

GLYPHOSATE: DESTRUCTOR OF HUMAN HEALTH AND BIODIVERSITY

An increase in the incidence of Type 2 diabetes, obesity and autism has been reported in Scotland. Similar increases have been seen globally. The herbicide glyphosate was introduced in 1974 and its use is accelerating. The manufacturers claim it to be safe, but none of the Regulatory Agencies are monitoring glyphosate levels in groundwater. By courtesy of independent researchers around the world we present evidence that glyphosate interferes with many metabolic processes in plants, animals and humans, and glyphosate residues have been found in all three. Glyphosate is an endocrine-disruptor (as are many herbicides) it damages DNA and it is a driver of mutations that lead to cancer. We present graphs from the US which correlate glyphosate application and the percentage of GE soy and corn crops to the incidence and prevalence of various diseases in those on a Western diet. The Pearson's correlation coefficients are very strong and highly significant for obesity, diabetes, autism, thyroid cancer, liver cancer, deaths from Parkinson's, Senile Dementia and Alzheimer's, inflammatory bowel disease and acute kidney failure. We present Cancer Research UK graphs of upward trends in cancer incidences between 1975 and 2009, which are in line with the US graphs. Other consequences are gastrointestinal disorders, heart disease, depression, infertility, birth defects and other cancers. The data for the amount of non-agricultural use of glyphosate in the UK appear to be confidential. Parts of South Wales, in former mining areas, Japanese knotweed and Himalayan Balsam abound. The local Council does not hold glyphosate records. Instead it contracts out to a commercial organisation to supply industry approved vegetation management techniques. A quote from the contractor: "The glyphosate we use called round up has a hazard free label." The level of glyphosate in a river draining from areas of Japanese knotweed was 190 parts per trillion (ppt) and local tap water was 30 ppt. These were of the order of concentrations found in a study in 2013 which showed that breast cancer cell proliferation is accelerated by glyphosate in extremely low concentrations: "*potential biological levels at part per trillion (ppt) to part per billion (ppb).*"

Another Silent Killer

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global network of
independent scientists,
toxicologists,
beekeepers,
environmentalists,
Governments, Industry
and Regulators

Summary

Glyphosate, the most widely used herbicide, is destroying human and animal health as a result of disruption of gut bacteria. Two key problems caused by glyphosate in the diet are nutritional deficiencies, especially minerals and essential amino-acids, and systemic toxicity.

We present graphs from the US which correlate glyphosate application and the percentage of GE soy and corn crops to the incidence and prevalence of various diseases in those on a Western diet. The Pearson's correlation coefficients are very strong and highly significant for obesity, diabetes, autism, thyroid cancer, liver cancer, deaths from Parkinson's, Senile Dementia and Alzheimer's, inflammatory bowel disease and acute kidney failure. We present Cancer Research UK graphs of upward trends in cancer incidences between 1975 and 2009, which are in line with the US graphs. Other consequences are gastrointestinal disorders, heart disease, depression, infertility, birth defects and other cancers. The data for the amount of non-agricultural use of glyphosate in the UK appear to be confidential. Parts of South Wales, in former mining areas, invasive plants such as Japanese knotweed and Himalayan Balsam abound. The local Council does not hold annual records of glyphosate application to these invasive weeds. It has a contract with a commercial organisation to supply industry-approved vegetation management techniques. A quote from the contractor: *"The glyphosate we use called round up has a hazard free label"*.

Monsanto Corporation has been repeatedly convicted in Law Courts around the world for not telling the truth about the safety of its best-selling weed-killer, Roundup®. In 2010, in a document on glyphosate use in Europe, Monsanto continues to promote the myth. It is described as *"environmentally benign" ... "has an excellent safety profile to operators, the public and the environment" ... "uses to benefit mankind and the environment."*

The level of glyphosate in one Welsh river draining from areas of Japanese knotweed spraying was 190 parts per trillion (ppt) and local tap water was 30 ppt. These were of the order of concentrations found in a study in 2013 which showed that breast cancer cell proliferation is accelerated by glyphosate in extremely low concentrations: *"The present study used pure glyphosate substance at log intervals from 10^{-12} to 10^{-6} M. These concentrations are in a crucial range which correlated to the potential biological levels at part per trillion (ppt) to part per billion (ppb) which have been reported in epidemiological studies."* In the UK the incidence of breast cancer almost doubled between 1975 and 2010.

Glyphosate sales in Europe are increasing because industry is continually finding new uses. It is recommended throughout the crop cycle, including as a drying agent 7-10 days before harvest. This leaves glyphosate residues on crops which enter the food chain of animals and humans. On non-agricultural land it is sprayed *"around structures on farms, amenity and industrial areas and on railways."* In urban areas it is sprayed on vegetation on streets, pavements and major highways. Japanese Knotweed, Bracken and Rhododendron and are amongst many invasive weeds for which Roundup® is promoted. It is *"approved for weed control in forestry and aquatic areas"*. In the US its use has increased dramatically on GE crops because of super-weeds. Massive amounts of GM soya is being imported into Europe for animal feed and some foods, and Regulators have been allowing the industry to increase the Maximum Residue Limits for glyphosate in food and feed in imports.

Independent scientists have measured glyphosate in soil, air and rainwater. During flooding events, run-off is particularly high after urban use. The effects of pesticides are manifest at water catchment areas. However, levels of glyphosate and the neonicotinoid insecticides are not monitored in surface water, groundwater or drinking water by the US Geological Survey

National Water Quality Assessment Program, under the European Water Frame Directive, or by the UK Environment Agency.

Regulators and Industry have only tested the 'active' ingredient glyphosate. The commercial formulations contain an untested adjuvant which is toxic to human cells. The work of independent scientists has been rejected or suppressed by Industry, Regulators or Rapporteur Member States. Industry data are hidden on the grounds of commercial confidentiality. When scientists have exposed the dangers of GMOs many have been vilified or have lost their jobs.

Glyphosate and aminomethylphosphonic acid (AMPA) residues were found in soy bean plants, leaves and grains; higher levels were found when glyphosate was sprayed several times during the crop year. In 2013, glyphosate and AMPA residues were found in the urine of more than one third of urban dwellers in 18 countries in Europe. Glyphosate must be in our food and/or drinking water. Regulators have increased the Maximum Residue Levels in food and feedstuffs of glyphosate, neonicotinoid insecticides and many other pesticides.

GMO crops were approved by the European Food Safety Authority (EFSA) after 90-day feeding studies on rats by Monsanto. Séralini's team at CRIIGEN argued that 90 days was too short to evaluate chronic toxicity of glyphosate and GM crops. His team did a 2-year study and found Roundup®-tolerant maize and Roundup® provoked chronic hormone and sex dependent pathologies. Female mortality was 2-3 times increased mostly due to large mammary tumours and disabled pituitary. Males had liver congestions, necrosis, severe kidney nephropathies and large palpable tumours. Tumours started to occur in male rats at 4 months, one month beyond the time for which GMs were tested. When the paper was published in October 2012, industry and GMO scientists cried "*fraud!*" However, EFSA has eventually agreed on 2-year feeding studies for new GMOs. Here is a 12-minute YouTube made by Séralini's team over the 2-year period of testing in rats.

http://www.youtube.com/watch?v=Njd0RugGjAg&feature=player_embedded

Evidence was published in 2013 (a combined study from Australia and the US) that pigs fed a GM diet had abnormal organs, compared with those on a non-GM diet. GM-fed females had on average a 25% heavier uterus than non-GM-fed females and the level of severe inflammation in stomachs was markedly higher in pigs fed on the GM diet. This confirmed the experiences of some farmers that mortality was higher in sows on GM feed compared with non-GM. Sows had digestive problems, some died and the piglets had diarrhea. Reproductive problems were manifested by abortions, deformities in new born pigs and smaller litters. They required more antibiotics. Studies of the effects on pathogens in farm animals showed that glyphosate destroys beneficial bacteria and allows harmful ones, such as salmonella and clostridium, to flourish. This could account for outbreaks of food poisoning in humans that continue to occur. In the search for the causes of serious diseases of entire herds of animals in northern Germany, especially cattle, glyphosate has repeatedly been detected in the urine, faeces, milk and feed of the animals.

Glyphosate causes environmental damage to earthworms, songbirds, small mammals and bees. Glyphosate, an endocrine-disrupting herbicide, and the systemic neonicotinoid insecticides, cause immune suppression in insects and mammals. Both are highly toxic to aquatic organisms, amphibians, bees and fish.

US Kid's Health Report October 2012¹. A Generation in Jeopardy: How pesticides are undermining our children's health & intelligence p 26

“Our current system of industrial agriculture and pest control relies on chemical inputs sold by a handful of corporations. These multinational corporations wield tremendous control over the system, from setting research agendas to financing, crop selection and inputs throughout the production and distribution chain. Not surprisingly, these same corporations also hold significant sway in the policy arena, investing millions of dollars every year to influence voters, lawmakers and regulators at both the state and federal level to protect the market for pesticides. The result is agriculture, food and pest control systems that serve the interests of these corporations well. It does not, however, serve farmers, who have lost day-to-day control of their operations and are putting themselves and their families in harm's way. Farmworker interests are not served, as workers are continuously exposed to chemicals known to harm human health. And the health of children across the country is compromised by exposure to pesticides used to control pests in agriculture and where they live, learn and play. In short, the system is broken”.

The above statement from Pesticides Action Network North America applies equally well to the UK. The British Government played its part in suppressing the dangers of GM Crops. In 1998 Prime Minister Tony Blair received a phone call from the White House. A Senior GM Scientist Dr Arpad Pusztai working in Scotland had shown that rats fed GM potato had sustained immune damage. Dr Pusztai's Department at the Rowett Research Institute in Scotland was closed down, Dr Pusztai was suspended, he was silenced and he was banned from working on GMO. Likewise, in 2012, the BBC Science Media Centre did its best to discredit Prof Gilles-Eric S eralini when his 2-year feeding study in rats showed tumours, liver and kidney damage. The BBC Science Media Centre and the Department of Health played down the advice of the Royal College of Obstetricians and Gynaecologists for pregnant patients to avoid exposure to pesticides, some of the most toxic of which are marketed for home and garden use. GM Roundup® Ready crops are lethal to human health and the environment, yet the Defra, Science and Environment Ministers are trying to force them on an unwilling public.

As well as working closely with the Agrochemical Corporations, the British Government's Strategy for UK Life Sciences² is dependent on funding from the Pharmaceutical Corporations and the Pesticides Industry. Syngenta's parent company is AstraZeneca. Syngenta and AstraZeneca are represented on the UK Advisory Committee on Pesticides and the Committee on Toxicity of Chemicals in Foods, Consumer Products and the Environment. The founder of Syngenta is the Chairman of Cancer Research UK (CRUK). CRUK is giving money (£450 million/year) to the Government's Strategy for UK Life Sciences and AstraZeneca is providing 22 compounds to academic research to develop medicines. AstraZeneca manufactures six different anti-cancer drugs mainly aimed at breast and prostate cancer. The Corporation has links in Asia, including Hospitals in China, Japan, Korea, and collaborators in Russia. AstraZeneca's Oncology Website³ has the following prediction: *“Cancer claims over 7 million lives every year and the number continues to rise. Deaths are estimated to reach 12 million by 2030.*

¹ <http://www.panna.org/publication/generation-in-jeopardy>

² https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/32457/11-1429-strategy-for-uk-life-sciences.pdf

³ <http://www.astrazeneca.co.uk/medicines/oncology>

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This document has been compiled by Rosemary Mason MB ChB FRCA with information from a global network of independent scientists, toxicologists, beekeepers, environmentalists, as well as the UK, US and Australian Governments, the Pesticides Industry and Regulators.

With grateful thanks to Anthony Samsel, Dr Stephanie Seneff and Dr Nancy Swanson; however, the responsibility for the contents of this paper lies with the author.

02/09/2013

Part 1 Medical Agencies in Scotland highlight epidemics of obesity, diabetes and autism in 2013

- Ms Judson, Scottish Director of Diabetes UK, was quoted as saying: “*Since 2006 the incidence of diabetes had increased by 25.6% and the consequences of diabetes such as blindness and the need for amputation were also increasing in younger age groups.*” She said people as young as 13 have been diagnosed with Type 2 diabetes⁴.
- A similar warning about obesity had come from Dr Andrew Fraser representing the Royal College of Physicians of Edinburgh on 10th March 2013⁵.
- On June 12/13th 2013, an autism conference was held in Edinburgh⁶. Dr Martha Herbert, an expert on autism from Harvard Medical School, was an invited speaker. Dr Herbert believes the culprit is an environmental toxin in autistic children that interferes with nutrient absorption. “*We need to get them built up again, getting the gut micro-flora sorted out*”. The US has had an even more dramatic (and earlier) rate of increase than in Scotland (261% for boys and 385% for girls between 1997 and 2008)⁷.

Samsel and Seneff have reviewed independent evidence against glyphosate

In a Review, Samsel & Seneff argue that Glyphosate, a widely used herbicide, is associated with most of the diseases and conditions associated with a Western diet, including gastrointestinal disorders, obesity, depression, autism, infertility, cancer and Alzheimer’s disease. It is claimed by industry supporters that: “*Glyphosate is not poisonous to mammals- it inhibits EPSP (5-enolpyruvylshikimate-3 phosphate) synthase an enzyme that mammals lack because we obtain aromatic amino acids in our diet*”. However, we can only absorb nutrients by courtesy of the bacteria in our gut. Glyphosate disrupts our gut bacteria, without which we could not live. It is a strong chelator of essential minerals, such as cobalt, zinc, manganese, calcium, molybdenum and sulphate. In addition it kills off beneficial gut bacteria and allows toxic bacteria such as *Clostridium difficile* to flourish⁸. Two key problems caused by glyphosate in the diet are nutritional deficiencies, especially minerals and essential amino-acids, and systemic toxicity.

Glyphosate residues are increasingly found in humans and animals

Samsel & Seneff’s paper has some complicated metabolic concepts, so we have provided links to 3 videos. In the first Dr Stephanie Seneff is interviewed by Jeffrey M. Smith, the Executive Director of the Institute for Responsible Technology and bestselling author of *Genetic Roulette* and *Seeds of Deception*. The whole interview takes about an hour, but it has been also split up into shorter sections in which obesity, diabetes and autism are discussed

⁴ <http://www.thetimes.co.uk/tto/health/news/article3799473.ece>

⁵ <http://www.scotsman.com/news/health/doctors-warn-obesity-is-lifestyle-choice-for-scots-1-2828840>

⁶ <http://www.scotsman.com/lifestyle/autism-unlocking-a-generation-1-2944710>

⁷ 87222060-CDC-Autism-Study-March-2012.pdf

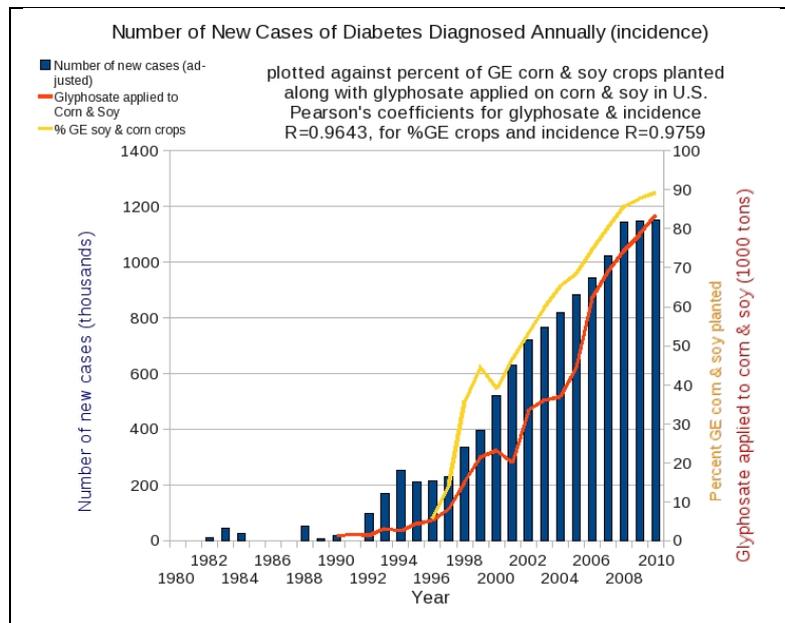
⁸ <http://www.nationofchange.org/new-study-finds-roundup-could-be-linked-severe-health-issues-1367071482>

separately⁹. The second interview, conducted by Zen Honeycutt¹⁰ for Moms Across America, is in two parts. In Part 1 Anthony Samsel explains the implications of children eating GM foods with glyphosate residues: for example, impaired learning abilities, decreased IQ, autism, allergies and asthma. In Part 2¹¹ he explains the mechanisms of action of glyphosate in the causation of different diseases. There are 160 crops/fruit/vegetables containing glyphosate residues. Gut bacteria form a protective layer over our cell walls; glyphosate disruption causes a leaky gut resulting in inflammatory bowel diseases. Disrupted aromatase impairs immune function. Glyphosate allows toxins through the blood-brain barrier. It disrupts the Cytochrome P450 enzymes in the liver and kidney which provides the mechanism for detoxification of environmental toxins.

Incidence of diabetes, obesity and autism in the US plotted against % GE corn and soy crops planted along with glyphosate applied to corn and soy

The following graphs for the United States are reproduced by kind permission of Dr Nancy Swanson from Genetically Modified Organisms and the Deterioration of Health in the United States¹² (see original doc for references, raw data and statistics).

The incidence of the three diseases has been plotted against the % of GE corn and soy and the glyphosate applied.



Graph 1 US data for % GE corn and soy crops planted and glyphosate applied plotted against the number of new cases of diabetes (adjusted) diagnosed annually. Crop and glyphosate data from the United States Department of Agriculture; diabetes data from U.S. Centers for Disease Control (CDC).

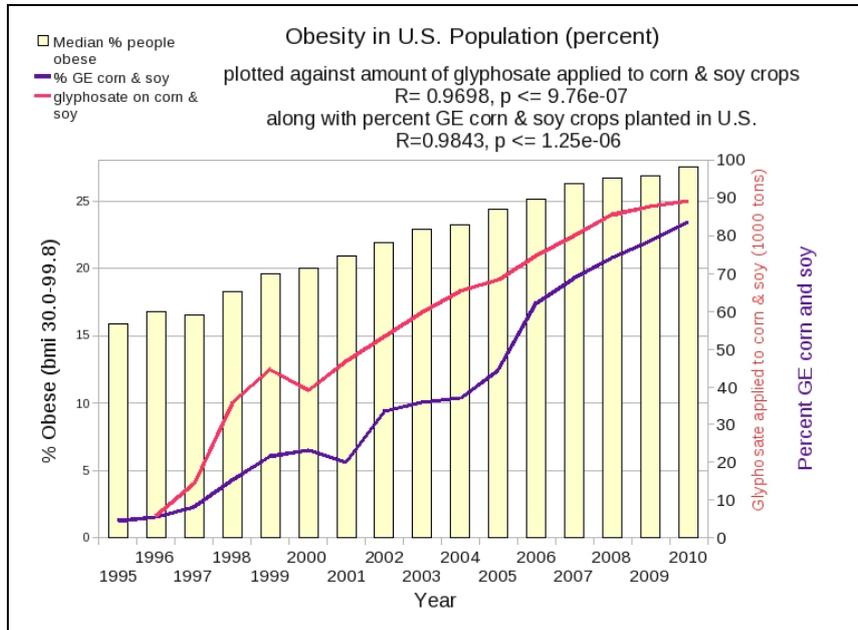
⁹ http://www.youtube.com/watch?v=h_AHLDXF5aw&feature=player_embedded
<http://www.youtube.com/watch?v=3rIHhdYCUVw> diabetes
<http://www.youtube.com/watch?v=JB4GFyjewHQ> obesity
<http://www.youtube.com/watch?v=JB4GFyjewHQ> autism

¹⁰ http://www.momsacrossamerica.com/glyphosate_and_autism_asthma_copd_diabetes_and_more

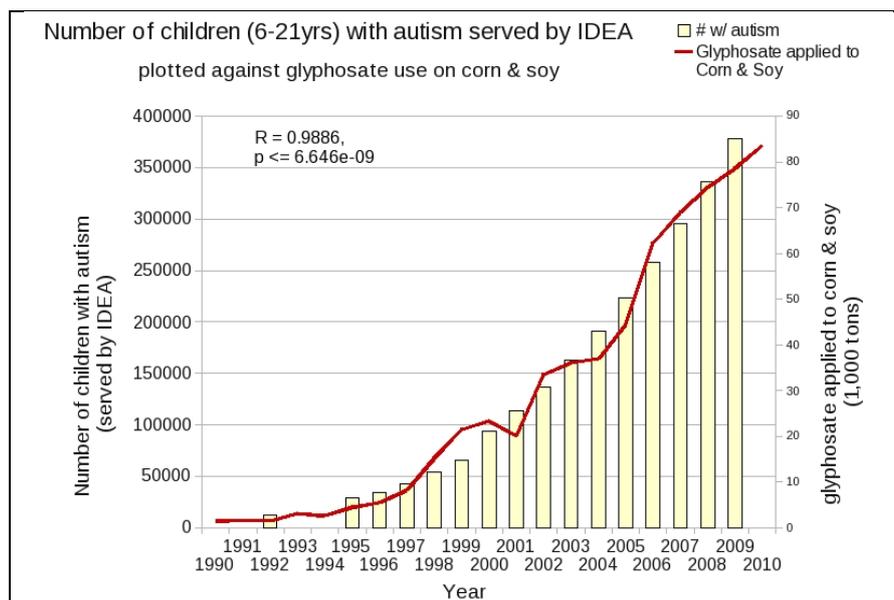
¹¹ <http://www.youtube.com/watch?v=nVjntXhDrx8>

¹² <http://sustainablepulse.com/wp-content/uploads/GMO-health.pdf>

The incidence of Type 2 diabetes, obesity¹³ and autism¹⁴ has undergone similar increases in England and Wales¹⁵. According to Department of the Environment, Food and Rural Affairs, the total area of crops treated with glyphosate in the UK¹⁶ is 1,835,306 ha. However, we have no idea how much is used for the domestic or commercial markets, for forestry, amenity or aquatic areas or to keep towns and cities clear of invasive weeds.



