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## Facing a Silent Spring...

Pesticides. Ecological devastation. And cancer. The story of an environmental victim

As an environmental activist and writer, I have tried for years to promote nationwide concern about the deteriorating state of our environment. The idea of writing about my own travails as an environmental victim had, however, never crossed my mind. But obviously, I could not have escaped what was and is happening all around me.

Cancer is a frightening word. It means a terminal disease with periods of excruciating pain. And the treatment, full of poisons, is often as horrific as the disease itself. So how would you feel if you are told that you are suffering not just from cancer, but from such an extremely rare form of it that there is hardly any treatment available? That it has already invaded both your eyes, formed a small tumour in the centre of your brain so that it cannot even be surgically removed without cutting up the brain completely and has even reached your spinal cord? And that as the cancer grows in the eyes, the mass of cancerous cells will pull out the retina in both your eyes and make you go permanently blind; the tumour in the brain will grow to put pressure on the brain and cause strokes, among other things; and the malignant cells in the spinal cord could affect the various nerve endings

attached to the cord any time and cause you acute pain and/or irreversibly paralyse parts of your body? The end of all this suffering will, of course, be death. Maybe not more than a year later, but a large part of that year could be spent in bed groping in darkness and pain.

Terrifying prospects, as you will agree. These were the prospects I faced in early 1994. And they were enough to make me think how merciful was God to those whom he let die peacefully in their sleep.

Failing to find even a diagnosis for the symptoms in my eyes — black lines inside my left eye so that I could hardly see from it — in India, I was finally referred to the National Eye

*Chairperson and founder of the Centre for Science and Environment (CSE), Anil Agarwal passed away on January 2, 2002, after a seven-year battle against cancer. He also suffered from asthma. In 1999, he wrote this article on his experience with cancer. He believed that his own cancer had a message. As a tribute to our boss and guru, we reproduce for our readers his very own story in his own words.*

Institute in USA, whose scientists after diagnosing ocular and central nervous system Non-Hodgkin's Lymphoma (NHL), referred me to their prestigious sister institution, the National Cancer Institute (NCI). I learnt that the black lines in my eyes were cancer cells which had formed a sheet in front of the retina.

Fortunately, doctors at NCI had an experimental chemotherapy for the disease. They first pumped in fatal doses of a cancer drug so that it could break past the blood-brain barrier and enter the otherwise well-protected central nervous system and eyes in quantities sufficient to kill the cancer cells. They had to immediately follow up with an antidote to save me from dying. The treatment gave me an year's blissful 'remission' (a period without measurable cancer). After an year, in late 1995, the cancer cells returned. I was faced once again with the prospect of blindness, neurological disorders and death.

The doctors said that this time they had caught the recurrence so early that they were sure the 1994 treatment would get me back in remission, but they were also certain the remission would not last even a year. I needed something more definite, something with a higher probability of cure — "such that you can live till 70 or beyond till only old age kills you", as one of the doctors who was very fond of me put it. She and others knocked their heads together and came up with a solution: medicos in Paris were experimenting with bone marrow transplants to cure nhl. "After we put you into remission, you must immediately go in for this treatment," they recommended.

Bone marrow transplant is one the most invasive medical procedures developed by modern science. I went through it in mid-1996 and hope that I have finally gotten rid of the disease. That, however, is something that only time will tell. Meanwhile, I will keep praying that some medical scientist somewhere, will continue to look for a simpler, less horrifying and more definitive cure for this rare disease.

### People as statistics

But why should this story of an individual cancer patient be of interest to

anybody in a large and growing nation like India? Individuals are, after all, mere statistics. My case, however, is instructive because it represents today the scale of life-threatening and destructive processes that we are inflicting upon ourselves. My cancer, like most other cancers, is deeply related to environmental pollution — an issue, on which, ironically, I have written numerous articles and books, given lectures and made films to increase public awareness of the threats we face. Therefore, I feel a sense of moral responsibility for going on.

The poor, naturally, suffer more than the rich from environmental degradation. However, at least the powerful urban middle and upper classes — we had thought — were intelligent and self-indulgent enough to try and protect themselves and moderate the impact of environmental destruction on their own lives. That theory has proved to be a total chimaera. The elite of our nation have failed to internalise the ecological principle that every poison we put out into environment comes right back to us in our air, water and food. These poisons slowly seep into our bodies and take years to show up as cancer, as immune system disorders, or as hormonal or reproductive system disorders — affecting even the foetus.

