editing'. It then describes the little we know about the experiment before providing background on CRISPR, the pre-He ethical and legal status of human germline genome editing, and on He himself. The fourth, and longest, section provides a detailed narrative of the revelation of the He experiment and its fallout. The fifth section critiques the experiment, which I believe merits unequivocal condemnation on several grounds. The last section suggests some important immediate reactions, by 'Science' and by China.



www.eurostemcell.org/spotlight-first-gene-edited-babies

DIY Bacterial Genome Engineering CRISPR Kit

Brand: The ODIN

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$169.00

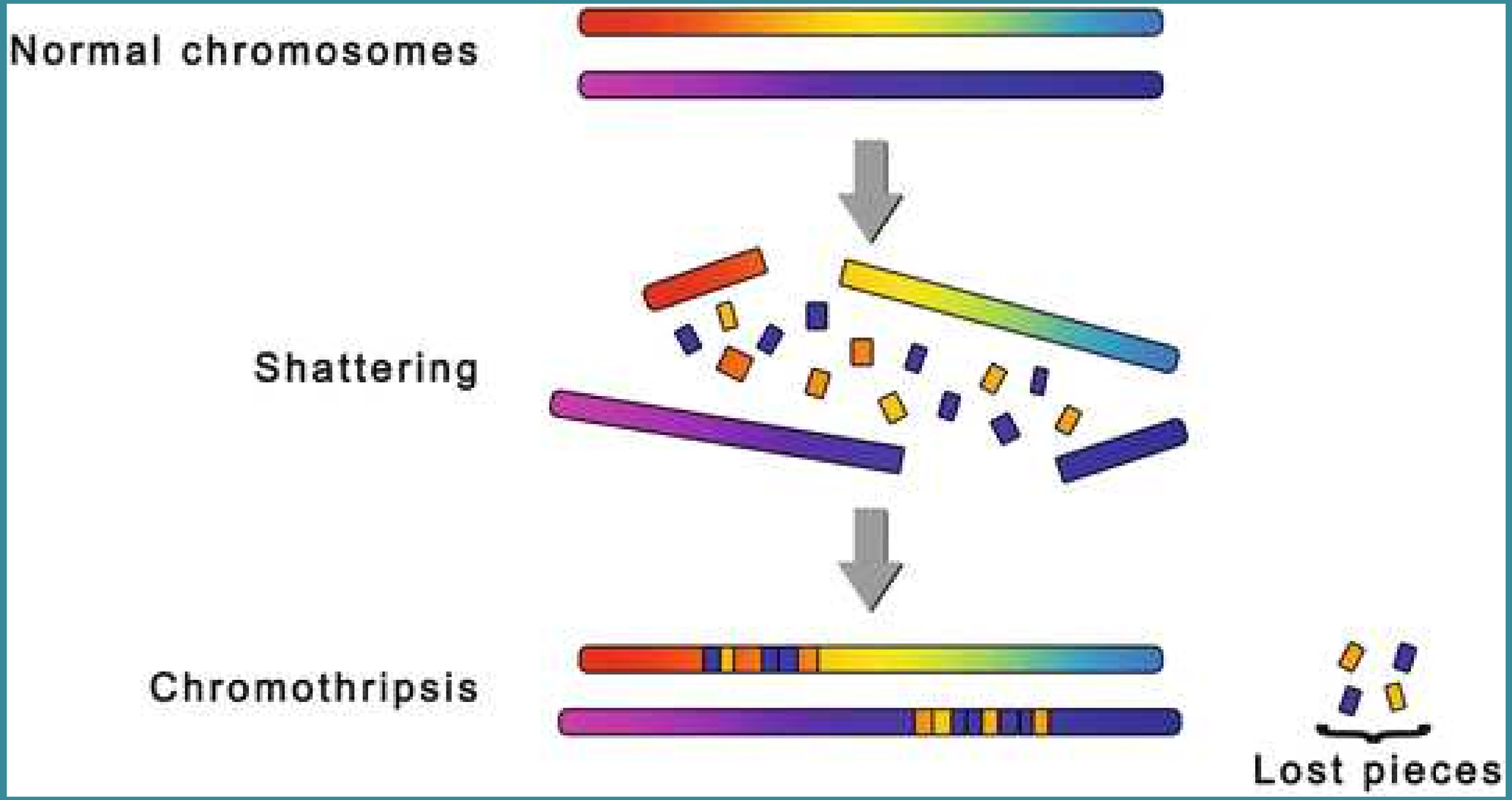
Or **$16.98**/mo (12 mo). Select from 1 plan

FREE Returns

- All-In-One kit, you don't need anything else but water and a microwave
- Actual Genetic Engineering
- Learn CRISPR Technology through Hands-On experimentation

Report an issue with this product or seller

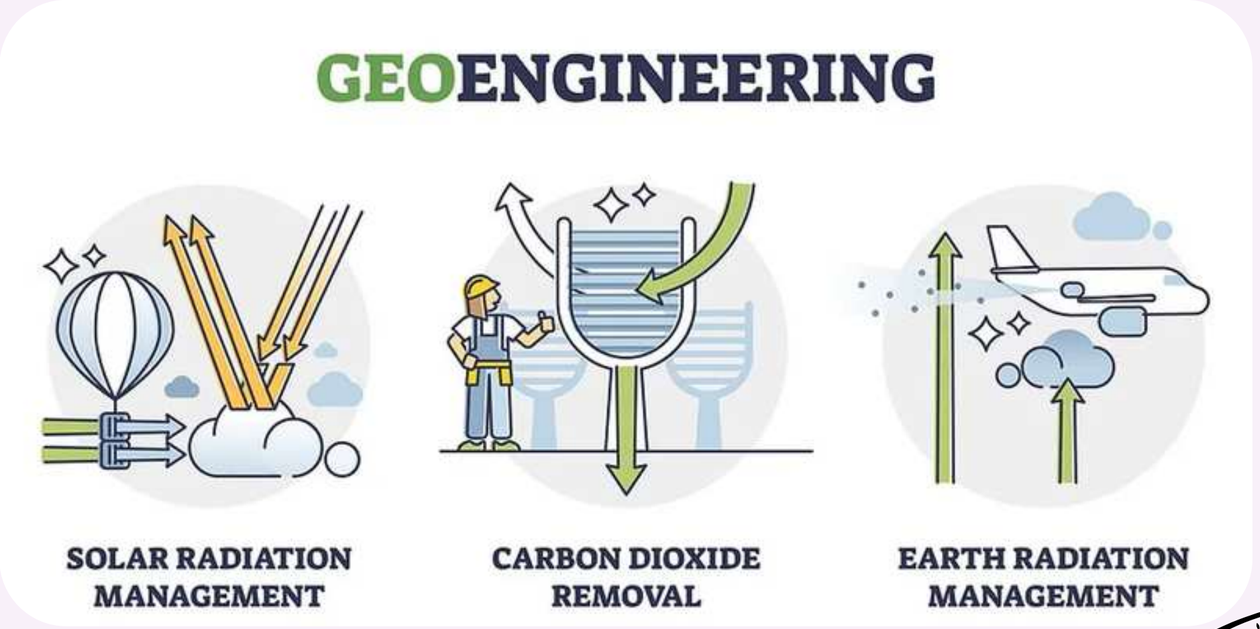
WHAT CAN GO WRONG?


