



Marla Spivak

Figure 1.
Honey bee with red
coloured resin on her hind leg.
Public Forum 9/9/15

*Kristina
Lefever*

HONEY BEE HEALTH

The Benefits of Propolis

Marla Spivak, PhD

(MacArthur Fellow and McKnight Distinguished Professor in Entomology
at the University of Minnesota, USA)

Most beekeepers I know dislike propolis with a passion. The presence of this sticky, resinous substance in bee hives makes opening and managing colonies very difficult.

Most of my clothes are permanently stained with propolis, usually on the backside from climbing into the bee truck and sitting down on a glob of it. I also was not so fond of propolis until we discovered that it has very amazing health benefits to bees. I hope by the end of the article, you become a propolis convert, too.

Propolis is the term beekeepers

use to refer to plant resins that bees collect and deposit in the nest cavity. Bees add varying amounts of wax to the resins but, to my knowledge, they do not modify the chemical nature of the resins.

Why?

There must be a reason bees go to the trouble of collecting plant resins. They are not easy to collect: bees have to scrape up the sticky resin with their mouthparts, pack it on their hind legs and, when back in the nest, other bees have to help pull it off their legs (Figure 1). There is no food reward in collecting propolis – they don't eat it, so why collect it?

The older bee books say that propolis is a barrier to seal cracks and provide mechanical support in the nest (reviewed in Simone-Finstrom and Spivak, 2010). But this answer is not entirely satisfactory.

Nest Lining

When bees nest inside hollow trees, they coat the inside of the cavity with propolis, sometimes several millimeters thick (Figure 2 (overleaf)).

Bees can deposit a very thick layer of propolis around the entrance to the tree cavity. They don't make this propolis envelope inside our man-made bee boxes, but they often reduce the size of the entrance

with propolis and stick propolis between boxes and where the frames touch the box.

Despite our intentional or inadvertent attempts to select against colonies that collect lots of propolis, the bees persist so they must need it.

The most important clue about its benefit comes from this fact: we know that propolis has remarkable medicinal properties for humans. It is highly antimicrobial, meaning that is it antibacterial, antifungal and even antiviral. So does it have medicinal benefit to the bees?

Benefit to Bee Health

One of my previous graduate students, Mike Simone-Finstrom, became interested in the potential benefits of propolis to bee health.

We constructed some small five-frame nucleus boxes and Mike painted the inside of some with a propolis extract (propolis dissolved in 70% ethanol at a known concentration). One set of boxes was painted with extract of propolis from Minnesota, another set with 'green' propolis from Brazil.

*Learn to love
propolis which
has health
benefits for our
honey bees*

www.bee-lab.umn.edu

A third set was painted with just ethanol as a control. He put small colonies of bees in each box, paint-marked a set of newly emerged bees, and introduced them into each colony. After seven days, he collected the painted bees and examined their immune systems by measuring gene transcripts for antimicrobial peptides (see box below).

He found that bees exposed to a propolis envelope for just seven days had lower bacterial loads in and on their bodies, and had 'quieter' immune systems compared with bees in a colony with no propolis envelope. In other words, the propolis in the colony was killing off microbes in the nest, so that the bees' immune systems did not have to gear up and make peptides and cellular responses that fight off infection.

In essence, the propolis envelope acts as an external antimicrobial layer that enshrouds the colony, benefiting bee immune defenses (Simone-Finstrom, et al, 2009). Yes, it seals cracks and probably provides structural support, but the main benefit is probably its antimicrobial value.

Comment

"Bees don't produce antibodies but their immune systems do produce a number of proteins, or antimicrobial peptides that can fight off infection. They also have cells that can phagocytize (eat up) or encapsulate microbes. We can measure the relative amount of gene transcripts of the peptides and cellular products using real-time quantitative PCR."

Here is an analogy of the benefits of the propolis envelope in human terms.

