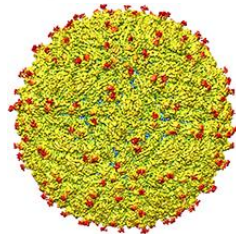


Microcephaly in Brazil: Is it Really Just Zika?



Part II



Stephanie Seneff
WAPF Wise Traditions
November 12, 2016



Outline (Part II)

- A Role for Herbicides?
 - Glyphosate
 - Glufosinate (Liberty Herbicide)
- Fighting Zika: Is the Cure Worse than the Disease?
 - Controlling mosquitoes with pesticides
 - GMO mosquitoes and molecular mimicry
 - A viral infection in cows
 - Zika vaccine development
- Summary

A Role for Herbicides?

Glyphosate

Sugar Cane and Roundup*

- Roundup is used to ripen sugar cane in NE Brazil at harvest
- The workers harvest by machete and chop off a small chunk of stalk to chew on as they harvest throughout the day
- They suffer from end-stage kidney failure
- Kidney failure is much lower in other regions where they have switched to a different ripening agent besides glyphosate
- The workers also take stalk sections home for the family to eat



www.alamy.com - A01J5C



* Prof.. Don Huber, Personal Communication

Sugar Cane, Sugar Beets and Ethanol*

- Brazil is a leader in introducing flexible fuel vehicles (FFVs) into the market.
 - Designed to run on gasoline or gasoline-ethanol blends of up to 85% ethanol (E85)
- Brazil has a major industry converting sugar from sugar beets and sugar cane to ethanol
- Ethanol-based fuels produce toxic carcinogens: formaldehyde and acetaldehyde**
- There is likely glyphosate present in the fuel

*<https://en.wikipedia.org/wiki/Pernambuco>

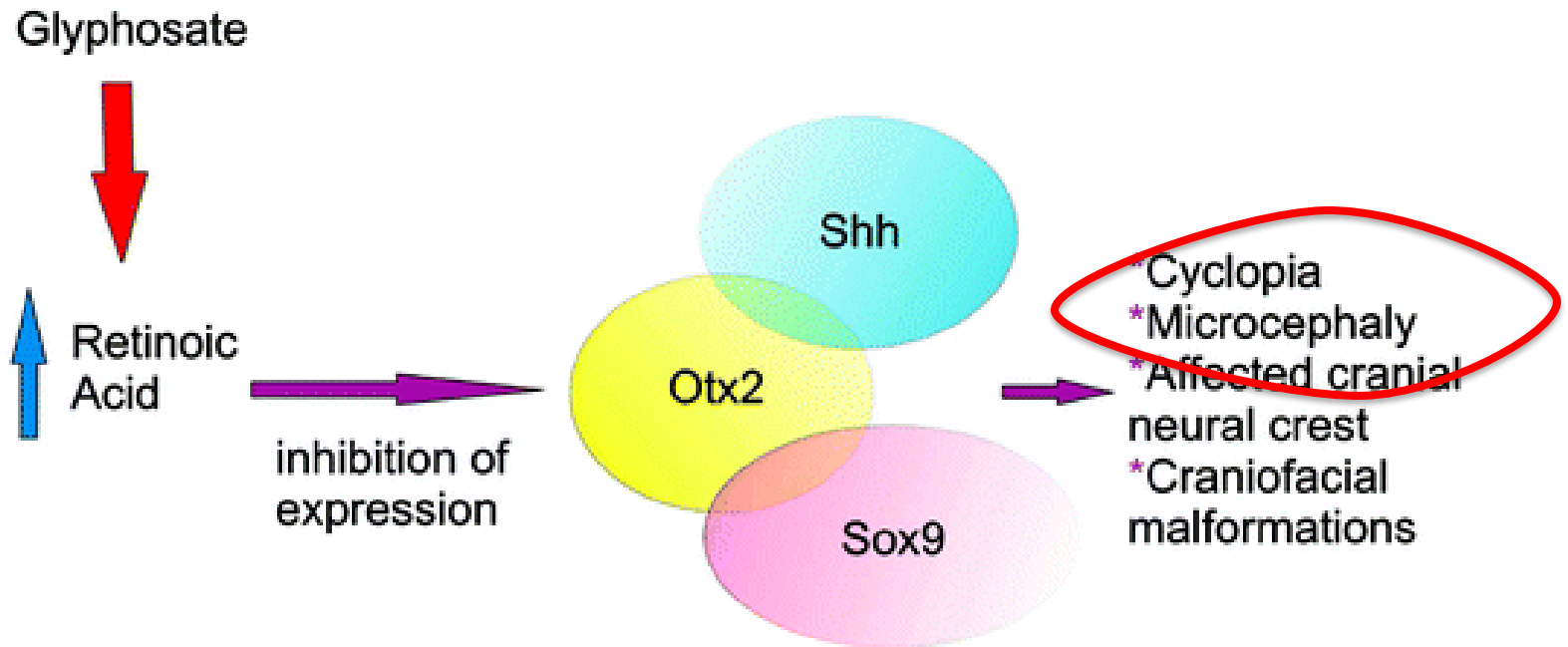
** MZ Jacobson, *Environ. Sci. Technol.*, 2007, 41 (11), pp 4150–4157

Trucks in Brazil Lining Up Following Truckers' Strike: February, 2015 *



*kticradio.com/agricultural/deal-reached-in-brazil-truckers-strike-trucks-still-blocked/

“Glyphosate-Based Herbicides Produce Teratogenic Effects on Vertebrates by Impairing Retinoic Acid Signaling”*



*A Paganelli et al., Chem Res Toxicol 2010; 23(10):1586-1595.

"Glyphosate-Based Herbicides Produce Teratogenic Effects on Vertebrates by Impairing Retinoic Acid Signaling"*

"GBH (Glyphosate-Based Herbicides) produced similar effects in chicken embryos, showing a gradual loss of rhombomere domains, reduction of the optic vesicles, and *microcephaly*. This suggests that *glyphosate itself* was responsible for the phenotypes observed, rather than a surfactant or other component of the commercial formulation."

*A Paganelli et al. Chem. Res. Toxicol 2010;23(10): 1586-1595.