Normal chromosomes
Shattering
Chromothripsis
Lost pieces

What is Geoengineering?

Large-scale, deliberate manipulation of Earth's climate systems to counteract "climate change".

- **Solar Radiation Management (SRM):** Reflecting sunlight using aerosols or mirrors.
- **Stratospheric Aerosol Injection:** Spraying fine particles (e.g., aluminum, barium) into the atmosphere.
- **Cloud Seeding:** Using chemicals to influence rainfall patterns.
- **Carbon Dioxide Removal (CDR):** Capturing and storing CO_2 from the atmosphere.



How GMOs could be integrated into geoengineering techniques

Synthetic Microbes for Aerosol Interaction

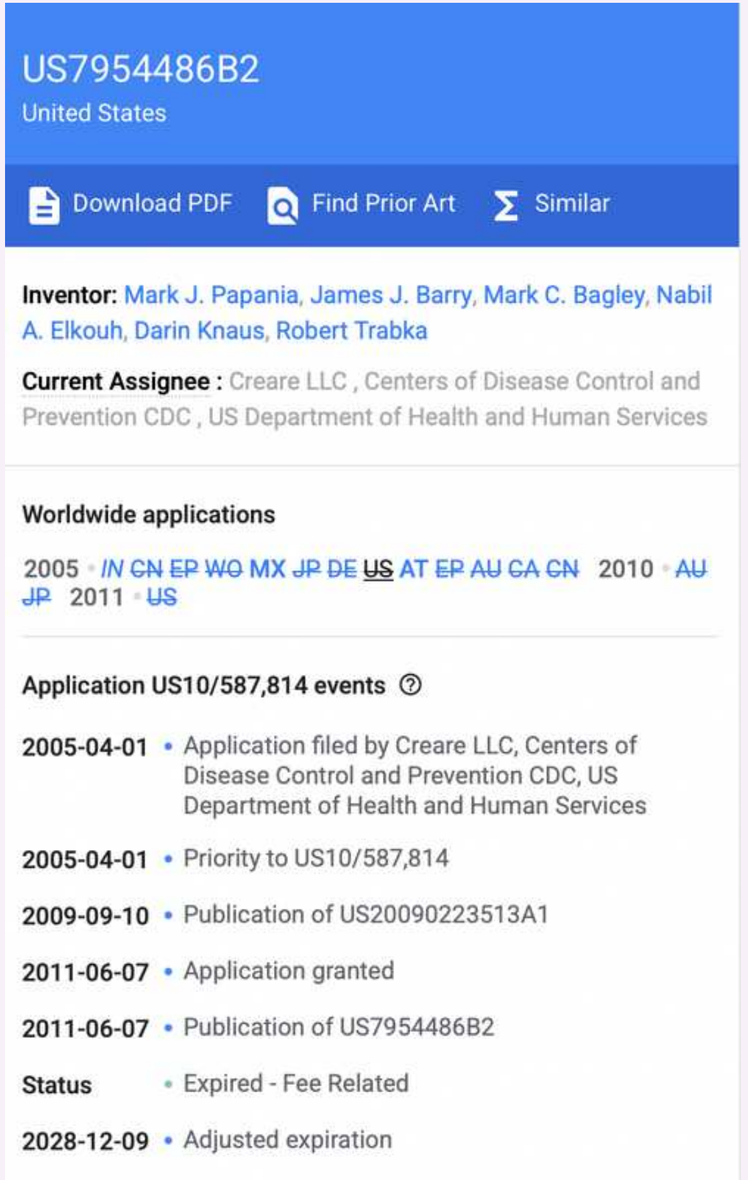
Microbes could be engineered to:

- Reflect sunlight, degrade pollutants, or act as “biological aerosols” or “biological mirrors”.
- To produce microscopic reflective particles (e.g., silica-like shells) that scatter sunlight.
- Unlike traditional aerosol spraying (e.g. aluminum or barium), GMO microbes could multiply and maintian their reflective capacity without repeated spraying.
- Why? To create self-sustaining cloud seeding agents.

Aerosol delivery systems and methods

Abstract

- Methods and systems for aerosol delivery of agents to a patient are described herein. The present system can be used to administer various types of agents, such as a vaccine or other types of pharmaceutical substances. Certain embodiments of the present system utilize an actuator coupled to a disposable aerosolizing element that aerosolizes an agent for delivery to a patient when acted upon by the actuator. The aerosolizing element prevents the agent from contacting the actuator and other non-disposable components of the system so that little or no cleaning or maintenance is required. The present system also can include an aerosolization rate monitor that monitors the rate at which an agent is being aerosolized and provides feedback to the user to ensure that the proper dose is being administered.



Degrade Pollutants?

Some proposals involve microbes engineered to metabolize:

- Methane
- Carbon dioxide
- Industrial pollutants
- Aromatic hydrocarbons or VOCs
- This is part of a field called atmospheric bioremediation, still theoretical, but rapidly advancing.

Natural Fungi vs GMO Microbes for Bioremediation

Natural Fungi (Non-GMO)

Safe & Natural
Utilize natural decomposition processes **without** genetic modification.

Stable & Sustainable
Form natural ecosystems; low risk of unintended spread or **mutation.**

Eco-Friendly Cleanup
Break down **pollutants** (e.g., oil, pesticides, heavy metals) safely.

VS

GMO Microbes

Gene Escape Risk
Modified genes may transfer to **wild species,** causing **unpredictable ecological effects.**

Potential Instability
Engineered microbes may **mutate,** producing **unintended toxins.**

Controversial & Costly Cleanup
Face regulatory hurdles and public concern over safety.

Fungi offer a safer, eco-friendly approach to environmental cleanup.