Graph 2 US data for % GE corn and soy crops planted and glyphosate applied to corn & soy plotted against % of U.S. population who are obese (BMI 30.0-99.8). Crop and glyphosate data from the USDA; obesity data from U.S. CDC. By kind permission of Dr Nancy Swanson.



¹³ <http://news.sky.com/story/1127385/obesity-warning-for-british-children>

¹⁴ <http://www.telegraph.co.uk/health/9160322/Number-of-children-with-autism-soars-by-more-than-50-per-cent-in-five-years.html>

¹⁵ <http://www.walesonline.co.uk/news/health/tackling-epidemic-diabetes-wales-4715622>

¹⁶ <http://pusstats.csl.gov.uk/>

Graph 3 Number of children with autism plotted against glyphosate use on GE corn and soy. Autism data were obtained from the U.S. Department of Education, which keeps track of school age children receiving services under the Individuals with Disabilities Education Act (IDEA). This plot is shown using data from USDE for the number of autistic children receiving services. By kind permission of Dr Nancy Swanson.

In 1970, the incidence of autism in the US was 1:10,000. In 2007 it was 1:150. In 2009 it was 1:100. In 2013 it is 1:50 and by 2025 it will be 1:2, i.e. 50%.

Part 2 Evidence from industry of massive increases in glyphosate use in Europe, the US and Latin America

Glyphosate is now used to dry crops before harvest as well as for weed control

Pre-harvest application of glyphosate to wheat and barley in the UK was suggested as early as 1980, but its routine use as a drying agent 7-10 days before harvest began in 2006.

Monsanto's document: The agronomic benefits of glyphosate in Europe [2010]¹⁷

Page 3: "*Since its discovery in the early 1970's the unique herbicidal active ingredient glyphosate 'has become the world's most widely used herbicide because it is efficacious, economical and environmentally benign.'* These properties have enabled a plethora of uses which continue to expand to this day providing excellent weed control both in agricultural and non-crop uses to benefit mankind and the environment. Glyphosate has an "excellent safety profile to operators, the public and the environment". The document outlined at least 16 use areas (p3) from vegetation control on land throughout agricultural production, on GM Roundup® Ready Crops and on non-agricultural land "*around structures on farms, amenity and industrial areas and on railways*" (p 4). In 2004 it was used on 13% wheat area. By 2006 it became used more routinely for weed control or pre-harvest treatment (at least 40% cereal and 80% oilseed rape, p 21). This increases glyphosate residues in animal and human food.

Monsanto's recommendations for the use of Roundup® in UK towns and cities

Streets and pavements¹⁸, Japanese knotweed¹⁹, Bracken²⁰, Rhododendron²¹ are amongst many weeds for which Roundup® is promoted. "*It is approved for weed control in amenity, industrial, forestry and aquatic areas*". "*Roundup Pro Biactive and ProBiactive 450 can be used at any time of the year as long as weeds are green and actively growing*". Monsanto advises re-spraying if die-back is not observed at 6 weeks. However, repeated spraying of weeds with Roundup® results in 'super-weeds' since weeds become resistant. NEW RULES 2012: Streets and pavements⁹. "*From 2012 new rules from the regulator, Chemical Regulations Directorate (CRD) prohibits blanket spraying of any herbicide on non-porous hard surfaces. Targeted treatment of weeds must be undertaken on roads, pavements, concrete and paved areas and drains must not be oversprayed.*" Did the CRD find toxic levels of glyphosate in water?

¹⁷ <http://www.monsanto.com/products/Documents/glyphosate-background-materials/Agronomic%20benefits%20of%20glyphosate%20in%20Europe.pdf>

¹⁸ <http://www.monsanto-ag.co.uk/content.output/165/165/Roundup/Amenity/Streets%20and%20Pavements.msp>

¹⁹ <http://www.monsanto-ag.co.uk/content.output/170/170/Roundup/Difficult%20Weeds/Japanese%20Knotweed.msp>

²⁰ <http://www.monsanto-ag.co.uk/content.output/171/171/Roundup/Difficult%20Weeds/Bracken.msp>

²¹ <http://www.monsanto-ag.co.uk/content.output/174/174/Roundup/Difficult%20Weeds/Rhododendron.msp>

In the US, Benton County’s 3-year control of river weeds; is it linked to birth defects?

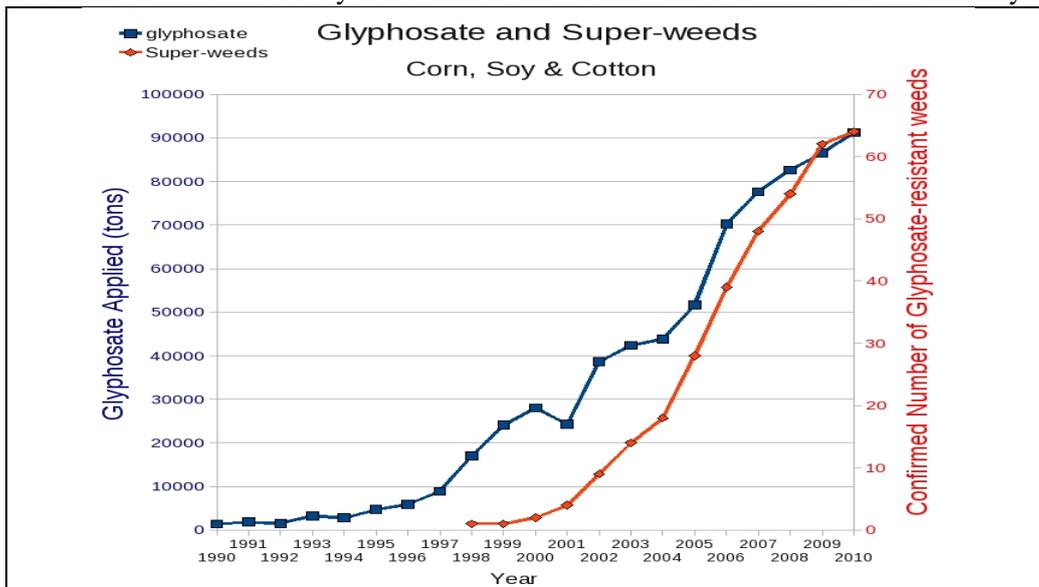
Washington State has a Noxious Weed Control Board and glyphosate is the main herbicide recommended for noxious weed eradication. Benton County Herbicide treatment started in the Yakima River in 2010 and continued for 3 years without monitoring glyphosate levels in water²². Three Washington Counties (Yakima, Benton and Franklin) sharing the same irrigation water for agriculture, reported a high number of pregnancies resulting in a fatal birth defect, anencephaly²³. The cause was a mystery to state health officials²⁴.

Since the introduction of GM seeds in 1996 the amount of glyphosate used on crops in the US has increased almost 10-fold; 27 million pounds to 250 million pounds in 2009²⁵ Industry and lobbyists claim that GM crops reduce the amount of pesticides and that ‘*super-weeds*’ are a myth. The photograph and Graph 4 below and prove them to be wrong.



Northern Indiana. Giant Ragweed (3 m) resistant to glyphosate.

Farm workers have to weed it by hand. This is one of nine different weeds that commonly occur.



²² <http://agr.wa.gov/plantsinsects/weeds/npdespermits/docs/IPMFreshwaterEmergentNoxiousQuarantineListedWeeds.pdf>

²³ <http://farmwars.info/?p=11137>

²⁴ <http://abcnews.go.com/Health/washington-state-health-officials-stumped-high-rate-birth/story?id=19687592>

²⁵ http://water.usgs.gov/nawqa/pnsp/usage/maps/show_map.php?year=2009&map=GLYPHOSATE&hilo=L

Graph 4 Glyphosate and Super-weeds: Glyphosate applied to Corn, Soy and Cotton crops in the U.S. and the number of confirmed glyphosate-resistant weeds. Glyphosate data from USDA; super-weed data from Charles Benbrook. By kind permission of Dr Nancy Swanson.

Impacts of genetically engineered crops on pesticide use in the US – the first sixteen years²⁶. Charles Benbrook showed that: *“Herbicide-resistant crop technology has led to a 239 million kilogram (527 million pound) increase in herbicide use in the United States between 1996 and 2011”*... *“The spread of glyphosate-resistant weeds in herbicide-resistant weed management systems has brought about substantial increases in the number and volume of herbicides applied. If new genetically engineered forms of corn and soybeans tolerant of 2,4-D are approved, the volume of 2,4-D sprayed could drive herbicide usage upward by another approximate 50%.*

Monsanto found guilty in courts around the world for false claims about Roundup®
Glyphosate is not environmentally benign. Monsanto Corporation has been repeatedly convicted in Law Courts around the world for not telling the truth about the safety of its best-selling weed-killer, Roundup®. Despite being found guilty every time Monsanto continues to promote the myth.

- 1996 The Attorney General of the State of New York, Consumer Frauds and Protection Bureau, Environmental Protection Bureau. False advertising by Monsanto regarding the safety of Roundup® herbicide (glyphosate)²⁷.
- 2001 French environmental groups had brought the case on the basis that glyphosate, Roundup®'s main ingredient, is classed as "*dangerous for the environment*" by the European Union. France's highest court confirmed an earlier judgment that Monsanto had falsely advertised its herbicide as "*biodegradable*" and claimed it "*left the soil clean.*"
- 2004 Brazil. *“To affirm in advertising that transgenic soy seeds were beneficial to the environment, has cost to the multinational Monsanto American Agrochemicals fined \$250,000 by the Federal Regional Court of Brazil. Monsanto used misleading advertising to promote the soybeans, in year 2004, encouraging consumption of GM seeds when even they were prohibited in Brazil. And they not only encouraged their consumption, but also claimed that these seeds were highly beneficial to the environment. This consideration took into account to the Court of Justice headquartered in the Porto Alegre City”*²⁸.
- 2007/2008 *“In the latest ruling, France's Supreme Court upheld two earlier convictions against Monsanto by the Lyon criminal court in 2007, and the Lyon court of appeal in 2008, the AFP news agency reports.”*
- *“In Brazil, Monsanto has been convicted by a court for false advertising claims that GM soy and the herbicide glyphosate, as used in the 'no-till with herbicides' model of cultivation, are beneficial to the environment. This is not the first time Monsanto has been convicted by a court for false advertising over claims that its glyphosate-based herbicides are safe and environmentally friendly. Court rulings against Monsanto's misleading advertising of glyphosate herbicides as safe for human health and the environment date back to the 1990s”*²⁹.

²⁶ <http://www.enveurope.com/content/24/1/24>

²⁷ <http://www.mindfully.org/Pesticide/Monsanto-v-AGNYnov96.htm>

²⁸ <http://cimalatinamerica.blogspot.co.uk/2012/08/brazil-brazilian-court-convicts-monsanto.html>

²⁹ <http://bit.ly/OZ9icp>

Monsanto's Mission Statement for its projects in Latin America (2012 website)

“Monsanto is committed to helping improve lives – especially the lives of farmers in small rural communities around the world.” Pablo Vaquero, Monsanto Latin America South corporate affairs director, said: *“Today, we are helping to change the lives of many individuals in remote and forgotten communities where opportunities are scarce. We are convinced that by helping with training and education, as a company, we are able to add value to people and their communities.”*

‘Projects have been implemented in 14 provinces in Argentina (Buenos Aires, Santa Fe, Córdoba, La Pampa, San Luis, Santiago del Estero, Entre Ríos, Corrientes, Formosa, Misiones, Salta, Tucumán, Jujuy and Chaco) and one in the Republic of Paraguay. Many farmers and people know about Monsanto Company because of the Roundup® Ready trait, which is a trait that gives in-plant tolerance to Roundup® agricultural herbicides. The trait was introduced to the market in 1996 and brought a whole new element to farmers. In 1996, farmers could now plant soybeans, spray the soybeans with Roundup®, and poof- the weeds were gone and the soybeans were still as healthy as they were before they sprayed the field’.

The same rural communities in which glyphosate was regularly sprayed on Roundup® Ready Soya had increased incidence of birth defects, miscarriages, infertility, cancers, DNA damage, neurological development problems in children and allergies³⁰

“For nearly 10 years, the residents of rural and periurban areas, where agricultural activities are carried out based on the current model of agro-industrial production, have been demanding to the political authorities, the courts of justice, and also protesting before the general public, because they feel that the health of their communities is being environmentally affected, mainly through sprayings of agrochemicals used for different types of agricultural crops, but also for the handling and storage of these chemicals in populated areas, the waste disposal, as well as the collection of grains soaked with chemicals within the towns. The towns specified in the Monsanto Latin America website above: “are only some of the places where the increased number of cancer cases, birth defects, reproductive and endocrine disorders, have been suffered and detected ever since systematic pesticide spraying has become commonplace” ...

In these towns GM corn and Roundup® Ready Soy required increasing amounts of glyphosate to be sprayed because of glyphosate-resistant weeds.

- In 1996, the sprayings started at less than 2 liters/hectare
- By 2010 some areas are sprayed with 10 liters/hectare, and almost 20 liters/hectare in other areas (five to 10 times the amount of glyphosate over 14 years).

Prof Andrés Carrasco and his team in Buenos Aires showed that glyphosate caused malformations in amphibian and chicken embryos, confirming the effects on humans

Paganelli, A. *et al.* Glyphosate-Based Herbicides Produce Teratogenic Effects on Vertebrates by Impairing Retinoic Acid Signaling *Chem. Res. Toxicol.*, 2010, 23 (10), 1586–1595

DOI: 10.1021/tx1001749³¹

Reports of neural defects and craniofacial malformations from regions where glyphosate-based herbicides (GBH) are used led them to undertake an embryological approach to explore the effects of low doses of glyphosate in development. Treated embryos were highly abnormal with marked alterations in cephalic and neural crest development and shortening

³⁰ INGLES-Report-from-the-1st-National-Meeting-Of-Physicians-In-The-Crop-Sprayed-Towns.pdf :Faculty of Medical Sciences, National University of Cordoba, Argentina, August 27th & 28th 2010

³¹ <http://pubs.acs.org/doi/abs/10.1021/tx1001749>

of the anterior-posterior (A-P) axis. It was shown that the effects were due to the glyphosate itself, rather than the additive.

Evidence of *in vitro* genotoxicity of glyphosate metabolite in humans

Mañas F *et al.* Genotoxicity of AMPA, the environmental metabolite of glyphosate, assessed by the Comet assay and cytogenetic tests. *Ecotoxicol Environ Saf.* 2009 72 (3):834-7. doi: 10.1016/j.ecoenv.2008.09.019³². AMPA was found to be genotoxic in all tests.

Lawyer Dr Graciela Gomez gained small victories on behalf of the rural communities

On 21/08/2012, judgement was announced in a court case in Argentina against GM soy producers and glyphosate. Sofica Gatica, who initiated her complaints in 2001, had two children with birth defects (one of whom died at birth without kidneys) and she made the first health survey in the neighbourhood of Ituzaingo, near Cordoba. *“Five hours after the initial time of the announcement, the verdict was in: one farmer was absolved due to lack of evidence, but the other farmer and the aviator were found guilty. Well, actually, conditional jail. This means they can very much get out of doing any time, although they will be obliged to do social work.”* The Argentine government continues to allow GM Soya to be grown.



A baby with a neural tube defect; this is a meningo-myelocoele. More extensive defects can occur. Hospital de Posadas, Misiones, Argentina. Photograph by kind permission of Dr Graciela Gomez.



Julieta, who died aged 7 months from multiple abnormalities in 2010
Bandera Santiago del Estero
Photograph by kind permission of Dr Graciela Gomez

³² <http://www.ncbi.nlm.nih.gov/pubmed/19013644>

In 2013 birth defects are still occurring in rural Argentina

Dr Medardo Vasquez is a neonatal specialist at the Children's Hospital in Cordoba. *"I see new-born infants, many of who are malformed. I have to tell parents that their children are dying because of these agricultural methods. In some areas in Argentina the primary cause of death for children less than one year old are malformations."* Fritz Kreiss: News Report Sunday 17 March 2013³³.



Fabian Tomasi aeroaplicador
(aerial pesticide applicator)
Entre Rios Argentina.

Photograph by kind permission
of Dr Graciela Gomez.

In 2012 Bayer expanded its domestic market in 2012 to promote home usage of neonicotinoid insecticides and a concentrated form of glyphosate³⁴

"Last season Bayer Garden introduced new packaging designed to create a 'family' feel across its products. The aim was to make sure gardeners would know the product they were about to purchase was manufactured by a company they already knew and trusted through favourite products, including Provado Ultimate Bug Killer, Bio Slug & Snail Killer and Super Strength Glyphosate. The company also returned to the television, running a high profile advertising campaign that focused on its unique Simple Soluble Sachets. (Adjuvant: Ethoxylated hydrogenated tallow alkylamines).

Bayer's description of how imidacloprid kills termite colonies by immune suppression³⁵

- Imidacloprid binds to the nicotineric acetylcholine receptors, which leads to paralysis and eventual death.
- When termites stop grooming the naturally-occurring fungi in the soil kill the termites. Premise® 200sc makes fungi 10,000 times more dangerous to termites. Nature assists Premise® in giving unsurpassed control.
- In Denmark imidacloprid preparations are sold in Garden Centres for killing ants.
- For termites and ants, substitute the word 'honeybees'. That is why *Varroa destructor* and other pathogens weaken bees; by suppressing the immune system³⁶.
- Glyphosate³⁷ also suppresses the immune system. It acts synergistically with parasites to reduce fish survival at environmentally relevant concentrations.
- Atrazine³⁸ also causes immune suppression in amphibians at levels below the US EPA threshold for drinking water.

³³ <http://www.nationofchange.org/argentina-s-bad-seeds-1363532747>

³⁴ <http://www.gardenforum.co.uk/tradeforum/peoplenews/?artid=2382>

³⁵ <http://www.research.bayer.com/en/20/-termites.pdf>

³⁶ <http://www.stmconnect.com/toc/jeit/2013v1n1/page3-12.pdf>

³⁷ <http://onlinelibrary.wiley.com/doi/10.1111/j.1365-2664.2010.01791.x/full>

³⁸ <http://www.pnas.org/content/99/15/9900.full>

Shift in pest management on crops worldwide

Over the last 20 years, a shift in pest management worldwide has taken place without anyone realizing. The industry has moved away from reactive to prophylactic. Now many fungicides, pesticides and herbicides are applied to the seeds before sowing. Application of the chemical before pest damage has occurred often involves routine, calendar-based spraying and pre-emptive treatments³⁹. It is like humans taking permanent antibiotics.

Multiple pesticides found in pollen collected by bees in the US

Pettis JS, Lichtenberg EM, Andree M, Stitzinger J, Rose R, *et al.* Crop Pollination Exposes Honey Bees to Pesticides Which Alters Their Susceptibility to the Gut Pathogen *Nosema ceranae*. PLoS ONE 2013, 8(7): e70182⁴⁰. The project was funded by the US Department of Agriculture and the National Honey Board.

*“We collected pollen from bee hives in seven major crops to determine 1) what types of pesticides bees are exposed to when rented for pollination of various crops and 2) how field-relevant pesticide blends affect bees’ susceptibility to the gut parasite *Nosema ceranae*. Our samples represent pollen collected by foragers for use by the colony, and do not necessarily indicate foragers’ roles as pollinators. In blueberry, cranberry, cucumber, pumpkin and watermelon bees collected pollen almost exclusively from weeds and wildflowers during our sampling. Thus more attention must be paid to how honey bees are exposed to pesticides outside of the field in which they are placed. We detected 35 different pesticides in the sampled pollen, and found high fungicide loads. Our results highlight a need for research on sub-lethal effects of fungicides and other chemicals that bees placed in an agricultural setting are exposed to”. Two herbicides were measured, but not glyphosate. Carfentrazone-ethyl: estimated use in 2009, 0.09 million pounds; pendimethalin: estimated use in 2009, 14 million pounds; glyphosate: estimated use in 2009, 250 million pounds and increasing dramatically.*

We asked Lord Smith Chairman of the UK Environment Agency to measure glyphosate and the neonicotinoid insecticides in ground water⁴¹

We sent him evidence that:

- Contamination of groundwater is destroying human health
- Environment Agency’s own data was used in a British Geological Survey Report 2012⁴². On page 35: *“Glyphosate is now the most widely used herbicide in the world, with dramatic increases in agricultural use since the introduction of (GM) glyphosate resistant crops. Microbial degradation produces aminomethyl phosphonic acid (AMPA) (Kolpin et al., 2000) and it has been anticipated that AMPA may be problematic. The high water solubility of both the parent and the metabolite has meant that their analysis has been difficult... ...Similarly for parent compounds which have non-agricultural applications, there will be routes to groundwater which would not be identified, such as routes which do not pass through the soil zone. Kolpin (2006) showed AMPA to be detected in wastewater-impacted surface waters about four times as frequently as the parent.”*
- We pointed out that the BGS Report was unpublished.