"Glyphosate-Based Herbicides Produce Teratogenic Effects on Vertebrates by Impairing Retinoic Acid Signaling"*

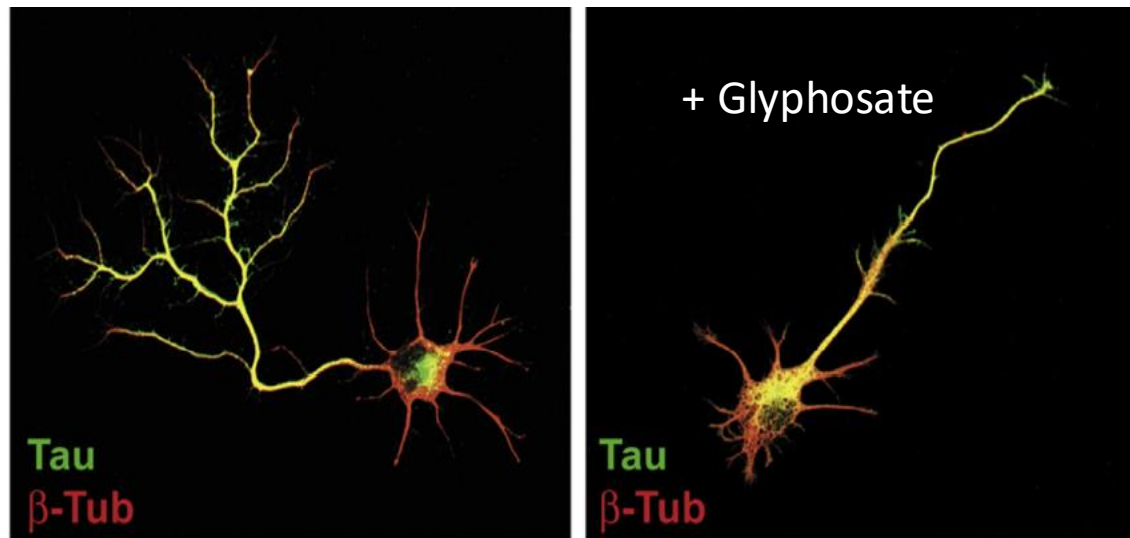
Retinoic acid receptors contain a highly conserved glycine that is essential for their proper function

the phenotypes observed, rather than a surfactant or other component of the commercial formulation."

*A Paganelli et al. Chem. Res. Toxicol 2010;23(10): 1586-1595.

“Neuronal development and axon growth are altered by glyphosate through a WNT non-canonical signaling pathway”*

- Neurons grown in culture & exposed to glyphosate
- “They elicited shorter and unbranched axons and they also developed less complex dendritic arbors compared to controls”



*RP Coullery et al., NeuroToxicology 2016;52:150-161.

Glyphosate Could Cause Microcephaly through Impaired Methylation Pathway

- Disrupted folate one-carbon metabolism (methylation pathway)
 - Folate carries the methyl group that methylates DNA during development to regulate gene expression
 - Folate is produced for the host by gut microbes from the shikimate pathway which glyphosate suppresses
- Methyl group is provided by metabolism of glycine
 - A critical enzyme in this pathway depends on a glycine-rich region that glyphosate could disrupt

Glyphosate and Anencephaly*

- Yakima, Benton and Franklin counties in Washington State have an unusually high number of pregnancies affected by anencephaly
- 75 pesticides were analyzed in studying contamination due to surrounding agriculture
 - 47 (63%) of these were detected
 - Glyphosate was applied in large amounts, *but was not studied*
- 5% solution of glyphosate was also used heavily around irrigation ditches to control weeds
 - Main herbicide recommended due to its “low toxicity”

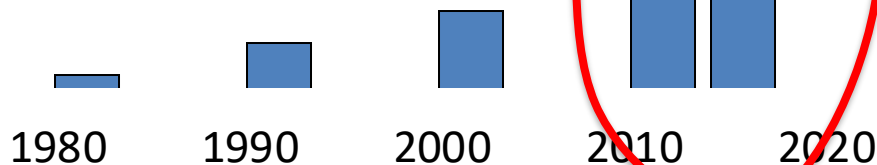


* Barbara H. Peterson. *Farm Wars*, <http://farmwars.info/?p=11137>

“Glyphosate, Brain Damaged Babies, and Yakima Valley - A River Runs Through It”*



Noxious aquatic weed control program with Glyphosate ‘Rodeo’



“Glyphosate, Three Rivers, and Anencephaly”

Yakima Harold Republic
Slide thanks to Prof. Don Huber, with permission

*Farm Wars 3/6/14

Pigs and GMO Roundup-Ready Feed

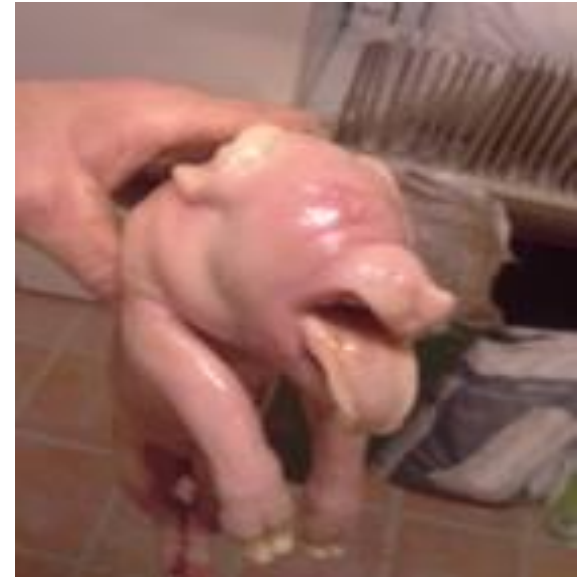
"In my experience, farmers have found increased production costs and escalating antibiotic use when feeding GM crops. In some operations, the livestock death loss is high, and there are unexplained problems including spontaneous abortions, deformities of new-born animals, and an overall listlessness and lack of contentment in the animals."

Howard Vlieger, Iowa-based Farmer, author of paper on pigs comparing GMO vs non-GMO feed

Ib Pedersen's Danish Piglets*

“In a period of two years and 8 months, we have photographed 128 deform-born pigs. The types of deformities are catalogued as follows:

Tails – 28, Spinal – 20, *Cranial -16*, feet – 16, Sex organ – 16, legs – 13, Ear – 9, kidney – 2, Skin – 2, missing anus – 2, Eye – 1, Thong – 1, Stomach born outside – 1, Motoric problems.”



*http://www.theecologist.org/News/news_analysis/2560697/changing_to_nongmo_soy_transformed_the_health_of_my_pigs.html

Recapitulation

- Glyphosate is used on both sugar cane and sugar beets grown in Brazil
 - Brazil produces an ethanol-based fuel from sugar beets and sugar cane
- Glyphosate's impairment of retinoic acid signaling can cause microcephaly
- Glyphosate suppresses neuronal growth in vitro
- Glyphosate disrupts the supply of methyl groups for methylation multiple ways
- Glyphosate is the likely cause of the anencephaly epidemic in Yakima, WA.
- Pigs and piglets fed glyphosate-laden GMO feed are suffering from many health issues, including cranial deformities.