GMO Science
educate to regenerate
www.GMOScience.org

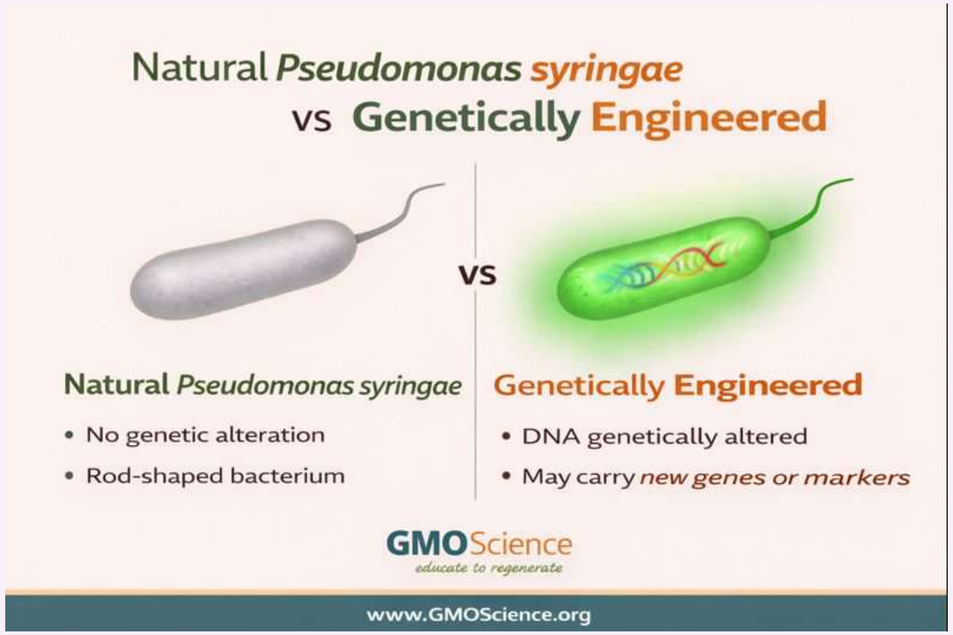
Function as Cloud-Seeding Agents?

Engineered bacteria (especially *Pseudomonas syringae*) already naturally produce ice-nucleating proteins used in cloud seeding.

Ice nucleation proteins from Pseudomonas syringae, (the InaZ protein and truncated/engineered forms of this protein), are expressed in E. coli (i.e., GE bacteria).

Synthetic engineering could enhance this ability, creating self-replicating cloud-modifying microbes capable of:

- production of snow or rain
- hail suppression
- fog dispersal
- cloud seeding, weather modification, and artificial cloud creation



Aerosol delivery systems and methods

Abstract

The present invention relates to bacterial preparations comprising ice nucleation proteins. Such bacterial preparations can in particular be used for the production of snow or rain, for hail suppression or for fog dispersal.

WO2021063943A1
WIPO (PCT)

Download PDF | Find Prior Art | Similar

Other languages: French

Inventor: Werner Lubitz, Mascha RESCH, Johannes KASSMANNHUBER

Current Assignee : LOGON PATENTVERWERTUNGS-VERWALTUNGS GmbH

Worldwide applications

2020 · US AU EP ~~WO~~

Application PCT/EP2020/077224 events

2020-09-29 • Application filed by LOGON PATENTVERWERTUNGS-VERWALTUNGS GmbH

2020-09-29 • Priority to AU2020360827A

2020-09-29 • Priority to US17/763,770

2020-09-29 • Priority to EP20775895.4A

2021-04-08 • Publication of WO2021063943A1

2022-03-30 • Anticipated expiration

Status • Ceased

My biggest concerns...

- Inhalation of GMOs or their byproducts could cause inflammation to the lungs/cause immune reactions.
- Once released, GM microorganisms could alter atmospheric chemistry, weather patterns, and microbial ecosystems.
- GMO crops increase antibiotic resistance.
- Living organisms (although not intended to be freely replicating) cannot be easily contained, raising serious biosecurity and health risks.
- No long-term studies exist on human exposure to airborne GMOs.

GMOs to Influence Weather: Engineered Algae Over Oceans

Overview:

- A growing concept in climate engineering proposes using GE algae released over large ocean surfaces to influence local or regional weather patterns.
- This idea sits at the intersection of synthetic biology, ocean fertilization, and hydrological manipulation.
- While not widely discussed publicly, it has appeared in scientific literature and DARPA-linked research.

DARPA & ENVIRONMENTAL GENETIC EDITING – WHAT'S PUBLICLY KNOWN

DARPA

- **DARPA** has funded **advanced** synthetic **biology** programs (e.g., **Living Foundries**) that accelerate engineering of biological systems.
- **HEGAAs** (Horizontal Environmental **Genetic Alteration Agents**) are engineered agents to alter genes in the environment.
- **DARPA's solicitation** included **gene-editing** agents for environmental use.
- **No confirmed** deployments exist, but the research illustrates frameworks for programmable genome editing outside labs.

Sources: DARPA programs including Living Foundries and public descriptions of HEGAAs

Why GMO Algae?

Engineered microbes have advantages over chemical geoengineering:

- Self-replicating → No continuous spraying needed
- They multiply naturally, potentially creating persistent climate effects
- Tunable genetic switches
- Synthetic genes could be designed to activate only in sunlight, certain temperatures, or salinity thresholds
- Programmable cloud formation
- Through DMS (dimethyl sulfide; powerful natural cloud-forming compound), isoprene, or ice-nucleating proteins
- Low cost compared to aircraft-based spraying
- A single deployment could expand into a basin-wide bloom

GMOs to Influence Weather Systems

Simply, GMO algae could be engineered to:

- Be released in oceans to increase reflectivity or alter cloud formation (ocean fertilization).
- GMO crops could be engineered to release more or less water vapor to influence local humidity and precipitation (evapotranspiration).

Risks to Climate, Oceans, and Human Health

- **Uncontrollable spread:** Ocean currents promote global dissemination of any released GMO algae
- **Ecological collapse** (”gene drive drift”): Could outcompete native phytoplankton (produce 50% of the Earth’s oxygen/absorb billions of tons of CO2 yearly/emit DMS which seeds clouds and reflects sunlight cooling the earth: a natural geoengineering system), disrupt food webs, alter oxygen levels, create toxic algal blooms
- **Create weather instability** which intensifies storms, shift drought/flood zones, destabilize predictable seasonal cycles leading to unintended regional climate extremes
- **Bioaerosol inhalation:** If GMO algae produce toxic aerosols, humans will inhale them. Health effects? Unknown.

