



Ms Navanethem Pillay  
 UN High Commissioner for Human Rights  
 Office of the High Commissioner for Human Rights  
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19<sup>th</sup> March 2013

Dear Ms Pillay,

**Request for intervention to uphold the right of everyone to the enjoyment of the highest attainable standard of physical and mental health – GM crops engineered to be resistant to three herbicides: 2,4-D, glufosinate ammonium and glyphosate.**

1. This request is submitted by: the African Centre for Biosafety, the Network for a GM Free Latin America, the Pesticide Action Network, North America, GRAIN, Aquí el logo de la Red Nacional de Acción Ecologista (RENACE), Terra de Direitos and AS-PTA Agricultura Familiar e Agroecologia..

1.1 The African Centre for Biosafety (ACB) is a non-profit organisation, based in Johannesburg, South Africa. It has a respected record of evidence-based work in contributing to the GMO decision-making process; and protecting genetic diversity, traditional knowledge and seed sovereignty, built upon the values of equal access to and use of resources and support for the growing agro-ecological farming movement.<sup>1</sup>

1.2 The Network for a GE Free Latin America (Red por una América Latina Libre de Transgénicos (RALLT), was formed in 1999 by several peasants, environmental and human rights organizations to halt the expansion of genetically modified (GM) crops in Latin America and its adverse impacts on human health, food and farming systems, food sovereignty and the environment.<sup>2</sup>

1.3 Pesticide Action Network, North America (PANNA) works to replace the use of hazardous pesticides with ecologically sound and socially just alternatives. As one of five PAN Regional Centers worldwide, it links local and international consumer, labour, health, environment and agriculture groups into an international citizens' action network. For 30 years, the network has

<sup>1</sup> See, <http://www.acbio.org.za>

<sup>2</sup> See, [www.rallt.org](http://www.rallt.org)

defended basic rights to health, livelihood and environmental quality.<sup>3</sup>

1.4 GRAIN is an international, non-profit organisation that works to support small farmers and social movements in their struggles for community-controlled and biodiversity-based food systems.<sup>4</sup>

1.5 Red Nacional de Acción Ecologista (RENACE), is a national network in Argentina working on social and environmental issues.<sup>5</sup>

1.6 Terra de Direitos is a Human Rights Organization based in Brazil, acting in defense and promotion of human rights, mainly the economic, social cultural and environmental rights. The Organization works ensuring the right of farmers and traditional people to free usage of biodiversity and the recognition of traditional knowledge, enabling the free usage of genetic resources for food and for food and for the conservation of agrobiodiversity.<sup>6</sup>

1.7 AS-PTA Family Farming and Agroecology is a Non- Governmental, Not-For-Profit organization created in 1983 whose mission is to foster the transformation of the Brazilian agriculture into a new development model based on family farmers and on the use of the agroecological approach to agricultural production<sup>7</sup>.

### **Previous correspondence**

On the 28<sup>th</sup> of November 2012 we wrote to the Special Rapporteur on the Right of Everyone to the Enjoyment of the Highest Attainable Standard of Physical and Mental Health, Mr Anand Grover, requesting his intervention against genetically modified (GM) crops engineered to be tolerant to the chemical 2,4-D.

In this letter we brought to Mr Grover's attention applications by the Dow Chemical company to commercialise two new GMO varieties, engineered to be resistant to herbicides based on 2,4-D and glufosinate ammonium. We further summarised the rationale for these (the emergence of glyphosate resistant weeds in the major GM crop growing countries, particularly the USA), the health risks associated with 2,4-D, global citizen campaigns against 2,4-D resistant GM crops and the terrible experiences of Argentinians who have been exposed to glyphosate used in association with GM glyphosate tolerant crops. We cited from the substantial body of evidence that supports alternatives to GM based agriculture, and concluded by calling upon Mr Grover to request the government of South Africa to reverse its decision to grant import approval for Dow's GM maize variety, DAS-40278-9, and the governments of Argentina, Brazil, South Africa and the United States to:

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<sup>3</sup> See, <http://www.panna.org>