Think of a house or office with mould in the walls. Some people's immune systems are chronically activated in mouldy environments, causing them to sneeze. If propolis was painted all over the walls of the house or office, it would probably kill the moulds, which in turn would reduce the person's immune response.

Mounting an immune response, especially a chronic one, is costly to an individual and eventually takes a toll on overall health.

Chalkbrood and Propolis

Mike Simone-Finstrom ran another clever experiment. He infected colonies with chalkbrood disease by grinding up chalkbrood mummies and homogenising them in pollen patties. He found that the number of resin foragers (per unit time) increased in colonies after infection with chalkbrood, but did not increase in uninfected colonies.

The increase in the number of resin foragers was subtle, as resin foragers are relatively rare in most colonies, especially compared with pollen and nectar foragers. But the result was remarkable (Simone-Finstrom and Spivak, 2012).

Do bee colonies self-medicate?

We are currently repeating this experiment with another bee disease, American foul brood, to see if the increase in resin foraging after infection is robust.

In another experiment, Mike S-F found that colonies with a propolis envelope had less chalkbrood infection compared

with colonies with no propolis envelope (Simone-Finstrom and Spivak, 2012). It is unclear how the propolis on the walls of the box helps fight off a brood infection. The mode of action of propolis is likely to come both from contact with it and from the rich smelling volatiles.

More research is needed in this area.

Where is it Collected?

Two other graduate students are now pursuing other questions related to the health benefits of propolis to bees. One student, Mike Wilson (at one point I was advising three students named Mike – confusing!), is discovering from which plants bees collect resin.

This Mike climbs trees, and collects resin from leaf buds. Then he collects individual foragers returning to the hive with plant resin on their hind legs. He analyses the resin from the plant and the resin from the bee using RPHPLC time-of-flight mass spectrometry and gets a metabolic 'fingerprint' of all the compounds present in each sample. He can match the fingerprints statistically using principle components analysis (Wilson, et al, submitted for publication).

In our area, despite the presence of conifers, birch, alders and other trees, he found that bees collect resin mostly from cottonwood (*Populus deltoids*) and balsam poplar (*Populus balsamifera*). Cottonwood resin is yellow; balsam poplar resin is red. There are hybrid poplars in our area and when bees collect resin from them, this can be yellow, brown, orange or red.

