

17 Reasons to Ban Glyphosate
by Nancy L. Swanson, Ph.D.

1. Within the last 20 years there has been an alarming increase in serious illnesses in the US, along with a marked decrease in life expectancy (Bezruchka, 2012).
2. The onset of serious illness is appearing in increasingly younger populations: neurological disease (Pritchard et al., 2013); obesity, asthma, behavior & learning problems and chronic disease in children and young adults (Van Cleave et al., 2010); type II diabetes in youth (Rosenbloom et al., 1999).
3. The rate of chronic disease in the entire US population has been dramatically increasing with an estimated 25% of the US population suffering from multiple chronic diseases (Autoimmunity Research Foundation, 2012).
4. During this same time period, there has been an exponential increase in the adoption of Genetically Modified Food (GMO) crops with associated applications of glyphosate to food crops (Benbrook, 2012).
5. Glyphosate and its degradation product, aminomethylphosphonic acid (AMPA) have been detected in **air** (Majewski et al., 2014, Chang et al., 2011), **rain** (Scribner et al., 2007, Majewski, 2014), **groundwater** (Scribner, 2007), **surface water** (Chang, 2011; Scribner, 2007; Coupe et al., 2012), **soil** (Scribner, 2007) and **sea water** (Mercurio et al., 2014). These studies show that glyphosate and AMPA **persist in the soil and water** and the amounts detected are increasing over time with increasing agricultural use.
6. Glyphosate residues are high in our food (Bohn et al., 2014).
7. Glyphosate bioaccumulates in organs and tissue (Kruger et al, 2014).
8. The connection between glyphosate and chronic disease has been outlined in a recent review paper by Samsel & Seneff (2013a).
9. Time trends of the rise in chronic diseases along with the rise of glyphosate use, and the adoption of GMO crops shows very high correlations with very strong statistical significance (Swanson, 2013).
10. Glyphosate has been shown to be toxic to the liver and kidneys (Cattani et al., 2014; Jayasumana et al., 2014; Lushchak et al., 2009; El-Shenawy, 2009; de Liz Oliveira Cavalli et al., 2013; Séralini et al., 2011).
11. Glyphosate is a patented chelating agent (U.S. patent number [3160632 A](#)) causing mineral deficiencies.
12. Glyphosate is a patented anti-microbial & biocide (U.S. patent number [20040077608 A1](#) & U.S. patent number 7771736 B2), it preferentially kills beneficial bacteria in our intestines leading to nutrient deficiency, chronic intestinal diseases inflammation, and autoimmune diseases (Samsel & Seneff, 2013b; Kruger, 2013; Shehata et al., 2012; Carman et al., 2013).

13. Glyphosate leads to teratogenicity and reproductive toxicity in vertebrates (Antoniou et al., 2012).
14. Glyphosate is an endocrine disruptor (Gasnier et al., 2009; Paganelli et al., 2010; Antoniou et al., 2012; Thongprakaisang et al., 2013).
15. There are no "safe" levels of endocrine disruptors (Vandenberg et al., 2012; Bergman et al., 2013).
16. Imbalances and malfunctions of the endocrine system can lead to diabetes, hypertension, obesity, kidney disease, cancers of the breast, prostate, liver, brain, thyroid, non-Hodgkin's lymphoma (Marc et al., 2004; Thongprakaisang et al., 2013), osteoporosis, Cushing's syndrome, hypo- and hyperthyroidism, infertility, birth defects, erectile dysfunction, (Soto & Sonnenschein, 2010), sexual development problems and neurological disorders such as: learning disabilities, attention deficit disorder (de Cock et al., 2012), autism (Schulkin, 2007), dementia (Ghosh, 2010), Alzheimer's (Merlo et al., 2010), Parkinson's and schizophrenia (MacSweeney et al., 1978).
17. Endocrine disruptors are especially damaging to organisms undergoing hormonal changes: fetuses, babies, children, adolescents and the elderly (Bergman et al., 2013).