³⁹ <http://ento.psu.edu/publications/are-neonicotinoids-killing-bees>

⁴⁰ <http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0070182>

⁴¹ Personal communications from 09/04/2013 to 13/05/2013

⁴² <http://nora.nerc.ac.uk/14557/1/OR11013.pdf>

- A study in a German University of glyphosate residues in an urban population found significant contamination in all urine samples with 5 to 20 times above the legal limit for drinking water. The authors concluded it must be coming from food⁴³.
- Syngenta and Monsanto had initiated a new practice; desiccation of crops with glyphosate (or another herbicide) to dry them. This has resulted in glyphosate residues on crops, which then enter the food chain of animals and humans.

According to Dr Kennedy, the Gas Chromatography Mass Spectrometry (GCMS) scan cannot measure glyphosate

Dr Jo Kennedy replied on Lord Smith's behalf on 1st May 2013. With regard to glyphosate, she replied: *"The GCMS scan is not able to measure glyphosate, and glyphosate is not part of the routine suite of substances monitored for nationally across our network. The main reason for this is that glyphosate analysis is relatively costly and it was felt that the additional costs of analysis could not be justified. If local glyphosate problems have been identified in groundwater the Environment Agency can carry out operational monitoring at a local level."*

Why is the herbicide glyphosate not monitored in ground or drinking water in the US?

In the US in 2009 total sales of glyphosate were estimated to be 250 millions of pounds of active ingredient⁴⁴. Glyphosate and its metabolite AMPA are not monitored in groundwater, but atrazine and 2, 4-D are. The usage of glyphosate was 3.6 times greater than atrazine (70 million pounds)⁴⁵ and 4 times greater than 2, 4-D, the less toxic half of Agent Orange (62 million pounds)⁴⁶. Sometimes cheaper forms of 2, 4-D are contaminated with dioxins.

California set limits (1997) for glyphosate in drinking water⁴⁷

Summary: A Public Health Goal (PHG) of 1,000 ppb is developed for glyphosate in drinking water. California's and U.S. Environmental Protection Agency's Maximum Contaminant Levels (MCLs) are 700 ppb based on systemic toxicity (renal tubular dilation) in a three generation rat reproduction study with an NOAEL of 10 mg/kg-day. *"There are only a few published health effects studies on glyphosate in the past few years. The majority of the available studies on glyphosate were conducted by the Monsanto Company for the registration of glyphosate as a pesticide"*.

The United States Geological Survey (USGS) established a National Water Quality Assessment Program (NAWQA) for measuring pesticides in groundwater in 1991. It did not include glyphosate or the neonicotinoid insecticides

In 2008, a 10-year study (1993-2003) of pesticides in ground-water and drinking water⁴⁸ was published. In a press statement the author said: *"Despite sustained use of many popular pesticides and the introduction of new ones, results did not indicate increasing detection rates or concentrations in shallow drinking water resources over the 10 years studied"* In

⁴³ Brändli, D., Reinacher, S. Herbicides found in human urine. *Ithaka Journal* 1/2012: 270- 272.
<http://www.ithaka-journal.net/druckversionen/e052012-herbicides-urine.pdf>

⁴⁴ http://water.usgs.gov/nawqa/pnsp/usage/maps/show_map.php?year=2009&map=GLYPHOSATE&hilo=L

⁴⁵ http://water.usgs.gov/nawqa/pnsp/usage/maps/show_map.php?year=2009&map=ATRAZINE&hilo=L

⁴⁶ http://water.usgs.gov/nawqa/pnsp/usage/maps/show_map.php?year=2009&map=24D&hilo=L

⁴⁷ http://oehha.ca.gov/water/phg/pdf/glypho_c.pdf

⁴⁸ Bexfield, Laura M. (2008) Decadal-scale changes of pesticides in ground water of the United States, 1993-2003: *Journal of Environmental Quality* 37: S226-S239

2009 Trends in pesticides concentrations in corn-belt streams⁴⁹ was published. The authors made a similar statement in their press release: “*The declines in pesticide concentrations closely followed the declines in their annual applications, indicating that reduced pesticide use is an effective and reliable strategy for reducing pesticides contamination in streams.*”

The USGS Pesticide National Synthesis Data⁵⁰ of pesticides measured in water was published. It did not include glyphosate or the neonicotinoid insecticides

In 2013 a further Report was published⁵¹. This was an update on: “*a previously published water-quality dataset of 44 commonly used pesticides and 8 pesticide degradates suitable for national assessment of trends in pesticide concentrations in streams of the United States*”. Samples analysed at the USGS National Water Quality Laboratory by the GCMS analytical method were the most extensive in time and space and, consequently, were selected for trend analysis”. The UK Environment Agency had claimed that the GCMS cannot measure glyphosate. Is that why the USGS is not measuring them?

We had raised the absence of water data on neonicotinoid insecticides with Robert R Gilliom [Chief, Pesticide National Synthesis] in April 2011⁵². GMOs have neonicotinoid insecticides applied to the seed and are genetically modified to be Roundup® Ready (or other herbicide-tolerant). Glyphosate is the most used herbicide in the US and its use is increasing.

Estimation of Annual Agricultural Pesticide Use US 1992-2009⁵³

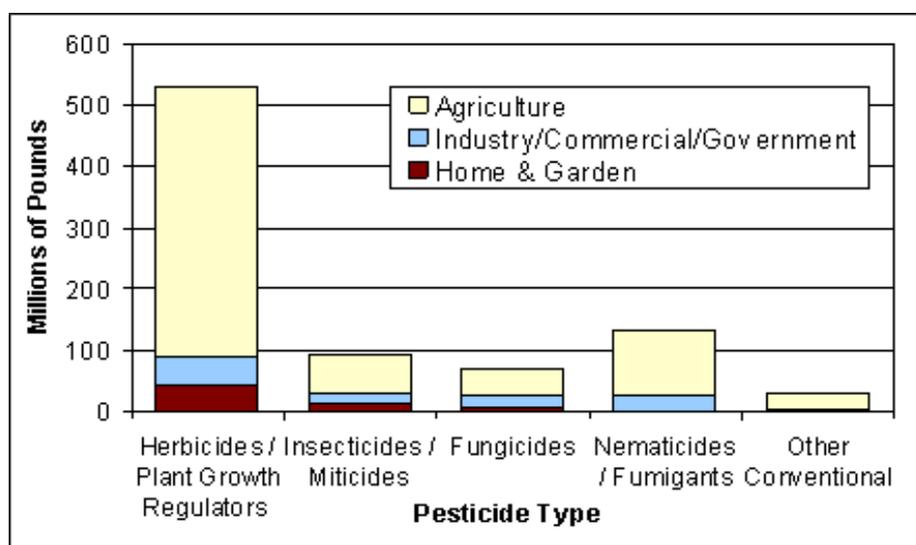


Fig 1 Amount of Conventional Pesticide Active Ingredient Used in the United States By Pesticide Type and Market Sector, 2007 Estimates US EPA

In the Foreword to this document, William H. Werkheiser USGS Associate Director for Water stated: “*The U.S. Geological Survey (USGS) is committed to providing the Nation with*

⁴⁹ Sullivan, D.J., Vecchia, A.V., Lorenz, D.L., Gilliom, R.J., and Martin, J.D. (2009) Trends in pesticide concentrations in corn-belt streams, 1996-2006: *U.S. Geological Survey*.

⁵⁰ Martin JD. Sources and preparation of data for assessing trends in concentrations of pesticides in streams of the United States, 1992-2006. U.S. Geological Survey Scientific Investigations Report 2009-55062.

⁵¹ <http://pubs.usgs.gov/ds/655/> Martin, JD, Eberle M, Nakagaki N. Sources and Preparation of Data for Assessing Trends in Concentrations of Pesticides in Streams of the United States, 1992-2010. Data Series 655.

⁵² Personal communication.

⁵³ <http://pubs.usgs.gov/sir/2013/5009/>

reliable scientific information...Information on the Nation's water resources is critical to ensuring long-term availability of water that is safe for drinking and recreation and is suitable for industry, irrigation, and fish and wildlife."

The map for glyphosate shows that the agricultural usage went from less than 20 million pounds in 1992 to 250 million pounds in 2009.⁵⁴ This excluded the use in the following sectors: home/garden/industry/commercial/government/market. In 2007 the non-agricultural sector accounted for more than 20% of the total amount of pesticides used.⁵⁵

Is it a coincidence that pesticides whose sales dominate global markets are not being monitored in ground, surface or drinking water by any Environmental Protection Agency anywhere? They are not being measured in Europe⁵⁶ or in the US⁵⁷ or by the Australian Pesticides and Veterinary Medicines Authority (APVMA). Why are all these killers of weeds being used? What has happened to farming?

All pesticide problems are manifest at water catchment areas

The American Bird Conservancy (ABC) commissioned world-renowned environmental toxicologist Dr Pierre Mineau and Cynthia Palmer an environmental lawyer and Pesticides Program Manager for ABC to conduct research on the effects of neonicotinoid insecticides on birds. The Report: Neonicotinoids and Birds: The Impact of the Nation's Most Widely Used Insecticides on Birds⁵⁸ was published in March 2013.

Dr Mineau, the UK Environment Agency and the European Water Frame Directive are in unanimous agreement about the approaches to pesticide assessment: *"Many of the problems facing our water environments are best understood and tackled at a catchment level."*

Page 8 of ABC: *"This suggests that we should be looking at possible links between neonicotinoid insecticides (or any other pesticide) and birds, not on a farm scale, but in the context of whole watersheds and regions. Impacts from the neonicotinoids may very well be further afield than the arable area on which they are used, and many of those impacts may be mediated through the aquatic environment."*

Mineau and Palmer have called for a ban on the use of the neonicotinoid insecticides as seed treatments and for the suspension of all applications pending an independent review of the products' effects on birds, terrestrial and aquatic invertebrates, and other wildlife.

"It is astonishing that EPA would allow a pesticide to be used in hundreds of products without ever requiring the registrant to develop the tools needed to diagnose poisoned wildlife. It would be relatively simple to create a binding assay for the neural receptor which is affected by this class of insecticides," said Dr Mineau.

Page 64 of ABC: *"It is clear that we are witnessing contamination of the aquatic environment at levels that will affect aquatic food chains. This has a clear potential to affect consumers of those aquatic resources, be they birds, fish or amphibians."*

Measurement of glyphosate in watersheds

Coupe *et al.* studied glyphosate and its major degradation product, aminomethylphosphonic acid (AMPA) levels in four agricultural basins⁵⁹. Three were in the Midwest US where the

⁵⁴ http://water.usgs.gov/nawqa/pnsp/usage/maps/show_map.php?year=2009&map=GLYPHOSATE&hilo=L

⁵⁵ http://epa.gov/pesticides/pestsales/07pestsales/usage2007_2.htm

⁵⁶ http://ec.europa.eu/environment/water/water-dangersub/pdf/com_2011_876.pdf

⁵⁷ <http://pubs.usgs.gov/ds/655/>

⁵⁸ http://www.abcbirds.org/abcprograms/policy/toxins/Neonic_FINAL.pdf

⁵⁹ Coupe, R.H. *et al.* Fate and transport of glyphosate and aminomethylphosphonic acid in surface waters of agricultural basins. *Pest Manag Sci* 2012; **68**: 16–30. <http://www.ncbi.nlm.nih.gov/pubmed/21128261>

intensity of use was greatest because of GM corn, soybeans and cotton, and one was from the vineyards of Eastern France. Paul Capel USGS chemist and an author of the study said that, despite the 8-fold increase in use of glyphosate between 1992 and 2007, details of the fate of the chemicals on a watershed scale were lacking⁶⁰. *“In these studies, Glyphosate was frequently detected in surface waters, rain and air in areas where it is heavily used in the basin. The consistent occurrence of glyphosate in streams and air indicates its transport from its point of use into the broader environment. The degradation product of glyphosate, aminomethylphosphonic acid (AMPA), which has a longer environmental lifetime, was also frequently detected in streams and rain”*. They concluded that: *“The watersheds most at risk for the offsite transport of glyphosate are those with high application rates, rainfall that results in overland runoff and a flow route that does not include transport through the soil...”* In Mississippi and Eastern France, where the use is almost continuous, glyphosate and AMPA were detected in almost every sample...”

Glyphosate is in the air and comes down in rainfall, as well as being in the rivers

Two-thirds to 100% of air and rainfall samples tested in Mississippi and Iowa in 2007–2008 contained glyphosate⁶¹. *“This is the first report on the ambient levels of glyphosate, the most widely used herbicide in the United States, and its major degradation product, aminomethylphosphonic acid (AMPA), in air and rain. The concentrations of glyphosate ranged from <0.01 to 9.1 ng/m³ and from <0.1 to 2.5 µg/L in air and rain samples, respectively.”*

Pesticides in surface drinking-water supplies of the northern Great Plains⁶²

Human health anomalies have been associated with pesticide exposure (including impaired cognitive abilities in children, an increased incidence of human birth malformations and cryptorchidism in male children). Of two insecticides and 27 herbicides that were detected in reservoir water, consistent detection of a subset of 7 herbicides suggested that atmospheric deposition, either directly or in rain, was the principal pathway from fields to the reservoirs. Highest concentrations and numbers of herbicides in drinking water were associated with a 133-mm rainfall over 15 days towards the end of the spring herbicide application. Drinking water contained 3-15 herbicides.

In storms, glyphosate from urban drainage systems contributes 60% of the load⁶³

Contributions of agricultural and urban uses to the glyphosate contamination of surface water were studied in a small catchment area in Switzerland (25 km²). *“The concentrations at peak discharge during storm events were elevated throughout the year with maximum concentrations of 4.15 µg L⁻¹ ... Extrapolations from agricultural loss rates and from concentrations found in the urban drainage system showed that more than half of the load during selected rain events originates from urban areas. The inputs from the effluent of the*

⁶⁰ <http://www.usgs.gov/newsroom/article.asp?ID=2909#.UhaEuNlxY8>

⁶¹ Feng-chih Chang, Matt F. Simcik, Paul D. Capel Occurrence and fate of the herbicide glyphosate and its degradate aminomethylphosphonic acid in the atmosphere *Environmental Toxicology and Chemistry* **30**, (3), 548–555, March 2011 <http://www.sciencedirect.com/science/article/pii/S0045653513008837>

⁶² <http://www.ncbi.nlm.nih.gov/pubmed/17687445>

⁶³ Hanke I, Wittmer I, Bischofberger S, Stamm C and Singer H, Relevance of urban glyphosate use for surface water quality. *Chemosphere* **81**:422–429 (2010). <http://www.sciencedirect.com/science/article/pii/S0045653510007411>

wastewater treatment plant, the overflow of the combined sewer system and of the separate sewer system summed up to 60% of the total load”. This confirms the study by Coupe *et al.* that the watersheds most at risk for the offsite transport of glyphosate are: ‘flow routes that do not include transport through soil’. That suggests that urban populations are more at risk from run-off from roads and from spraying of noxious weeds in, or close to, streams.

Data confirm that glyphosate is capable of reaching groundwater

Sanchís, J. *et al.* Determination of glyphosate in groundwater samples using an ultrasensitive immunoassay and confirmation by on-line solid-phase extraction followed by liquid chromatography coupled to tandem mass spectrometry. *Anal Bioanal Chem.* 2012 402 (7):2335-45. doi: 10.1007/s00216-011-5541-y.⁶⁴

“This is one of the few works related to the analysis of glyphosate in real groundwater samples and the presented data confirm that, although it has low mobility in soils, glyphosate is capable of reaching groundwater.”

Part 3 Pesticide Regulatory Agencies

Why did the EU authorise Glyphosate?

The Rapporteur Member State (RMS) for glyphosate is Germany. It was discovered that Draft Assessment Report (DAR) studies had found teratogenicity in mammals. Several malformations were found in rabbits and rats according to the industry’s own teratogenicity studies submitted for the 2002 EU approval of the active ingredient glyphosate. The original industry studies are claimed to be commercially confidential. However, the said industry data were compiled from the 1998 Draft Assessment Report by the German Government. (Germany will remain in this rôle for the next review of glyphosate in 2015.) Malformations include extra ribs, distortions affecting thoracic ribs, heart malformations, kidney agenesis, unossified sternbrae, reduced ossification of cranial centers and sacrocaudal vertebral arches, and also skeletal variations and major visceral malformations, which were unspecified in the DAR.

Independent scientists pointed this out and, in the light of the embryo research from Argentina where families in rural communities exposed to GM soya and glyphosate had children with birth defects, asked for new risk assessments⁶⁵

*“The publication of a study in 2010, showing that a glyphosate herbicide formulation and glyphosate alone caused malformations in the embryos of *Xenopus laevis* and chickens through disruption of the retinoic acid signalling pathway, caused scientific and regulatory controversy. Debate centred on the effects of the production and consumption of genetically modified Roundup Ready® soy, which is engineered to tolerate applications of glyphosate herbicide. The study, along with others indicating teratogenic and reproductive effects from glyphosate herbicide exposure, was rebutted by the German Federal Office for Consumer Protection and Food Safety, BVL, as well as in industry-sponsored papers. These rebuttals relied partly on unpublished industry-sponsored studies commissioned for regulatory purposes, which, it was claimed, showed that glyphosate is not a teratogen or reproductive toxin. However, examination of the German authorities’ draft assessment report on the industry studies, which underlies glyphosate’s EU authorisation, revealed further evidence of*

⁶⁴ <http://www.ncbi.nlm.nih.gov/pubmed/22101424>

⁶⁵ Antoniou, M. *et al.* Teratogenic Effects of Glyphosate-Based Herbicides: Divergence of Regulatory Decisions from Scientific Evidence *J Environ Anal Toxicol* 2012, S:4
<http://dx.doi.org/10.4172/2161-0525.S4-006>

glyphosate's teratogenicity. Many of the malformations found were of the type defined in the scientific literature as associated with retinoic acid teratogenesis. Nevertheless, the German and EU authorities minimized these findings in their assessment and set a potentially unsafe acceptable daily intake (ADI) level for glyphosate. This paper reviews the evidence on the teratogenicity and reproductive toxicity of glyphosate herbicides and concludes that a new and transparent risk assessment needs to be conducted. The new risk assessment must take into account all the data on the toxicity of glyphosate and its commercial formulations, including data generated by independent scientists and published in the peer-reviewed scientific literature, as well as the industry-sponsored studies."

Agencies and Industry have only tested the 'active' ingredient glyphosate. The commercial formulations contain an untested adjuvant which is toxic to human cells⁶⁶

The health and environmental agencies and pesticide companies assess the long-term effects on mammals of glyphosate alone, and not the full formulation. But the commercial formulations of these pesticides as they are sold and used contain added ingredients (adjuvants). These are often classified confidential and described as 'inerts'. However, they help to stabilize the chemical compound glyphosate and help it to penetrate plants, in the manner of corrosive detergents. The formulated herbicides (including Roundup®) can affect all living cells, especially human cells. This danger is overlooked because glyphosate and Roundup® are treated as the same by industry and regulators on long-term studies. The authors studied nine formulations and demonstrated that all formulations are more toxic than glyphosate alone. Among them, POE-15 appears to be the most toxic principle against human cells, even if others are not excluded.

Why did EFSA Reasoned Opinion Group grant 100-fold increase in Maximum Residue Limits (MRLs) of glyphosate in foods?

Monsanto Europe asked the European Food Safety Authority (EFSA) to raise the import tolerance for glyphosate in lentils "*in order to accommodate the authorised desiccation use of glyphosate in lentils in the US and Canada*" from 0.1 mg/kg to 10 mg/kg (i.e. 100 times). This was approved on 13th January 2012⁶⁷. A Joint FAO/WHO meeting on Pesticide Residues in 1994 had granted elevated Maximum Residue Limits (MRLs) for glyphosate on soya (from 5 mg/kg to 20 mg/kg) and soya bean fodder (from 20 mg/kg to 200 mg/kg)⁶⁸.

Complaint on 16/05/2012 to the European Commission about increase of MRLs

Michael Flüh replied on behalf of the European Commission⁶⁹ on 6th July 2012. "*As regards the toxicity of glyphosate and the maximum residue levels established in EU legislation, we refer again to our strict approval system in the EU. EU-MRLs are established based on a thorough assessment carried out by Member States and subsequently set by EFSA and are set at levels that ensure consumer safety based on the worst-case dietary habits across the EU*".