<sup>4</sup> See, <http://www.grain.org>

<sup>5</sup> See, <http://www.renace.net>

<sup>6</sup> See, <http://terradedireitos.org.br/>

<sup>7</sup> See, <http://aspta.org.br>

- Conduct rigorous, independent and transparent environmental, socio-economic and food safety assessment of 2,4-D resistant GM crops, and likely increases in 2,4-D use their introduction will entail;
- Not to grant any new approvals of certain GM crops until said assessments have been conducted;
- Initiated a process of reparations to those who have already suffered from impaired health and well-being as a result of exposure to glyphosate in association with GM herbicide-tolerant crops;
- Take immediate and appropriate measures to restore eco-systems that have been damaged or degraded as a result of the use of glyphosate in association with GM herbicide-tolerant crops;

It is now nearly 4 months since our letter to Mr Grover, and we are yet to receive any formal acknowledgment of receipt, let alone assurances that our legitimate concerns are being addressed. In the interim it has come to our attention that Dow is currently seeking to commercialise another GM soybean variety (DAS-44406-6), engineered for tolerance to three herbicides; those based upon 2,4-D, glufosinate ammonium and glyphosate. It is for these reasons that we now feel compelled to write to your office, respectfully requesting urgent action on this issue.

In the rest of this letter we will summarise the status of DAS-44406-6, recap some of the most significant health risks of 2,4-D and glufosinate from our first letter, add further information on the health risks of glyphosate and the lack of transparency around its authorisation, and re-iterate the actions we wish to be taken in response to this.

We have also written a second letter to Mr Grover, repeating our previous concerns. Both of the letters we have submitted to Mr Grover are attached to this communication as annexures.

#### **DAS-44406-6**

Dow Agrosience's GM soybean variety DAS-44406-6 has been genetically modified to be tolerant to herbicides based on 2,4-D, glufosinate ammonium and glyphosate. It is the only GMO currently pending approval that is tolerant to this combination of herbicides<sup>1</sup>, and thus sets a dangerous precedent. The drive to develop GMOs tolerant to herbicides other than glyphosate stems in large part from the rapid spread of glyphosate resistant weeds in the United States. Given the relatively short space of time in which this has happened, it is not fanciful to suggest that the same issue could soon confront 2,4-D and glufosinate (in addition to a number of other chemically tolerant GMOs in the pipeline such as Dicamba).

#### **Status of approvals of DAS-44406-6**

Dow has sought approval for commercial cultivation of DAS-44406-6 in the United States, Argentina,<sup>2</sup> Brazil<sup>3</sup> and Canada, and for import approval in Australia / New Zealand,<sup>4</sup> Canada, the European Union, Japan, South Africa, South Korea and Uruguay. At the time of writing the only confirmed approvals we are aware of are in Australia / New Zealand<sup>5</sup>, Japan<sup>6</sup> and South

Africa.

The approval for import of DAS-44406-6 in South Africa is all the more galling as, in response to intense pressure from civil society and the scientific community, there is currently a motion before the South African Parliament to have a previous decision on the approval of Dow's 2,4-D tolerant GM maize variety (DAS-40278-9) overturned.<sup>7</sup> The decision also appears to go against an apparently precautionary stance taken by South African biosafety regulators in response to Dow's application for import approval of another GM soybean variety, DAS-68416-4 (tolerant to 2,4-D and glufosinate).

In accordance with South African biosafety law, Dow placed a public notice in a national newspaper on the 1<sup>st</sup> of July 2012 of their application for import approval of DAS-68416-4.<sup>8</sup> The notice included an invitation for comments on Dow's risk assessment (RA) report, to which the ACB responded with an independent and thorough scientific evaluation of our own. The following paragraph, taken verbatim from our conclusions, neatly summarises the main shortcomings of Dow's report, and the implications for risk to human health:

"It is our opinion that Dow's application for commodity clearance of DAS-68416-4 is wholly insufficient, and therefore without merit. It has been impossible to independently verify the claims for safety and efficacy made in the application, as most of the information vital to this has been omitted as 'confidential business information'. For example, the dossier makes reference to and draws conclusions about safety from animal feeding studies. Detailed information about the composition of the animal study group, comparator groups, and the diets of both groups has not been included. The molecular characterisation is inconclusive, relying solely as it does on Southern Blot analysis, with no additional experiments carried out to address further unintended effects. Another noticeable shortcoming is the use of surrogate proteins produced in a bacterial rather than plant host. Previous studies have indicated that expression of the same protein can vary depending upon the host it is produced in."<sup>9</sup>