- Antoniou, M., Habib, M.E.M., Howard, C.V., Jennings, R.C., Leifert, C., Nodari, R.O., Robinson, C.J. and Fagan. J., 2012. Teratogenic Effects of Glyphosate-Based Herbicides: Divergence of Regulatory Decisions from Scientific Evidence. *Journal of Environmental and Analytical Toxicology*, S:4.
<http://earthopensource.org/files/pdfs/Roundup-and-birth-defects/Antoniou-Teratogenic-Effects-of-Glyphosate-Based-Herbicides.pdf>
- Autoimmunity Research Foundation., 2012. Incidence and prevalence of chronic disease. Autoimmunity Research Foundation. <http://mpkb.org/home/pathogenesis/epidemiology>
- Benbrook, C.B., 2012. Impacts of genetically engineered crops on pesticide use in the U.S. -- the first sixteen years. *Environmental Sciences Europe*, 24(24): 2190-4715.
<http://www.enveurope.com/content/24/1/24>
- Bergman, A., Heindel, J.J., Jobling, S., Kidd, K.A. and R. Zoeller, T. (eds.), 2013. State of the science of endocrine disrupting chemicals 2012, United Nations Environment Programme and the World Health Organization, ISBN: 978-92-807-3274-0 (UNEP) and 978 92 4 150503 1 (WHO) (NLM classification: WK 102)
- Bezruchka, S., 2012. The Hurrider I Go the Behinder I Get: The Deteriorating International Ranking of U.S. Health Status. *Annual Review of Public Health*, 33: 157-173.
<http://www.annualreviews.org/eprint/iESYF775U2MwVfrxfAR2/full/10.1146/annurev-publhealth-031811-124649>
- Bøhn, T., Cuhra, M., Travail, T., Sanden, M., Fagan, J. and Primicerio, R., 2013. Compositional differences in soybeans on the market: glyphosate accumulates in Roundup Ready GM soybeans. *Food Chemistry*. 153:207-15.
- Carman, J. A., Vlieger, H.R., Ver Steeg, L.J., Sheller, V.E., Robinson, G.W., Clinch-Jones C.A., Haynes, J.I., John, W. and Edwards, J.W., 2013. A long-term toxicology study on