The Industry hosted a secret meeting on 26/06/2012 to get GM into the UK⁷⁰

⁶⁶ Ethoxylated adjuvants of glyphosate-based herbicides are active principles of human cell toxicity. Toxicology 2013. <http://dx.doi.org/10.1016/j.tox.2012.09.006>

⁶⁷ <http://www.efsa.europa.eu/en/search/doc/2550.pdf>

⁶⁸ http://www.fao.org/fileadmin/templates/agphome/documents/Pests_Pesticides/JMPR/Evaluation94/glyphos.pdf

⁶⁹ Personal communication.

⁷⁰ <http://tinyurl.com/9jbce4g> , <http://tinyurl.com/8ahylza> , <http://tinyurl.com/92rrain>

Monsanto, Syngenta, Bayer and BASF and their industry body, the Agricultural Biotechnology Council (ABC) are setting the agenda for UK agricultural research with a view to bringing GM crops into the UK and exporting them overseas. Two Ministers and two MPs met with scientists from Defra, the John Innes Centre, Rothamsted Research and the National Farmers Union. They had a round table discussion including how to overcome the negative public opinion that currently prevents the UK achieving these outcomes and a strategy to attain them.

Further evidence of glyphosate residues in humans

Urine tests were performed in 182 volunteers from cities in 18 countries in Europe to measure glyphosate and aminomethylphosphonic acid (AMPA, a metabolite of glyphosate). On average, 44 % and 36 % of the urine samples analysed were found to contain quantifiable levels of glyphosate and AMPA respectively⁷¹.

Glyphosate and AMPA residues in soy bean plants, leaves and grains

Arregui, M.C. *et al.* Monitoring glyphosate residues in transgenic glyphosate-resistant soybean. *Pest Manag. Sci.* 2004 Feb; 60 (2):163-6⁷².

The objective of this work was to monitor glyphosate and AMPA residues in soybean plants and grains in field crops in Santa Fe Province, Argentina. Five sites were monitored in 1997, 1998 and 1999. Individual soybean plants were sampled from emergence to harvest, dried and ground. Analysis consisted in residue extraction with organic solvents and buffers, agitation, centrifugation, clean-up and HPLC with UV detection. In soybean leaves and stems, glyphosate residues ranged from 1.9 to 4.4 mg kg⁻¹ and from 0.1 to 1.8 mg kg⁻¹ in grains. Higher concentrations were detected when glyphosate was sprayed several times during the crop cycle, and when treatments approached the flowering stage. AMPA residues were also detected in leaves and in grains, indicating metabolism of the herbicide.

GMO food and animal feeds with glyphosate residues are coming into Europe

The industry and lobbyists claim that GM reduces the amount of pesticides that need to be sprayed during the year. The photograph on page 12 shows that weeds become resistant to glyphosate, so more and more has to be applied. This paper shows that GM fails to increase maize yields in mid-West US but increases the use of herbicides. Between 1996 and 2011, overall herbicide use on GMOs in the US increased by 239 million kilograms⁷³.

Endocrine Disrupting Chemicals (EDC) – 2012

An assessment of the State of Science of Endocrine Disruptors was prepared for the United Nations Environment Program and the World Health Organization by a group of approximately 50 experts⁷⁴.

The authors outlined evidence of 1) a high incidence, and increasing trends, of many endocrine-related disorders in humans; 2) observations of endocrine-related effects in wildlife populations; 3) identification of chemicals with endocrine disrupting properties linked to disease outcomes in laboratory studies.

Endocrine-related disorders in humans are manifest by:

- Increases in low semen quality in young men (up to 40%)
- Incidence of genital malformations has increased over time

⁷¹ <http://www.foeeurope.org/weed-killer-glyphosate-found-human-urine-across-Europe-130613>

⁷² <http://www.ncbi.nlm.nih.gov/pubmed/7797819>

⁷³ Heinemann JA et al. Sustainability and innovation in staple crop production in the US Midwest. *International Journal of Agricultural Sustainability*, 2013 <http://dx.doi.org/10.1080/14735903.2013.806408>

⁷⁴ http://unep.org/pdf/9789241505031_eng.pdf

- Adverse pregnancy outcomes and birth defects has increased in many countries
- Neurobehavioural disorders related to thyroid dysfunction has increased
- Endocrine-related cancers (breast, endometrial, ovary, prostate, testicular and thyroid cancers) have been increasing over the past 40-50 years
- Earlier onset of breast development in young girls which leads to breast cancer
- The prevalence of obesity and type 2 diabetes is increasing. The WHO estimates that 1.5 billion adults worldwide are overweight or obese and that the number with type 2 diabetes increased from 153 million to 347 million between 1980 and 2008

The conclusion was: “*It is essential to evaluate associations between EDC exposures and health outcomes by further developing methods for which proof of concept is currently under development.*” An Editorial in the Lancet⁷⁵ concluded: “*there is currently no widely agreed system for assessing the strength of associations between exposure to chemicals (including EDCs) and adverse health outcomes.*”

Were there too many cooks? Or was it reluctance amongst scientists to point fingers?

The herbicide atrazine was considered. It was banned in Europe in 2004, but is still widely used throughout the world. In 2009 it was the second most commonly applied herbicide in the US. Recommendations should have been made for it to be banned on multiple counts.

- On p 169: ‘*these data indicate that atrazine has convincing effects on the immune system, and further investigation is warranted.*’
- On p 196, the extent of atrazine’s current use in the USA is highlighted
- Hayes *et al* have written extensively about atrazine as an endocrine-disruptor in amphibians^{76,77} and it has been cited as a possible contributor to the massive global declines in amphibian populations⁷⁸.
- Birth defects in humans. Atrazine has been associated with a major anomaly in babies, gastroschisis. Gastroschisis is a congenital defect in the abdominal wall, through which the abdominal contents freely protrude. A case-controlled study of agricultural-related chemical exposure concluded: “*Maternal exposure to surface water atrazine is associated with fetal gastroschisis, particularly in spring conceptions*”⁷⁹.
- In the UK in Northfleet in Kent, nine babies within 12 years (from 1999-2012) had been born in the same street with gastroschisis⁸⁰. “*Southern Water acknowledged that atrazine had been found in 2008, but said tap water came from a variety of sources and any pollutant would be heavily diluted*”. An update on the Water Frame Directive on groundwater status in the UK had been presented to Defra’s Pesticides Forum in

⁷⁵ Endocrine-disrupting chemicals: how much of a health threat?

⁷⁶ Hayes, T.B. *et al.* Hermaphroditic, demasculinized frogs after exposure to the herbicide atrazine at low ecologically relevant doses. *PNAS* 2002 99 (8) 5476-5480

⁷⁷ Hayes, T.B. *et al.* Atrazine induces complete feminization and chemical castration in male African clawed frogs (*Xenopus laevis*) *PNAS* 2010, 107 (10): 4612-4617
doi: 10.1073/pnas.0909519107

⁷⁸ Hayes TB, Falso P, Gallipeau S, Stice M The cause of global amphibian declines: a developmental endocrinologist’s perspective. *Journal of Experimental Biology*, 2010, 213(6):921-933.

⁷⁹ Waller SA, Paul K, Peterson SE, *et al.* Agricultural-related chemical exposures, season of conception, and risk of gastroschisis in Washington State. *Am J Obstet Gynecol* 2010,202: 241.e1-6.

⁸⁰ <http://www.dailymail.co.uk/news/article-2142106/One-street-Nine-babies-born-horrific-rare-deformity-And-troubling-question--mothers-poisoned-weedkiller.html>

2008⁸¹. It showed that atrazine and/or its two breakdown products were found at more than 25% of monitoring sites and were present in quantities in excess of 0.1 µg/l. An investigation into the cases was carried out by the Kent Public Health Department. The Report, published on 05/03/2012⁸², did not find evidence of higher rates of gastroschisis than could be considered normal in the Waterdales Road area. Syngenta said: “*There is no proven link between atrazine and these defects. Atrazine does not cause developmental abnormalities.*” However, an unpublished Report on Emerging contaminants in groundwater 2011 was compiled from Environment Agency Data by the British Geological Survey and the Natural Environment Research Council.⁸³ Appendix 2, p 93 Summary of non-licences pesticides, atrazine was found at 1039 monitoring sites in the UK (maximum concentration: 13.04 µg/l: EU legal limit <0.1 µg/l).

- Atrazine-Induced Aromatase Expression Is SF-1 Dependent: Implications for Reproductive Cancers in Humans⁸⁴.
- In 2009, atrazine was the second most commonly applied herbicide in the US (70 million pounds)⁸⁵. Glyphosate is the commonest herbicide in the US and is widely applied throughout the world.
- “*In the US in 2012, in a settlement between plaintiffs and the manufacturer of the endocrine disrupting herbicide atrazine, Syngenta will pay \$105 million to settle a nearly 8-year-old lawsuit and could help reimburse community water systems (CWS) in 45 states that have had to filter the toxic chemical from its drinking water. It will provide financial recoveries for costs that have been borne for decades by more than 1,887 CWSs that provide drinking water more than one in six Americans across at least 45 states*⁸⁶. On October 23, 2012, Judge Phil Gilbert in the United States District Court for the Southern District of Illinois approved the \$105 million nationwide atrazine settlement. After an extensive notification effort that included two first-class letters, an email and direct phone contact, 1,085 class members filed claims seeking a portion of the \$105 million settlement fund. These class members will receive payments based on evidence of: (1) the levels of atrazine in the water; (2) how often atrazine had been found in the water; (3) how long ago atrazine had been found in the water; and (4) the population served. Generally, the more water processed by a system or the frequency of high concentrations of atrazine, the more money they received. The following map shows the location of each water system receiving funds and the magnitude of their recovery⁸⁷.”

⁸¹ Jo Kennedy Pesticides_Forum_Oct_2008_WFD.pdf

⁸² Investigation into gastro~ cases final amended.pdf

⁸³ <http://nora.nerc.ac.uk/14557/1/OR11013.pdf>

⁸⁴ [WuQiang Fan et al.](#) Atrazine-Induced Aromatase Expression Is SF-1 Dependent: Implications for Endocrine Disruption in Wildlife and Reproductive Cancers in Humans *Environ Health Perspect.* 2007 May; 115(5): 720–727. doi: [10.1289/ehp.9758](https://doi.org/10.1289/ehp.9758)

⁸⁵ http://water.usgs.gov/nawqa/pnsp/usage/maps/show_map.php?year=2009&map=ATRAZINE&hilo=L

⁸⁶ <http://www.atrazinesettlement.com/utility/GetFile/c3e918bf-742a-41fa-8af6-0637bcf0b253>

⁸⁷ <http://www.atrazinesettlement.com/>

Glyphosate - the missing endocrine-disruptor

Glyphosate is the most widely used herbicide in the world. It was introduced in 1974. Industry claims it to be safe. Is that why it wasn't even considered by experts in the State of Science as a candidate for the increasing burden of diseases of those on a Western diet?

Part 4 Other Independent Research on glyphosate and glyphosate-based herbicides, including Roundup®

Independent scientists have shown that glyphosate is an endocrine disruptor

Gasnier, C. *et al*, Glyphosate-based herbicides are toxic and endocrine disruptors in human cell lines. *Toxicology* doi:10.1016/j.tox.2009.06.006⁸⁸.

"All parameters were disrupted at sub-agricultural doses with all formulations within 24h. These effects were more dependent on the formulation than on the glyphosate concentration. First, we observed a human cell endocrine disruption from 0.5 ppm on the androgen receptor in MDA-MB453-kb2 cells for the most active formulation (R400), then from 2 ppm the transcriptional activities on both estrogen receptors were also inhibited on HepG2. Aromatase transcription and activity were disrupted from 10 ppm. Cytotoxic effects started at 10 ppm with Alamar Blue assay (the most sensitive), and DNA damages at 5 ppm. A real cell impact of glyphosate-based herbicides residues in food, feed or in the environment has thus to be considered, and their classifications as carcinogens/mutagens/reprotoxics is discussed.

Glyphosate is associated with most of the diseases and conditions associated with a Western diet⁸⁹.

"Here, we show how interference with Cytochrome P450 (CYP) enzymes acts synergistically with disruption of the biosynthesis of aromatic amino acids by gut bacteria, as well as impairment in serum sulfate transport. Consequences are most of the diseases and conditions associated with a Western diet, which include gastrointestinal disorders, obesity, diabetes, heart disease, depression, autism, infertility, cancer and Alzheimer's disease. We explain the documented effects of glyphosate and its ability to induce disease, and we show that glyphosate is the 'textbook' example of exogenous semiotic entropy: the disruption of homeostasis by environmental toxins."

There is a link to Stephanie Seneff being interviewed by Jeffrey Smith⁹⁰.

Birth defects in frog & chicken embryos and in humans⁹¹

Genetically-Engineered Corn and Roundup®-Ready Soya were introduced into the rural towns of Argentina and Paraguay in 1996. The devastation of human and animal health and biodiversity is described in this chapter: *"In South America, the incorporation of genetically modified organisms (GMO) engineered to be resistant to pesticides changed the agricultural*

⁸⁸ <http://www.ncbi.nlm.nih.gov/pubmed/19539684>

⁸⁹ Samsel, A., Seneff, S. Glyphosate's Suppression of Cytochrome P450 Enzymes and Amino Acid Biosynthesis by the Gut Microbiome: Pathways to Modern Diseases. *Entropy* **2013**, *15*, 1-x manuscripts; doi:10.3390/e140x000x <http://www.nationofchange.org/new-study-finds-roundup-could-be-linked-severe-health-issues-1367071482>

⁹⁰ Stephanie Seneff: video interview with Jeffrey Smith:
http://www.youtube.com/watch?v=h_AHLDXF5aw&feature=player_embedded

⁹¹ Lopez, S.L. *et al* GMO Pesticides Used in South American GMO-Based Agriculture: A Review of Their Effects on Humans and Animal Models. In *Advances in Molecular Toxicology*, Vol. 6, 201 published by Elsevier: ISSN 1872-0854

model into one dependent on the massive use of agrochemicals. Different pesticides are used in response to the demands of the global consuming market to control weeds, herbivorous arthropods, and crop diseases. Here, we review their effects on humans and animal models, in terms of genotoxicity, teratogenicity, and cell damage. We also stress the importance of biomarkers for medical surveillance of populations at risk.

European Commission is challenged about its continued registration of Roundup®⁹²

“The European Commission has previously ignored or dismissed many other findings from the independent scientific literature showing that Roundup® and glyphosate cause endocrine disruption, damage to DNA, reproductive and developmental toxicity, neurotoxicity, and cancer, as well as birth defects. Many of these effects are found at very low doses, comparable to levels of pesticide residues found in food and the environment.”...

“This issue is of particular concern now that Monsanto and other producers of genetically modified seed are trying to get their glyphosate-tolerant crops approved for cultivation in Europe. If the EU Commission gives its approval, this will lead to a massive increase in the amount of glyphosate sprayed in the fields of EU member states, as has already happened in North and South America. Consequently, people’s exposure to glyphosate will increase.”

The review of glyphosate was due to take place in 2012. Soon after the Commission was notified of the latest research showing that glyphosate and Roundup® caused birth defects, it quietly passed a directive delaying the review of glyphosate and 38 other dangerous pesticides until 2015.

Prof Gilles-Eric Séralini and colleagues at CRIIGEN in Caen had already questioned the adequacy of Monsanto’s testing both for glyphosate and GM crops⁹³.

“The 90-day-long tests are insufficient to evaluate chronic toxicity, and the signs highlighted in the kidneys and livers could be the onset of chronic diseases. However, no minimal length for the tests is yet obligatory for any of the GMOs cultivated on a large scale, and this is socially unacceptable in terms of consumer health protection. We are suggesting that the studies should be improved and prolonged, as well as being made compulsory, and that the sexual hormones should be assessed too, and moreover, reproductive and multigenerational studies ought to be conducted too.”

Séralini’s 2-year feeding study provoked chronic hormone and sex dependent pathologies in rats; males developed tumours at 4 months and females at 7 months

Séralini, G-E *et al.* Long term toxicity of a Roundup® herbicide and a Roundup®-tolerant genetically modified maize. *Food Chem Toxicol.* November 2012, 50: 4221-4231⁹⁴

“The health effects of a Roundup®-tolerant genetically modified maize (from 11% in the diet), cultivated with or without Roundup®, and Roundup® alone (from 0.1 ppb in water), were studied 2 years in rats. In females, all treated groups died 2 -3 times more than controls, and more rapidly. This difference was visible in 3 male groups fed GMOs. All results were hormone and sex dependent, and the pathological profiles were comparable. Females developed large mammary tumors almost always more often than and before controls, the pituitary was the second most disabled organ; the sex hormonal balance was modified by

⁹² Antoniou M, Habib M, Howard CV, *et al.* Roundup and birth defects: Is the public being kept in the dark? Earth Open Source. June 2011. <http://bit.ly/IP2FWH>

⁹³ Séralini, G-E. *et al.* Genetically modified crops safety assessments: present limits and possible improvements *Environmental Sciences Europe* 2011, 23:10 doi:10.1186/2190-4715-23-10.

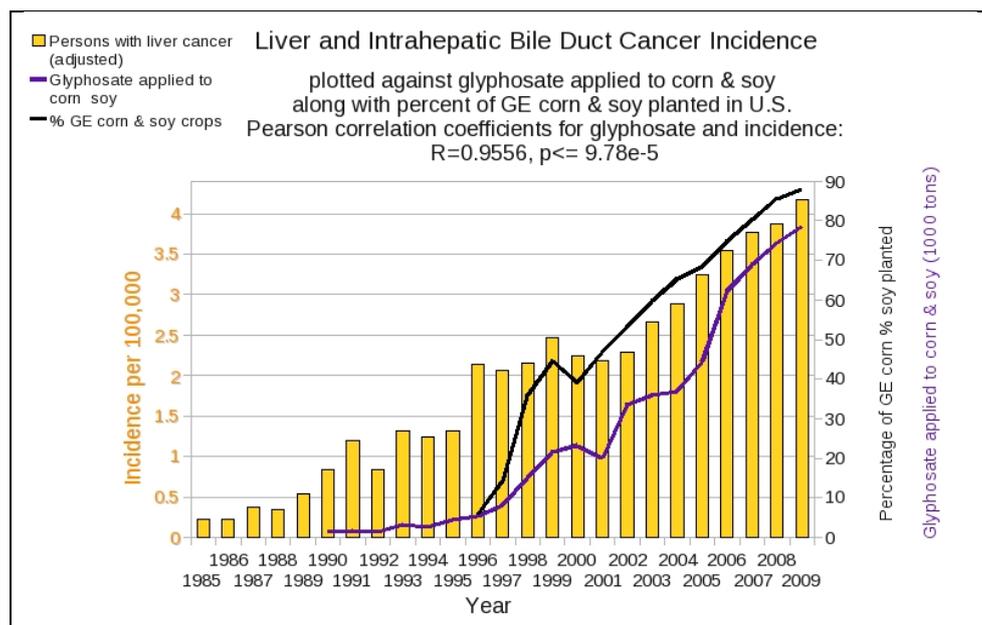
⁹⁴ <http://dx.doi.org/10.1016/j.fct.2012.08.005>

GMO and Roundup® treatments. In treated males, liver congestions and necrosis were 2.5 - 5.5 times higher. This pathology was confirmed by optic and transmission electron microscopy. Marked and severe kidney nephropathies were also generally 1.3 -2.3 greater. Males presented 4 times more large palpable tumors (kidney) than controls which occurred up to 600 days earlier. Biochemistry data confirmed very significant kidney chronic deficiencies; for all treatments and both sexes, 76% of the altered parameters were kidney related. These results can be explained by the non- linear endocrine-disrupting effects of Roundup®, but also by the overexpression of the transgene in the GMO and its metabolic consequences.”

Highlights:

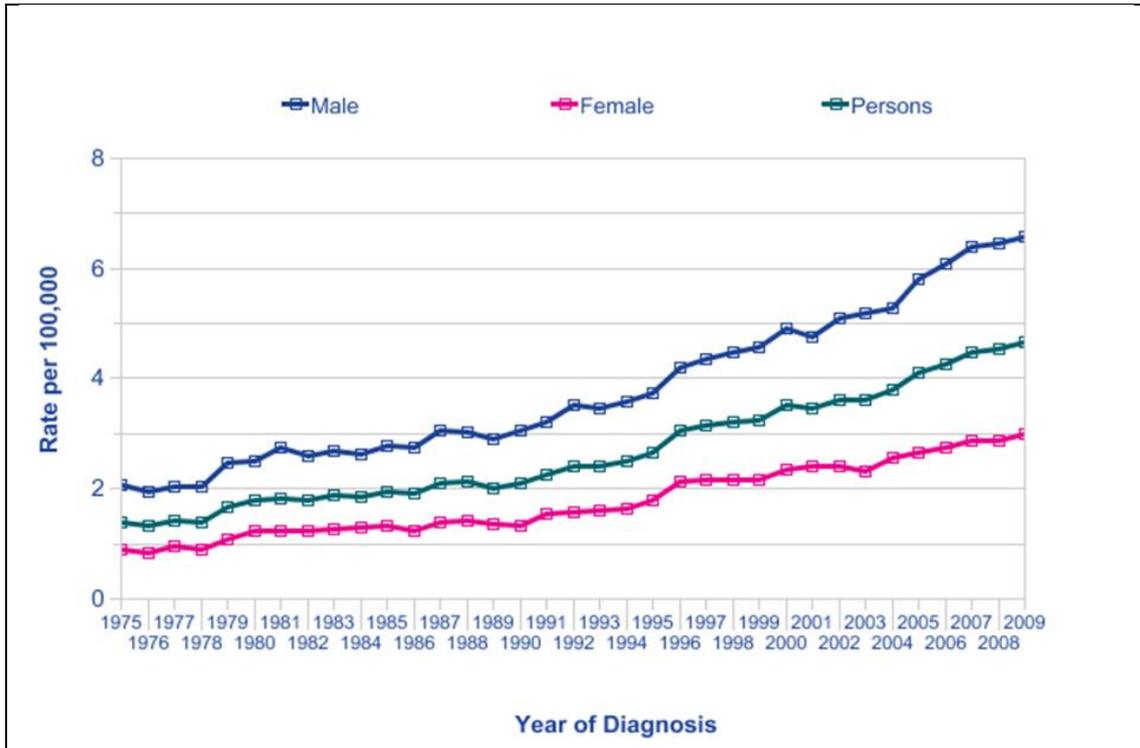
- A Roundup®-tolerant maize and Roundup® provoked chronic hormone and sex dependent pathologies.
- Female mortality was 2-3 times increased mostly due to large mammary tumours and disabled pituitary.
- Males had liver congestions, necrosis, severe kidney nephropathies and large palpable tumours.
- This may be due to an endocrine disruption linked to Roundup® and a new metabolism due to the transgene.
- GMOs and formulated pesticides must be evaluated by long term studies to measure toxic effects.