Biological Activity

Mike Wilson is also testing the biological activity of the

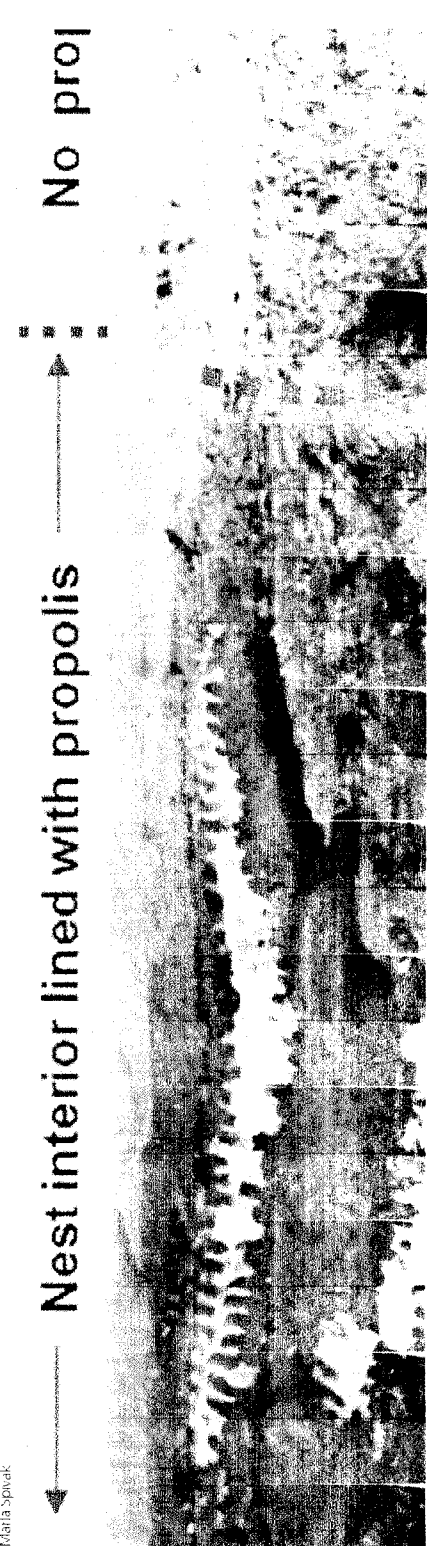


Figure 2. A cross-section of a honey bee nest around the colony is coated in a layer of the propolis envelope (Simone-Finstrom et al)

individual resin loads against the bee pathogen, *Pacnibacillus larvae*; the bacterium that causes American foul brood. Mike W runs these tests in the lab and has found out that balsam poplar is slightly better at inhibiting this bacterium than cottonwood resin. He has



thin a tree cavity. The nest interior is. Fungal growth can be seen above (Spivak, 2010)

also determined that hybrid poplars are not nearly as good. This means that the resins have different 'strengths' and abilities to kill off bacteria and probably other microbes.

Presence of Propolis

This leads to the research by

the third student, Renata Borba. Renata is testing whether bees need a full propolis envelope within the nest to help their immune system, or if just the presence of a propolis trap on top of the frames is sufficient. She also repeating the self-medication experiment I referred to above, by infecting colonies with American foul brood (by spraying spore solution on the combs).

In addition to counting returning resin foragers before and after infection, she will collect the resin loads and, using Mike Wilson's metabolomic fingerprinting techniques, determine if the bees switch resin species after infection. Do bees select resins of greater 'strength' after infection?

The jury is still out – Renata will be repeating her experiments over at least two summers to obtain a large enough data set to analyse because resin foragers are relatively rare.

There are many questions still unanswered and others we need to resolve further. But I do have two take home-messages for beekeepers:

Messages for Beekeepers

It would be good to allow colonies to make a propolis envelope inside beekeeping equipment as it would benefit the bees' immune systems. You can help them do this in two simple ways:

- cut and staple commercial propolis traps in the inside of each brood box
- construct bee boxes that have unfinished lumber on the inside and the rough surface will stimulate bees to line the inside of the box with propolis.

I don't recommend you make your own propolis extract to

paint inside the boxes because it requires harvesting propolis and then dissolving it in 70% ethanol. It is easier to let the bees collect the propolis and deposit it directly where it is needed.

I do not advocate feeding propolis to bees. Bees do not eat propolis. Even though it is a natural plant product, it is a powerful antibiotic. One summer, we tried feeding propolis dissolved in sugar syrup to bees and it did not cure American foul brood within the colonies.

I would not feed it to my bees.

Beekeeping Lore

Lastly, I bring up a challenge to beekeeping lore.

It has not been tested if bees incorporate propolis into brood cells. There seems to be a beekeeping legend that brood combs turn dark because bees deposit propolis in them. I do not think this is the case. In a tree cavity, bees DO put propolis on the cells that touch the tree wall (Figure 3). On rare occasions, I have seen some new comb look as though the rim has a very narrow band of resin around it. But I do not know how common this is, or if bees add more resin into the cell.

To test this, the wax comb would need to be dissolved, filtered and the residue tested for the presence of plant resins. We have tried to dissolve brood combs in ethanol and end up with a sludge that looks like

'slum gum' (the mess left after you have melted the wax out of old brood comb). It probably contains remnants of the silk cocoons, bee faeces and wax.

But does it contain propolis? I think not. But I'm very open to solid evidence to the contrary.