ALGAE VS. PHYTOPLANKTON: UNDERSTANDING THE DIFFERENCE

ALGAE

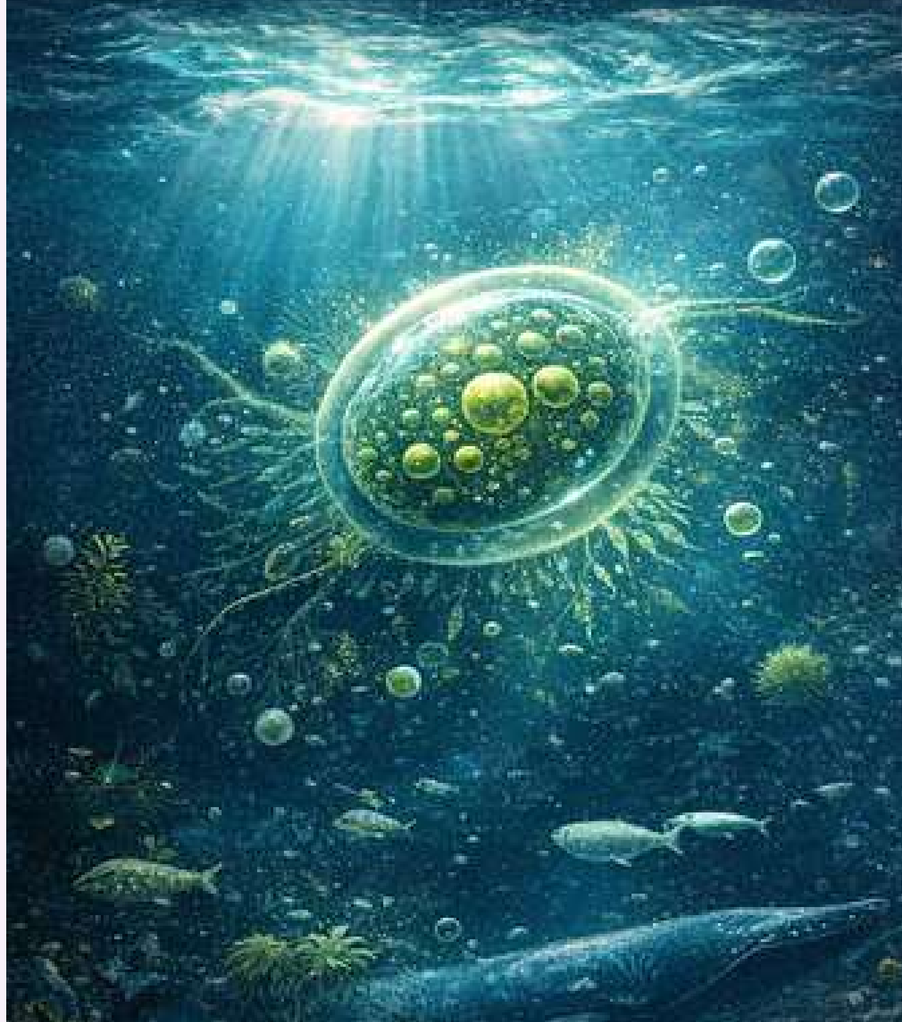
- **GENERAL TERM**
  Broad group of photosynthetic, plant-like orga.
- **HABITAT**
  Freshwater, saltwater & moist terrestrial.
- **TYPES**
  Microalgae (some are phytoplankton) and Macroalgae (kelp, nori, etc.)
- **VISIBILITY**
  Microscopic (*microalgae*) to large seaweeds (*macroalgae*).
- **ROLE**
  Produce oxygen, absorb CO_2, base of aquatic food chains.

PHYTOPLANKTON

- **SPECIFIC SUBSET**
  Microscopic, aquatic algae suspended in sunlit water.
- **HABITAT**
  Strictly aquatic—oceans, seas, lakes.
- **MOBILITY**
  Drift with water currents, unable to swim against them.
- **IMPORTANCE**
  Produce 50%+ of Earth's oxygen, massive carbon sink, foundation of ocean food web.

ALL PHYTOPLANKTON ARE ALGAE, BUT NOT ALL ALGAE ARE PHYTOPLANKTON.

PHYTOPLANKTON: THE UNSUNG CLIMATE REGULATORS



1. **Oxygen Production**
   Phytoplankton produce over 50% of Earth's oxygen—more than all rainforests combined.

2. **Carbon Sequestration**
   They absorb billions of tons of CO_2 annually, locking carbon away for centuries.

3. **Base of the Ocean Food Chain**
   All marine life, from zooplankton to whales, depend on phytoplankton.

4. **Climate Cooling via Cloud Formation**
   They emit compounds that seed clouds, reflecting sunlight and cooling the Earth.

5. **Indicators of Ocean Health**
   Population changes signal shifts in temperature, pH, and nutrient levels.

Earth's Lungs. Carbon Sinks. Climate Guardians.

Summary: My biggest concerns...

- Modified algae could produce **novel toxins** that contaminate seafood and enter the food chain, leading to gastrointestinal, neurological, or liver damage.
- Fertilizing oceans can cause explosive algal growth, creating **oxygen-depleted "dead zones"** that disrupt ecosystems and seafood supplies, with downstream consequences.
- Ocean sprays and winds can carry **aerosolized algal particles** inland, potentially exposing humans to respiratory irritants or allergenic compounds.
- Bioengineered algae may **alter marine microbial ecosystems**, affecting the ocean's role in climate regulation and ultimately human health via food and water systems.

SERIOUS RISKS OF RELEASING GMO ALGAE INTO THE OCEANS

Concern: **What if individuals with chronic coughs** are an early indicator?

- **Uncontrollable spread**
  Ocean currents promote **global dissemination** of any released GMO algae.
- **HEGAAs** (**Horizontal Environmental Genetic Alteration Agents**) are engincered agents to alter genes in the environment.
- **Weather instability** intensifies storms, shifts drought/flood zones, destabilizes predictable seasonal cycles leading to unintended regional climate extremes
- **Bioaerosol inhalation:** if GMO algae produce toxic aerosols, humans will inhale them. **Health effects?** Unknown.

Serious Risks: Uncontrollable spread, ecological collapse, weather instability, **bioaerosol inhalation.**

GMOs and Enhanced Carbon Capture

Engineered plants and trees, algae or microbes modified to increase CO2 absorption:

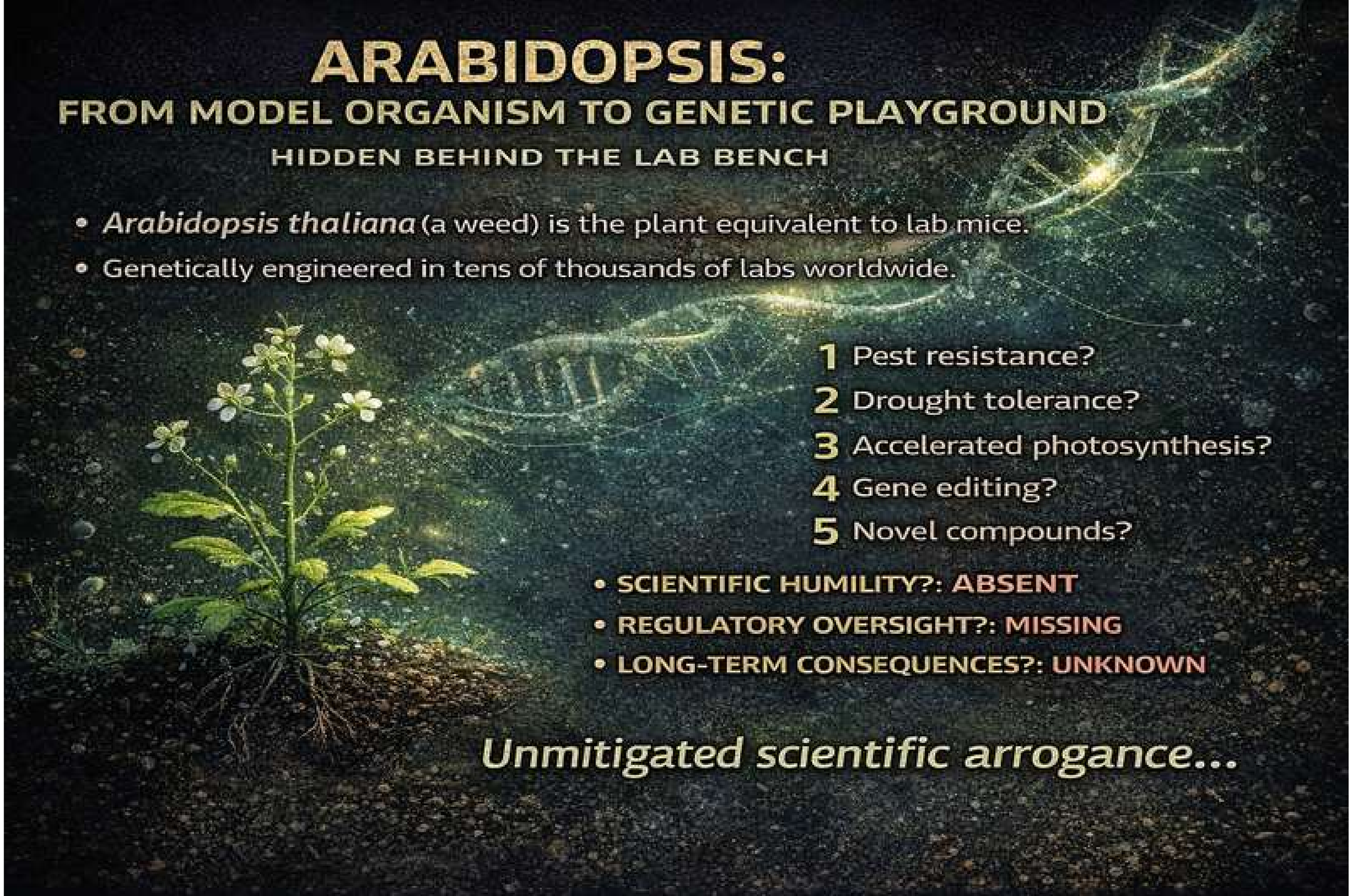
- U of Wisconsin modified a gene in Arabidopsis (flowering plant in the mustard family/Brassicaceae) to absorb 30% more CO2.
- Innovative Genomics Institute (IGI) is using CRISPR on plants and soil microbes to capture more carbon.
- Living Carbon (biotech startup), engineered poplar tress that had a 27% boost in carbon capture.

ARABIDOPSIS:

FROM MODEL ORGANISM TO GENETIC PLAYGROUND

HIDDEN BEHIND THE LAB BENCH

- *Arabidopsis thaliana* (a weed) is the plant equivalent to lab mice.
- Genetically engineered in tens of thousands of labs worldwide.



1. Pest resistance?
2. Drought tolerance?
3. Accelerated photosynthesis?
4. Gene editing?
5. Novel compounds?

- **SCIENTIFIC HUMILITY?: ABSENT**
- **REGULATORY OVERSIGHT?: MISSING**
- **LONG-TERM CONSEQUENCES?: UNKNOWN**

Unmitigated scientific arrogance...

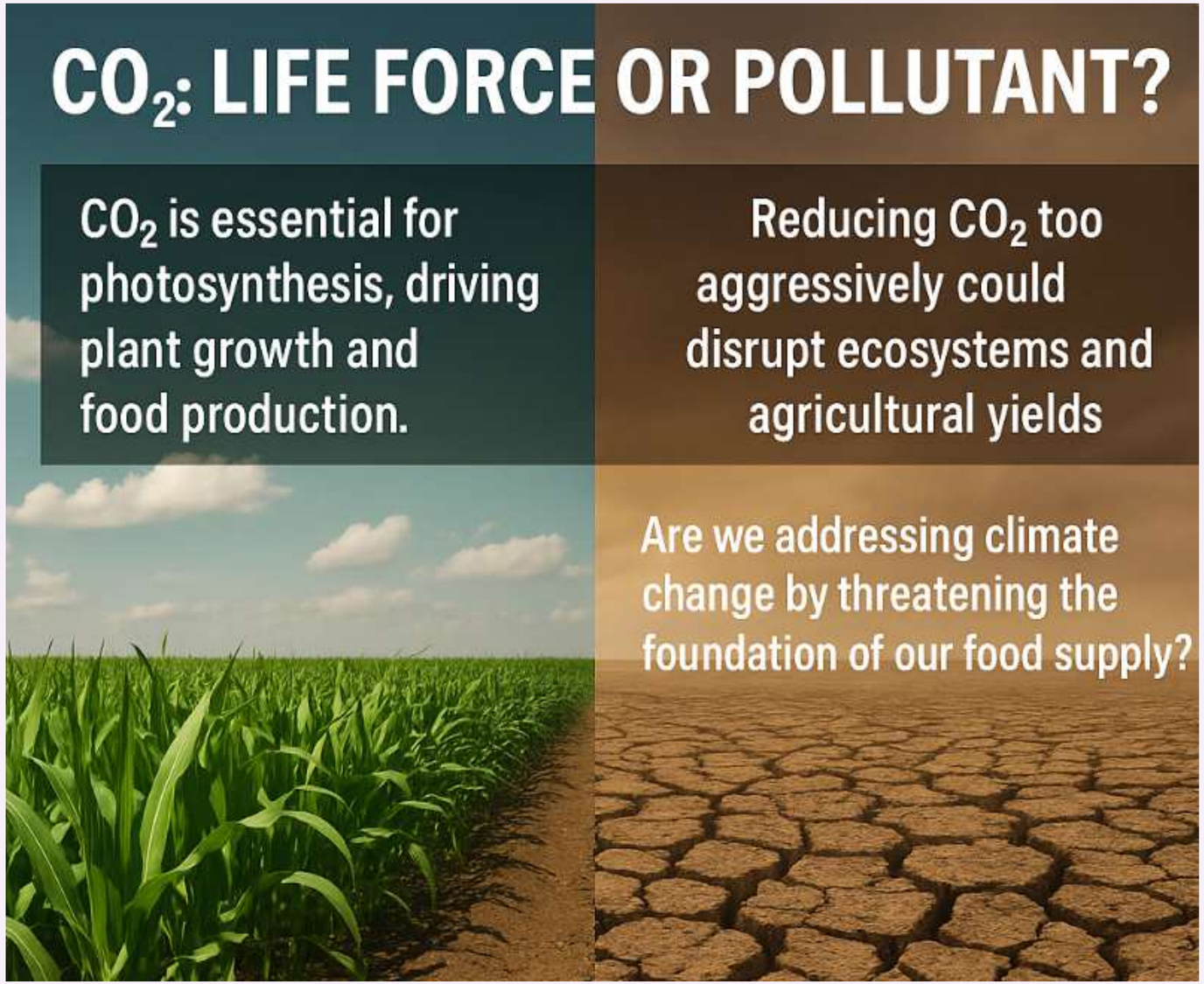
NSF Stories

Altered gene helps plants absorb more carbon dioxide, produce more useful compounds

Genetic change caused the plants to absorb 30% more carbon dioxide than normal

June 22, 2022

New funding from the Chan Zuckerberg Initiative kickstarts CRISPR-enabled carbon removal research at the Innovative Genomics Institute



My concern:

"Before we rush to engineer ways to strip CO_2 from the atmosphere, we must remember that this molecule is the life force of plants, and tampering with it could jeopardize the very foundation of our food chain."