Watch the 12 minute You Tube video explaining the whole 2-year experiment by Séralini’s team in the CRIIGEN laboratory⁹⁵.

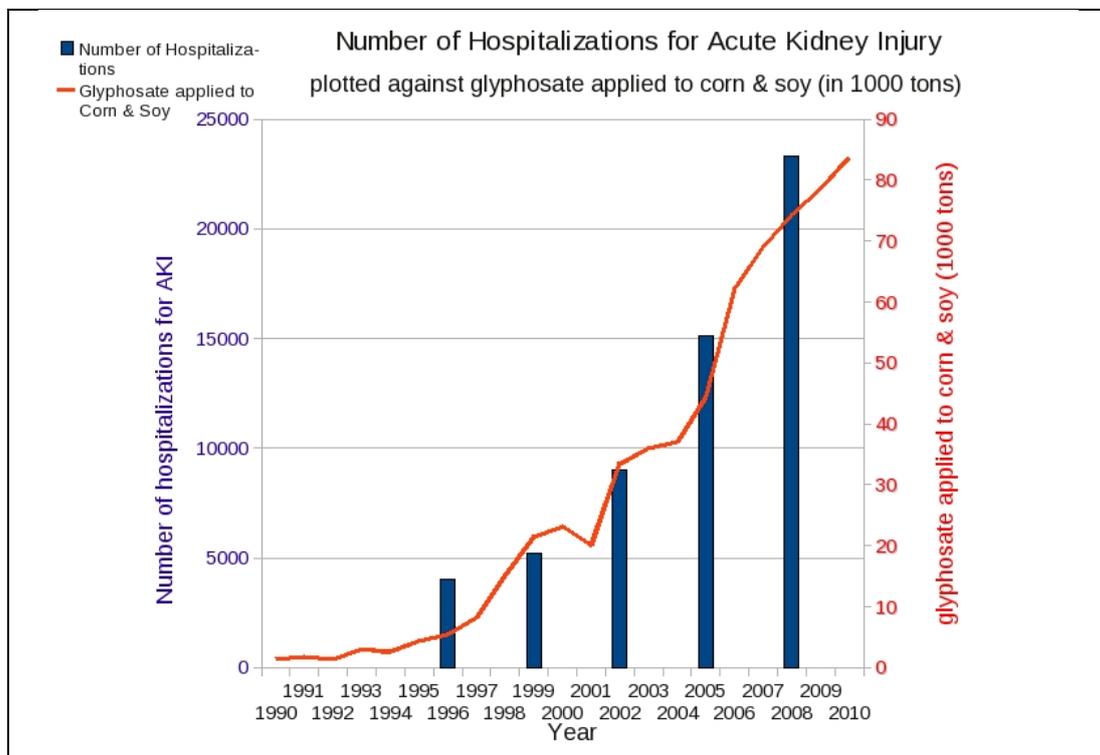


Graph 5 Persons with liver and bile duct cancer plotted against glyphosate applied to corn and soy and % GE corn & soy planted in the US By kind permission of Dr Nancy Swanson. Data from USDA and US CDC

⁹⁵ http://www.youtube.com/watch?v=Njd0RugGjAg&feature=player_embedded



Graph 6 Cancer Research UK (CRUK) Liver Cancer: European Age-Standardised Incidence Rates, male and females, Great Britain, 1975-2009⁹⁶



Graph 7 Number of Hospitalizations in the US for Acute Kidney Injury (a sudden, temporary, and sometimes fatal loss of kidney function) plotted against glyphosate applied to corn & soy. Data from USDA and US CDC

⁹⁶ <http://www.cancerresearchuk.org/cancer-info/cancerstats/types/liver/incidence/#trends>

Acute kidney injury (AKI) (See Graph 7 for US increases since 1990)

A new guideline report issued on Wednesday (28/08/2013) from the National Institute for Health and Care Excellence (Nice) says AKI (a sudden loss of kidney function) costs the NHS between £434m and £620m a year – more than it spends on breast, lung and skin cancer combined⁹⁷. Between 262,000 and 1 million people admitted to hospital as an emergency in a year will have AKI, of which just under a quarter will die. Dr Mark Thomas, chair of the new guideline development group and nephrologist at the Heart of England NHS Foundation Trust, said: "AKI has been something of a Cinderella condition in the past both within healthcare and in the public perception, yet it kills more people than any of the common cancers." He said AKI "is clearly one of the major patient safety issues for the NHS. It affects the vulnerable and leads to thousands of unnecessary deaths because of failings in care." Professor Donal O'Donoghue, the government's national clinical director for kidney care from 2007 to earlier this year, has said 32 people die needlessly every day from AKI. He said AKI represented a "human tragedy".

EFSA's new assessment of GM crops⁹⁸

The European Food Safety Authority (EFSA) has finally issued new guidelines for two-year whole food feeding studies to assess the risk of long-term toxicity and carcinogenicity from GM foods.

Non-Hodgkin's Lymphoma & Hairy Cell Leukemia

Two Swedish studies suggested that herbicides, particularly glyphosate, were associated with the above conditions.

Lennart Hardell, Mikael Eriksson, Marie Nordstrom: Exposure to pesticides as risk factor for non-Hodgkin's lymphoma and hairy cell leukemia: pooled analysis of two Swedish case-control studies. *Leuk Lymphoma*. 2002 May; 43(5):1043-9⁹⁹

Increased risk for non-Hodgkin's lymphoma (NHL) following exposure to certain pesticides has previously been reported. Among herbicides, significant associations were found for glyphosate (OR 3.04, CI 95% 1.08-8.52) and 4-chloro-2-methyl phenoxyacetic acid (MCPA) (OR 2.62, CI 95% 1.40-4.88). For several categories of pesticides the highest risk was found for exposure during the latest decades before diagnosis

Eriksson M, Hardell L, Carlberg M, Akerman M. Pesticide exposure as risk factor for non-Hodgkin lymphoma including histopathological subgroup analysis¹⁰⁰. *Int J.Cancer*. 2008, 123:1657-1663. In this category the dominating agent was glyphosate, which was reported by 29 cases and 18 controls, which produced OR (Odds Ratio) 2.02 (95% CI 1.10–3.71)

Glyphosate induces human breast cancer cells growth via estrogen receptors

Thongprakaisang S, Thiantanawat A, Rangkadilok N, Suriyo T, Satayavivad J. Glyphosate induces human breast cancer cells growth via estrogen receptors. *Food Chem Toxicol*. 2013, 59C: 129-136. doi: 10.1016/j.fct.2013.05.057¹⁰¹

The study found that breast cancer cell proliferation is accelerated by glyphosate in extremely low concentrations. "The present study used pure glyphosate substance at log intervals from

⁹⁷ <http://www.theguardian.com/society/2013/aug/28/kidney-care-lives-nice>

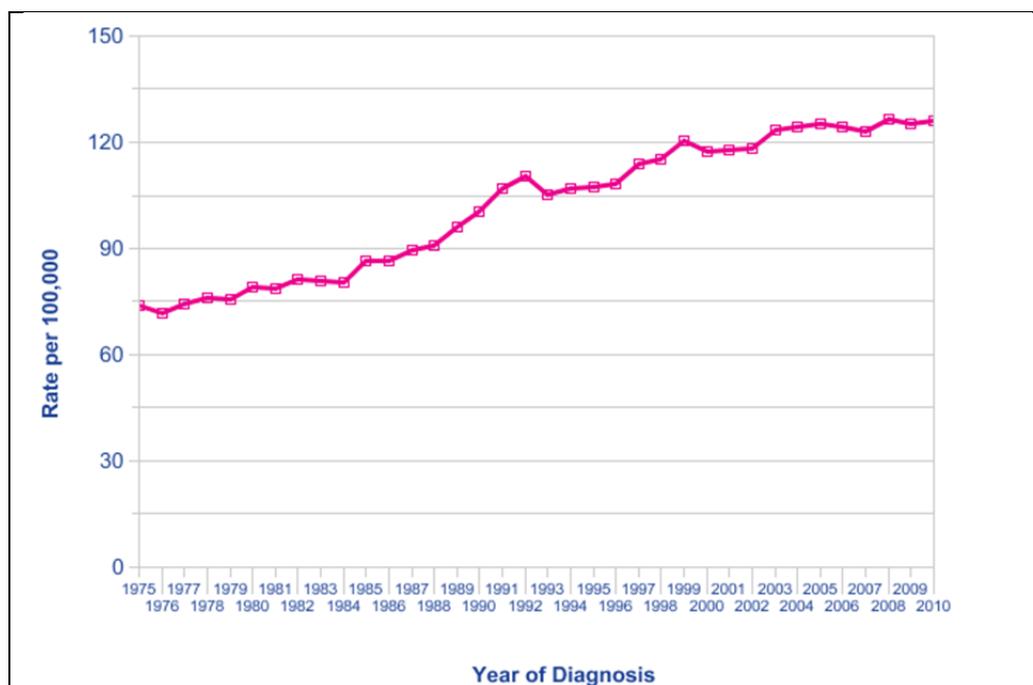
⁹⁸ <http://www.efsa.europa.eu/en/efsajournal/pub/3347.htm>

⁹⁹ <http://www.ncbi.nlm.nih.gov/pubmed/12148884>

¹⁰⁰ <http://onlinelibrary.wiley.com/doi/10.1002/ijc.23589/full>

¹⁰¹ <http://www.ncbi.nlm.nih.gov/pubmed/23756170>

10^{-12} to 10^{-6} M. These concentrations are in a crucial range which correlated to the potential biological levels at part per trillion (ppt) to part per billion (ppb) which have been reported in epidemiological studies.”



Graph 8 Cancer Research UK Breast Cancer (C50), European Age-Standardised Incidence Rates, Females, Great Britain, 1975-2010¹⁰²

Effects on male reproduction

Clair, É., Mesnage, R., Travert, C., Séralini, G-É. A glyphosate-based herbicide induces necrosis and apoptosis in mature rat testicular cells *in vitro*, and testosterone decrease at lower levels. *Toxicology in Vitro* **26** (2) 269-279 2012.¹⁰³

de Liz Oliveira Cavalli VL *et al.* Roundup® Disrupted Male Reproductive Functions By Triggering Calcium-Mediated Cell Death In Rat Testis And Sertoli Cells¹⁰⁴.

Yousef, M.I. *et al.* Toxic effects of carbofuran and glyphosate on semen characteristics in rabbits. *J Environ Sci Health B.* 1995 Jul; 30(4):513-34¹⁰⁵.

The present study was undertaken to investigate the effect of chronic treatment with two sublethal doses of Carbofuran (carbamate insecticide) and Glyphosate (organophosphorus herbicide) on body weight and semen characteristics in mature male New Zealand white rabbits. Pesticide treatment resulted in a decline in body weight, libido, ejaculate volume, sperm concentration, semen initial fructose and semen osmolality. This was accompanied with increases in the abnormal and dead sperm and semen methylene blue reduction time. The hazardous effect of these pesticides on semen quality continued during the recovery period, and was dose-dependent. These effects on sperm quality may be due to the direct cytotoxic effects of these pesticides on spermatogenesis and/or indirectly via hypothalamic-pituitary-testis axis which control the reproductive efficiency.

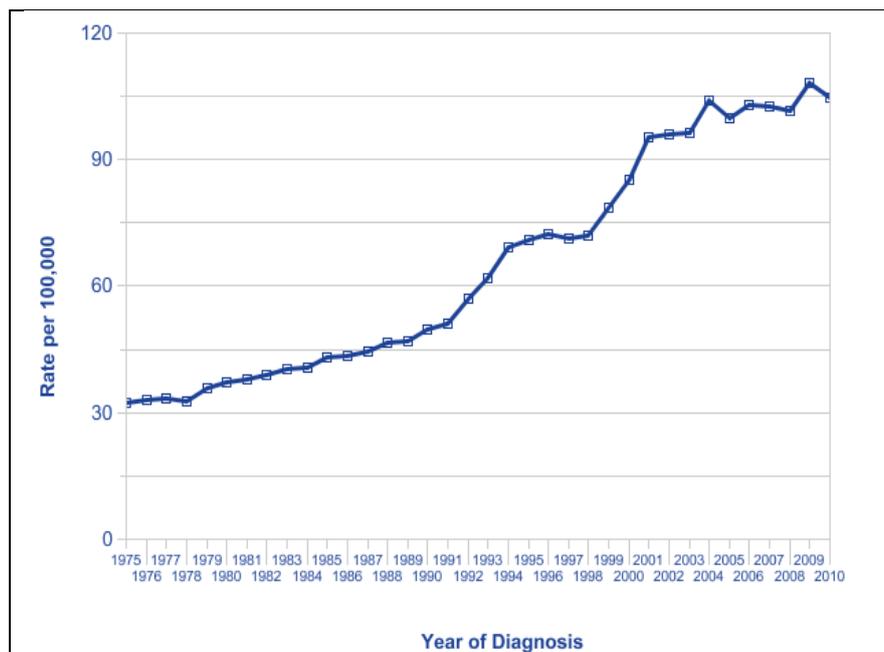
¹⁰² <http://www.cancerresearchuk.org/cancer-info/cancerstats/types/breast/incidence/#trends>

¹⁰³ <http://www.ncbi.nlm.nih.gov/pubmed/22200534>

¹⁰⁴ <http://www.sciencedirect.com/science/article/pii/S0891584913003262>

¹⁰⁵ <http://www.ncbi.nlm.nih.gov/pubmed/7797819>

What is causing the steep rise in prostate cancer in men in Great Britain?



Graph 9 CRUK incidence figures for Prostate Cancer 1975-2010. European Age standardised incidence rates per 100,000 Population, males, Great Britain¹⁰⁶

Hsing, A.V., Chokkalingam, A.P. Prostate cancer epidemiology *Frontiers in Bioscience* 2006, 11: 1388-1413¹⁰⁷. In examining the epidemiology of prostate cancer, the authors presented evidence for further areas of promising research: defects in DNA repair pathway, the role of inflammation markers and biological pathways related to dietary factors.

Effects on pathogens in farm animals: evidence that glyphosate destroys beneficial bacteria and allows harmful ones, such as salmonella, and clostridium, to flourish

Clair, E. *et al.* Effects of Roundup® and Glyphosate on Three Food Microorganisms: *Geotrichum candidum*, *Lactococcus lactis* subsp. *cremoris* and *Lactobacillus delbrueckii* subsp. *bulgaricus*. *Curr Microbiol.* Epub 2012 Feb 24.¹⁰⁸

Shehata, A.A. *et al.* The Effect of Glyphosate on Potential Pathogens and Beneficial Members of Poultry Microbiota *In Vitro*. *Current Microbiology* 2013, 66 (4): 350-358¹⁰⁹

Krüger, M. *et al.* Glyphosate suppresses the antagonistic effect of *Enterococcus* spp. on *Clostridium botulinum*. *Anaerobe* 2013, Feb 6¹¹⁰.

In the search for the causes of serious diseases of entire herds of animals in northern Germany, especially cattle, glyphosate has repeatedly been detected in the urine, faeces, milk and feed of the animals¹¹¹. Even more alarming, glyphosate was detected in the urine of the farmers. This could explain why the incidence of food poisoning is not decreasing in humans.

¹⁰⁶ <http://www.cancerresearchuk.org/cancer-info/cancerstats/types/prostate/incidence/uk-prostate-cancer-incidence-statistics#trends>

¹⁰⁷ <http://dceg.cancer.gov/files/hsing1113882006.pdf>

¹⁰⁸ <http://link.springer.com/article/10.1007/s00284-012-0098-3>

¹⁰⁹ <http://link.springer.com/article/10.1007/s00284-012-0277-2>

¹¹⁰ <https://www.ncbi.nlm.nih.gov/m/pubmed/23396248/?i=4&from=/15071029/related>

¹¹¹ <http://www.ithaka-journal.net/druckversionen/e052012-herbicides-urine.pdf>

Evidence of GMO harm in pig study¹¹²

Judy A. Carman, Howard R. Vlieger, Larry J. Ver Steeg *et al.* A long-term toxicology study on pigs fed a combined genetically modified (GM) soy and GM maize diet. *Journal of Organic Systems* 2013 8(1) 38-54.

This was a combined study between the US and Australia. GM-fed females had on average a 25% heavier uterus than non-GM-fed females, a possible indicator of disease that requires further investigation. Also, the level of severe inflammation in stomachs was markedly higher in pigs fed on the GM diet. The research results were striking and statistically significant.

Lead researcher Dr Judy Carman, adjunct associate professor at Flinders University, Adelaide, Australia, said: "Our findings are noteworthy for several reasons.

- First, we found these results in real on-farm conditions, not in a laboratory, but with the added benefit of strict scientific controls that are not normally present on farms.
- Second, we used pigs. Pigs with these health problems end up in our food supply. We eat them.
- Third, pigs have a similar digestive system to people, so we need to investigate if people are also getting digestive problems from eating GM crops.
- Fourth, we found these adverse effects when we fed the animals a mixture of crops containing three GM genes and the GM proteins that these genes produce. Yet no food regulator anywhere in the world requires a safety assessment for the possible toxic effects of mixtures. Regulators simply assume that they can't happen".

"Our results provide clear evidence that regulators need to safety assess GM crops containing mixtures of GM genes, regardless of whether those genes occur in the one GM plant or in a mixture of GM plants eaten in the same meal, even if regulators have already assessed GM plants containing single GM genes in the mixture."

Confirmation of 'changeover' studies

The new study lends scientific credibility to anecdotal evidence from farmers and veterinarians, who have for some years reported reproductive and digestive problems in pigs fed on a diet containing GM soy and corn. Iowa-based farmer and crop and livestock advisor Howard Vlieger, one of the coordinators of the study, said: "*For as long as GM crops have been in the feed supply, we have seen increasing digestive and reproductive problems in animals. Now it is scientifically documented. 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.*"

A Danish farming newspaper Effektivt Landbrug devoted a sizeable part of its 13th April 2012 edition to the discoveries by pig farmer Ib Borup Pedersen that GM soy has a damaging effect both on his animals and on his farming profitability. In the previous 2 years, the farm had experienced piglet diarrhoea and 35 sows had died of stomach problems. In the previous 9 months he had had 13 malformed, but live-born, piglets.

¹¹² <http://www.organic-systems.org/journal/81/8106.pdf>



Photograph by kind permission of Ib Borup Pedersen

A deformed piglet; Siamese twins

Another colleague had had similar experiences. In April 2011 Mr Pedersen changed to GM-free soya, without telling his stockman. Within days the stockman noticed that the piglet diarrhoea had stopped.

A Russian study found that feeding hamsters GMO soy resulted in complete sterility after two or three generations.