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Figure 3. New combs from a colony nesting in a tree cavity. The bees have put propolis around the rims of cells that are in contact with the tree wall. It is not clear if bees add propolis to cells within the brood nest



Marla Spivak is a MacArthur Fellow and McKnight Distinguished Professor in Entomology at the University of Minnesota. She has bred a line of honey bees, the Minnesota Hygienic line, available commercially in the US,

to defend themselves against diseases and parasitic mites. Current studies include the benefits of propolis to honey bees and the effects of individual landscapes and pesticides on honey bee and native bee health.

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5/19/15

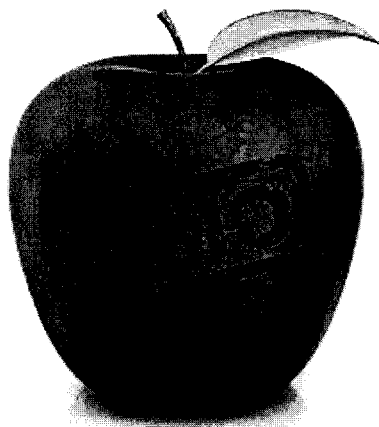
Monsanto Knew of Glyphosate / Cancer Link 35 Years Ago

By [Global Research News](#)

Global Research, April 19, 2015

Url of this article:

<http://www.globalresearch.ca/monsanto-knew-of-glyphosate-cancer-link-35-years-ago/5443741>



by GM-Free Cymru

According to evidence unearthed from the archives of the EPA (Environmental Protection Agency) in the United States, it has been established that Monsanto was fully aware of the potential of glyphosate to cause cancer in mammals as long ago as 1981.

Recently the WHO's International Agency for Research on Cancer (IARC) issued a statement in which glyphosate (the main component of Roundup herbicide) was classified as "probably carcinogenic" to humans and as "sufficiently demonstrated" for genotoxicity in animals (1). This announcement of a change to toxicity class 2A was given vast coverage in the global media, causing Monsanto to move immediately into damage limitation mode. The corporation demanded the retraction of the

report, although it has not yet been published! Predictably, there was more fury from the industry-led Glyphosate Task Force (2). This Task Force also sponsored a "rebuttal" review article (3) from a team of writers with strong links with the biotechnology industry; but because of the clear bias demonstrated in this paper (which suggests that glyphosate has no carcinogenic potential in humans) it is best ignored until it has been carefully scrutinized by independent researchers (4).

With Monsanto continuing to protest that glyphosate and Roundup are effectively harmless (5) if used according to instructions, in spite of accumulating evidence to the contrary, we undertook a search through Environmental Protection Agency (EPA) records with a view to finding out what was known about glyphosate at the time of its initial registration. This followed up earlier investigations by Sustainable Pulse which highlighted a sudden change in the EPA view on toxicity in 1991. What was discovered was very revealing. There were many animal experiments (using rats, mice and dogs) designed to test the acute and chronic toxicity of glyphosate in the period 1978-1986, conducted by laboratories such as Bio/dynamics Inc for Monsanto and submitted for EPA consideration. Two of these reports relate to a three-generation reproduction study in rats (6) (7), and another is called "A Lifetime Feeding Study Of Glyphosate In Rats" (8); but like all the other older studies they were and still are treated as Trade Secrets and cannot be freely accessed for independent scrutiny. That in itself is suggestive that the studies contain data which Monsanto still does not wish to be examined by experts in the toxicology field. It is also deeply worrying that EPA acceded to the routine Monsanto requests for secrecy on the flimsiest of pretexts.

However, archived and accessible EPA Memos from the early 1980's do give some indications as to what the rat studies contain (9). Although the studies predate the adoption of international test guidelines and GLP standards they suggest that there was significant damage to the kidneys of the rats in the 3-generational study — the incidence of tubular

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Autism and the Health Impacts of Monsanto Glyphosate Roundup on Children, Research Scientist at MIT

By [Global Research News](#)

Global Research, December 29, 2014

Url of this article:

<http://www.globalresearch.ca/autism-and-the-health-impacts-of-monsanto-glyphosate-roundup-on-children-research-scientist-at-mit/5421901>



Why? Evidence points to glyphosate toxicity from the overuse of Monsanto's Roundup herbicide on our food.