According to the latest GMO permit lists published by the South African Department of Agriculture, Forestry and Fisheries (DAFF)<sup>10</sup> this variety has still not been granted approval. We can only assume that the concerns we raised in our scientific objection have been taken cognisance of, and delayed the approval of DAS-68416-4 thus far. The application for the GM soybean variety that is the subject of this letter (DAS-44406-6) appears to have suffered no such scrutiny, given that the application was made in September 2012 and approval in February 2013 (a period which for South African GMO regulators would have included preparations for COP/MOP6 in India and the major holiday period in South Africa). Given that the very same risks we identified for DAS-68416-4 could be applied to DAS-44406-6 (and additional risks of glyphosate exposure with the latter), this is extremely disconcerting, and demonstrates a haphazard approach to biosafety from South African regulators.

## Health risks of DAS-44406-6

### 2,4-D

Our previous submission to Mr Grover, 'GM crops engineered to be resistant to the chemical 2,4-D' (28<sup>th</sup> November 2012), gives a comprehensive review of the health risks associated with 2,4-D. Nonetheless, it is worth repeating that 2,4-D has been heavily linked with cancer of the white blood cells, is cytotoxic, mutagenic and belongs to a herbicide group classified as 'possibly carcinogenic to humans' by the World Health Organisation. The use of 2,4-D is banned completely in Norway, Sweden and Denmark. In Canada several provinces have restricted 2,4-D's use.

### Glufosinate

Studies have shown that this chemical negatively affects the cardiovascular, nervous and reproductive systems in rodents and mammals.<sup>11</sup> In 2009 the European Parliament voted to ban glufosinate, along with 21 other pesticides classified as carcinogenic, mutagenic or toxic to reproduction. It has further been shown that the metabolite of glufosinate (NAG) produced by the transgenic plant can be reconverted into the pesticide itself by gut bacteria, leading to increased health risks for animals and consumers. The use of glufosinate will be completely phased out in the European Union by 2017.<sup>12</sup>

### Glyphosate

Glyphosate is one of the world's most ubiquitous agro-chemicals, and is the most traded active ingredient in the global herbicide market. It is a broad spectrum herbicide that works by inhibiting the enzyme enolpyruvylshikimate-phosphate-synthase (EPSPS), which is a catalyst for the production of three essential amino acids: phenylalanine, tyrosine, and tryptophan. Though the agro-chemicals industry has claimed glyphosate is benign to humans and animals, a plethora of studies have shown otherwise:

### Human health

- Glyphosate formations can induce cell death in human umbilical, embryonic and placental cells. The same study further added that 'adjuvants in Roundup are not inert'.<sup>13</sup>
- Cell exposure to glyphosate can trigger programmed cell death (to prevent the growth of tumours, for example). Research has revealed that Bt toxins (produced by the other significant GM trait on the commercial market<sup>14</sup>) can impair this process in human embryonic kidney cells.<sup>15</sup> This could have severe implications, as 'stacked' GM crops, which contain both traits, are becoming more and more prevalent.
- In Ontario, Canada, glyphosate use has been associated with an increased risk of spontaneous and late abortions among farm-workers.<sup>16</sup> Similar evidence has emerged from Argentina.<sup>17</sup>

## Animal health

- Glyphosate-based herbicide mixtures and glyphosate itself have been found to interfere with key molecular mechanisms regulating early embryonic development in both *Xenopus* (frogs) and Chickens.<sup>18</sup>
- Transgenic DNA fragments have been detected in goats fed on GM soybean. Further, fragments were also detected in tissues and organs of nursed kids, hinting at potential gene transfer through milk.<sup>19</sup>
- Fresh testicular cells from mature rats were exposed to glyphosate and its formulation at residues from 1 to 10,000 mg / kg (the range from levels found in some human urine to levels found in commercial agricultural). Cell damage was recorded within 24 hours. At lower so-called non-toxic concentrations of Roundup and Glyphosate (1 mg / kg), testosterone decreased by 35%.<sup>20</sup>