Michelle Perro, MD

GMOs and Enhanced Carbon Capture?

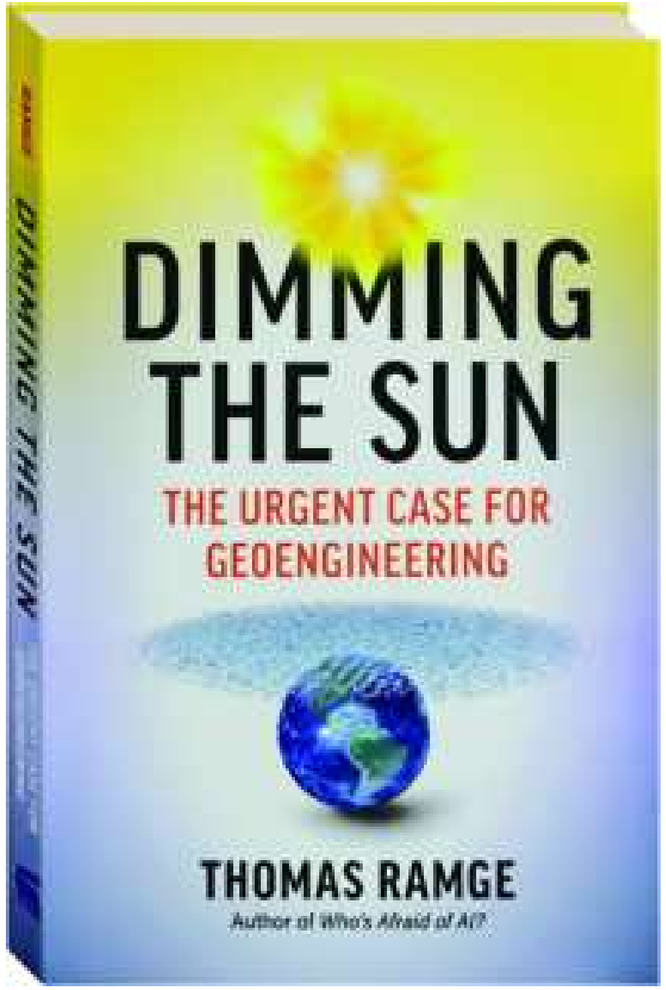
How Regenerative Organic Soil Increases Carbon Capture

Rebuilds soil structure, microbial diversity, and root biomass; the core engines of carbon sequestration:

- Draws CO_2 from the atmosphere through photosynthesis and stores it underground as stable carbon compounds
- Uses cover crops, compost, reduced tillage, and deep-rooted perennials to accelerate carbon storage
- Expands microbial networks and mycorrhizal fungi that convert plant carbon into long-lasting soil aggregates
- Locks carbon into the soil for decades to centuries
- Transforms farmland into a functional carbon sink while improving water retention, nutrient density, and ecosystem resilience

Corporate Control

Companies controlling both geoengineering technologies and GMO seed patents could create “climate-adapted seed monopolies”, forcing farmers to rely on engineered seeds suited for the new, altered climates.



DIMMING THE SUN: The Urgent Case for Geoengineering

Thomas Ramge

With time to avert the worst of climate change rapidly running out, Ramge makes a forceful case that the most responsible course of action is to dramatically increase research on solar engineering to slow the earth's warming.

The Dimming, Full Length Climate Engineering Documentary (Geoengineering Watch)

Dane Wigington

26M views

Mar 10 2021

Are GMOs Being Used for Weather Control?

- Synthetic biology is advancing engineered algae for CO2 capture and cloud formation applications
- Present ocean fertilization trials
- Patents exist for climate-modifying crops engineered for altered evapotranspiration or reflective surfaces

From Congress: https://www.congress.gov/crs-product/R47265

Synthetic/Engineering Biology: Issues for Congress

CRS PRODUCT (LIBRARY OF CONGRESS) Hide Overview ✕

CRS Product Type:	Reports
CRS Product Number:	R47265
Referenced Legislation:	P.L. 117-167
Topics:	Agriculture, Food & Rural Policy; Energy & Natural Resources; Environmental Policy; Health Care; Homeland Security & Emergency Management; Justice & Law Enforcement; Science & Technology
Publication Date:	09/30/2022
Author:	Kuiken, Todd

Synthetic biology has also been proposed as a conservation tool to aid species impacted by climate change. For example, certain aspects of coral bleaching result from sea temperature rise. There are genetic traits in certain species of coral that provide resilience to ocean warming. Researchers have explored mechanisms to assimilate those traits into the genomes of other coral species in order to build resilience to the impacts of sea temperature rise.[57] While early research suggest these manipulations are possible, considerable technological development,[58] governance framework planning, and public engagement efforts would be required before synthetic biology could be applied to corals.

References

1. Broecker, W.S., *Climatic Change*: Are We on the Brink of a Pronounced Global Warming:" *Science*, 1975
2. National Academies of Sciences. *Climate Intervention: Reflecting Sunlight to Cool Earth.*
3. United States Patent No. 8,967,029. *Climat*e-Resilient Crops with Modified Evapotranspiriation.
4. Smith, P., et al., Biotechnological Approaches for Carbon Sequestration in Crops and Microbes. *Natue Plants.*
5. Gattuso, J.-P., et al., Ocean-based CO_2 Removal and Algae Engineering for Climate Mitigation, *Science,* 2021

Solutions

Geoengineering Conspiracy ~ 31 States

States With Laws Passed
Passed into Law (Geoengineering/Weather Modification Bans):
Tennessee – Ban on intentional atmospheric chemical alteration
Florida – Law criminalizing unauthorized weather modification

States With Pending or One-Chamber Passage
Passed One Chamber / Pending Final Approval:
Arizona – Passed Senate geoengineering ban (awaiting full enactment)
Montana — Bill passed committee and Senate but failed in House.

