NATURAL RESOURCES DEFENSE COUNCIL

By Electronic Mail and Fascimile

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Re: Notice of Intent to Conduct a Special Registration Review of the Herbicide Atrazine

Dear Mr. Regimbal:

On behalf of the Natural Resources Defense Council (NRDC) and our more than 475,000 members, over 10,000 of who live in Minnesota, we submit the following comments on the Minnesota Department of Agriculture's (MDA) scoping document and related information about the special registration review of atrazine. See Notice of Intent to Conduct a Special Registration Review of the Herbicide Atrazine, 33 SR 488 (Sept. 8, 2008). We support MDA's decision to review Minnesota's registration of atrazine and appreciate the opportunity to comment on your scoping document.

First, we wish to join in the comments previously submitted to you by the Minnesota Center for Environmental Advocacy (MCEA). See Samuel Yamin, Minnesota Center for Environmental Advocacy Comments on the Minnesota Department of Agriculture Scoping Document for Special Registration Review of Atrazine (October 2008). As MCEA correctly notes, it is very important that MDA seeks to ensure that it gathers the most robust set of data possible on human exposure to atrazine in drinking water, including private drinking wells. At present, this is a serious data gap in the scoping document that should be addressed during the review process.

Second, when evaluating the toxic effects of atrazine, it is important for MDA to keep in mind the potential for atrazine to have synergistic effects with other chemicals to increase their toxic effects. In particular, single-chemical studies can underestimate risks from exposure to a chemical when it is confronted as a toxic mixture that commonly occurs in the real world.[1] One assessment of multiple pesticide exposures among men with non-Hodgkin's lymphoma (NHL) has reported a suggested synergistic effect of atrazine in combination with the pesticides carbofuran, diazinon, or alachlor.[2] Additionally, a laboratory study of frogs reported an increase in mortality of tadpoles exposed to multiple pesticides at levels that were non-lethal when occurring individually (0.1 ppb).[3] If MDA were to fail to consider exposure to atrazine with other co-contaminants, the risks posed by atrazine could be underestimated significantly.

Third, as part of its scoping and registration process, we believe the MDA and the Minnesota Pollution Control Agency (MPCA) should reexamine Minnesota's Chronic Standard for Surface Water, which were adopted for atrazine in 1994. Under these standards, MPCA has set an atrazine toxicity-based value for aquatic life at 10 ppb, with an exposure duration of 4 days. The scientific literature concerning atrainze's effect on aquatic life has advanced considerably since 1994 and this standard merits review here. Specifically, deformities such as hermaphroditism have been repeatedly been documented in amphibians exposed to even relatively low doses of atrazine. Atrazine has also been demonstrated in numerous studies to disrupt hormone activity in amphibians, particularly those exposed during early stages of development. Exposure during early developmental stages can have long-lasting or even permanent irreversible effects on adult behavior and survival, including increased susceptibility to infection, alterations in survival behavior, and reduced long-term survival. [4] Cumulatively, this evidence suggests that routine environmental exposures well below the thresholds set by MPCA, and spikes in exposure during critical windows, should be taken into account during the State's special registration review and that current standards set by MCPA and EPA are inadequate to protect aquatic species and ecosystems from harm.

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[1] Chevre N, Loepfe C, Singer H, Stamm C, Fenner K, Escher BI. Including mixtures in the determination of water quality criteria for herbicides in surface water. *Environ Sci Technol*. 15 2006;40:426-35; Christin MS, Menard L, Gendron AD, et al. Effects of agricultural pesticides on the immune system of *Xenopus laevis* and *Rana pipiens*. *Aquat Toxicol*. 30 2004;67:33-43.

[2] De Roos AJ, Zahm SH, Cantor KP, et al. Integrative assessment of multiple pesticides as risk factors for non-Hodgkin's lymphoma among men. *Occup Environ Med*. 2003;60:E11.

[3] Hayes TB, Case P, Chui S, et al. Pesticide mixtures, endocrine disruption, and amphibian declines: are we underestimating the impact*? Environ Health Perspect.* 2006; doi:10.1289/ehp.8051.