## Glyphosate in water

- A study conducted by the US geological survey from 2001 – 2006 detected glyphosate and AMPA in 32% of 608 surface water samples collected. In areas with near continual applications (common in areas with HT crops), glyphosate and AMPA were detected 'in almost every sample'.<sup>21</sup>
- In Catalonia, Spain, 140 ground water samples were analyzed from 2007 – 2010. The highest recorded sample was 25 times the European Unions' maximum level of pesticides permitted in water.<sup>22</sup>
- From 1999 – 2003 the Danish government initiated a pesticide leaching assessment programme, aimed at evaluating the leaching of risk pesticides under field conditions. Glyphosate and AMPA were found to leach from the root zone in average concentrations that exceeded the maximum permitted concentration of pesticides in water (0.1 µg/L).<sup>23</sup>

## International reviews, bans and restrictions of glyphosate

Several countries have undertaken scientific re-evaluation of glyphosate, with some initiating partial bans. In Denmark, following a major government study on the leaching of pesticides into groundwater, glyphosate is now banned from being sprayed on hard surfaces, while half of all municipalities in Sweden have also prohibited its use.<sup>24</sup> When it was announced in Argentina in 2009 that glyphosate had caused deformations in amphibian embryos, a government committee was established including ministries of health, environment and agriculture to investigate its health and environmental impacts.<sup>25</sup>

In the USA the Environmental Protection Agency (EPA) placed glyphosate under review in 2009, and has set a deadline of 2015 to determine whether it should continue to be sold, or be subjected to limitations.<sup>26</sup> The European Union last approved glyphosate in 2002, a decision which was due for review in 2012. However, this has been delayed until 2015.

The decision to delay glyphosate's review in the European Union is particularly controversial given recent events. During 2010 a study by Paganeli et al (see above) found that glyphosate and Roundup caused severe malformations in embryos of the South African clawed frog *Xenopus laevis* and chickens. In response, EU Health Commissioner John Dali sent the paper to Germany (the EU's rapporteur for glyphosate) for analysis, saying the EU review of glyphosate could be brought forward if the new evidence was justified. However, the German Federal Office for Consumer Protection and Food Safety (BVL) dismissed the Paganeli study, citing 'a huge and reliable database' vouching for the safety of glyphosate.<sup>27</sup>

The 'huge and reliable database' the BVL was referring to can be found in the 1998 German draft assessment report (DAR) on glyphosate, which contains toxicology data not available to the general public. In 2012 a group of independent scientists were able to access this report, and found it to rely on industry data sets that are neither fully disclosed nor independently verified. Further, the DAR overlooks evidence from these same studies of skeletal, visceral and heart malformations in rabbits, and skeletal malformation in rats.<sup>28</sup> In December 2012 a German court ruled that there is no public interest reason to publish the original industry toxicity studies on glyphosate, following a legal case waged by Pesticide Action Network Europe and Greenpeace Netherlands.<sup>29</sup>

### **Combinatorial effects of multiple herbicides**

The rationale behind the development of DAS-44406-6 is to pro-long the efficacy (and therefore commercial viability) of GM herbicide tolerant crops and their associated herbicides. DAS-44406-6 is unique in that, at the time of writing at least, it is the only GM crop tolerant to 2,4-D, glufosinate ammonium and glyphosate that is pending approval for commercial cultivation, and entry into the global food chain.

In this submission and our initial letter to Mr Grover we have catalogued a large body of studies that link 2,4-D, glufosinate and glyphosate based herbicides with increased risks to human health. Though we are not aware of any independent studies that have investigated the combinatorial effects of 2,4-D, glufosinate and glyphosate, though research on combinations of other agro-chemicals has revealed enhanced toxic effects.<sup>30</sup> This is a notable gap in risk assessment knowledge given the large doses of these herbicides used in combination DAS-44406-6 will result in. As detailed above, these combinations will not only be present as residues in food for humans and animals, but will in all likelihood find their way into public water supplies in each country DAS-44406-6 is cultivated in.