States With Introduced Legislation
Introduced (Not Yet Law):
New Jersey – Geoengineering prohibition bill
North Carolina – Ban on atmospheric modification
Pennsylvania – "Clean Air Preservation Act"
Rhode Island – Broad geoengineering ban proposed
Texas – Restrictions on government weather modification
Vermont

Also reported as considering similar bills: Iowa, Kentucky, Mississippi, New Hampshire, North Dakota, South Carolina, Utah, Wyoming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H.R.4403 – Clear Skies Act
23 July 2025 | ZEROGeoengineering.com | Representative Greene introduced the "Clear Skies Act" "to prohibit weather modification within the United States, and for other purposes." The bill would provide criminal penalties of $100,000 for each violation and up to 5 years jail time. Additionally, civil penalties may be imposed by EPA and FAA – $10,000 for each violation in addition to any other penalties provided by law. Further, the legislation includes repeal of federal statutes authorizing weather modification.

Clear Skies Act — Key Facts & Status

Clear Skies Act (H.R. 4403)

- **Introduced** in the U.S. House on **July 15, 2025** (H.R. 4403)
- Sponsored by Rep. Marjorie **Taylor Greene** (R-GA)
- **Purpose:** Prohibit weather modification & geoengineering in the U.S. and its territories
- **Status:** Pending, referred to House **Energy & Commerce Committee** – **not voted on yet**

Not passed or advanced in Congress.

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Clear Skies Act — Current Status Update

Latest Update:

- **Rep. Marjorie Taylor Greene** has resigned (effective Jan. 5, 2026).
- **No new sponsor** has assumed the **Clear Skies Act** (H.R. 4403).
- Legislation remains in the **"introduced"** stage without advancement.

Status: No successor sponsor to carry Greene's **Clear Skies Act.**

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Get Off the Couch

- Policy campaigns to ban or regulate experiments and GMO releases.
- Public education & outreach (reports, events, consumer guides).
- Legal challenges and regulatory petitions.
- Coalition building with farmers, indigenous groups, and climate justice networks.

Calls to Action

Legislative Action and and Policy Reform

- Example: In Maui County, Hawaii, voters passed a ballot initiative banning GMO crop cultivation due to health and environmental concerns.
- Example: Support “Right to Know GMO” campaigns, which successfully pushed for mandatory GMO labeling laws in states like Vermont.
- Action Step: Call your representative to support federal bills like the Genetically Engineered Food Right-to-Know Act.

Calls to Action

Ban/Restrict GMO Cultivation and Geoengineering Experiments

- Example: Over 20 counties in California (including Mendocino and Santa Cruz) have passed ordinances banning GMO crops.
- Example: TN and FL have recently passed laws banning geoengineering and weather modification activities.
- Action Step: Partner with groups like Organic Consumers Association, Alliance for Natural Health, Center for Food Safety, and Friends of the Earth to lobby for local GMO and geoengineering bans.

Calls to Action

Shift to Regenerative Organic Agriculture

- Example: Buy from farms certified under the Regenerative Organic Certification (e.g., Rodale Institute, Patagonia Provisions).
- Example: Participate in Community Supported Agriculture (CSA) programs, like those run by Farm Fresh To You or local co-ops.
- Action Step: Convert your backyard or community garden to organic methods (compost, crop rotation) to model chemical-free food systems.

Calls to Action

Corporate Accountability and Transparency

- Example: Boycott brands tied to GMO-heavy supply chains (e.g., Kellogg's, Nestlé) and switch to verified organic products like Nature's Path or Lundberg Rice.
- Example: Email companies to demand clarity on ingredient sourcing (e.g., consumer campaigns that pressured General Mills to remove GMOs from Cheerios).
- Action Step: Donate or volunteer for watchdog groups like Center for Food Safety or GMO Free USA that push for corporate transparency.

Calls to Action

Strengthen Global Food Sovereignty

- Example: Participate in seed swaps through networks like Seed Savers Exchange to preserve heirloom, organic/non-GMO seeds.
- Example: Support global food movements like La Via Campesina, which fights corporate control over seeds and promotes farmer rights.
- Action Step: Advocate for local food sovereignty ordinances (e.g., Maine's "Food Sovereignty Law," giving local communities control over food production and sales).

Calls to Action

What US Consumers Can Do to End Geoengineering

- Call or email state and federal reps to support bills banning weather modfication using tools like GovTrack.us or 5 Calls App.
- Join safety campaigns run by groups like Geoengineering Watch and Center for Food Safety.
- Act locally: Encourage city councils to pass “No Geoengineering” resolutions, similar to anti-spraying initiatives in California counties by attending town halls and environmental board meetings to raise awareness.
- Share vetted resources and documentaries (e.g., *The Dimming*, *What in the World Are They Spraying?*), & host community talks, podcasts, or social media campaigns to inform others about the risks of geoengineering.

To All State and Federal Lawmakers:

We, the undersigned physicians from across the United States, strongly oppose the spraying into the atmosphere of any and all toxic materials for geoengineering and weather modification/manipulation purposes, including:

- metals such as aluminum, barium, strontium, and others
- chemicals such as sulfuric acid and others
- materials such as graphene oxide and others

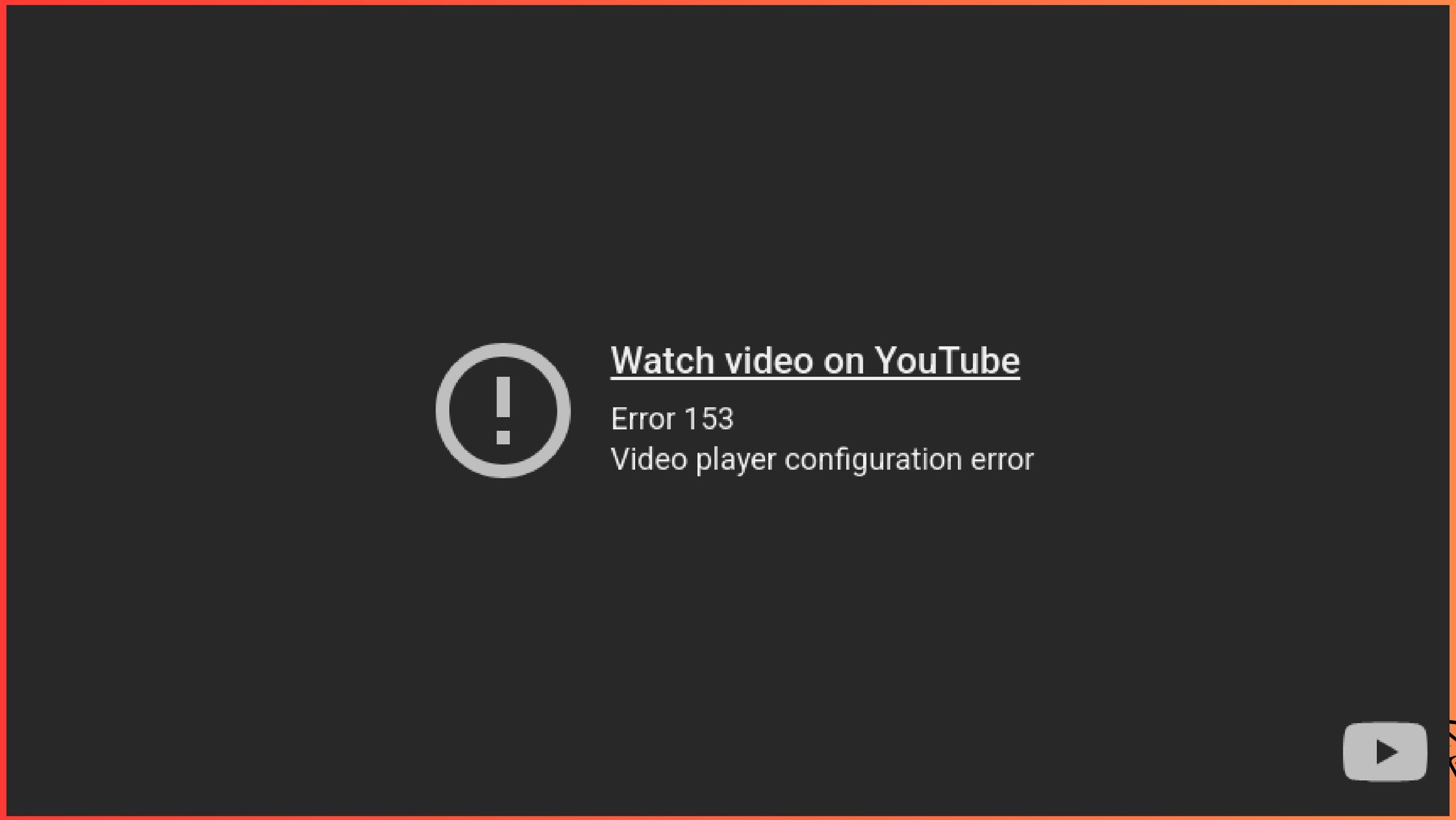
These practices, which are currently in widespread, nationwide use, constitute deliberate pollution of the Earth's atmosphere, causing multiple toxicities to the population and poisoning the entire environment, including our air, water, and soil.