Glufosinate

(Liberty Herbicide)

Glyphosate Resistant Weeds

- Widespread appearance of glyphosate-resistant weeds has necessitated ever-increasing applications of glyphosate on Roundup-Ready crops
- Liberty is an alternative herbicide to kill these resistant weeds – *glufosinate!*
- LibertyLink is a GMO modification to support glufosinate resistance



Increased Use of Glufosinate after 2010

- **LibertyLink** is a Bayer-owned brand of genes for use in agriculture providing tolerance to **Liberty** herbicide and glufosinate
- LibertyLink is the only GMO herbicide tolerant gene other than Roundup-Ready on the market.
- LibertyLink versions of cotton, corn and soybeans are approved in Brazil
 - LibertyLink soybeans approved in 2010



Glufosinate is a Glutamate Analogue!*

- Its toxicity to plants is based on its disruption of glutamine synthetase by pretending to be glutamate
 - This causes a build-up of excess ammonia and glutamate and a depletion of glutamine
- As an analogue of glutamate, it could substitute for glutamate during protein synthesis – and this could lead to microcephaly!

*G Haerlein, Rev Environ Contam Toxicol 1994;138:73-145.

Protein Disruption Through Coding Errors

Amino Acid	Imposter	Protein	Disease
serine	BMAA	Glutamate transporter	ALS (Lou Gehrig's)
proline	Aze	Myelin basic protein	Multiple Sclerosis
glutamate	glufosinate	Asparagine synthetase	Microcephaly Immune deficiency
glycine	glyphosate	Many proteins	Autism, microcephaly, etc.

Microcephaly and Asparagine Synthetase*

- Loss-of-function mutation in asparagine synthetase causes a severe condition
 - Congenital microcephaly, intellectual disability, progressive cerebral atrophy, and intractable seizures
- Mutant mice have enlarged ventricles, reduced thickness of cortex, and learning disabilities

*EK Ruzzo et al., Neuron 2013;80(2):429-41.

Microcephaly and Asparagine Synthetase*

- Loss-of-function mutation in asparagine synthetase causes a severe condition

Asparagine synthetase has a conserved glutamate that is essential for its function**

reduced thickness of cortex, and learning disabilities

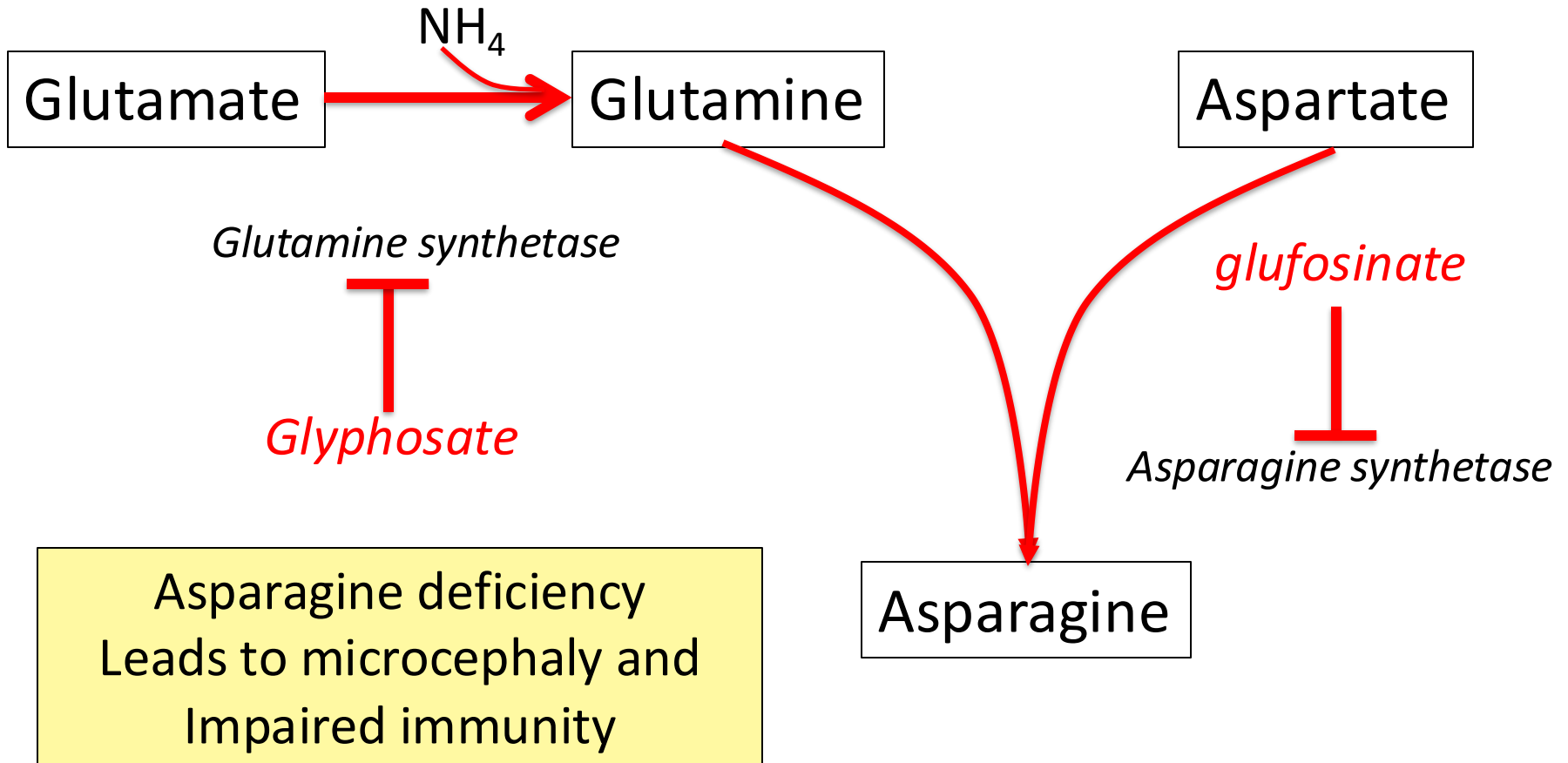
*EK Ruzzo et al., Neuron 2013;80(2):429-41.

** ME Meyer et al., Biochemistry 2010;49(43):9391-401.

A Theory Emerges: Glyphosate/Glufosinate Synergy

- Glyphosate disrupts glutamine synthesis through chelation of manganese
 - Glutamine is precursor to asparagine
- Glufosinate disrupts enzyme that synthesizes asparagine
- Both shortages of glutamine and impaired enzyme activity result in severe deficiency in asparagine → microcephaly

A Bit of Chemistry



Glufosinate Induces Autistic Symptoms in Mice*

- 1 mg/kg administered three times a week to dam during gestation and lactation
- Offspring demonstrated autistic behaviors – socialization impairment, repetitive activities
- Dose was about 5 times lower than the EPA approved dose



* A. Laugeray et al., *Frontiers in Behavioral Neuroscience* 2014;8:390.