A joint study was carried out by the National Association for Gene Security and the Institute of Ecological and Evolutional Problems. One group of hamsters acted as a control; one was fed non-GM soya, one was fed with some GMO and the fourth one with an increased amount of GMO. *“When they selected new pairs from their cubs, their growth rate was slower and reached their sexual maturity slowly. We failed to get cubs from these pairs, which were fed with GM foodstuffs. It was proved that these pairs lost their ability to give birth to their cubs.” Dr. Alexei Surov said¹¹³.*

Associations with neurodegenerative disorders in humans

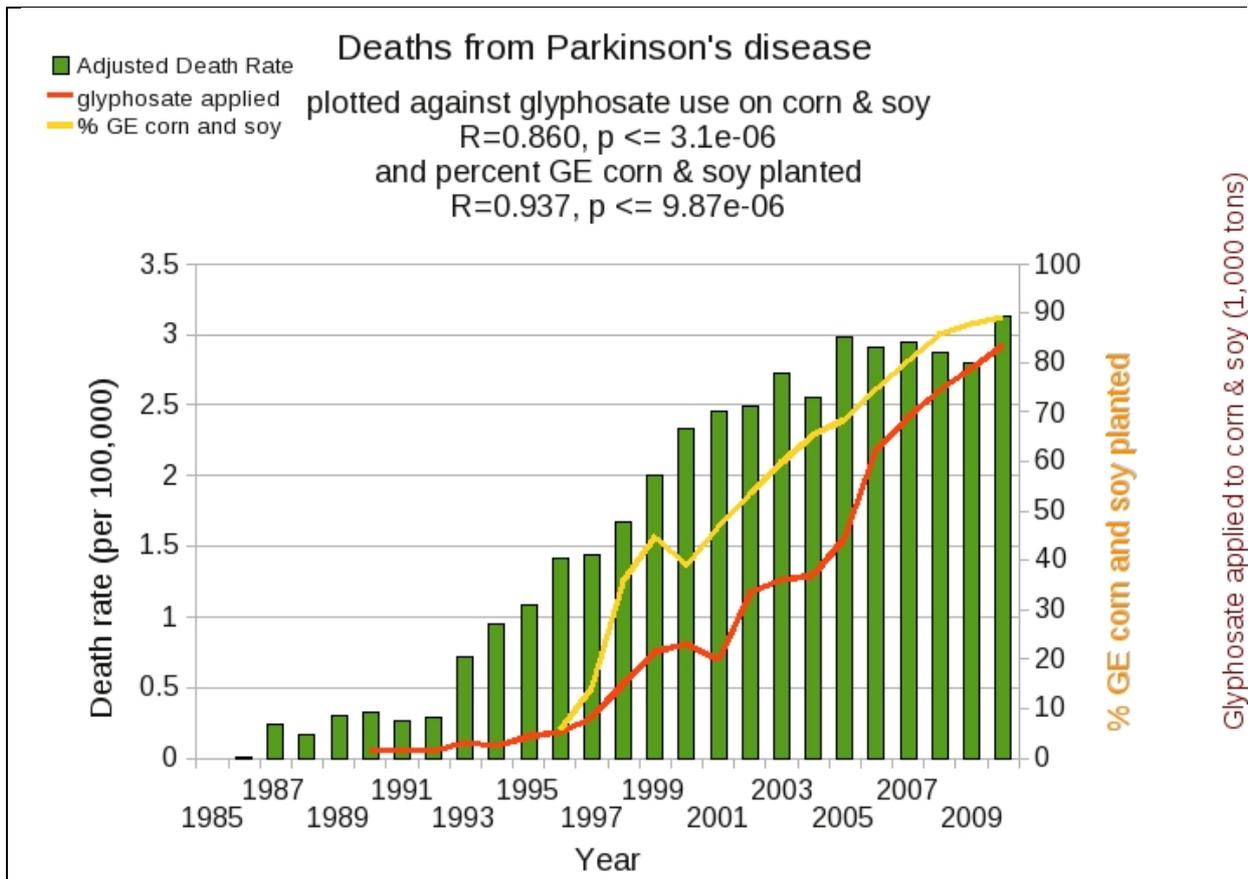
Ya-xing Gui *et al.* Glyphosate induced cell death through apoptotic and autophagic mechanisms. *Neurotoxicology and Teratology* 2012, 34 (3): 344–349¹¹⁴

Herbicides have been recognized as the main environmental factor associated with human neurodegenerative disorders such as Parkinson's disease (PD). Previous studies indicated that the exposure to glyphosate, a widely used herbicide, is possibly linked to Parkinsonism, however the underlying mechanism remains unclear. We investigated the neurotoxic effects of glyphosate in differentiated PC12 cells and discovered that it inhibited viability of differentiated PC12 cells in dose- and time-dependent manners. Furthermore, the results showed that glyphosate induced cell death via autophagy pathways in addition to activating apoptotic pathways. Interestingly, deactivation of Beclin-1 gene attenuated both apoptosis and autophagy in glyphosate treated differentiated PC12 cells, suggesting that Beclin-1 gene is involved in the crosstalk between the two mechanisms.

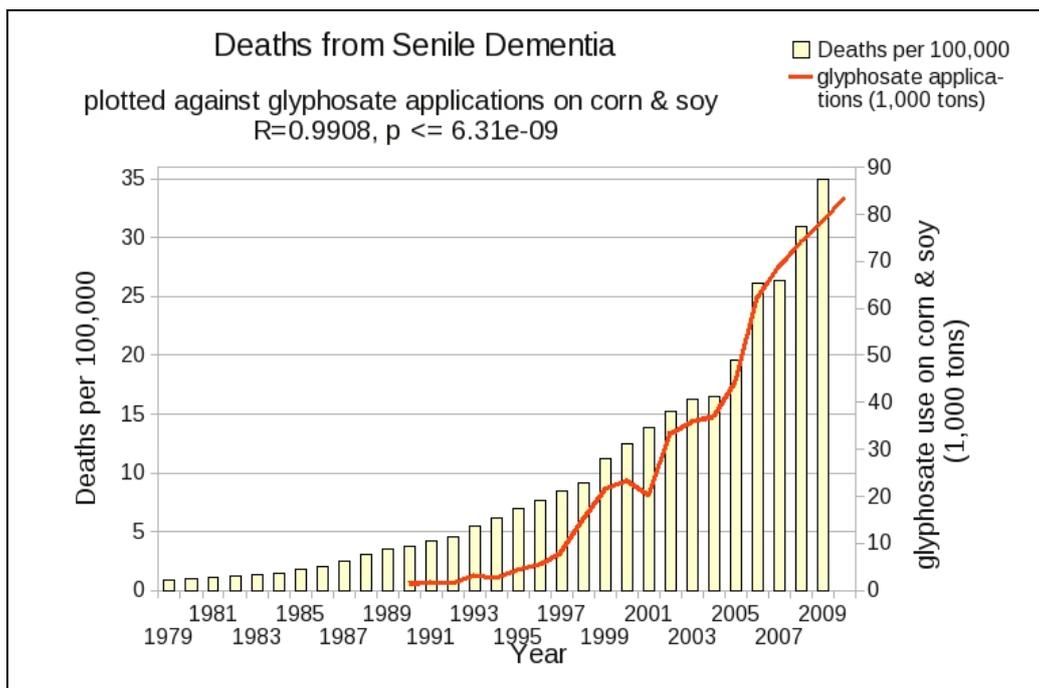
¹¹³ <http://voiceofrussia.com/2010/04/16/6524765.html/>

¹¹⁴ <http://www.sciencedirect.com/science/journal/08920362>

<http://www.activistpost.com/2012/04/roundup-herbicide-linked-to-parkinsons.htm>



Graph 10 Adjusted Death Rate from Parkinson's disease. Data from USDA and CDC. By kind permission of Dr Nancy Swanson



Graph 11 Deaths per 100,000 from Senile Dementia plotted against glyphosate applications on corn and soy. Data from USDA and CDC. By kind permission of Dr Nancy Swanson

Environmental damage: Effects on earthworms, songbirds, small mammals and bees

Springett, J.A, Gray R.A.J. Effect of repeated low doses of biocides on the earthworm *Aporrectodea caliginosa* in laboratory culture. *Soil Biol. Biochem.* 1992, 24(12): 1739-1744. *Repeated applications of glyphosate significantly affected the growth and survival of earthworms.*

Santillo DJ, Brown PW, Leslie DM. Response of songbirds to glyphosate-induced habitat changes on clearcuts. *J Wildlife Manage.* 1989, 53: 64–71. The authors investigated the use of glyphosate on intensively managed pine forests in Maine. Follow up for 1-3 years found a reduction in the complexity of vegetation and a reduction in the number of bird species.

Santillo DJ *et al.* Responses of small mammals and habitat to glyphosate application on clearcut. *J Wildlife Manage.* 1989, 53 (1): 164-172. The authors investigated the use of glyphosate on intensively managed pine forests in Maine. At 1-3 years there fewer small mammals; insectivores and herbivores were reduced because they were dependent on insect and plant communities which had been destroyed by glyphosate.

Fouk, K.E.; Reeves, C. Identifying the role of glyphosate-containing herbicides on honeybee mortality rates and colony collapse disorder¹¹⁵.

The results of this study indicate that the mortality rate of bees that were fed glyphosate-supplemented diets, both pure glyphosate and Roundup QuikPro®, were significantly greater than that of hives without glyphosate supplemented diets (p < 0.001).

Genotoxic effects of glyphosate in fish and amphibians

de Castilhos, G.N, Cestari, M.M. Genotoxic effects of the herbicide Roundup(®) in the fish *Corydoras paleatus* (Jenyns 1842) after short-term, environmentally low concentration exposure. *Environ Monit Assess.* 2013, 185 (4):3201-7. doi: 10.1007/s10661-012-2783-x¹¹⁶.

“We conclude that for the low concentration used in this research, the herbicide shows potential genotoxic effects. Future research will be important in evaluating the effects of this substance, whose presence in the environment is ever-increasing”.

Relyea, R.A. The lethal impacts of Roundup® and predatory stress on six species of North American tadpoles. *Arch. Environ. Contam. Toxicol.* 2005, 48: 351-357¹¹⁷. *“The decline in amphibians across the globe has sparked a search for the causes, and recent evidence suggests a connection with pesticides.”* Relyea found that the survival in tadpoles was greatly reduced with glyphosate at lower doses than in previous studies and that any additional predatory stress made Roundup® twice as lethal.

Glyphosate causes immune suppression in fish

Kelly, D.W. *et al.* Synergistic effects of glyphosate formulation and parasite infection on fish malformations and survival. *Journal of Applied Ecology* 2010, 47: 498–504¹¹⁸.

This is the first study to show that parasites and glyphosate can act synergistically on aquatic vertebrates at environmentally relevant concentrations, and that glyphosate might increase the risk of disease in fish. Our results have important implications when identifying risks to aquatic communities and suggest that threshold levels of glyphosate currently set by regulatory authorities do not adequately protect freshwater systems.

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http://k12science.missouristate.edu/Junior_Academy/MJAS%20Docs/State%202009/Papers%202009/HS_ENV/Fouk_Kayla_HS.pdf

¹¹⁶ <http://link.springer.com/article/10.1007%2Fs10661-012-2783-x>

¹¹⁷ <http://training.fws.gov/EC/Resources/pesticides/Aquatic%20Effects/Relyea2005.pdf>

¹¹⁸ <http://onlinelibrary.wiley.com/doi/10.1111/j.1365-2664.2010.01791.x/pdf>

The use of pesticides around the world has produced biological deserts

Here is a description of a 600 acre farm in Ohio with GMO corn on which Craig Childs¹¹⁹ spent a long weekend and found virtually nothing. *"I listened and heard nothing, no bird, no click of insect. There were no bees. The air, the ground, seemed vacant...It felt like another planet entirely," he said, a world denuded.*

Robert Krulwich's blog commented on Craig Child's description¹²⁰: *"Yet, 100 years ago, these same fields, these prairies, were home to 300 species of plants, 60 mammals, 300 birds, hundreds and hundreds of insects. This soil was the richest, the loamiest in the state. And now, in these patches, there is almost literally nothing but one kind of living thing. We've erased everything else. There's something strange about a farm that intentionally creates a biological desert to produce food for one species: us. It's efficient, yes. But it's so efficient that the ants are missing, the bees are missing, and even the birds stay away. Something's not right here. Our cornfields are too quiet."* In the UK in 2012, on a warm August evening, in a garden surrounded by arable crops, no moths came to the candles¹²¹. There was not a single insect. Few people have noticed, or care much about their loss. But flying insects are the visible manifestation of a massive iceberg of trillions of invertebrates working away unseen in soil and water. The neonicotinoid insecticides attack the nervous system receptors of all invertebrates. These are the small things that run the world. Destroy these and you ultimately destroy life itself, at least as a planet fit for humans.

A major pollution incident on the River Kennet, a chalk stream in the UK

George Monbiot wrote an article on August 5th 2013: *"Neonicotinoids are the new DDT killing the natural world."* In it he exposed the Government's cooperation with the Pesticides Industry. *"UK is collaborating in peddling the corporate line that neonicotinoid pesticides are safe to use."*¹²² He was enraged by a pollution incident that had destroyed 15 miles of pristine chalk stream. The pollution incident, which was discovered on 1st July 2013, was with chlorpyrifos an organophosphate, one of a group of pesticides that had, in theory, been banned in 1982¹²³. By 11th July it had wiped out insect and fresh water shrimp populations in the River Kennet that are food for fish, birds and amphibians. The river was beginning to stink¹²⁴. An Environment Agency spokesman described chlorpyrifos as *"a common agricultural pesticide."* A former MP said it should be banned.

Why are the organophosphates chlorpyrifos and dimethoate still being registered?

Two organophosphates are still being authorised in the UK. In 2009, the total agricultural area treated with chlorpyrifos was 277,593 ha and in 2010 dimethoate 48,264 ha¹²⁵. Defra had always denied a link between organophosphate used as sheep dip in the 1980s and

¹¹⁹ Craig Childs Apocalyptic Planet

¹²⁰ <http://www.npr.org/blogs/krulwich/2012/11/29/166156242/cornstalks-everywhere-but-nothing-else-not-even-a-bee>

¹²¹ Personal observations

¹²² <http://www.theguardian.com/environment/georgemonbiot/2013/aug/05/neonicotinoids-ddt-pesticides-nature>

¹²³ <http://www.newburytoday.co.uk/2013/kennet-pollution-hunt-for-culprit>

¹²⁴

http://www.gazetteandherald.co.uk/news/towns/marlboroughheadlines/10541095.Effects_of_pollution_on_River_Kennet_beginning_to_come_clear/

¹²⁵ <http://pusstats.csl.gov.uk/>.

neurological problems in farmers. However, a new independent study contradicted the Defra findings. Mackenzie Ross, S.J. *et al.* Neurobehavioural problems following low level exposure to organophosphate pesticides: A systematic & meta-analytic review. *Clinical Reviews in Toxicology*; 2012¹²⁶. These findings have implications for working practice for farm-workers and for other occupational groups exposed to organophosphates such as Aviation Workers and Gulf War Veterans.

Prenatal exposure to chlorpyrifos has effects on neurodevelopment aged 3 and aged 7

In the US it has been proved in several prospective studies that pre-natal exposure to chlorpyrifos causes neurodevelopmental problems. *It has long been associated with delayed neurocognitive development and most recently with decrements in working memory at age 7.*

Rauh, V. A. *et al.* Impact of Prenatal Chlorpyrifos Exposure on Neurodevelopment in the First 3 Years of Life Among Inner-City Children *Pediatrics* 2006, 118 (6) e1845-e1859 <http://doi: 10.1542/peds.2006-0338>¹²⁷.

Rauh, V *et al.* Seven-Year Neurodevelopmental Scores and Prenatal Exposure to Chlorpyrifos, a Common Agricultural Pesticide. *Environ Health Perspect.* 2011, 119:1196-1201 <http://dx.doi.org/10.1289/ehp.1003160>¹²⁸. *We report evidence of deficits in Working Memory Index and Full-Scale IQ as a function of prenatal CPF exposure at 7 years of age. These findings are important in light of continued widespread use of CPF in agricultural settings and possible longer-term educational implications of early cognitive deficits.*

Lovasi GS *et al.* Chlorpyrifos exposure and urban residential environment characteristics as determinants of early childhood neurodevelopment *Am J Public Health.* 2011, 101 (1): 63-70. doi: 10.2105/AJPH.2009.168419¹²⁹

Horton, M.K. *et al.* Does the home environment and the sex of the child modify the adverse effects of prenatal exposure to chlorpyrifos on child working memory? *Neurotoxicology and Teratology* 34, (5) 2012, 534–541¹³⁰

Human Health Effects of Developmental Exposure to Chemicals in Our Environment

Epigenetics is the study of gene changes caused by environmental exposure to chemicals in the environment. The Faroes Statement 2007¹³¹: “*The periods of embryonic, foetal and infant development are remarkably susceptible to environmental hazards. Toxic exposures to chemical pollutants during these windows of increased susceptibility can cause disease and disability in infants, children and across the entire span of human life*”.

The Policy Statement from the American Academy of Pediatrics about Pesticide Exposure in Children from the COUNCIL ON ENVIRONMENTAL HEALTH¹³² “*This statement presents the position of the American Academy of Pediatrics on pesticides. Pesticides are a collective term for chemicals intended to kill unwanted insects, plants, molds, and rodents. Children encounter pesticides daily and have unique susceptibilities to their potential toxicity. Acute poisoning risks are clear, and understanding of chronic health implications from both acute and chronic exposure are emerging. Epidemiologic evidence demonstrates associations between early life exposure to pesticides and pediatric cancers, decreased cognitive function, and behavioral problems.*”

¹²⁶ <http://www.ncbi.nlm.nih.gov/pubmed/23163581>

¹²⁷ http://www.ipminstitute.org/Fed_Agency_Resources/rauh_chlorpyrifos_pediatrics.pdf

¹²⁸ <http://ehp.niehs.nih.gov/1003160/>

¹²⁹ <http://ajph.aphapublications.org/doi/abs/10.2105/AJPH.2009.168419?journalCode=ajph>

¹³⁰ <http://dx.doi.org/10.1016/j.ntt.2012.07.004>

¹³¹ <http://www.ncbi.nlm.nih.gov/pubmed/18226057>

¹³² <http://pediatrics.aappublications.org/content/130/6/e1757>

In addition, the Royal College of Obstetricians and Gynaecologists has issued advice to the pregnant patient about avoiding exposure to pesticides¹³³.

These statements are dismissed out of hand by the Pesticides Industry

Carol J. Burns *et al.* Pesticide Exposure and Neurodevelopmental Outcomes: Review of the Epidemiologic and Animal Studies. *Journal of Toxicology and Environmental Health, Part B: Critical Reviews* 2013, 16:3-4, 127-283, DOI: 10.1080/10937404.2013.783383¹³⁴

After 158 pages of Tables, Abbreviations and Statistical Analyses: “*In conclusion, epidemiologic evidence for causality between exposure to specific pesticides during critical periods of brain development and neurobehavioral outcomes is not compelling.*”

The Review was funded by the Crop Protection Association. Carol Burns is employed by Dow. The remainder: “*are or have previously been employed by Exponent, Inc., a research and scientific consultant firm with clients from industry (including crop protection) and government*”.

- Dow is a manufacturer of chlorpyrifos (see above) which has been linked to neurodevelopmental problems.
- Dow was also the first manufacturer of the herbicide 2,4-D in 1947. In 1986 it was associated with a six-fold increase of Non-Hodgkin’s Lymphoma (NHL) among farmers exposed to herbicides more than 20 days per year. This was found to be consistent with the six-fold excess risk associated with exposure to either phenoxyacetic acids or chlorophenols in a Swedish study¹³⁵.

There are many weed killer products sold in the UK that contain 2,4-D and dicamba. They can be purchased on-line for amenity turf and pitch turf for professional use. It is the third most commonly used herbicide in the US¹³⁶. In Australia (July 2013) cheap generic 2, 4-D is being imported that has been found to contain high levels of dioxins, but APVMA does not monitor for dioxins¹³⁷. In the 1970s and 1980s, men were employed by the Agriculture Protection Board to spray noxious weeds. In Kimberley alone 320 men died and now their partners and children are getting sick. Nigel Sinclair’s father and uncle died, and now he, at 31, has terminal cancer.

Relationships between Syngenta, AstraZeneca and Defra/Fera

In 1997, Dr Peter Campbell went straight from being the Head of Ecotoxicology Branch at the Pesticides Safety Directorate in York into the post of Head of Ecological Sciences at Syngenta¹³⁸. In 2009 Syngenta and BBSRC gave £1 million to fund Warwick University and Rothamsted Research “*to help to improve honeybee health*”¹³⁹. (Rothamsted had lost funding for its Bee Unit in 2006). Syngenta funded scientific assistants at Exeter University in 2012. Syngenta pioneered Operation Bumblebee in the UK and in 2010 announced expansion of

¹³³ Royal College of Obstetricians and Gynaecologists : May 2013 Chemical Exposures in Pregnancy.pdf

¹³⁴ <http://dx.doi.org/10.1080/10937404.2013.783383>

¹³⁵ Hoar, S.K. *et al.* Agricultural Herbicide Use and Risk of Lymphoma and Soft-Tissue Sarcoma. *JAMA* 1986;256:1141-1147 <http://occupationalcancer.ca/wp-content/uploads/2012/05/Hoar-1986-Agricultural-herbicide-use-and-risk-of-lymphoma-and-STs.pdf>

¹³⁶ http://water.usgs.gov/nawqa/pnsp/usage/maps/show_map.php?year=2009&map=24D&hilo=L

¹³⁷ <http://mobile.abc.net.au/news/2013-07-22/four-corners-dangerous-dioxins/4833848>

¹³⁸ <http://uk.linkedin.com/pub/peter-campbell/4/283/6ba>

¹³⁹ <http://www.bbsrc.ac.uk/news/archive/2009/091001-pr-1million-award-honeybee-decline.aspx>

programmes across Europe; up to €1 million over 5 years¹⁴⁰. Programmes included “*What Operation Bumblebee can do for your golf course?*”

Syngenta had representatives on the Advisory Committee on Pesticides (ACP), the Committee on Toxicity of Chemicals in Foods, Consumer Products and the Environment (COT), on the Panel to choose the Pollinator Initiative Projects and on the Government’s Foresight Future of Farming Report¹⁴¹. Syngenta’s parent company AstraZeneca had two representatives on COT.

