Agrichemicals of Concern in West Bengal, India

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Industrial agriculture – the predominant form of agriculture now being practiced worldwide – relies heavily on the use of chemical pesticides to control crop loss from insects, animals and microorganisms. Over the past several decades, pesticides have revolutionized farming techniques and have facilitated the shift from small-scale, self-sufficient and diversified agriculture towards industrial mono-cropping. Only when viewed from a narrow and distorted economistic perspective does the application of chemical pesticides seem beneficial. It is now widely known that the agrochemicals being applied in staggering quantities worldwide pose serious hazards to both the environment and human health. Furthermore, as target pests mutate and evolve in response to pesticide application the chemicals decrease in effectiveness and thus must be applied in increasing quantity or replaced with new and stronger chemical varieties.

In developed nations such as the United States, concern over the impacts on human health and the environment has led to the banning of many pesticides and the strict regulation of others. However, agrochemicals represent a multi-billion dollar industry and the multinational corporations that manufacture large quantities of pesticides find markets for their products in the developing world. For example, seventy percent of the pesticides used in India are banned or severely restricted in the West. In the Indian state of Punjab DDT and BHC – agrochemicals banned in the west – have been widely detected in human breast milk.[i] During the 1980s, the US was producing 100 – 150 million pounds per year of pesticides considered too dangerous for domestic use. These chemicals were produced for export to nations with less stringent environmental standards. Ironically, such nations often use these chemicals on crops that they grow for export back to the US and Western Europe – in this way, citizens of developed countries may be exposed to chemicals banned by their own governments.[ii]

Agrichemical reconnaissance

A cursory survey of the agrichemical products in use in West Bengal in the region around the *Basudha* agricultural biodiversity research farm was conducted during October of 2007 in order to identify particular agrichemicals that pose a threat to drinking water contamination. Thirteen farmers' households in Panchal and Arjunpur villages were visited and interviews conducted about which pesticide chemicals were being used. A complete inventory of agrichemicals was taken from one pesticide shop in Panchal, along with a partial inventory from another shop. Also, researchers have indicated that the pesticides 2,4-D and carbofuran are thought to be widely present in India as groundwater contaminants.[iii]

This research revealed the following[iv]:

Out of the ***twenty-eight*** agrichemical products identified…

… ***seventeen*** are moderately to highly acutely toxic to humans

… ***six*** are possible human carcinogens and ***four*** are known human carcinogens

… ***thirteen*** are cholinesterase inhibitors (indicating neurotoxicity)

… ***nine*** are suspected endocrine disruptors

… ***two*** are reproductive or developmental toxins

… ***seventeen*** are classified as "Bad Actors" by the Pesticide Action Network[v]

… and ***nine*** represent significant threats to groundwater contamination.

See table below for a summary of the ecological and human health effects of each agrichemical product. The chemicals that constitute threats to groundwater contamination are: methyl parathion, methomyl, dimethoate, imidacloprid, acephate, phorate, carbofuran, thiophanate methyl, and 2,4-D.

The human health effects of the chemicals identified as potential groundwater contaminants are as follows:

- methyl parathion: PAN Bad Actor; high acute toxicity in humans; cholinesterase inhibitor; suspected endocrine disruptor
- methomyl: PAN Bad Actor; high acute toxicity in humans; cholinesterase inhibitor; suspected endocrine disruptor
- dimethoate: PAN Bad Actor; high acute toxicity in humans; possible human carcinogen; cholinesterase inhibitor; reproductive or developmental toxin
- imidacloprid: moderate acute toxicity in humans
- acephate: PAN Bad Actor; slight acute toxicity in humans; possible human carcinogen; cholinesterase inhibitor
- phorate: PAN Bad Actor; high acute toxicity in humans; cholinesterase inhibitor
- carbofuran: PAN Bad Actor; high acute toxicity in humans; cholinesterase inhibitor
- thiophenate methyl: PAN Bad Actor; slight acute toxicity in humans; known human carcinogen; reproductive or developmental toxin
- 2,4-D: moderate acute toxicity in humans; possible human carcinogen; suspected endocrine disruptor