Glufosinate Induces Autistic Symptoms in Mice*

- 1 mg/kg administered three times a week to dam during



We can expect a dramatic rise in the use of glufosinate on core crops as more and more weeds become resistant to Roundup

- Dose was about 5 times lower than the EPA approved dose

* A. Laugeray et al., Frontiers in Behavioral Neuroscience 2014;8:390.

Recapitulation

- In Brazil, glyphosate-resistant weeds have necessitated the addition of glufosinate as a supplementary herbicide on new GMO versions of corn, soy and cotton resistant to both chemicals
- Glufosinate is a non-coding amino acid analogue of glutamate that has been shown to cause microcephaly and autism in animal studies
- Glyphosate and glufosinate would conspire to interfere with the synthesis of asparagine in the brain, and this can lead to microcephaly



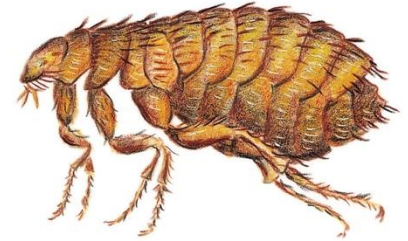
Fighting Zika: Is the Cure Worse than the Disease?



Controlling Mosquitoes with Pesticides

Pyriproxyfen: Insecticide*

- Pyriproxyfen is a commonly used larvicide to control mosquitoes, fleas on pets and the whitefly in agriculture
- Brazil is the only country that puts pyriproxyfen in the drinking water to control mosquitoes (since 2014)
- Pyriproxyfen is a powerful juvenile hormone analog
- Juvenile hormone controls metamorphosis and reproduction in insects



*D Evans et al., A Possible Link Between Pyriproxyfen and Microcephaly.
<http://necsi.edu/research/social/pandemics/pyriproxyfen>

Pyriproxyfen: Insecticide, Cont'd*

- Juvenile hormone and retinoic acid (vitamin A) are both lipid-soluble terpenoids
- Isotretinoin (a vitamin A analogue) causes microcephaly in human babies via maternal exposure
- Juvenile hormone and its analogs bind to the vertebrate retinoic acid receptor
 - This could prevent the normal retinoic acid from binding to the receptor and cause developmental disorders in mammals
- Liver CYP enzymes needed to detox pyriproxyfen are suppressed by glyphosate



*D Evans et al., A Possible Link Between Pyriproxyfen and Microcephaly.
<http://necsi.edu/research/social/pandemics/pyriproxyfen>

Aerial Spraying to Combat Mosquitos Linked to Increased Risk of Autism in Children*

- Swampy region in central New York
- Health officials use airplanes to spray *pyrethroid* pesticides each summer
 - Motivated by concern about eastern equine encephalitis virus carried by mosquitoes
- 25% increased risk to autism and developmental delay compared to regions where pyrethroid pesticides are not sprayed

*www.aap.org/en-us/about-the-aap/aap-press-room/pages/Aerial-Spraying-to-Combat-Mosquitos-Linked-to-Increased-Risk-of-Autism-in-Children.aspx

Massive New Study Suggests Pesticide the Cause of Microcephaly — NOT Zika Virus*

"The mathematical analysis demonstrates that there are at least 60,000 Zika-infected pregnancies in Colombia, yet the near absence of microcephaly calls for a renewed investigation into the cause of this birth defect."

"*Pyriproxyfen* had never been applied to drinking water on such a scale as it was in Brazil, which began the application in 2014—just before the outbreak of microcephaly."

[*http://complete-health-and-happiness.com/](http://complete-health-and-happiness.com/)

massive-new-study-suggests-pesticide-the-cause-of-microcephaly-not-zika-virus/?t=DM

Spraying Naled to Control Zika

Planes flew over Miami Beach last August and September spraying naled to control mosquitoes -- allegedly to fight Zika



Naled spraying in the United States*

- Naled is a neurotoxic organophosphate pesticide
- Naled's breakdown product *DICHLORVOS* (another organophosphate insecticide) interferes with prenatal brain development. In laboratory animals, exposure for just 3 days during pregnancy when the brain is growing quickly reduced brain size 15 percent.**
- The European Union bans the use of naled, calling it "a potential and unacceptable risk" to human health and the environment

*<http://www.cnn.com/2016/09/09/health/florida-zika-spraying-starts/>

**<http://nospray.org/naled-insecticide-fact-sheet/>

Naled kills bees*

- Headline: ‘Like it’s been nuked’: Millions of bees dead after South Carolina sprays for Zika mosquitoes
- For the first time, an airplane dispensed Naled in a fine mist, raining insect death from above between 6:30 a.m. and 8:30 a.m. Sunday.
- A profile of the chemical in Cornell University’s pesticide database warned that “Naled is highly toxic to bees.”



*Ben Guarino, The Washington Post, September 1, 2016.

Naled May Be DDT and Zika May Be Polio All Over Again*

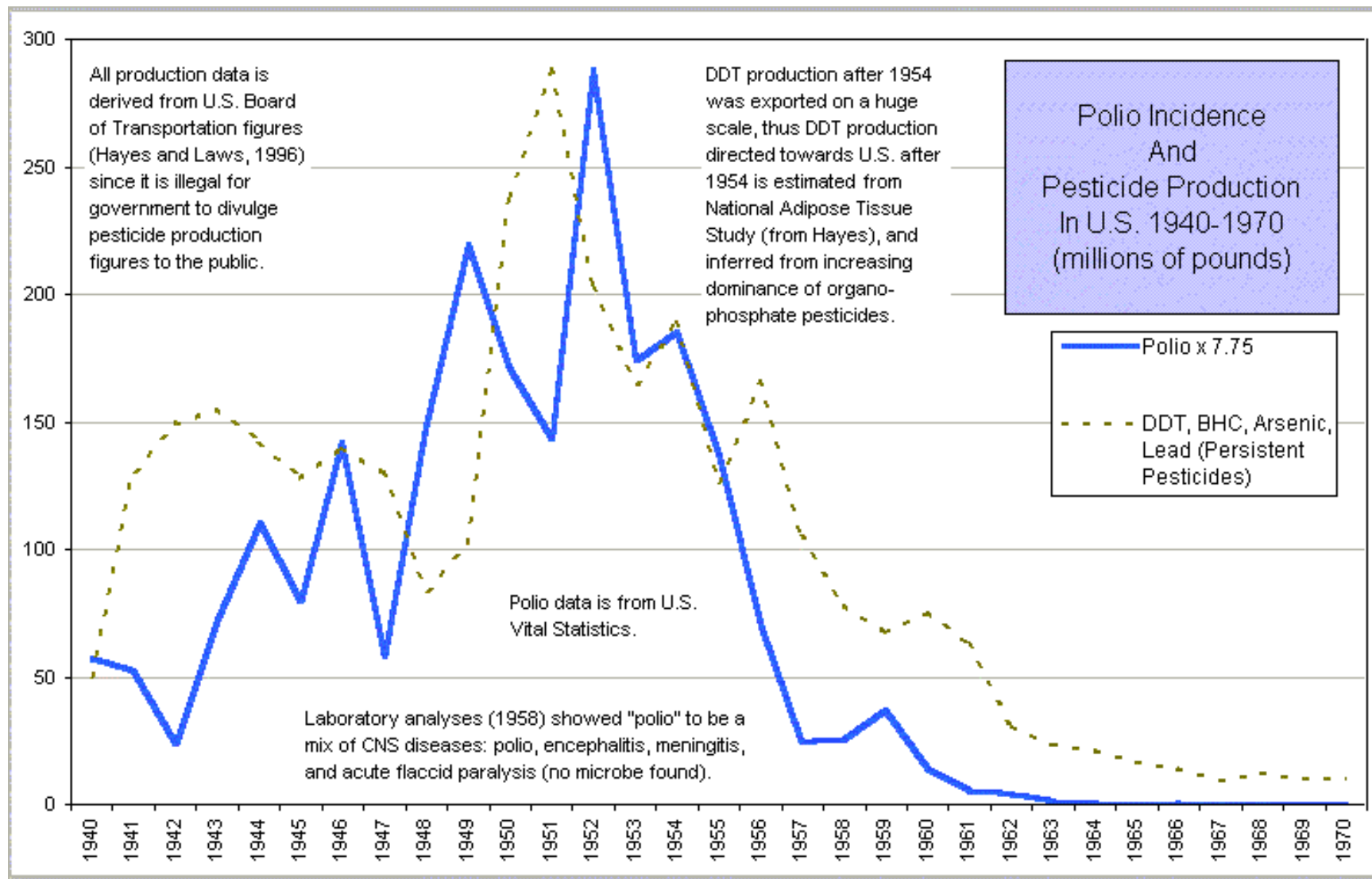
- In the mid 1940's, US government fumigation campaign massively sprayed DDT due to the belief that mosquitoes might be spreading polio.
- The rise and fall in paralytic polio rates echoed the rise and fall in DDT usage