Is it, therefore, not imperative for a society to find a way that balances its urge for economic growth and material comforts with the requirements of its natural and human health? Isn't this something that we owe to ourselves and to our children?

### Cancer as statistics

Although cancer statistics in India — relatively poor — probably understate the extent of the disease, what they tell us is terrifying. There are six hospital-based cancer registries in India — five in Bangalore, Mumbai, Madras, Delhi and Bhopal and one in the rural area of Barsi near Pune — which give us an idea of urban and rural cancer incidence in India. Age-adjusted cancer incidence rate per 100,000 people in the five urban centres varied between 101.2 (Bhopal) to 143.6 (Delhi) for women in 1990, whereas for males it was between 107.5 (Bhopal) and

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138.9 (Mumbai). This incidence was twice the incidence rate of 56.2 in Barsi, which shows that living in our polluted urban centres more than doubles our chances of developing cancer.

There is another way of looking at this data by asking the question: what is the chance that I will be affected by cancer during my lifetime? The answer is stunning. If you are living in one of the four metros — Bangalore, Mumbai, Madras or Delhi — the chance of your catching cancer during a lifetime is as high as seven-11 per cent. In other words, one out of every 10-15 people living in these cities is going to become a cancer victim during his/her lifetime. Or, assuming an average household size of five, it means every second to third household in these metros will have a member falling victim to the disease. However, if you were living in Barsi, the chances of cancer in a lifetime would go down by half — only one out of 20-36 persons will get cancer in their lifetime.

But while cancer is an issue that impinges on national consciousness in the West, it does not do so in India. Experts in us argue that what is occurring in their country is nothing short of a 'cancer epidemic'. The concern for cancer shared by millions in the public has strongly fuelled environmental regulations for control of air and water pollution and toxic wastes. In India, cancer is still largely regarded as a relatively insignificant threat to public health. Yet one conservative estimate puts the total number of national cancer cases by the year 2001 at 806,000. This figure, of course, does not include people who probably cannot even reach hospitals and get diagnosed, especially amongst the vast population of rural and urban poor.

Let me look at statistics about the cancer I am suffering from Non Hodgkin's Lymphoma. In 1990-91, NHL was listed amongst the eight most common forms of cancer in Delhi,

Madras and Bangalore amongst males and in Delhi, amongst females, too. But there are less than 200 medically recorded cases worldwide where NHL has affected the eyes; I am probably the first case of ocular lymphoma diagnosed from India.

### Causes of NHL

It is impossible to pinpoint why a particular individual gets cancer. Carcinogenesis can result from stress (which depresses the immune system), bad diets, environmental toxins like pesticides, air pollutants and industrial chemicals, waste products and even genes. While diet and stress are factors more associated with personal lifestyles, environmental contamination is a societal problem and, therefore, needs greater attention and regulation.

In India, the meagre data collected by NCRP for different cities shows a steady increase. In Madras, there is literally a doubling of incidence in 10

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years between 1982 and 1991 amongst both males and females, besides substantial increases in Mumbai and Bangalore. While the database for Delhi and Bhopal is too small to identify any trend, the statistics do show that Delhi has the highest incidence amongst both males and females followed by Mumbai. Interestingly, a comparison clearly shows that NHL incidence is rising faster than overall cancer incidence; in Mumbai and Madras, the difference in increase is quite dramatic. However, in a conspiracy of silence, almost all specialists at the Tata Cancer Memorial Centre in Mumbai replied in the negative when asked if NHL was increasing in India.

Cancer experts believe that risk of lymphatic cancers including NHL increases when the body's immune system gets affected or suppressed. Says N K Mehrotra, head of the environmental carcinogenesis laboratory in the Industrial Toxicology Research Centre (ITRC), Lucknow, "The causes of lymphoma are as yet unknown, but it

mainly occurs due to cumulative effects of pollutants and reduced immunity in the body." A number of NHL cases in the US occur in people who have been affected by HIV, the dreaded AIDS virus. In India too, the spread of HIV will definitely boost the incidence of NHL. But the NCI does not believe that the HIV virus, or cancer-causing viruses like human t-cell leukaemia virus-1 or the Epstein-Barr virus, play an important role in the increase of NHL. Neither do dietary factors, according to it.