Defra’s Pesticides Forum Annual Report 2011 concluded: “*The work of the UK Pesticides Forum in 2011 confirms that the use of pesticides is **not** adversely impacting on the health of UK citizens or the environment. This is testimony to the effectiveness of both statutory and voluntary controls.*”

Syngenta commissioned a paper from Dr Helen Thompson, Fera Chief Bee Scientist An assessment of key evidence about Neonicotinoids and bees March 2013¹⁴²

The UK voted against the EU ban on neonicotinoids because it was waiting for ‘*new research on bumblebees to be completed by Fera*’.

Effects of neonicotinoid seed treatments on bumble bee colonies under field conditions was published by Dr Helen Thompson *et al.* Fera, York¹⁴³.

A letter from Defra Minister Owen Paterson to Syngenta (April 2013) was released to the *Observer* under freedom of information rules. He told the chemicals company Syngenta that he was ‘*extremely disappointed*’ by the European Commission’s proposed ban. He said that ‘*the UK has been very active*’ in opposing it and ‘*our efforts will continue and intensify in the coming days*’¹⁴⁴.

On June 4 2013, EFSA rejected the study by Thompson *et al.* 2013 as weak. It said it “*does not change the conclusions of the risk assessment*” of January 2013¹⁴⁵.

Dr Helen Thompson left Fera to join Syngenta¹⁴⁶ on 1 September 2013.

Why is the Government determined to get GM crops into Britain?

Syngenta applied to EFSA GMO Panel for GM Roundup®-tolerant maize¹⁴⁷: “*The UK Competent Authority and Syngenta applied for placing on the market of a GM, herbicide tolerant (glyphosate) maize GA21 for food and feed uses, import, processing and cultivation.*” It was adopted by the Panel on GMO on 16 December 2011. The GMO Panel claimed that there were no effects on human or animal health or the environment. However, in the main document, the Panel admitted to the problems of reduction in farmland biodiversity, selection of weed communities and selection of glyphosate-resistant weeds and

¹⁴⁰ <http://www.bbsrc.ac.uk/news/archive/2009/091001-pr-1million-award-honeybee-decline.aspx>

¹⁴¹ <http://www.bis.gov.uk/assets/foresight/docs/food-and-farming/11-546-future-of-food-and-farming-report.pdf>

¹⁴² <http://www.defra.gov.uk/publications/files/pb13937-neonicotinoid-bees-20130326.pdf>

¹⁴³

http://www.fera.defra.gov.uk/scienceResearch/scienceCapabilities/chemicalsEnvironment/documents/report_PS2371Mar13.pdf

¹⁴⁴ <http://www.guardian.co.uk/environment/interactive/2013/apr/29/environment-secretary-letter-syngenta-insecticide-ban>.

¹⁴⁵ <http://www.efsa.europa.eu/en/efsajournal/pub/3242.htm>

¹⁴⁶ <http://www.theguardian.com/environment/2013/jul/26/government-bee-scientist-pesticide-firm>

¹⁴⁷ <http://www.efsa.europa.eu/en/efsajournal/pub/2480.htm>

destruction of food webs and the ecological functions they provide. Nevertheless, it was approved by the Panel, which covered itself by saying "*The magnitude of these potential adverse environmental effects will depend on a series of factors including the specific herbicide and cultivation management applied at farm level, the crop rotation...etc.*" and recommended "*case-specific monitoring*". However, the Chairman of the Panel, who had been involved in every case of risk assessment of GE crops since the start of EFSA, did not declare his conflict of interest.

Monsanto and the Competent Authority of the Netherlands applied to EFSA GMO Panel for herbicide-tolerant GM soybean. It was adopted June 2012¹⁴⁸. "*If subjected to appropriate management measures, the cultivation of soybean 40-3-2 is unlikely to have environmental effects any more adverse than those associated with conventional soybean cultivation*".

Prof Maurice Moloney was appointed Director and Chief Executive of Rothamsted Research on 15/04/2010¹⁴⁹. "*Previously, he was the head of the Cell Biology Group at Calgene Inc., where he developed the first transgenic oilseed plants using Canola as the model. This resulted in a landmark patent in plant biotechnology and eventually became the basis of RoundUp® Ready and Liberty Link® Canola, which now commands 85% of the Canola acreage in Canada, a market of more than \$100 MM per annum.*"

Prof Jonathan Jones¹⁵⁰ was Head of the Sainsbury Laboratory between 1994 and 1997. He then returned to the post in 2003. In 1997 he left to start two companies: Mendel Biotechnology (MBT) to carry out genomics experiments and Norfolk Plant Sciences Ltd to combine health-promoting traits and disease-resistance traits in potatoes and tomatoes. Monsanto is an investor and collaborator in MBT and in the 2008 Annual Report, Monsanto's Vice President Stephen Padgett is listed as on the Advisory Board. Prof Jones admitted in *The Observer* in 2010 that MBT had contracts with Monsanto, Bayer and BP, but that "*he had never tried to hide them*". In Plant Science News, 16/10/2011: "Leading plant researchers' call for science-based GM regulation", both he and Prof Maurice Moloney, Director of Rothamsted Research, forgot to declare their "*multinational*" connections.

Prof Jonathan Jones believes glyphosate to be harmless to mammals

January 2012 I had emailed Prof Jones about Monsanto's GM corn not being sold in France.

Dear Rosemary

Glyphosate is not poisonous to mammals- it inhibits EPSP synthase, an enzyme that mammals lack because we obtain aromatic amino acids in our diet. Roundup the herbicide contains surfactants- basically soaps- the consumption of which is ill advised. Roundup is considerably less damaging to the environment than the herbicides it replaced, such as those made by American Cyanamid (now bankrupt).

France has elected to reject the judgement of the European Court that it has no right to block planting of an approved insect resistant maize variety containing MON810. Fortunately Spain and Portugal have not been so stupid and their farmers plant 100k hectares of GM maize which requires less insecticides to control corn borer.

If the cost of deregulation of useful and benign GM traits were lower, there would be more competition for the MNCs from small companies and the public sector.

Regards Jonathan"

¹⁴⁸ <http://www.efsa.europa.eu/en/efsajournal/pub/2753.htm>

¹⁴⁹ <http://www.rothamsted.ac.uk/PersonDetails-Who=1086.html>

¹⁵⁰ <http://www.tsl.ac.uk/profile/jonathan-jones.asp>

Why is the pesticides industry investing so much money in human health?

Syngenta's parent company is AstraZeneca. AstraZeneca manufactures six different anti-cancer drugs mainly aimed at breast and prostate cancer. The Corporation has links in Asia, including Hospitals in China, Japan, Korea, and collaborators in Russia. AstraZeneca's Oncology Website¹⁵¹ has the following portentous prediction: "*Cancer claims over 7 million lives every year and the number continues to rise. Deaths are estimated to reach 12 million by 2030.*"

Michael Pragnell MA MBA was the founder of Syngenta and CEO of Syngenta AG based in Switzerland (from its public listing in 2000 to the end of 2007). He was appointed a Trustee of Cancer Research UK (CRUK) in March 2010 and Chairman in November 2010. CRUK is donating money (£450 million/year) to the Government's Strategy for UK Life Sciences¹⁵² and AstraZeneca is providing 22 compounds to academic research to develop medicines.

Signatures of mutational processes in human cancer: Genetic map of cancer mutations

A study of mutations from 7,042 cancers by the Sanger Institute revealed that 21 distinct mutational signatures that alone, or in combination, drive 30 different types of cancer¹⁵³. Mutations of DNA may be due to "*chemicals in the environment or faults that arise during aging.*" "*The work has shed light on how the body's natural defences might inadvertently drive a range of cancers. When cells are infected by viruses, they can switch on genes that produce a family of enzymes. These enzymes destroy viruses by mutating their DNA, but the onslaught may cause collateral damage.*" "*It's speculation, but it may be that in killing the virus, many mutations are scattered in the genome of the cell itself, and that cell can then go on to become a cancer,*" said Prof Mike Stratton. "*The findings are expected to drive research into the causes of mutations behind each cancer. One way to do this is to expose human cells to suspected carcinogens in the environment to see if they produce similar patterns of mutations*"¹⁵⁴.

Pesticides are the obvious choice, since they are ubiquitous and are designed to kill

But few scientists dare to mention them for fear of being vilified by industry, losing their jobs, or threats of withdrawal of funding from their Universities. Prof Nic Jones, Chief Scientist at Cancer Research UK (whose Chairman is Michael Pragnell of Syngenta) was silent on the subject of pesticides. He could only suggest smoking and overexposure to UV rays as possible causes of faults in DNA that can lead to cancer¹⁵⁵. CRUK website on Pesticides and Cancer denies links to pesticides: "*For now, the evidence is not strong enough to give us any clear answers. But for individual pesticides, the evidence was either too weak to come to a conclusion, or only strong enough to suggest a "possible" effect. The scientific evidence on pesticides and cancer is still uncertain and more research is needed in this area*"¹⁵⁶.

¹⁵¹ <http://www.astrazeneca.co.uk/medicines/oncology>

¹⁵² https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/32457/11-1429-strategy-for-uk-life-sciences.pdf

¹⁵³ <http://www.nature.com/nature/journal/vaop/ncurrent/full/nature12477.html>

¹⁵⁴ <http://www.theguardian.com/science/2013/aug/14/genetic-map-cancer-mutation-disease>

¹⁵⁵ <http://www.theguardian.com/science/2013/aug/14/genetic-map-cancer-mutation-disease>

¹⁵⁶ <http://www.cancerresearchuk.org/cancer-info/healthyliving/cancercontroversies/pesticides/>

Many independent scientists over the years have been subjected to outrageous treatment when they have suggested inconvenient truths about GMO science¹⁵⁷.

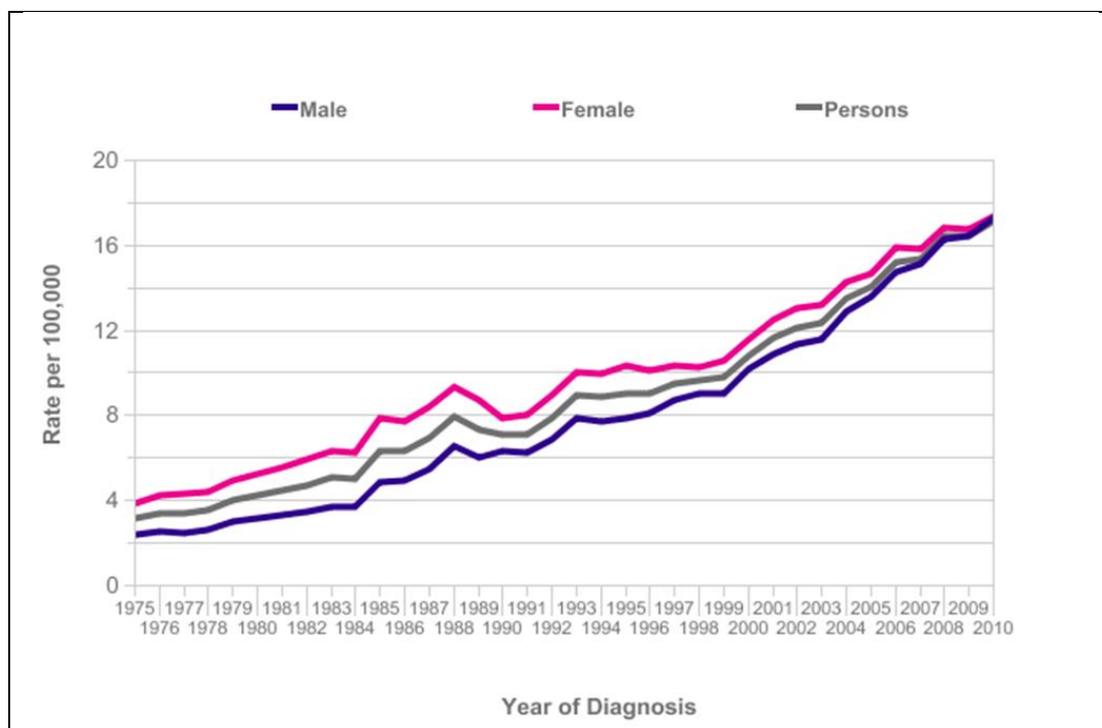
Cancer Research UK: Chairman, founder of Syngenta: 21/08/2013 Death rates from malignant melanoma in men higher than in women. Sunburn can damage DNA

“Death rates from malignant melanoma – the most serious type of skin cancer – are 70 per cent higher in men than women, despite similar numbers being diagnosed with the disease each year – according to the latest figures from Cancer Research UK, today (Wednesday). Each year in the UK, 3.4 men per 100,000 compared with 2.0 women die from malignant melanoma. But incidence rates are similar with 17.2 men per 100,000 diagnosed compared with 17.3 women.

This means that, of the 6,200 men who develop melanoma each year, 1,300 die from the disease, while 900 of the 6,600 women who develop it die.

And the gap is predicted to widen in the future, with death rates from malignant melanoma on the increase in men but remaining stable for women.

Since the early 70s, death rates in men have increased by 185 per cent compared to a rise of only 55 per cent in women. The key risk factors for melanoma include excessive exposure to UV from sunlight or sunbeds, pale skin colour and a high number of moles, and a family or personal history of the disease. Sunburn is a clear sign that the DNA in your skin cells has been damaged and, over time, this can lead to skin cancer”.



Graph 12 Malignant Melanoma: Age standardised incidence rates per 100,000 Population by sex, Great Britain. Prepared by Cancer Research UK¹⁵⁸

Evidence that pesticides can damage DNA

There is plenty of independent science that demonstrates that pesticides can damage DNA

¹⁵⁷ http://www.gmfrecymru.org.uk/open_letters/Open_letter26Jan2011.html The GM science community is its own worst enemy. Open Letter to Sir Paul Nurse, President of the Royal Society.

¹⁵⁸ <http://info.cancerresearchuk.org/cancerstats/faqs/#>

Simoniello, M.F. *et al.* DNA damage in workers occupationally exposed to pesticide mixtures. *J Appl Toxicol.* 2008, 28 (8): 957-65. doi: 10.1002/jat.1361¹⁵⁹.

“Pesticides are used in agriculture to protect crops but represent at the same time a potential risk to farmers and environment. The aim of this work is the evaluation of 54 subjects occupationally exposed to pesticides and 30 subjects as a control group using the quantification of DNA damage level by means of the alkaline Comet assay and the evaluation of repair processes. Damage index Comet assay (DICA) and damage index repair assay (DIRA) were studied in 27 pesticide applicator workers, 27 non-pesticide applicators and controls. Our results show that both exposed groups revealed significant increase in DICA when compared with controls ($P < 0.0001$), as well as in DIRA ($P < 0.0001$). However, the spraying group exhibited a marginally significant difference in DICA ($P = 0.05$) when years of exposure are considered and a significant difference ($P < 0.05$) when the personal protective equipment used by individuals was taken as a comparison factor. The influence of confounding factors on the genotoxic effects of occupational exposure to pesticides was investigated and no significant differences were observed considering age, gender, smoking and alcohol consumption in relation to DICA and DIRA. Since DNA damage is an important step in events leading from carcinogen exposure to cancer disease, our study highlights the potential health risk associated with agrochemical exposure in developing countries with vast cultivated areas, such as Argentina”.

Danieli Benedetti *et al.* Genetic damage in soybean workers exposed to pesticides: Evaluation with the comet and buccal micronucleus cytome assays. *Mutation*

Research/Genetic Toxicology and Environmental Mutagenesis 2013, 752 (1-2): 28-33¹⁶⁰

“Soybean cultivation is widespread in the State of Rio Grande do Sul (RS, Brazil), especially in the city of Espumoso. Soybean workers in this region are increasingly exposed to a wide combination of chemical agents present in formulations of fungicides, herbicides, and insecticides. In the present study, the comet assay in peripheral leukocytes and the buccal micronucleus (MN) cytome assay (BMCyt) in exfoliated buccal cells were used to assess the effects of exposures to pesticides in soybean farm workers from Espumoso. A total of 127 individuals, 81 exposed and 46 non-exposed controls were evaluated. Comet assay and BMCyt (micronuclei and nuclear buds) data revealed DNA damage in soybean workers. Cell death was also observed (condensed chromatin, karyorrhectic, and karyolytic cells). Inhibition of non-specific choline esterase (BchE) was not observed in the workers. The trace element contents of buccal samples were analyzed by Particle-Induced X-ray Emission (PIXE). Higher concentrations of Mg, Al, Si, P, S, and Cl were observed in cells from workers. No associations with use of personal protective equipment, gender, or mode of application of pesticides were observed. Our findings indicate the advisability of monitoring genetic toxicity in soybean farm workers exposed to pesticides”.

Glyphosate and the additives in Roundup® are toxic to human cells

Marc, J., Mulner-Lorillon, O., Bellé, R. Glyphosate-based pesticides affect cell cycle regulation¹⁶¹. *Biol Cell.* 2004, 96 (3): 245-9 *Cell-cycle dysregulation is a hallmark of tumor cells and human cancers. Failure in the cell-cycle checkpoints leads to genomic instability and subsequent development of cancers from the initial affected cell. All the tested products,*

¹⁵⁹ <http://www.ncbi.nlm.nih.gov/pubmed/18636400>

¹⁶⁰ <http://www.sciencedirect.com/science/article/pii/S138357181300003X>

¹⁶¹ <http://www.ncbi.nlm.nih.gov/pubmed/15182708>

Amega, Cargly, Cosmic, and Roundup Biovert induced cell cycle dysfunction. The threshold concentration for induction of cell cycle dysfunction was evaluated for each product and suggests high risk by inhalation for people in the vicinity of the pesticide handling sprayed at 500 to 4000 times higher dose than the cell-cycle adverse concentration.

Marc, J., Bellé, R. Formulated Glyphosate Activates the DNA-Response Checkpoint of the Cell Cycle Leading to the Prevention of G2/M Transition *Toxicological Sciences* 2004, 82 (2): 436-442.¹⁶² “At a concentration that efficiently impeded the cell cycle, formulated glyphosate inhibited the synthesis of DNA occurring in S phase of the cell cycle. The extent of the inhibition of DNA synthesis by formulated glyphosate was correlated with the effect on the cell cycle.”

Koller, V.J. *et al.* Cytotoxic and DNA-damaging properties of glyphosate and Roundup in human-derived buccal epithelial cells¹⁶³. *Arch. Toxicol.* 2012, 86 (5): 805-13 doi:

10.1007/s00204-012-0804-8

“Recent findings indicate that glyphosate exposure may cause DNA damage and cancer in humans. Since we found genotoxic effects after short exposure to concentrations that correspond to a 450-fold dilution of spraying used in agriculture, our findings indicate that inhalation may cause DNA damage in exposed individuals”.

Sophie Richard, Safa Moslemi, Herbert Sipahutar, Nora Benachour, Gilles-Eric Séralini. Differential Effects of Glyphosate and Roundup on Human Placental Cells and Aromatase *Environ Health Perspect.* 2005, 113 (6): 716–720¹⁶⁴ *Here we show that glyphosate is toxic to human placental JEG3 cells within 18 hr with concentrations lower than those found with agricultural use, and this effect increases with concentration and time or in the presence of Roundup adjuvants. Surprisingly, Roundup is always more toxic than its active ingredient. We tested the effects of glyphosate and Roundup at lower nontoxic concentrations on aromatase, the enzyme responsible for estrogen synthesis. The glyphosate-based herbicide disrupts aromatase activity and mRNA levels and interacts with the active site of the purified enzyme, but the effects of glyphosate are facilitated by the Roundup formulation in microsomes or in cell culture.*

Martini, C.N. *et al.* A commercial formulation of glyphosate inhibits proliferation and differentiation to adipocytes and induces apoptosis in 3T3-L1 fibroblasts. *Toxicol In Vitro.* 2012, 26 (6): 1007-13. doi: 10.1016/j.tiv.2012.04.017¹⁶⁵. *According to our results, a glyphosate-based herbicide inhibits proliferation and differentiation in this mammalian cell line and induces apoptosis suggesting GF-mediated cellular damage. Thus, GF is a potential risk factor for human health and the environment.*

US National Cancer Institute Agricultural Health Study¹⁶⁶

A prospective study of agricultural workers. The AHS cohort includes 90,000 men and women who live in Iowa or North Carolina who were recruited between 1993 and 1997. *What are some of the cancer trends among farmers? For example, farming communities have higher rates of leukemia, non-Hodgkin's lymphoma, multiple myeloma, and soft tissue sarcoma, as well as cancers of the skin, lip, stomach, brain, and prostate*”. Scientific studies have suggested that pesticide exposure may increase the risk of developing Parkinson's disease.