"Is it possible that Naled, which is intended to kill off the mosquitoes believed to be carrying a virus theorized to cause microcephaly, may itself end up causing microcephaly, as well as other birth defects?"

*Marco Cáceres, Aug 29, 2016

<http://www.thevaccinereaction.org/2016/08/naled-may-be-ddt-and-zika-may-be-polio-all-over-again/>

Polio and Pesticides*



*From **Dissolving Illusions**, Suzanne Humphries

Recapitulation

- Efforts to control mosquitoes through toxic pesticides may be a causal factor in microcephaly
- In NE Brazil, pyriproxyfen has been added to the drinking water since 2014
 - Neighboring Colombia, with high Zika infection rates, has no associated microcephaly
- Pyrethroid pesticides sprayed in NY were associated with increased autism risk
- Naled is an organophosphate pesticide sprayed in the US to control mosquitoes: banned in Europe
 - Decimated bee colony in South Carolina
- DDT sprayed to control mosquitoes during the polio epidemic may have led to paralysis attributed to polio virus
 - History repeats itself with Zika?

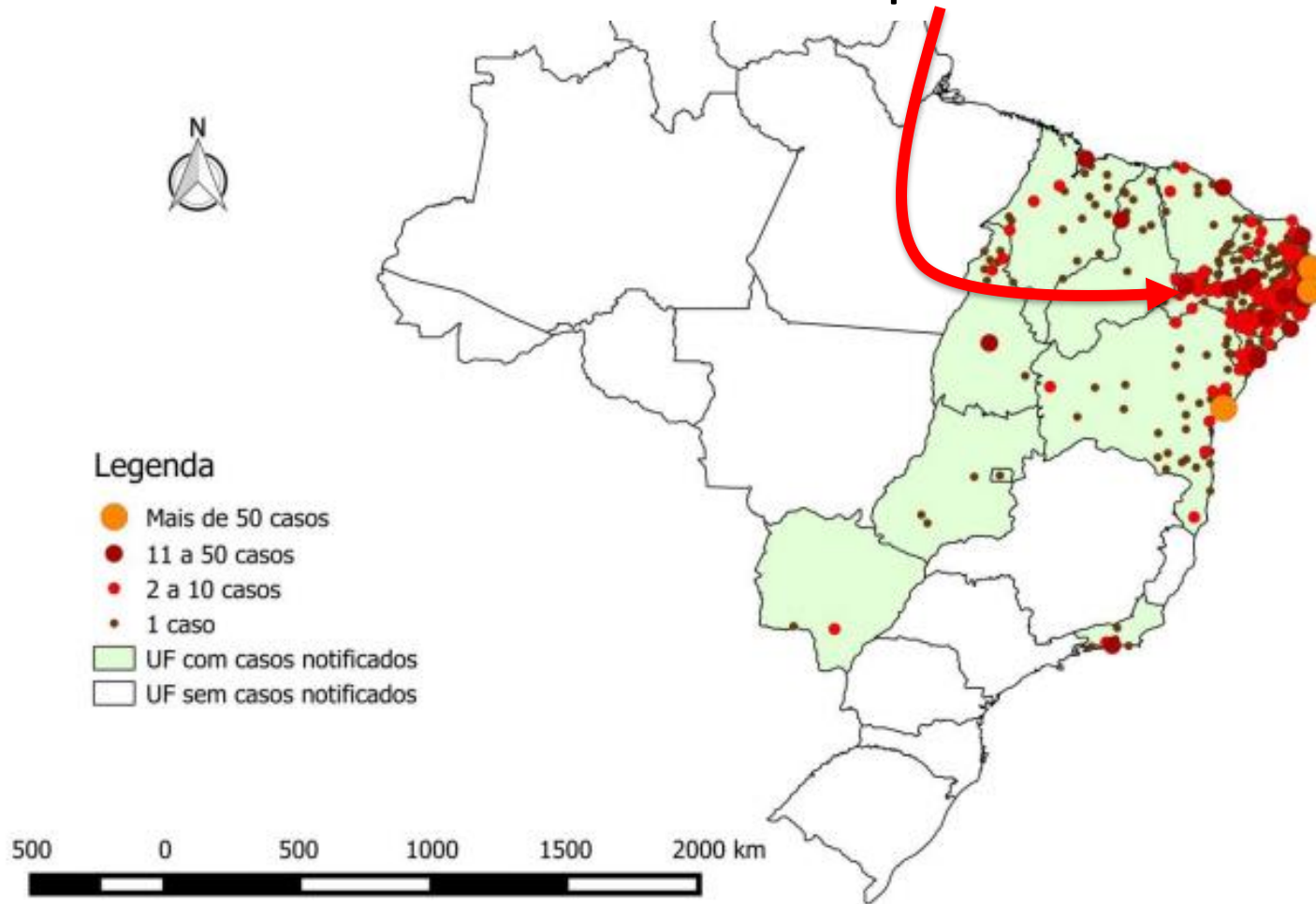
GMO Mosquitoes and Molecular Mimicry

GMO Mosquitoes*

- Millions of GMO *Aedes aegypti* mosquitoes released in Brazil, beginning in 2011, to combat dengue fever
 - This species also carries Zika virus
- Mosquito called OX513A developed by Oxitec: engineered to require tetracycline to survive
- Field releases in Itaberaba, in the semi-arid *northeast region of Brazil*

*Janet Fang, Genetically Modified Mosquitoes Released In Brazil, July 7, 2015
<http://www.iflscience.com/plants-and-animals/dengue-fighting-mosquitoes-are-suppressing-wild-populations-brazil/>

GMO Mosquito Introduced Here



Fonte: Ministério da Saúde e Secretarias Estaduais de Saúde (atualizado em 5/12/2015). Dados sujeitos a alteração.