Name	Class	Use	Crops	PAN Bad Actor	Acute Toxicity	Carcinogen	Cholinesterase Inhibitor	Endocrine Disruptor	Reproductive or Developmental Toxin	Groundwater Contaminant	Toxicity to Aquatic Life
cypermethrin	pyrethroid	insecticide	cotton, fruit and vegetable crops; also found in household ant and cockroach killers and in mosquito bed netting			possible	possible				high
chlorpyrifos	organophosphorus	insecticide, nematicide	oranges, almonds, cotton, walnuts, alfalfa	x	moderate	not likely	x	suspected			moderate to very high
quinalphos	organophosphorus	insecticide		x	moderate		x				moderate to high
monoctotophos	organophosphorus	insecticide		x	high		x				slight to high
methyl parathion	organophosphorus	insecticide, nematicide	walnuts, corn, onions, dried beans, almonds	x	high		x	suspected		potential	slight to very high
methomyl	carbamate	insecticide	corn, lettuce, alfalfa, strawberries	x	high	not likely	x	suspected		potential	slight to very high
carbendazim	benzimidazole	fungicide	landscaping		slight	possible		suspected			slight to high
dimethoate	organophosphorus	insecticide	alfalfa, tomatoes, oranges, corn, broccoli	x	high	possible	x		x	potential	moderate to very high
imidacloprid	chloro-nicotinyl	insecticide	structural pests, lettuce, landscap, grapes		moderate	not likely				potential	non to very high
butachlor	chloroacetanilide	herbicide		x		known					slight to high
hexaconazole	azole	fungicide				possible					
triazophos	organophosphorus	insecticide		x	high		x				
kitazin (iprobenfos)	organophosphorus	fungicide		x	slight		x				slight to moderate
mancozeb	dithiocarbamate	fungicide	onions, grapes, tomatoes, potatoes	x		known		suspected			non to high
fenobucarb (BPMC)	carbamate	insecticide		x	moderate		x				slight to very high
lambda cyhalothrin	pyrethroid	insecticide	alfalfa, lettuce, rice		moderate			suspected			very high
acephate	organophosphorus	insecticide	lettuce, cotton, celery	x	slight	possible	x			potential	non to very high
dichlorvos	organophosphorus	insecticide		x	high	known	x				
phorate	organophosphorus	insecticide, nematicide	cotton, potatoes, sugarbeets, corm	x	high	not likely	x			potential	slight to very high
carbofuran	carbamate	insecticide, nematicide	alfalfa, grapes, oats, artichokes	x	high	not likely	x			potential	non to very high
tricyclazole	azole	fungicide			moderate						slight to moderate
copper oxychloride	inorganic	fungicide	grapes, pears, wlanuts, peaches		slight						slight to very high
alphamethrin	pyrethroid	insecticide			moderate			suspected			high to very high
thiophanate methyl	benzimidazole	fungicide	pistachios, landscape, almonds, strawberries	x	slight	known			x	potential	non to very high
cartap hydrochloride	nereistoxin	insecticide									moderate
acetamiprid	chloro-nicotinyl	insecticide	cotton, lettuce, tomatoes, apples			not likely					
endosulfan	organochlorine	insecticide	tomatoes, lettuce, alfalfa, cotton, cantaloupe	x	high	not likely		suspected			slight to very high
2,4 D	chlorophenoxy acid or ester	herbicide, plant growth regulator	landscape, right-of-way, wheat, forage grasses, barley		moderate	possible		suspected		potential	non to slight

For more information on pesticides and drinking water filtration using charcoal, see our website: ***aqsolutions.org***

References

[i] The state of India's environment 1984 - 1985. Argawal A et al. Centre for Science and Environment, New Delhi, 1985.

[ii] The Circle of Poison. Weir D and Shapiro M. the Institute for Food and Development Policy, 1981.

[iii] Gupta VK, Ali I, Suhas, Saini VK. Adsorption of 2,4-D and carbofuran pesticides using fertilizer and steel industry wastes. Journal of Colloid and Interface Science 299 (2006) 556–563.

[iv] Pesticide Action Network online pesticide database: http://pesticideinfo.org, accessed 10/19/07.

[v] According to the Pesticide Action Network, Bad Actors are chemicals that exhibit one or more of the following properties: high acute toxicity, cholinesterase inhibition (neurotoxicity), known or probable carcinogenicity, known reproductive or developmental toxicity, or are known to constitute a groundwater pollution threat.