- pigs fed a combined genetically modified (GM) soy and GM maize diet, *Journal of Organic Systems*, 8(1): 38-54. <http://www.organic-systems.org/journal/81/8106.pdf>
- Cattani, D., de Liz Oliveira Cavalli, V.L., Heinz Rieg, C.E., Dominguez, J.T., Dal-Cim, T., Tosca, C.I., Mena Barreto Silva, F.R. and Zamoner, A., 2014. Mechanisms underlying the neurotoxicity induced by glyphosate-based herbicide in immature rat hippocampus: Involvement of glutamate excitotoxicity. *Toxicology*. 2014 Mar 15;320C:34-4
<http://www.ncbi.nlm.nih.gov/pubmed/24636977>
- Chang, F.C., Simcik, M.F. and Capel, P.D., 2011. Occurrence and fate of the herbicide glyphosate and its degradate aminomethylphosphonic acid in the atmosphere. *Environmental Toxicology and Chemistry*, 30(3): 548-55.
- Coupe, R.H., Kalkhoff, S.J., Capel, P.D., and Gregoire, C., 2012. Fate and transport of glyphosate and aminomethylphosphonic acid in surface waters of agricultural basins. *Pest Management Science*, 68(1): 16-30.
<http://onlinelibrary.wiley.com/enhanced/doi/10.1002/ps.2212#Survey>
- de Cock, M., Maas, Y.G. and van de Bor M., 2012. Does perinatal exposure to endocrine disruptors induce autism spectrum and attention deficit hyperactivity disorders? *Acta Paediatrica*, 101(8): 811-819. Abstract: <http://www.ncbi.nlm.nih.gov/pubmed/22458970>
- de Liz Oliveira Cavalli, V.L., Cattani, D., Heinz Rieg, C.E., Pierozan, P., Zanatta, L., Benedetti Parisotto, E., Wilhelm Filho, D., Mena Barreto Silva, F.R. and Pessoa-Pureur R, Zamoner, A., 2013. Roundup disrupts male reproductive functions by triggering calcium-mediated cell death
- El-Shenawy, N.S., 2009. Oxidative stress responses of rats exposed to Roundup and its active ingredient glyphosate. *Environmental Toxicology and Pharmacology*. 28(3):379-85.
- Gasnier, C., Dumont, C., Benachour, N., Clair, E., Chagnon, M.C. and Séralini, G.E., 2009. Glyphosate-based herbicides are toxic and endocrine disruptors in human cell lines. *Toxicology*, 262(3): 184-191. <http://www.ncbi.nlm.nih.gov/pubmed/19539684>
- Ghosh, A., 2010. Endocrine, metabolic, nutritional, and toxic disorders leading to dementia. *Annals of Indian Academy of Neurology*, (Suppl 2): S63-8. <http://www.ncbi.nlm.nih.gov/pubmed/21369420>
- Jayasumana, C., Gunatilake, S. and Senanayake, P., 2014. Glyphosate, Hard Water and Nephrotoxic Metals: Are They the Culprits Behind the Epidemic of Chronic Kidney Disease of Unknown Etiology in Sri Lanka? *International Journal of Environmental Research and Public Health*, 11, 2125-2147;
- Krüger, M., Shehata, A.A., Schrödl, W. And Rodloff, A., 2013a. Glyphosate suppresses the antagonistic effect of *Enterococcus* spp. On *Clostridium botulinum*. *Anaerobe*, 20: 74-78.
- Krüger, M., Schledorn, P., Schrödl, W., Hoppe, H.W., Lutz, W. and Shehata, A.A., 2014. Detection of Glyphosate Residues in Animals and Humans. *Journal of Environmental and Analytical Toxicology*, 4(2): 210-15.
- Lushchak, O.V., Kubrak, O.I., Storey, J.M., Storey, K.B. and Lushchak, V.I., 2009. Low toxic herbicide Roundup induces mild oxidative stress in goldfish tissues. *Chemosphere*. 76(7):932-7.
- MacSweeney, D., Timms, P. and Johnson A., 1978. Preliminary Communication Thyro-endocrine pathology, obstetric morbidity and schizophrenia: survey of a hundred families with a schizophrenic proband. *Psychological Medicine*, 8(1): 151-155. Abstract: <http://journals.cambridge.org/action/displayAbstract?fromPage=online&aid=4985600&fulltextType=RA&fileId=S0033291700006735>
- Marc, J., Mulner-Lorillon, O. and Bellé, R., 2004. Glyphosate-based pesticides affect cell