GMO Mosquitoes, cont'd*

- Grown in contained spaces in Cayman Islands
 - Fed sucrose as larvae followed by blood as adults (sucrose comes from sugar beets or sugar cane)
- Males engineered to become infertile without access to tetracycline
- They could be harboring more glyphosate than mosquitoes in the wild



*AF Harris et al., Nature Biotechnology 2011; 29:1034-1037.

Zika and Molecular Mimicry

Studies from the Vaccine Induced Immunological Damage (VIID) Program (James Lyons Weiler)

Zika E Protein: GWGNGCGLFGKGSLV

IGG heavy chain: GYSSGCGYWGGTLV

- Lots of glycines! – These could get displaced by glyphosate during protein synthesis!!
- Likely to disrupt protein folding and cause resistance to breakdown
 - Autoimmune reaction to similar protein (IGG heavy chain)

Zika and Molecular Mimicry

Studies from the Vaccine Induced Immunological Damage (VIID) Program (James Lyons Weiler)

A Zika virus growing in a GMO mosquito is likely to end up with glyphosate in its proteins

- Likely to disrupt protein folding and cause resistance to breakdown
 - Autoimmune reaction to similar protein (IGG heavy chain)

A Chromosomal Breakage Syndrome With Profound Immunodeficiency*

- Chromosomal Breakage Syndrome: case study
- Spontaneous chromosomal breaks, gaps and rearrangements in T-cells
- Failure to thrive, *microcephaly*, immune deficiency, neurological abnormalities
- *Very low levels of immunoglobulins*

*ME Conley et al., Blood 1986;67(5):1251-1256.

A Chromosomal Breakage Syndrome With Profound Immunodeficiency*

- Chromosomal Breakage Syndrome: case study

Suggests a link between microcephaly and low immunoglobulins which can arise because of an autoimmune response to IgG heavy chain via Zika protein mimicry

*ME Conley et al., Blood 1986;67(5):1251-1256.

PNKP & Microcephaly*

- The body relies on DNA repair mechanisms to repair chromosomal breaks and errors
- PNKP is intimately involved in DNA repair
 - PNKP is both a phosphatase and a kinase: it takes away and adds phosphate groups to DNA
- Mutations in PNKP have been shown to cause microcephaly, seizures and defective DNA repair
- Glyphosate substitution for conserved glycines in PNKP would disrupt both of its activities

*JJ Reynolds et al., Nucleic Acids Res 2012;40(14):6608-19.

Recapitulation

- New GMO mosquito engineered to control mosquito populations was introduced into NE Brazil just before the microcephaly crisis
- GMO mosquito may harbor Zika virus contaminated with glyphosate in its proteins
- A Zika peptide strongly resembles the IGG heavy chain
 - Both peptides have many glycine residues
 - Molecular mimicry could lead to low immunoglobulin and immune deficiency
- A chromosomal breakage syndrome is associated with very low immunoglobulin levels and microcephaly

A Viral Infection in Cows

Another Virus Involved?*

- Adriana Melo was the Brazilian doctor who first reported a potential link between Zika and microcephaly
- She found bovine viral diarrhoea virus (BVDV) proteins in the brains of 3 fetuses with microcephaly from Paraíba state.
 - Their brains tested positive for Zika RNA, but NOT Zika protein

*D Butler. Brazil asks whether Zika acts alone to cause birth defects.
Nature News, 25 July 2016.

BVDV in Cows

- BVDV is a serious problem among cows worldwide
- BVDV is immunosuppressive and it causes respiratory problems and infertility
- A fetus exposed in utero can become a persistent carrier because it identifies the virus proteins as "self" proteins
- In MMR, MMRV, Rotavirus and Varicella vaccines, the live virus is grown on *fetal bovine serum*



Stunted PI calf, the stethoscope provides an idea of scale

“Zika virus may not be alone: proteomics associates a bovine-like viral diarrhea virus to microcephaly”*

- Detected BVDV proteins in brain autopsy of three microcephalic fetuses with Zika virus infection

One sentence summary:

"Proteomics analysis lead us to suspect the presence of a Bovine-like viral diarrhea virus (BVDV-like) in the brain tissue of fetuses bearing microcephaly during the outbreak in Paraíba State, Brazil, 2015."

“Herd-level prevalence and risk factors for bovine viral diarrhoea virus infection in cattle in the State of Paraíba, Northeastern Brazil”*

- A cross-sectional study from September 2012 to January 2013
- 2443 animals were sampled from 478 herds
- 65.5% of the herds were found to be infected
- 39.1% of the individual animals were infected
- *Large number of calves was a risk factor*

*LG Fernandes et al., Trop Anim Health Prod. 2016 Jan;48(1):157-65.

The Smoking Gun?

- BVDV is a member of the Pestivirus family
- BVDV was detected in serum of two children with microcephaly in the US*
- MMR vaccine: live viruses are grown on fetal bovine serum
 - BVDV has been detected in MMR**
- Virulent BVDV strain has been traced to Brazil as the original source***



* BJ Potts et al., The Lancet 1987; 329(8539): 972-973.

** R Harasawa et al. J Clin Microbiol 1994;32: 1604-1605.

*** M Giangaspero, Tropical Medicine & Surgery 2013;1:6.

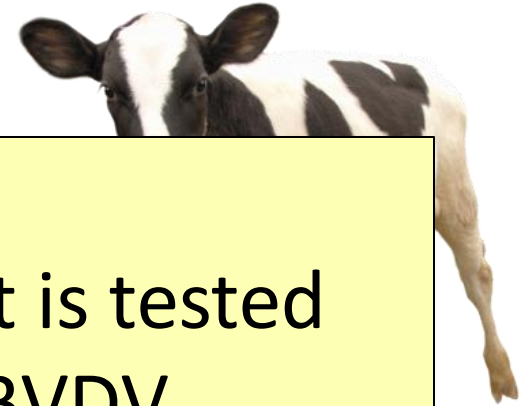
The Smoking Gun?