[4] For an overview of much of the science on atrazine's effect see Sass, J.B., Colangelo A. European Union bans atrazine, while the United States negotiates continued use. *Int J Occup Environ Health*, 2006 July;12:260-267.

Fourth, as you are aware, the United States Environmental Protection Agency (EPA) recently conducted an "Ecological Watershed Monitoring Program" that required atrazine manufacturers to monitor atrazine concentrations in the surface water of 40 watersheds in ten Midwestern states between 2004 and 2006. The Program included one watershed, encompassing the North Fork of the Whitewater River, in southeast Minnesota.[5] The purpose of the Ecological Watershed Monitoring Program was to determine whether atrazine concentrations in surface water reached levels of concern that might pose unreasonable risks to aquatic plants, invertebrates, or fish. Because these data shows that 48% of the samples monitored contained atrazine and that atrazine levels spiked to as high at 15 ppb, we wanted to ensure that it was incorporated into your review. A summary of the monitoring data can be found below. The original data may be obtained from the EPA through the following web site: http://www.epa.gov/pesticides/reregistration/atrazine/atrazine_update.htm#ewmp.

Table 1. Atrazine in the North Fork Whitewater River watershed in Minnesota, U.S. EPA Ecological Watershed Monitoring Program.

Watershed	Years sampled	Number of samples analyzed	Number of samples containing atrazine[6]	Maximum atrazine concentration (ppb)	Number of samples with concentrations above:	
					3 ppb	10 ppb
North Fork Whitewater River	2005-06	111	53 (48%)	15.03	4	2

Finally, with regard to the scoping document's discussion of the scientific literature, we agree with MCEA that the scoping document's bibliography fails to cite many studies relevant to the MDA's special registration review. In addition to the studies cited by the MCEA, we have attached a list of additional literature not included in the scoping bibliography that should be addressed. In particular, we would note that a recent study which appeared in *Nature* evaluated the role that atrazine may play in parasitic infection of amphibians. The study found that atrazine "was the best predictor (out of more than 240 plausible candidates) of the abundance of larval trematodes (parasitic flatworms) in the declining northern leopard frog."[7]

[5] This watershed straddles the Minnesota/Wisconsin border and is located in "Area 9," as identified in MDA's *Summary of Pesticide Detections in Groundwater and Surface Water Resources From MDA 2006 Annual Monitoring Report and Other Sources* at p. 3.

[6] This program had a level of detection (LOD) of 0.05 ppb. See http://www.nrdc.org/media/docs/050217A2.pdf.

[7] Rohr, J., Schotthoefer, A., Raffel, T., Carrick, H., Halstead, N., Hoverman, J. Johnson, C., Johnson, L., Lieske, C., Piwoni, M., Schoff, P., and Beasley, V. Agrochemicals increase trematode infections in a declining amphibian species. *Nature*. 2008;445;1235-1239.

Thank you for your consideration these comments. We look forward to commenting further as the special registration review of atrazine proceeds.

Very truly yours,

Andrew E. Wetzler
Deputy Director, Midwest Program

Additional Studies Relevant to Review of Atrazine

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Kiesecker JM. Synergism between trematode infection and pesticide exposure: a link to amphibian limb deformities in nature? *Proc Natl Acad Sci USA.* 2002;99:9900-4

Kniewald J, Jakominic M, Tomljenovic A, et al. Disorders of male rat reproductive tract under the influence of atrazine. *J Appl Toxicol*. 2000;20:61-8

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Laws SC, Ferrell JM, Stoker TE, Schmid J, Cooper RL. The effects of atrazine on female Wistar rats: an evaluation of the protocol for assessing pubertal development and thyroid function. *Toxicol Sci.* 2000;58:366-76

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Storrs SL, Kiesecker JM. Survivorship patterns of larval amphibians exposed to low concentrations of atrazine. *Environ Health Perspect.* 2004;112:1054–1057

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Swan SH. Semen quality in fertile US men in relation to geographical area and pesticide exposure. *Int J Androl.* 2006;29:62-8