For over three decades, Stephanie Seneff, PhD, has researched biology and technology, over the years publishing over 170 scholarly peer-reviewed articles. In recent years she has concentrated on the relationship between nutrition and health, tackling such topics as Alzheimer's, autism, and cardiovascular diseases, as well

as the impact of nutritional deficiencies and environmental toxins on human health.

At a conference last Thursday, in a special panel discussion about GMOs, she took the audience by surprise when she declared, **"At today's rate, by 2025, one in two children will be autistic."** She noted that the side effects of autism closely mimic those of glyphosate toxicity, and presented data showing a remarkably consistent correlation between the use of Roundup on crops (and the creation of Roundup-ready GMO crop seeds) with rising rates of autism. Children with autism have biomarkers indicative of excessive glyphosate, including zinc and iron deficiency, low serum sulfate, seizures, and mitochondrial disorder.

A fellow panelist reported that after Dr. Seneff's presentation, "All of the 70 or so people in attendance were squirming, likely because they now had serious misgivings about serving their kids, or themselves, anything with corn or soy, which are nearly all genetically modified and thus tainted with Roundup and its glyphosate."

Dr. Seneff noted the ubiquity of glyphosate's use. Because it is used on corn and soy, all soft drinks and candies sweetened with corn syrup and all chips and cereals that contain soy fillers have small amounts of glyphosate in them, as do our beef and poultry since cattle and chicken are fed GMO corn or soy. Wheat is often sprayed with Roundup just prior to being harvested, which means that all non-organic bread and wheat products would also be sources of glyphosate toxicity. The amount of glyphosate in each product may not be large, but the cumulative effect (especially with as much processed food as Americans eat) could be devastating. A recent study shows that pregnant women living near farms where pesticides are applied have a 60% increased risk of children having an autism spectrum disorder.

Other toxic substances may also be autism-inducing. You may recall our story on the CDC whistleblower who revealed the government's deliberate concealment of the link between the MMR vaccine (for measles, mumps, and rubella) and a sharply increased risk of autism, particularly in African American boys. Other studies now show a link between children's exposure to pesticides and autism. Children who live in homes with vinyl floors, which can emit phthalate chemicals, are more likely to have autism. Children whose mothers smoked