- BVDV is a member of the

- IgG is the immunoglobulin that is tested to diagnose antibodies to BVDV and infer infection in cows*

– BVDV has been detected in MMR**

- Virulent BVDV strain has been traced to Brazil as the original source***



The Smoking Gun?

Does the attack on IgG induced by glyphosate-contaminated Zika protein lead to an impaired immune system (*reduction in IgG*) and vulnerability to fetal brain infection with BVDV (potentially a contaminant in vaccines)?

GMO mosquito passes
glyphosate-contaminated
Zika to female



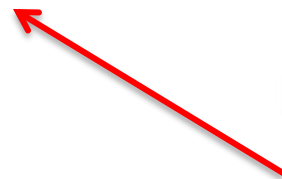
Female bites woman



3 Woman develops immune deficiency



Woman gets MMR
vaccine containing
glyphosate-
contaminated
BVDV



During pregnancy, fetal brain is
attacked by autoantibodies due
to immune reaction to BVDV

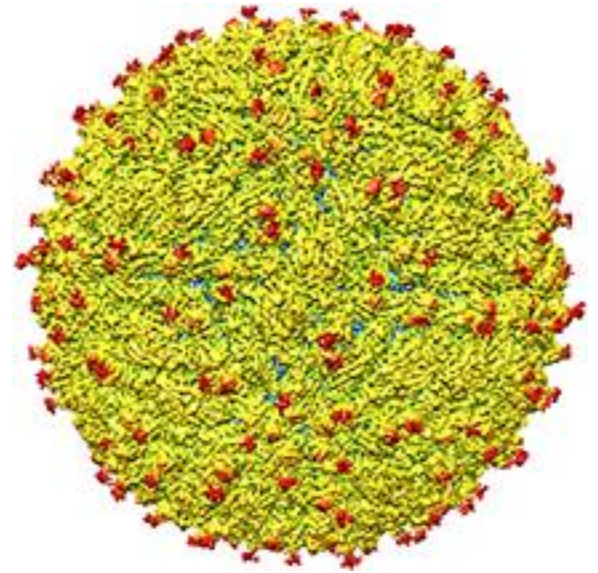


Baby born with microcephaly

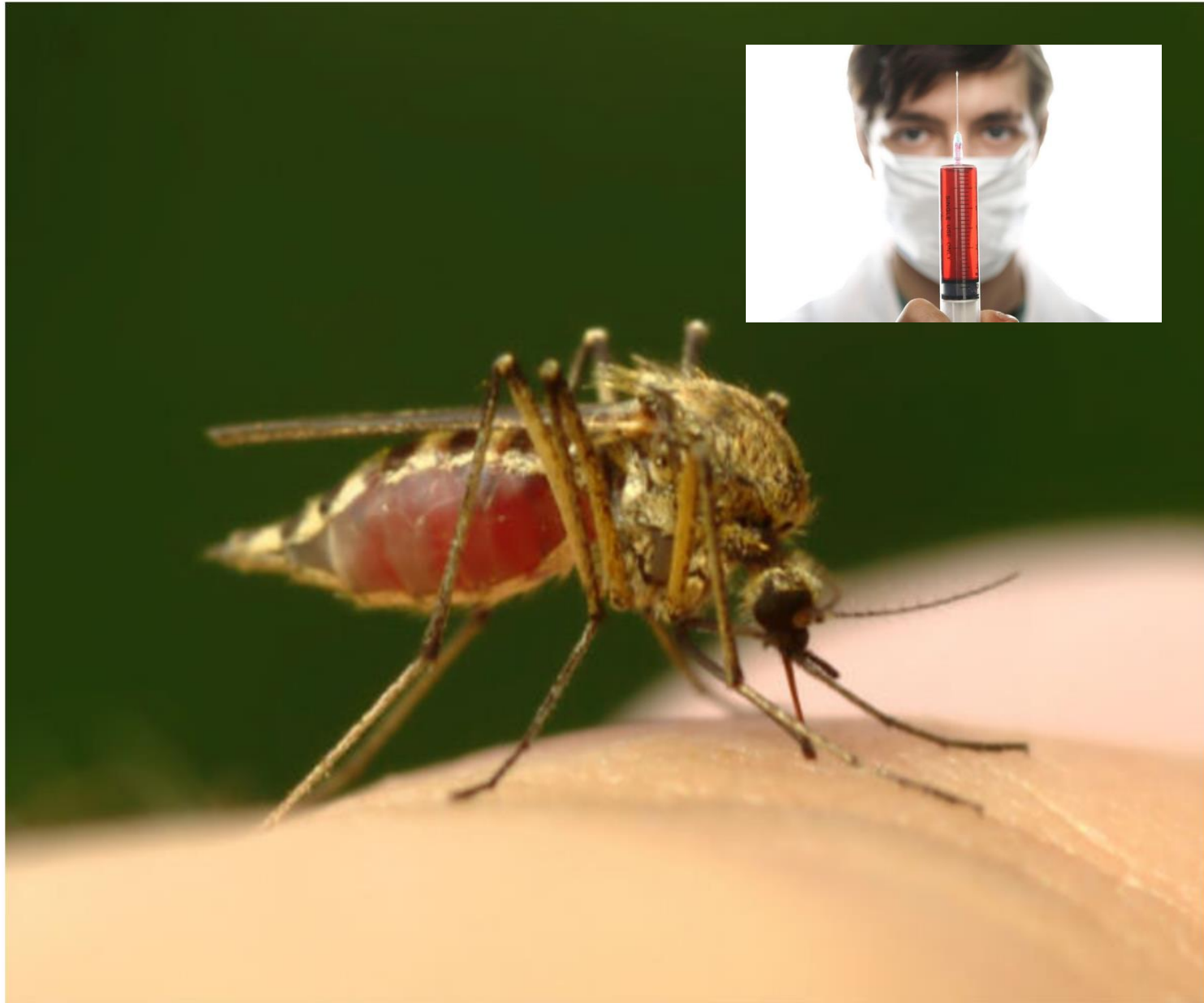
Zika Vaccine Development

What is Zika?

- Zika is a flavivirus: this family also includes dengue, West Nile, yellow fever, Japanese encephalitis and tick-borne encephalitic viruses.
- Flaviviruses contain an RNA genome (not DNA) surrounded by a lipid (fatty) membrane inside a protein shell.
- The protein is glycosylated: bound to complex sugar chains dangling around the exterior



Takeda Gets Up to \$312 Million in US Funding for Zika Vaccine



Takeda Gets Up to \$312 Million in US Funding for Zika Vaccine



“Takeda will harness its work against dengue, a virus from the same family, to develop a vaccine against Zika.”