The NCI says that certain immunosuppressive genetic syndromes can play a role in causing NHL, but that they are too rare to bring about any major increase in cases. Similarly, 50-fold increases in risk of NHL have been observed among organ transplant patients, because they receive powerful immunosuppressive drugs on a long-term basis; but again, these conditions affect very few people. The NIH study argues that improved diagnostic facilities and recent reclassification of other cancers into lymphomas account for a tiny fraction of the increase in NHL.

### The menace: pesticides

The key factor which is, therefore, attracting worldwide interest amongst epidemiologists is environmental pollution. Several studies carried out in Canada, Sweden and the US have shown a strong correlation between the risk of NHL and use of pesticides. Frequent use of herbicides, particularly 2,4-dichlorophenoxyacetic acid (2,4-d) has been associated with a 200-800 per cent (two-eight times) increased risk of NHL in Sweden. According to one study, the association between NHL and phenoxy acid herbicides may be because of contamination by dioxin, a highly poisonous immunosuppressant. The NCI study argues that though the number of people working in agriculture occupationally exposed to these and other pesticides is not large enough to explain the overall increases in NHL, the general population is also at a heightened risk because of the use of these pesticides in homes, lawns and golf courses. Dogs whose owners have used 2,4-d, for instance, have a heightened risk of contracting malig-

nant lymphoma.

Since the use of pesticides, particularly phenoxy herbicides (2,4-d, 2,4,5-t or 2,4,5-trichlorophenoxyacetic acid, and MCPA or 2-methyl-4-chlorophenoxyacetic acid) and organophosphate pesticides has increased over the last 40 years, the NCI argues that they could have played a significant role in contributing to the rising incidence of NHL.

The general population can be exposed to pesticides in three ways:

- through vector control
- through residues in environment
- through residues in food

This segment of population tends to have only a low-dose, chronic exposure, but larger doses can be transmitted if the exposure is persistent and bioaccumulative. Persistent pesticides move through air, soil and water, finding their way into living tissues where they can bioaccumulate up the food chain into human diets. Roughly 85-90 per cent of pesticides applied agriculturally never reach target organisms, but disperse through the air, soil and water. People who can be exposed to high levels of bioaccumulated pesticides include

- habitual consumers of fish, livestock and dairy products;
- fetuses and nursing infants whose mothers' bodies have accumulated persistent pesticides; and,
- sick people who metabolise their fatty tissues (which contain bioaccumulated pesticides) while ill.

According to an ITRC survey of studies on pesticide residues, high levels of residues of BHC, lindane, heptachlor, endosulphan and dieldrin have been found in just about everything necessary for life from food to water. The list does not even include tea whose DDT residues are so high that Germany is refusing to import Indian tea.

How do these residue levels compare with residues in industrialised

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countries or with acceptable daily intake (ADI) standards? Badly, at best. Studies have shown that people in Delhi have one of the highest levels of DDT bioaccumulated in their body fat. Another study of 1991 on pesticide residues in Delhi by A Nair and M K K Pillai reports that DDT and HCH residues were present in Delhi's water, soil and fauna. Human breast milk samples in Delhi show DDT and HCH levels comparable to those found in Punjab, an area of intensive farming. Infants ingesting this breast milk receive roughly 12 times the allowable daily intake of DDT.

Adding to the concern about carcinogenic effects of pesticides are the latest findings of a new discipline of science called immunotoxicity, which studies substances with a negative impact on the immune system. A recent review of over 100 primary experimental studies of immunosuppressive nature of pesticides reports that the large majority of these studies reveal various types of immunosuppressive effects. Reduced immunity influences cancer incidence. A weak or devastated immune system allows cancerous cells to escape and form a tumour. One can only imagine the kind of havoc pesticides can play in a country where a large percentage of the population is malnourished and, hence, suffers from immunodeficiency.

### Organic solvents & industrial chemicals

According to NCI, exposure to organic solvents also leads to increased risk of nhl. Organic solvents are widely used in the paints industry, in dry-cleaning and woodcrafts, and large numbers of workers are potentially exposed to them. Among the solvents which are suspected carcinogens are chlorinated hydrocarbon solvents, methylene chloride, trichloroethylene, chloroform, formaldehyde and benzene. A Swedish study also lists styrene, trichloroethylene, perchloroethylene and chlorophenols as substances whose exposure heightens the risk of NHL. A British study shows heightened risk of NHL amongst those exposed to wood dust and epoxy glues.