¹⁶² <http://toxsci.oxfordjournals.org/content/82/2/436.full.pdf>

¹⁶³ <http://www.ncbi.nlm.nih.gov/pubmed/22331240>

¹⁶⁴ [10.1289/ehp.7728](http://dx.doi.org/10.1289/ehp.7728)

¹⁶⁵ <http://www.ncbi.nlm.nih.gov/pubmed/22546541>

¹⁶⁶ <http://www.cancer.gov/cancertopics/factsheet/Risk/ahs>

All pesticide exposure is now associated with cancer risk, not just farmers

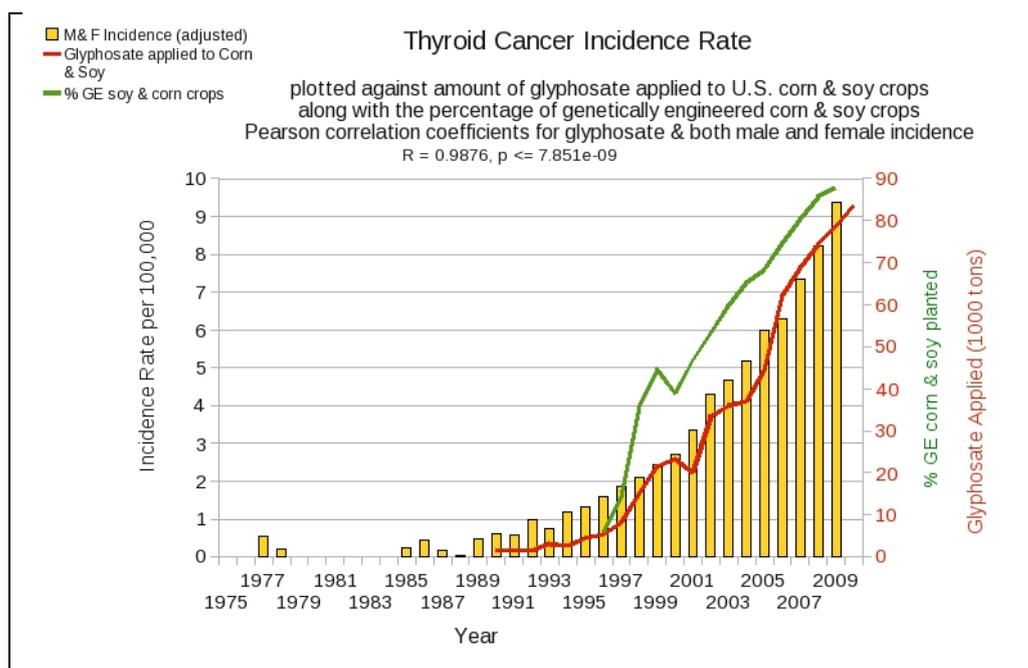
Alavanja, M.C.R., Ross, M.K., Bonner, M.R. Increased Cancer Burden Among Pesticide Applicators and Others Due to Pesticide Exposure. *CA Cancer J Clin* 2013 63 (2): 120–142¹⁶⁷. “There is substantial evidence that the pesticides used in agricultural, commercial, and home and garden applications are associated with excess cancer risk...Rather than wait for human carcinogens to be identified, several European countries, including Sweden, Denmark, the Netherlands, and others, have initiated pesticide use reduction policies that have resulted in substantially diminished pesticide use overall” ...but not the British Government, nor that of the United States. In both countries the Industry has persuaded governments that they should adopt chemically-based systems of Agriculture ‘in order to feed the world’. These are chemicals of mass destruction, to which all humans are now exposed in the home and farm environment, in groundwater and drinking water.

Thyroid cancer rates are increasing in Scotland

“In 1986, there were 1.8 cases of thyroid cancer per 100,000 Population. But since then, the rate has risen sharply to 3.1 - which translates into hundreds of extra tumours being discovered. There were a record 202 cases in Scotland in 2007”¹⁶⁸.

Reynolds, R.M. *et al.* Changing trends in incidence and mortality of thyroid cancer in Scotland *Clinical Endocrinology* 2005, 62: 156-62¹⁶⁹.

Thyroid cancer was three times more common in females than in males and was more common in older than younger age groups. Between 1960 and 2000, the annual EASR of thyroid cancer increased from 1.76 to 3.54 per 100,000 for females ($P < 0.001$) and from 0.83 to 1.25 per 100,000 in males ($P < 0.001$). The overall thyroid cancer increase between 1975 and 2000 was primarily caused by an increase in papillary thyroid cancer, particularly over the most recent decade.



¹⁶⁷ <http://onlinelibrary.wiley.com/doi/10.3322/caac.21170/full>

¹⁶⁸ <http://www.dailyrecord.co.uk/news/health/campaigners-demand-probe-into-rise-in-scots-1101255>

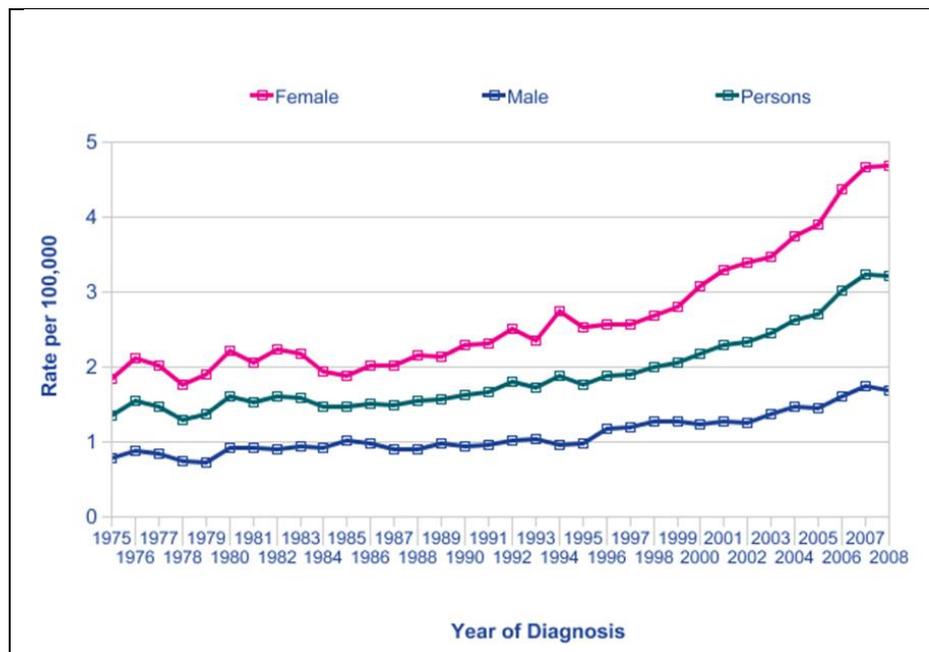
¹⁶⁹ <http://www.ncbi.nlm.nih.gov/pubmed/15670190>

Graph 13 Incidence of thyroid cancer (adjusted) related to glyphosate applied to corn & soy crops and % GE soy & corn crops in the US. Data from USDA and CDC. Graph reproduced by kind permission of Dr Nancy Swanson.

US Annual percentage changes for cancer of the thyroid between 1975 and 2010¹⁷⁰

Sex	Period	Trend
Female	1975-1981	-1.6
	1981-1996	+2.5*
	1996-2010	+6.6*
Male	1975-1980	-4.6
	1980-1997	+1.8*
	1997-2010	+5.5*

Statistically significant*



Graph 14 CRUK statistics: Thyroid cancer (C73), European Age-Standardised Incidence Rates, Great Britain, 1975-2008¹⁷¹

Strong correlation was shown between cancer of the thyroid and glyphosate use on GE corn and soy crops, and that thyroid cancer affects women more than men. Many scientific studies have shown links between thyroid disruption and neurological diseases. *“Thyroid hormones are critical for development of the fetal and neonatal brain, as well as for many other aspects of pregnancy and fetal growth. Hypothyroidism in either the mother or fetus frequently results in fetal disease; in humans, this includes a high incidence of mental retardation.... numerous studies with rats, sheep and humans have reinforced this concept...”*¹⁷² According to de Cock *et al*¹⁷³, *“Perinatal exposure to Endocrine Disrupting Chemicals appears to be associated with the occurrence of ASD [autism spectrum disorder] as well as ADHD*

¹⁷⁰ <http://seer.cancer.gov/statfacts/html/thyro.html>

¹⁷¹ <http://www.cancerresearchuk.org/cancer-info/cancerstats/types/thyroid/incidence/>

¹⁷² http://www.vivo.colostate.edu/hbooks/pathophys/endocrine/thyroid/thyroid_preg.html

¹⁷³ <http://www.ncbi.nlm.nih.gov/pubmed/22458970>

[Attention Deficit Hyperactivity Disorder]. Disruption of thyroid hormone function ... may offer an explanation for the observed relations....” MacSweeney *et al.* reported, “that the mothers of 104 schizophrenic patients had: (1) a significantly higher incidence of thyroid disease than a carefully matched control group; (2) significantly more abortions, still-births and greater infant mortality. The findings and possible relevance of thyroid disease to schizophrenia are discussed¹⁷⁴.”

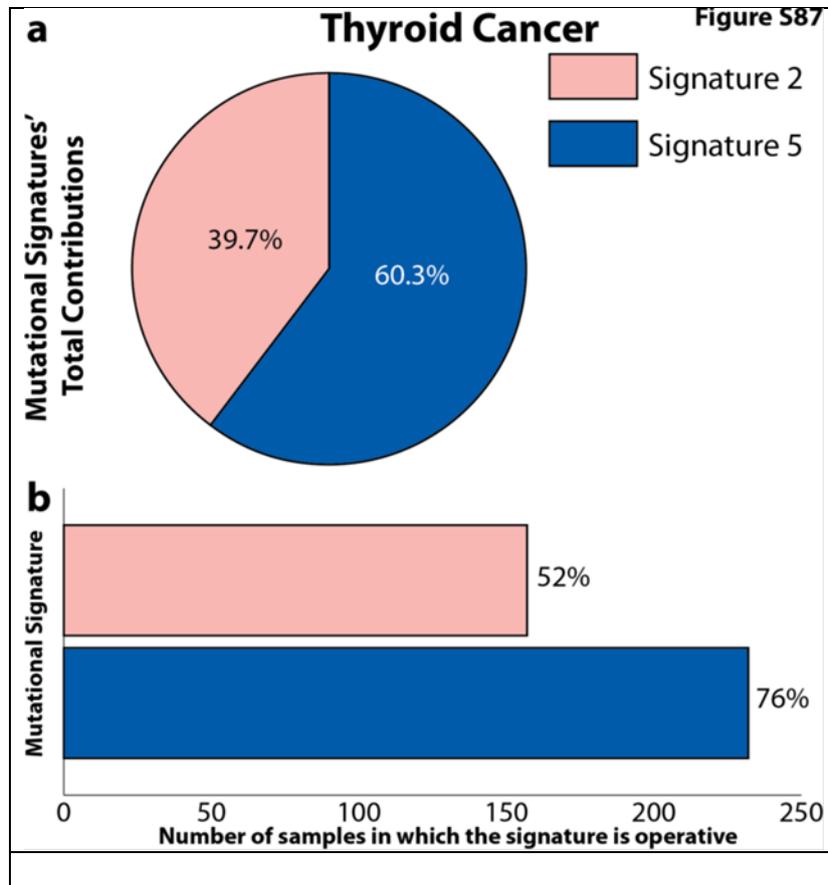


Fig 2: Summary of the contributions of the signatures of mutational processes operative in thyroid cancer¹⁷⁵
Supplementary Figure 87 from Alexandrov, L.B. *et al.*

World Health Cancer Statistic 2008 Cancer mortality and morbidity

“Cancer is a leading cause of death and accounted for 7.6 million deaths (around 13% of all deaths) in 2008¹⁷⁶. Lung, breast, colorectal, stomach, and prostate cancers cause the majority of cancer deaths. Important risk factors for cancer include tobacco use, unhealthy diet, physical inactivity and the harmful use of alcohol.*

The WHO Regions for Europe and the Americas had the highest incidence of all types of cancer combined for both sexes. High income countries had approximately ten times the rate

¹⁷⁴

<http://journals.cambridge.org/action/displayAbstract;jsessionid=3F7D8DD133AA9E1021A46FA46E03F054.journals?fromPage=online&aid=4985600>

¹⁷⁵ <http://www.nature.com/nature/journal/vaop/ncurrent/extref/nature12477-s1.pdf>

¹⁷⁶ http://www.who.int/gho/ncd/mortality_morbidity/cancer_text/en/

of prostate cancer incidence of the lower middle income countries. For breast cancer, incidence rates rose rapidly with level of country income. High income countries had more than three times the rate of low income countries. Similarly, colorectal cancer incidence rates also rose by level of country income. High income countries had considerably higher colorectal cancer incidence rates than any other income group. This was nearly five times higher than the rate in low income countries”

*There is no mention of pesticides. Is the WHO is protecting the pesticides industry too?

Part 5 Have we reached a point of no return?

Only One Chance: How Environmental Pollution Impairs Brain Development¹⁷⁷

Prof Philippe Grandjean, Professor of Environmental Health, Harvard University and University of Southern Denmark.

“Today, one out of every six children suffers from some form of neurodevelopmental abnormality. The causes are mostly unknown. Some environmental chemicals are known to cause brain damage and many more are suspected of it, but few have been tested for such effects. The brain’s development is uniquely sensitive to toxic chemicals, and even small deficits may negatively impact our academic achievements, economic success, risk of delinquency, and quality of life. Chemicals such as lead, mercury, polychlorinated biphenyls (PCBs), arsenic, and certain solvents and pesticides pose an insidious threat to the development of the next generation’s brains”¹⁷⁸

Prof Philippe Grandjean’s new book gives a courageous account of how, over the years, industrial chemicals have damaged children’s brains and how each industry has fought to protect its products. The Pesticides Industry is no different. But this time we have a major disaster.

Can a collapse of global civilisation be avoided?

Professor Paul Erhlich has written about this in increasing urgent terms.

Ehrlich PR, Ehrlich AH. Can a collapse of global civilization be avoided? *Proc R Soc B* 2013, 280: 20122845¹⁷⁹. Ehrlich PR The MAHB, the Culture Gap, and Some Really Inconvenient Truths. *PLoS Biol* 2010, 8(4): e1000330. doi:10.1371/journal.pbio.1000330¹⁸⁰

Here are some pertinent phrases from these papers:

- *There have been increasing signs of great toxic peril for humanity and its life-support systems, with a growing threat from the release of hormone-disrupting chemicals that could even be shifting the human sex ratio and reducing sperm counts*
- *destroying fables such as ‘growth can continue forever if it’s in service industries’, or ‘technological innovation will save us’*
- *reduction of the worship of ‘free’ markets*
- *Unfortunately, awareness among scientists that humanity is in deep trouble has not been accompanied by popular awareness and pressure to counter the political and economic influences implicated in the current crisis*
- *Without significant pressure from the public demanding action, we fear there is little chance of changing course fast enough to forestall disaster*

¹⁷⁷ Only one chance: How environmental pollution impairs brain development – and how to protect the brains of the next generation” Oxford University Press

¹⁷⁸ www.chemicalbraindrain.info

¹⁷⁹ <http://dx.doi.org/10.1098/rspb.2012.2845>

¹⁸⁰ <http://www.plosbiology.org/article/info%3Adoi%2F10.1371%2Fjournal.pbio.1000330>

- *This will require developing mechanisms to force big corporations (including those in big agriculture and big pharma) to bear social responsibilities like the real individuals whose rights they legally want to assume*

Permanent People's Tribunal (PPT) Corporate Account Verdict¹⁸¹

The PPT Session was held in Bangalore, India between December 3 and 6, 2011. In accordance with the program (Attachment 2), witnesses, technical witnesses and survivors made oral presentation of specific cases and submitted supporting documents. As established in its Statute, the Tribunal notified the legal representatives of the transnational corporations headquartered in Germany (Bayer and BASF), Switzerland (Syngenta) and the United States (Monsanto, DuPont, Dow Chemical Company).

FINDINGS

The Tribunal makes the following declaration of responsibility for the six indicted TNCs and three Governments in particular and further also declares the responsibilities of all States, international organizations, UN Specialist Agencies, all other institutions of global governance.

CONCERNING THE INDICTED SIX CORPORATIONS (BASF, BAYER, DOW CHEMICAL, DUPONT, MONSANTO, SYNGENTA)

- The Tribunal finds on all evidence presented before it, the six TNCs *prima facie* responsible for gross, widespread and systematic violations of the right to health and life, economic, social and cultural rights, as well as of civil and political rights, and women and children's rights.
- The Tribunal further finds that their systematic acts of corporate governance have caused avoidable catastrophic risks, increasing the prospects of extinction of biodiversity, including species whose continued existence is necessary for reproduction of human life.

Annex 1

Synoptic list of the cases which have more specifically been submitted to the PPT

Defendants: Monsanto, Dow, Dupont (USA), Bayer, BASF (Germany), Syngenta (Switzerland) Pages 33-37 consist of 40 cases brought against the Corporations.

¹⁸¹ Corporate account verdict.pdf <http://www.internazionaleleliobasso.it/?lang=en>

Postscript on chemical weapons and pesticides

Questions and Answers for the British and American Governments

- **Q:** Who ‘wields tremendous control’ over the British and American Governments¹⁸²?
- **A:** The Agrochemical Corporations.
- **Q:** With regards to pesticide regulations, who controls human health and biodiversity?
- **A:** The Agrochemical Corporations.
- **Q:** Who has manufactured the chemical weapons used in Syria and Vietnam?
- **A:** The Agrochemical Corporations. The factories in Germany that made chemical weapons during the war were turned into factories to make pesticides.
- **Q:** What is the difference between chemical weapons and pesticides?
- **A:** For some pesticides the mode of action is identical.
- **Q:** What chemical did John Kerry reveal was used in Syria?
- **A:** Sarin; a potent organophosphate compound which kills by inhibiting anticholinesterase
- **Q:** What is chlorpyrifos?
- **A:** Chlorpyrifos, an organophosphate insecticide, is also an inhibitor of anticholinesterase. This is an enzyme vital to the nervous systems of animals and humans. Symptoms of acute chlorpyrifos poisoning in adults include headache, nausea, dizziness, muscle twitching, weakness, increased sweating and salivation, and occur when cholinesterase activity has been reduced by about 50%. Unconsciousness, convulsions, and death can result with sufficient exposure.
- **Q:** If it poisons insects, what does it do to the human fetal brain when it is the same size as that of an insect brain?
- **A:** “*Prenatal exposure to chlorpyrifos (CPF), an organophosphorus insecticide, has long been associated with delayed neurocognitive development and most recently with decrements in working memory at age 7*”¹⁸³. “*We report evidence of deficits in Working Memory Index and Full-Scale IQ as a function of prenatal CPF exposure at 7 years of age. These findings are important in light of continued widespread use of CPF in agricultural settings and possible longer-term educational implications of early cognitive deficits*”¹⁸⁴.
- **Q:** In that case is there any difference between chemical weapons and pesticides?
- **A:** Chemical weapons kill fast: the effects are obvious for anyone to see. The effect of pesticides on humans and the environment is extremely subtle. Pesticides are silent destroyers: by the time the patterns are obvious, it is too late. People are being used as guinea pigs.
- **Statement:** John Kerry, in justification of the bombing of Syria by the US on 30/08/2013: “*History will judge us harshly if we turn a blind eye to use of weapons of mass destruction*”.
- **Q:** Has John Kerry forgotten the Vietnam War, after which he gave evidence to Congress about US War Crimes?

¹⁸² <http://www.panna.org/publication/generation-in-jeopardy>

¹⁸³ <http://dx.doi.org/10.1016/j.ntt.2012.07.004>

¹⁸⁴ <http://dx.doi.org/10.1289/ehp.1003160>

- *A: In the course of 10 years, American forces sprayed nearly 20 million gallons of the chemical (a dioxin, Agent Orange) in Vietnam, Laos and parts of Cambodia in an effort to deprive guerrilla fighters of cover by destroying plants and trees where they could find refuge¹⁸⁵
Among the illnesses contracted by people exposed to the dioxin are non-Hodgkin's lymphoma, several varieties of cancer, type 2 diabetes, soft tissue sarcoma, birth defects in children, spina bifida and reproductive abnormalities, to name a few.
The U.S. government, however, has dismissed these figures as unreliable and inflated.*

Earlier this month (July 2013) the Association for Victims of Agent Orange in Ho Chi Minh City has filed its fourth lawsuit against Monsanto & Dow, the American chemical companies that produced Agent Orange.

- *South Korea's highest court on Friday upheld a ruling, ordering two U.S. Agent Orange makers to compensate 39 Vietnam War veterans in one of the country's most prominent lawsuits¹⁸⁶.*
- *The Supreme Court (SC) recognised the epidemiological correlation between the toxic defoliant and skin diseases for the first time, saying the 39 victims should receive a total of 466 million won (\$415,000) from Dow Chemical and Monsanto. U.S. forces widely sprayed Agent Orange, which contained the lethal chemical dioxin, in Vietnam during the conflict to deprive enemy guerrillas of forest cover and destroy food crops. Veterans in South Korea estimate the number of Korean victims of the chemicals at about 150,000. Many insisted they were suffering from various ailments associated with exposure to the powerful herbicide. Vietnam says millions of its people have died or suffered from direct or second-generation disabilities as a result of the use of Agent Orange.*
- *Washington has never accepted responsibility for the Vietnamese government's claim.*

¹⁸⁵ <http://www.dailymail.co.uk/news/article-2401378/Agent-Orange-Vietnamese-children-suffering-effects-herbicide-sprayed-US-Army-40-years-ago.html>

¹⁸⁶ <http://www.thehindu.com/todays-paper/tp-international/dow-monsanto-ordered-to-pay-agent-orange-victims/article4913976.ece>