Takeda Gets Up to \$312 Million in US Funding for Zika Vaccine



“**DENVax**: live attenuated vaccine developed using wildtype DEN2 strain attenuated in primary *dog kidney cells* and further attenuated by *mutation* in NS3 gene.”

Merck's Recent Research on Dengue Virus Vaccines*

- Chimeric yellow fever-dengue constructs: Two different virus *species* are merged
- In vitro, two or three cDNA fragments are ligated together from separate plasmids and used to generate a full-length dengue *viral cDNA template*
 - The fragments contain *the code for* antigen from *multiple strains* of Dengue
- Viral RNA is produced *by a human cell* as a copy of the assembled cDNA template

“With the advent of recombinant DNA technology and infectious clone systems, it is now possible to generate recombinant flaviviruses entirely from cloned cDNA using reverse genetics.”

*D Govindarajan et al., PLoS One. 2016; 11(3): e0152209.

New DNA Plasmid Zika Vaccine*

“A safe and effective vaccine to prevent Zika virus infection and the *devastating birth defects it causes* is a public health imperative.”

Dr. Anthony S. Fauci,
NIAID Director



*National Institutes of Health News Release August 3, 2016

New DNA Plasmid Zika Vaccine*

“A safe and effective

US Congress has approved \$1.1 Billion to
develop a Zika vaccine

imperative.”

Dr. Anthony S. Fauci,
NIAID Director



*National Institutes of Health News Release August 3, 2016

“Inovio Pharmaceutical's DNA Vaccine for Zika Virus Induces Robust Immune Responses in Preclinical Study”*

- DNA vaccine constructs targeting multiple Zika virus antigens were synthetically generated using Inovio's SynCon vaccine technology.
- These SynCon constructs were administered using Inovio's CELLECTRA[®] electroporation delivery technology.
- Inovio's Zika DNA vaccine resulted in the development of detectable specific antibodies in the blood, in all vaccinated mice.

*Inovio news release

DNA Plasmid Vaccines*

“When the vaccine is injected into the arm muscle, cells read the genes and make Zika virus proteins, which self-assemble into virus-like particles.”

“The body mounts an immune response to these particles, including neutralizing antibodies and T cells.”

*<https://www.nih.gov/news-events/news-releases/nih-begins-testing-investigational-zika-vaccine-humans>

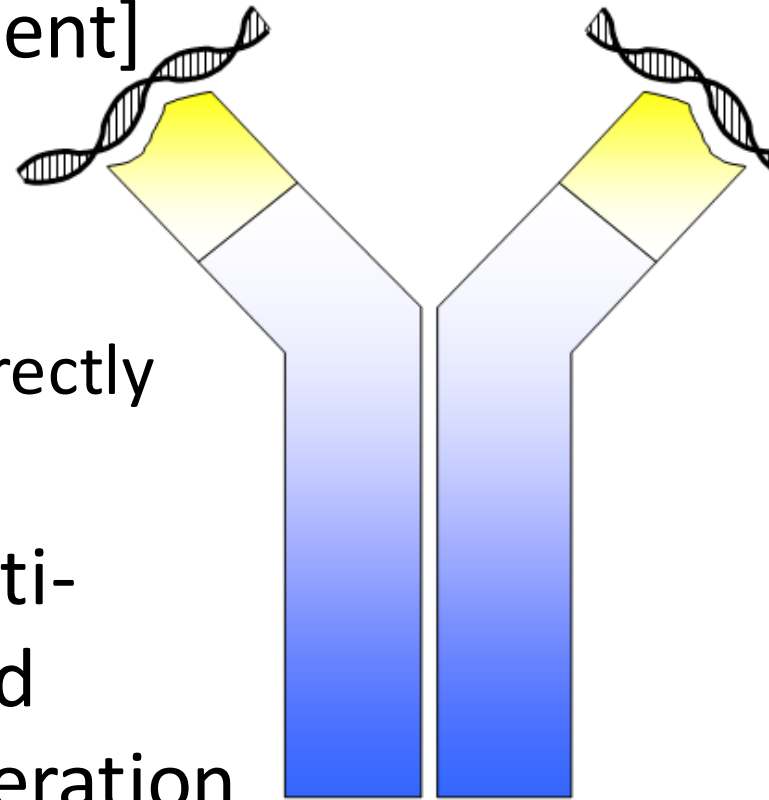
The role of CpG in DNA vaccines*

- DNA vaccines: plasmid DNA *induces human cells* to produce the antigen that then induces the antibody to the virus, bacterium or parasite whose proteins are encoded in the plasmid
- Stimulatory *unmethylated CpG motifs* in the plasmid DNA significantly enhance immune response

*MJ McCluskie et al., Springer Semin Immunopathol. 2000;22(1-2):125-32.

"Do DNA vaccines induce autoimmune disease?"*

- Examined plasmid DNA vaccines [like Zika vaccines under development]
- Looked for (and found) *anti-DNA autoantibodies*
 - Anti DNA autoantibodies are directly linked to *Lupus*
- Looked for (but didn't find) anti-muscle cell autoantibodies and myositis: muscle tissue degeneration



*G Mor et al., Hum Gene Ther. 1997 Feb 10;8(3):293-300.

Concerns about Plasmid-based DNA Vaccines*

1. Are they likely to induce systemic or organ-specific autoimmune disease?
2. Will they tend to induce tolerance rather than immunity?
3. Are they effective in individuals with depressed immune function?

*DM Klinman et al., Springer Semin Immunopathol 1997; 19: 245.

A Dark Scenario

- Zika vaccine contains peptide that resembles immunoglobulin heavy chain and is accidentally contaminated with glyphosate
 - Through molecular mimicry, woman develops autoantibodies to IgG antibody
- MMR vaccine or flu vaccine contains bovine diarrhea virus as a contaminant
 - Mother's weakened immune system can't fight the virus
 - Fetus develops microcephaly due to bovine virus infection
- Zika vaccine causes microcephaly, which is what it was intended to prevent!!

Recapitulation

- The US government has allocated \$1.1 billion for Zika vaccine development
- Industry researchers are developing exotic plasmid vaccines as “pseudo viruses” blended from multiple strains of multiple species
 - DNA version of genetic code for RNA viruses
 - Human cells synthesize the antigen and then develop antibodies to it
- Unmethylated CpG DNA in the vaccine sends alarm bells to the immune system and acts as adjuvant
- A dark scenario predicts microcephaly as a direct consequence of the Zika vaccine, following contamination with glyphosate and bovine diarrhea virus

Summary

- The microcephaly epidemic in NE Brazil has generated a world-wide panic situation that is uncalled for
- Many other factors besides Zika can plausibly contribute to microcephaly
 - Glyphosate, glufosinate, thiamine deficiency, multiple vaccines, BVDV, GMO mosquito, larvicides, insecticides
- Push to spray toxic chemicals to kill mosquitoes and to introduce GMO mosquitoes and to develop new vaccines against Zika will backfire