global research

Monsanto sued in Los Angeles County for false advertising

April 21, 2015
2:10 PM MST

Roundup Label
↓

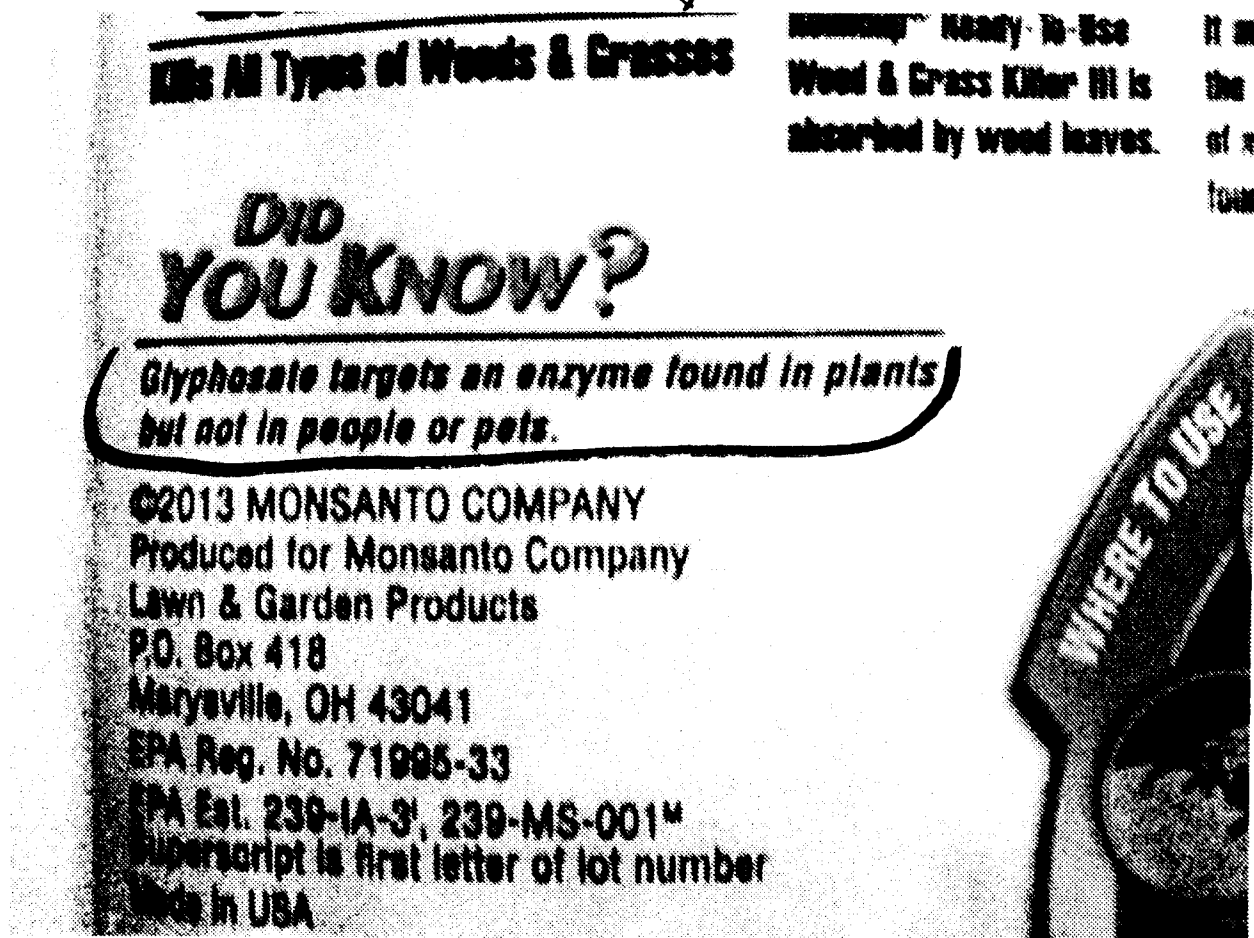


Exhibit #1

T. Matthew Phillips

Today a class action lawsuit (Case No: BC 578 942) was filed in Los Angeles County, California against the Monsanto corporation. The suit alleges that Monsanto is guilty of false advertising by claiming that glyphosate, the active ingredient in Roundup, targets an enzyme only found in plants and not in humans or animals. Monsanto makes this claim to support the contention that glyphosate is harmless to humans.

In the lawsuit, the argument is made that the targeted enzyme, EPSP synthase, is found in the microbiota which reside in our intestines and therefore this enzyme is found in humans and animals. It is further stated in the lawsuit that there are many human and animal health problems associated with the disruption of our intestinal microbes.

"Because it kills-off our gut bacteria, glyphosate is linked to stomach and bowel problems, indigestion, ulcers, colitis, gluten intolerance, sleeplessness, lethargy, depression, Crohn's Disease, Celiac Disease, allergies, obesity, diabetes, infertility, liver disease, renal failure, autism, Alzheimer's, endocrine disruption, and the W.H.O. recently announced glyphosate is 'probably carcinogenic'."



The International Agency for Research on Cancer, part of the World Health Organization (WHO), last month declared that glyphosate is Group 2A carcinogen. The American Cancer Society quickly followed suit, also listing glyphosate as a Group 2A carcinogen.

