This report below is important because of the recent finding in Germany that urban people have glyphosate in their bodies at five to twenty times the level allowable in drinking water.

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Subject: [COMFOOD:] Reproductive problems with Roundup

by Glory Warner - Research paper written for Biochemistry class in Fresno, CA

This paper explores the relationship between the herbicide glyphosate and problems in human reproduction. Glyphosate, the active ingredient in Roundup and other generic herbicides, is one of the most widely used herbicides in the world. This chemical works by interfering with the biosynthesis of certain aromatic amino acids like tyrosine, tryptophan and phenylalanine. It does this by inhibiting the enzyme EPSPS (Romano, 309). This particular process of amino acid formation is exclusive to plants and so appeared to have no effect on animals. Studies have found, however, that glyphosate also interferes with important mammalian amino acid synthesis and certain enzymes crucial to reproduction and hormones. While these problems may seem to mainly affect workers directly exposed to it in larger quantities, studies find that even small quantities may have detrimental effects (Romano, 309). With the advent and increase in GMO food crops, which have been engineered to tolerate the chemical, (Romano, 317) more of it is being used and thus being found in many surface and underground water as a result of agricultural runoff as well as urban landscape use. The use of it has been increasing in everything from animal feed to human food crops.

Glyphosate has been shown to alter testosterone levels and testicular morphology as shown in an article written by R.M. Romano, et. al., that appears in The Archives of Toxicology 2010. In this study prepubescent male rats were given feed with different levels of glyphosate: 5, 50, and 250mg respectively. Rats from all test groups showed significant delay in puberty age compared to the control group and also exhibited testicles that weighed less (Romano, 317). A related observation made by the researchers was that the lining of the testicular seminiferous tubules was reduced by as much as 24%, suggesting a decrease in the number of germ cells in the treated rats. Perhaps the most important finding of the study was that testosterone levels decreased significantly in all of the treated rats, with as much as a 50% decrease in the hormone (Romano, 313). The researchers say that these effects are due to glyphosate's disruption to the production of sex hormones by inhibiting the enzyme that produces them.

An article that appeared in the Journal of Environmental Health Perspectives in June 2005 written by Sopie Richard, et.al explored the Differential Effects of Glyphosate on the enzyme Aromatase. Aromatase is a mammalian cytochrome enzyme crucial for sex steroid hormone synthesis. This enzyme is composed of the product of the CYP19 gene and the associated NADPH. Aromatase is important in gametogenesis in both males and females and is the precursor of sex differentiation (Richard, 716). The researchers used human placental cells and also isolated and analyzed aromatase from equine testis to understand exactly how the

enzyme is affected by glyphosate. They found that glyphosate acts as a competitive inhibitor to this important enzyme; disallowing the substrate to bind to the active site, and carry out its normal duty. The natural hormone Androstenedione seems to facilitate herbicide access to the active site of the enzyme. (Richard, 720) These effects are thought by the authors to be a result of the suppression of gene expression since mRNA levels were decreased following treatment with glyphosate.

Both articles used in this article refer to Glyphosate as an endocrine disrupter, due to the herbicides effect on important enzymes and hormones (Romano, 315 and Richard, 720) and the fact that effects were found at very low levels. In fact, serious effects were found far below a normal agricultural herbicide treatment. The cellular study found the disruption occurring at concentrations 100 times lower than the recommended use in agriculture and as soon as 18 hours after exposure (Richard, 720). The study involving young male mice found that "even the lower doses allowed the observation of the harmful effects of the herbicide" (Romano, 315).

One aspect of Roundup vs. Glyphosate mentioned in both articles is the role of the surfactant, which is the substance added to a pesticide to make it bind to the plant being treated. The surfactant is a non-active ingredient found in Roundup but not in pure glyphosate. The surfactant seems to enhance the detrimental effects of the compound glyphosate (Richard, 718). "The toxicity from inert ingredients is higher than from active ingredients and that their presence produces a larger toxic effect" (Romano, 317). This is significant, as an analysis using pure Glyphosate, would not produce results that reflect the marked outcomes Roundup has on animals. Outside the laboratory, in an agricultural or landscape setting, Glyphosate is always used with a surfactant. The Richards paper also quotes from another study utilizing rabbits where the adjuvants in Roundup helped the active ingredient to be retained and conjugated. Harmful effects on semen quality were still noted 6 weeks after treatment with Roundup (Richards, 719). This shows that the effects of exposure are not just acute but may affect individuals over their lifetime for many years.

These two articles point to serious problems with the use of a chemical that has been touted by Monsanto as harmless to humans. They also show that problems are not just isolated to a certain time frame or window but appear to effect important enzymes and hormones at different stages of the mammalian life cycle and to persist in their effects over time.