It should also be noted that a recent study revealed polyethoxylated tallowamine (POE-15), an 'adjuvant', and not glyphosate itself, to be the most toxic substance in glyphosate based herbicides.<sup>31</sup> The implications of this finding for the health risks posed by DAS-44406-6 are startling, given the potential combination of unknown quantities of adjuvants in the three herbicide groups, and their active ingredients.

As previously stated, GMOs tolerant to multiple herbicides are a response to weeds developing resistance to single herbicide groups, particularly glyphosate at the present time. GM crops

that are 'insect resistant', that is that produce their own toxins, are experiencing similar constraints.<sup>32</sup> The biotechnology industry's response to insect resistance has followed the same logic as their approach to weed resistance; to combine more insect resistant genes in their seeds. In 2010 Monsanto released a GM maize variety, 'Smartstax', that had eight inserted transgenes; 6 inferring insect resistance and 2 inferring herbicide tolerance (to glyphosate and glufosinate).<sup>33</sup> Given the pace with which glyphosate resistant weeds have developed, and the inevitable development of resistance to glufosinate and 2,4-D that will follow the widespread adoption of GM crops such as DAS-44406-6, how long will it be before the biotechnology developers will be presenting GM crops resistant to combinations of 4,5 or even 6 chemical herbicides?

### **Relief sought**

Our previous communication to Mr Grover highlighted the rights that the introduction of GMOs based on 2,4-D and other toxic herbicide tolerance would curtail, including Article 25 (1) of the Universal Declaration of Human Rights that "Everyone has the right to a standard of living adequate for health"; Article 12 of the International Covenant on Economic, Social and Cultural Rights and Article 24 of the Convention on the Rights of the Child.

Re-emphasising the concerns noted above, and in previous correspondence, we reiterate our calls to:

Request that the governments of Argentina, Brazil, South Africa and the United States conduct a comprehensive, independent and transparent environmental, socio-economic and food safety assessment of both the impacts of genetically modified (GM) crops engineered to be resistant to Dow Chemicals' herbicide, 2,4-D, and the impacts of a likely significant increase in use of 2,4-D as a direct consequence of introduction of these 2,4-D resistant crops, before any new approvals are granted for the commercial growing, importing or exporting of these crops and their products;

Request said governments to also conduct a comprehensive, independent and transparent environmental, socio-economic and food safety assessment of the combined effects of 2,4-D, glufosinate, glyphosate and their adjuvants;

Recommend that such assessment be conducted by a multi-disciplinary team of experts, appointed by these governments, in consultation with the public in their respective countries in an open and transparent manner by way of public hearings;

Recommend to the governments of Argentina, Brazil, South Africa and the United States not to grant any new approvals with regard to the GM crops set out in Annex A of our letter to Mr Grover, until the assessments referred to above have been satisfactorily completed and the results made public, showing that such GM crops and the herbicides with which they are designed to be used will not undermine the right to health;



Request the government of South Africa to reverse its decision to grant the approval for the importation for food, feed and processing, of Dow Chemical's GM soybean variety, DAS-44406-6);

Recommend to the governments of Argentina, Brazil, South Africa and the US that they initiate a process of making reparations to those people who have already suffered impairment to their health and well-being, as a result of exposure to glyphosate-tolerant GM crops currently grown in these countries; and

Recommend to the governments of Argentina, Brazil, South Africa and the US to take immediate and appropriate measures to restore ecosystems that have been damaged or degraded as a result of the use of glyphosate in association with GM herbicide-tolerant crops.

Signed

Mariam Mayet, African Centre for Biosafety and Carlos Vicente, GRAIN on behalf of the ACB, GRAIN and the other organisations and signatories.



<sup>1</sup> See: [http://www.aphis.usda.gov/biotechnology/petitions\\_table\\_pending.shtml](http://www.aphis.usda.gov/biotechnology/petitions_table_pending.shtml)

<sup>2</sup> Ministry of Agriculture, CONABIA, [Serie histórica de liberaciones experimentales, 2010 and 2011,](http://64.76.123.202/site/agregado_de_valor/biotecnologia/50-EVALUACIONES/_historica/index.php)  
[http://64.76.123.202/site/agregado\\_de\\_valor/biotecnologia/50-EVALUACIONES/\\_historica/index.php](http://64.76.123.202/site/agregado_de_valor/biotecnologia/50-EVALUACIONES/_historica/index.php)

<sup>3</sup> Application n. 01200.003948/2012-75, CTNBio, on sept. 25th 2012.