Kindler Stout 5/19/15
Public Forum

Thank you Mr. Mayor and six council members FOR THE OPPORTUNITY to testify today, May 19, 2015. My NAME is KINDLER STOUT. I live between Helman School and Briscoe School (since 1987.)

I'd like to assume that each of you would like to see less RoundUp used BY HOMEOWNERS, who typically use several times the prescribed dosages per acre.

And I'm going to assume that SEVERAL OF YOU would PREFER to leave the matter of herbicides UP TO THE PARKS DEPARTMENT, who, of course are also contracted to spray at schools.

So what I want to EMPHASIZE today is: WHAT ANOTHER JURISDICTION HAS DONE: I will be happy to provide you with details and documentation. the city is RICHMOND, CALIFORNIA, hardly a hotbed of extreme activism. Richmond is northeast of San Francisco, across the bay. You see huge oil refineries there, driving from Sacramento or Davis, into the bay area.

In November of 2013 the city council there "approved an item directing staff to craft a new city law requiring GMO labeling of food sold at local grocers." In July 2012, Richmond "adopted an Integrated Pest Management Ordinance to guide the work of city departments tasked with WEED AND PEST CONTROL." "Pesticides shall be used only as a last resort...following cultural, mechanical, and biological methods..." I'd like today's council members to know that dozens of Ashlanders have been reading reports like this now for three years--several a month!

SECONDLY, I want to be sure you know that our municipalities also find themselves capable of SINGLING OUT A SPECIFIC CORPORATION. I can get the dates for you. THE CITY OF SAN DIEGO "FILED A LAWSUIT AGAINST MONSANTO, accusing the corporation of polluting the city's bay with carcinogenic chemicals that are so dangerous to human health they were banned in the U.S. more than 30 years ago." The proposal in front of the Ashland City Council is of course of a different nature, since nobody and no department is forced to put such chemicals into OUR FACES.

THEREFORE, THIRDLY, I'd like to list about a dozen of MONSANTO'S PRODUCTS:

Saccharin

PCB.

Polystyrene

DDT/Dioxin (from 2,4,5-T)

Agent Orange

petroleum-based fertilizer

Aspartame

Bovine Growth Hormone

GMO 'Terminator seeds'

and RoundUp, the substance of tonight's deliberation. Public interest groups have been fighting all of these substances for years!

Sri Lanka became the first COUNTRY TO BAN GLYPHOSATE in March of last year, due to an elaborate study on Chronic Kidney Disease in farm workers. Sri Lanka banned GMOs back in 2003.

There is more than a suspicion that ROUNDUP IS 125 TIMES (OR CLOSER TO 1000 TIMES) MORE DANGEROUS THAN REGULATORS ADMIT, due to tests being performed on glyposate alone, rather than on RoundUp per se.

AND FINALLY, as a REASON citizens WANT THEIR CITY TO HELP PROTECT THEM: On March 26 of this year we learned that the UNITED NATIONS ADVISORY TO ELIMINATE GLYPHOSATE was actually based on Monsanto's own research documents, THAT THE EPA HAD SUPPRESSED FOR 30 YEARS!! Many people in your 'audience' today have been learning stuff like this about GMOs (which are typically sold to farmers with a contract REQUIRING THE USE OF ROUNDUP) and RoundUp, itself, daily or weekly, and we are SEEKING ACTIONS AT EVERY LEVEL to bring attention to a chemical and a technology already banned in many places around the globe. OUR STATE LEGISLATORS have mostly sided with chemical corporations to keep county and city governments from trying to protect their citizens, even though our wonderful Representative Buckley and Senator Bates have strongly opposed that majority. WE ASK YOU TO STAND WITH Mr. BATES and Mr. BUCKLEY AND MOST OF THE FOLKS HERE TONIGHT and TAKE THIS uncomfortable STEP TO HELP TURN THE TIDE IN FAVOR OF RUNNING THINGS AS IF PEOPLE MATTERED.

Thank you, Kindler Stout