- cycle regulation, *Biology of the Cell*, (2004) 96(3): 245-9.
- Majewski, M.S., Coupe, R.H., Foreman, W.T. and Capel, P.D., 2014. Pesticides in Mississippi air and rain: a comparison between 1995 and 2007. *Environmental Toxicology and Chemistry*, E-pub ahead of print, <http://www.ncbi.nlm.nih.gov/pubmed/24549493>
- Merlo, S., Spampinato, S., Canonico, P.L., Copani, A. and Sortino, M.A., 2010. Alzheimer's disease: brain expression of a metabolic disorder? *Trends in Endocrinology and Metabolism*, 21(9): 537-544. <http://www.cell.com/trends/endocrinology-metabolism/retrieve/pii/S1043276010000792>
- Mercurio P, Flores F, Mueller JF, Carter S, Negri AP. Glyphosate persistence in seawater. *Mar Pollut Bull.* 2014 Jan 24. pii: S0025-326X(14)00022-8. doi:10.1016/j.marpolbul.2014.01.021.
- Paganelli, A., Gnazzo, V., Acosta, H., López, S.L. and Carrasco, A.E., 2010. Glyphosate-based Herbicides Produce Teratogenic Effects on Vertebrates by Impairing Retinoic Acid Signaling. *Chemical Research in Toxicology*, 23 (10): 1586–1595. Abstract: <http://pubs.acs.org/doi/abs/10.1021/tx1001749>
- Pritchard, C., Meyers, A., and Baldwin, D., 2013. Changing patterns of neurological mortality in the 10 major developed countries.-- 1979-2010. *Public Health*, 127(4): 357-368. <http://dx.doi.org/10.1016/j.puhe.2012.12.018>
- Rosenbloom, A.L., Joe, J.R., Young, R.S. and Winter, W.E., 1999. Emerging epidemic of type 2 diabetes in youth. *Diabetes Care*, 22(2):345-54. <http://www.ncbi.nlm.nih.gov/pubmed/10333956>
- Samsel, A. and Seneff, S., 2013a. Glyphosate's Suppression of Cytochrome P450 Enzymes and Amino Acid Biosynthesis by the Gut Microbiome: Pathways to Modern Diseases. *Entropy*, 15(4): 1416-1463. <http://www.mdpi.com/1099-4300/15/4/1416> (Viewed: 20 April 2013)
- Samsel, A. and Seneff, S., 2013. Glyphosate, pathways to modern diseases II: Celiac sprue and gluten intolerance. *Interdisciplinary Toxicology*, 6(4): 159–184. <http://onlinelibrary.wiley.com/enhanced/doi/10.1002/ps.2212#Survey>
- Schulkin, J., 2007. Autism and the amygdala: An endocrine hypothesis. *Brain and Cognition*, 65(1): 87–99. Abstract: <http://www.sciencedirect.com/science/article/pii/S0278262607000656> (Viewed: 18 February 2013)
- Scribner, E.A., Battaglin, W.A., Gilliom, R.J. And Meyer, M.T., 2007 Concentrations of glyphosate, its degradation product, aminomethylphosphonic acid, and glufosinate in ground- and surface-water, rainfall, and soil samples collected in the United States, 2001-06S. Geological Survey Scientific Investigations Report 2007-5122: 111 pages.
- Seralini, G.E., Mesnage, R., Clair, E., Gress, S., de Vendomois, J. and Cellier, D., 2011. Genetically modified crops safety assessments: present limits and possible improvements. *Environmental Sciences Europe*, 23: 10. <http://www.enveurope.com/content/23/1/10> (Viewed: 15 November 2013)
- Shehata, A.A., Schrodler, W., Aldin, A.A., Hafez, H.M. and Kruger, M., 2012. The Effect of Glyphosate on Potential Pathogens and Beneficial Members of Poultry Microbiota In Vitro. *Current Microbiology*, 66(4):350-8. Abstract: <http://www.ncbi.nlm.nih.gov/pubmed/23224412>
- Soto, A.M. and Sonnenschein, C., 2010. Environmental causes of cancer: endocrine disruptors as carcinogens, *Nature Reviews Endocrinology*. 6: 363-370. Abstract <http://www.nature.com/nrendo/journal/v6/n7/full/nrendo.2010.87.html> (Viewed: 15 November 2013)

- Swanson, N.L., 2013. Genetically Modified Organisms and the deterioration of health in the United States. <http://sustainablepulse.com/wp-content/uploads/GMO-health.pdf>
- Thongprakaisang, S., Thiantanawat, A., Rangkadilok, N., Suriyo, T. and Satayavivad, J., 2013. Glyphosate induces human breast cancer cells growth via estrogen receptors, *Food and Chemical Toxicology*, 59: 129-136.
<http://dx.doi.org/10.1016/j.fct.2013.05.057>
- Van Cleave, J., Gortmaker, S.L. and Perrin, J.M., 2010. Dynamics of obesity and chronic health conditions among children and youth. *Journal of the American Medical Society*, 303(7): 623-30. <http://www.ncbi.nlm.nih.gov/pubmed/20159870> (Viewed: 9 February 2013)
- Vandenberg, L.N., Colburn, T., Hayes, T.B., Heindel, J.J., Jacobs, D.R. Jr., Lee, D., Shioda, T., Soto, A.M., vom Sal, F.S., Welshons, W.V., Zeller, R.T. and Myers, J.P., 2012. Hormones and Endocrine-Disrupting Chemicals: Low-Dose Effects and Nonmonotonic Dose Responses. *Endocrine Reviews*, 33 (3): 378-455.
<http://edrv.endojournals.org/content/33/3/378.full>