<sup>4</sup> Food standards Australia New Zealand (FSANZ) is a single governing body responsible for food standards, including the regulation of GMOs, in both countries.

<sup>5</sup> [http://www.foodstandards.gov.au/srcfiles/A1073\\_AppR.pdf](http://www.foodstandards.gov.au/srcfiles/A1073_AppR.pdf)

<sup>6</sup> [http://www.bch.biodic.go.jp/english/lmo\\_2011.html](http://www.bch.biodic.go.jp/english/lmo_2011.html)

<sup>7</sup> **National Assembly order paper – Tuesday, 26<sup>th</sup> February 2013.** Parliament of the Republic of South Africa.

[www.parliament.gov.za/live/.../Processed/20130227/491710\\_1.pdf](http://www.parliament.gov.za/live/.../Processed/20130227/491710_1.pdf)

<sup>8</sup> Marion van Rooyer, senior administrative officer, officer of Director General, South African Department of Agriculture, Forestry and Fisheries. 30/07/2012. Personal correspondence.

<sup>99</sup> Stafford, W & Jones, G (2012). **Independent scientific biosafety assessment of the application for commodity clearance of transgenic soybean, DAS-68416-4.** African Centre for Biosafety.

[www.acbio.org.za/images/stories/dmdocuments/soybeanDAS-68416-4-objection.pdf](http://www.acbio.org.za/images/stories/dmdocuments/soybeanDAS-68416-4-objection.pdf)

<sup>10</sup> See: [www.nda.agric.za/doiDev/sideMenu/biosafety/doc/GMO%20permits%20-%202013\(no%20marker\)1.pdf](http://www.nda.agric.za/doiDev/sideMenu/biosafety/doc/GMO%20permits%20-%202013(no%20marker)1.pdf)