Enquiries in India conducted by researchers of CSE reveal that no study of contamination of drinking

water sources by these solvents has been conducted so far. Studies, however, have shown that the following solvents were present in effluents of the paint industry:

2,4,6-Trichlorophenol	Benzene
2,4-Dichlorophenol	Chloroform
2,4-Dinitrophenol	Methylene
4,6-Dinitro-o-cresol	Chloride
Pentachlorophenol	Trichloroethylene
Phenol	

What is frightening is that not all these contaminants can be removed by existing wastewater treatment processes in India, thus leading to the contamination of natural water sources which ultimately provide us with drinking water.

### Growing horde

The Indian pesticide industry today has an installed capacity of 116,000 tonnes (t) per annum, of which about 70,000 t is in the organised sector, whereas the rest is in some 500-odd units belonging to the smallscale sector. It is doubtful that the smallscale sector has any appreciable control over contamination by pesticides. In 1994-95, India produced almost all the pesticides it consumed — some 83,000 t in the agricultural sector alone. Imports are currently about 2,000 t only. With liberalisation, controls on creating additional capacity for pesticide formulations has been lifted and there is no restrictions excepting six pesticides (aluminium phosphide, dimethoate, quinalphos, carbaryl, phorate and fenitrothion) for which licensing is compulsory. A Planning Commission study has projected pesticide consumption by 2000 ad at 118,000 t — 97,000 t for agriculture and 21,000 t for public health. It is interesting to note that most of the growth in the world pesticide industry is in developing nations.

Like the pesticides industry, the Indian paints industry has also been growing rapidly. Between 1950 and 1982, production increased from 40,000 t to 190,000 t (107,000 t in the organised sector and 83,000 t in the smallscale sector) — the smallscale sector increased production eight-fold compared to the organised sector's slightly over three-fold increase. The smallscale sector is particularly notorious for its poor or non-

### The Indian pesticide industry today has an installed capacity of 1,16,000 tonnes (t) per annum

existent waste-water treatment facilities. Following liberalisation, a lot of hazardous paint and dyestuff industry has moved to India because of growing environmental controls in the West and inadequate controls in India.

### More questions

There are countless questions that keep crossing my mind. Why did I get afflicted with this disease? How cancer-prone are we becoming as a nation? Who is responsible? What should we do about it? It is clear from the sum total of the evidence available that environmental contamination could have been a key cause of my cancer. As I am not an agricultural labourer or a farmer spraying pesticides, the maximum likelihood in my case is of exposure through food and water.

My principal interest in writing this article is to inform the Indian people that they must not remain ignorant and nonchalant about the acute threats they face to their own health and to the health of their children. I find no concern in India about clean air, water or food, all of which are not just bacteriologically but also chemically contaminated today. At a seminar organised by a leading Delhi-based NGO on Delhi's drinking water supply system in 1995, I had to point out that while there was so much talk about the inadequacy of water supply, there was almost none about its quality. What good is lots of water if it is so contaminated?

Bacteriological contamination shows up in acute epidemics and hence, often leads to a hue and cry amongst the public and in the media. But chemical contamination takes years to show up in the form of cancers or hormonal and reproductive disorders, and hence unless there are good epidemiological studies carried out on a regular basis and a constant effort made by the medical profession and a vigilant media to inform the public about the health threats it faces, there will be no pressure whatsoever on the regulatory authorities to do any-

thing to protect the environment.

Ignorance is bliss for the the politician and the bureaucrat. Apart from the influence of industrial lobbies which may operate underhand, India's overt governance systems themselves are incompetent. An excellent illustration of this is the fact that the Ministry of Environment and Forests has no team working on the dangers posed by toxins like pesticides that permeate the environment and food systems.

Summing up, I can only say that had not fate, friends and well-wishers and committed scientists from various parts of the world not intervened to help in my case, it would have been a Silent Spring for me in the prime of life. I can only hope and wish that that no fellow citizen has to suffer the same fate. And that Indian civil society can, one day, force our misguided government to come to its senses.

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