In the name of the health and civil rights of all citizens, we call for all such practices to be stopped and outlawed.

Sincerely,

Dr. Clayton J. Baker, MD, New York
(Correspondence: cjbakermd@consultant.com)

Physicians Stepping Up!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Lest we forget...

Operation Sea-Spray:

- Biowarfare testing on civilians
- Environmental or atmospheric experimentation without public consent
- The trustworthiness of government agencies during secret military operations
- Precedent for geoengineering concerns and unauthorized testing

Why “Conspiracy” is the Wrong Scientific Frame

Unknown Does Not Mean Untrue:
A Scientific Frame

- **Absence of criminal charges does not equate to absence of activity.** Historical examples (e.g., Operation Sea-Spray, MKULTRA) show that government biological and atmospheric experiments have occurred without public disclosure or legal action, which means that unanswered questions about **atmospheric releases** and **environmental interventions** remain **scientifically and ethically valid** areas of inquiry.

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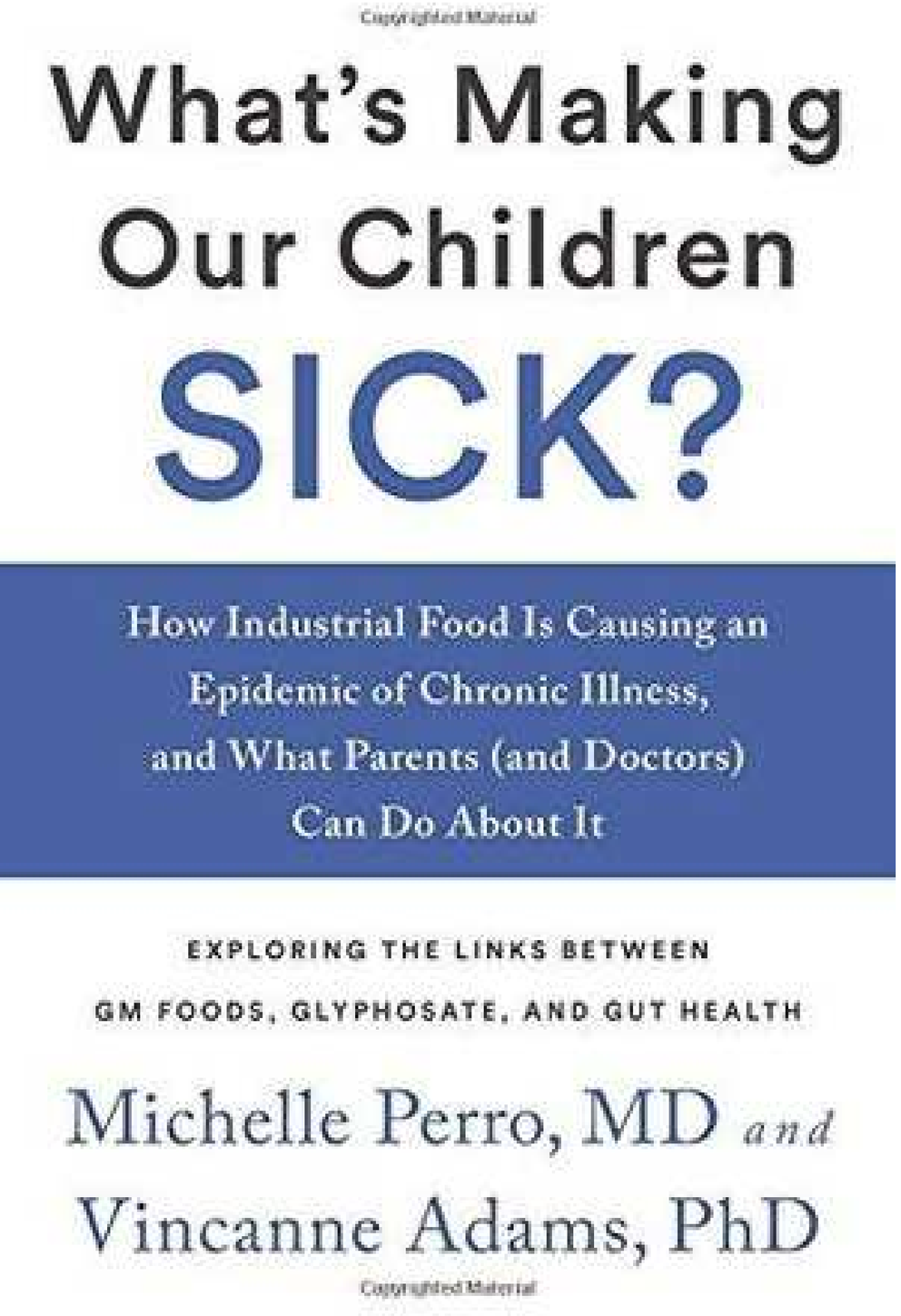
"Leadership and learning are indispensable to each other."
— John F. Kennedy, 35th President of the United States



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