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- <sup>11</sup> Watts, M. (2008). **Glufosinate-ammonium monograph**. Pesticide Action Network New Zealand. [http://www.pananz.net/resources/Div\\_Loaded\\_Files/Documents/Glufosinate/Glufosinate%20monograph%2012%20Dec%202008.pdf](http://www.pananz.net/resources/Div_Loaded_Files/Documents/Glufosinate/Glufosinate%20monograph%2012%20Dec%202008.pdf)
- <sup>12</sup> <http://www.testbiotech.org/en/node/505>
- <sup>13</sup> Nora Benachour & Gilles-Eric Seralini (2009). **Glyphosate formulations induce apoptosis and necrosis in human umbilical, embryonic and placental cells**. *Chemical Research in Toxicology*. 22. Pp .97-105. DOI: 10.1021/tx800218n
- <sup>14</sup> Monsanto's drought tolerant' maize was granted approval in the United States at the end of 2011, though Herbicide Tolerant and Insect resistant GM crops remain the two major varieties sold up until now.
- <sup>15</sup> Mesnage, R. Clair, E. Gress, S. Then, C. Szekacs, A. Seralini, G.E (2011). **Cytotoxicity on human cells of Cry1Ab and Acry1Ac Bt insecticidal toxins alone or with a glyphosate-based herbicide**. *Journal of applied toxicology*. DOI 10.1002/jat.2712
- <sup>16</sup> Tye E. Arbuckle, Zhiqiu Lin, and Leslie S. Mery (2001). **An Exploratory Analysis of the Effect of Pesticide Exposure on the Risk of Spontaneous Abortion in an Ontario Farm Population**. *Environ Health Perspect* 109:851–857
- <sup>17</sup> Antoniou, M. Robinson, C. Fagan, J (2012). **GMO myths and truths: An evidence based examination of the claims made for the safety and efficacy of genetically modified crops**. *Earth open source*
- <sup>18</sup> Alejandra Paganelli, Victoria Gnazzo, Helena Acosta, Silvia L. Lo'pez, and Andre's E. Carrasco (2010). **Glyphosate-Based Herbicides Produce Teratogenic Effects on Vertebrates by Impairing Retinoic Acid Signaling**. *Chem. Res. Toxicol*.
- <sup>19</sup> R. Tudisco, V. Mastellone, M. I. Cutrignelli, P. Lombardi-, F. Bovera, N. Mirabella, G. Piccolo, S. Calabro', L. Avallone and F. Infascelli (2010). **Fate of transgenic DNA and evaluation of metabolic effects in goats fed genetically modified soybean and in their offsprings**.
- <sup>20</sup> Émilie Clair, Robin Mesnage, Carine Travert, Gilles-Éric Seralini (2012). **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, pp. 269 - 279
- <sup>21</sup> Coupe, R.H. Kalkhoff, S.J. Capel, P.D. and Gregoire, C. (2011). **Fate and transport of glyphosate and aminomethylphosphonic acid in surface waters of agricultural basins**. *Pest management science*.
- <sup>22</sup> Sanchis, J et al (2011). **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**. doi:10.1007/s00216-011-5541-y
- <sup>23</sup> Kjar, J. et al (2004). **The Danish Pesticide leaching assessment programme**. Geological survey of Denmark and Greenland. [http://pesticidvarsling.dk/monitor\\_uk/2003.html](http://pesticidvarsling.dk/monitor_uk/2003.html)
- <sup>24</sup> Riley, P. Cotter, J. Contiero, M. Watts, M. (2011). **Herbicide tolerance and GM crops: Why the world should Roundup glyphosate**. Greenpeace. <http://www.greenpeace.org/international/Global/international/publications/agriculture/2011/363%20-%20GlyphoReportDEF-LR.pdf>
- <sup>25</sup> Valente, M. 15th April, 2009. **Health-Argentina: Scientists reveal effects of glyphosate**. Inter Press Service. <http://www.ipsnews.net/2009/04/health-argentina-scientists-reveal-effects-of-glyphosate/>
- <sup>26</sup> Gillam, C. 8th April, 2011. **Cancer cause or crop aid? Herbicide faces big test**. Reuters. <http://www.reuters.com/article/2011/04/08/us-glyphosate-epa-idUSTRE7374WX20110408>
- <sup>27</sup> Antoniou M, Habib MEM, Howard CV, Jennings RC, Leifert C, et al. (2012) **Teratogenic Effects of**

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**Glyphosate-Based Herbicides: Divergence of Regulatory Decisions from Scientific Evidence.** *J Environ Anal Toxicol* S4:006. doi:10.4172/2161-0525.S4-006

<sup>28</sup> Ibid.

<sup>29</sup> **Public can't see industry toxicity studies on glyphosate – court.** GMWatch 17<sup>th</sup> December 2012. [http://www.gmwatch.org/index.php?option=com\\_content&view=article&id=14523:-public-cant-see-industry-toxicity-studies-on-glyphosate-court](http://www.gmwatch.org/index.php?option=com_content&view=article&id=14523:-public-cant-see-industry-toxicity-studies-on-glyphosate-court)

<sup>30</sup> Benachour, N., Moslemi, S., Sipautar, H., Seralini, G-E (2007). **Cytotoxic effects and aromatase inhibition by xenobiotic endocrine disruptors alone and in combination.** *Toxicology and applied pharmacology*, 222, 129 – 140.

<sup>31</sup> Mesnage R., Bernay B., Seralini G-E. (2013, in press). **Ethoxylated adjuvants of glyphosate-based herbicides are active principles of human cell toxicity.** *Toxicology*. <http://dx.doi.org/10.1016/j.tox.2012.09.006>

<sup>32</sup> ACB (2012). **Hazardous Harvest: GM crops in South Africa, 2008 – 2012.** <http://www.acbio.org.za/index.php/publications/gmos-in-south-africa/379-hazardous-harvest-genetically-modified-crops-in-south-africa-2008-2012>

<sup>33</sup> Jones (2010). **The GM stacked gene revolution: A biosafety nightmare.** African Centre for Biosafety. <http://www.acbio.org.za/index.php/publications/gmos-in-south-africa/290-stacked-gmo>