The Killing Fields

Farmer deaths due to exposure to pesticides in Warangal District

Report of the Fact-finding Team

- Toxics *Link*
- Sarvodaya Youth Organisation
- Centre for Resource Education
- Community Health Cell

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THE FACT-FINDING TEAM

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ABOUT PARTICIPATING ORGANISATIONS

- **Toxics *Link*** is an information-clearing house on environmental-toxicity related issues. It is a group that exchanges information with experts, organisations and individuals working on toxics in India. Toxics Link has offices in New Delhi, Mumbai and Chennai

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- **Sarvodaya Youth Organisation** is a voluntary organisation working on agricultural issues in rural areas. It also has done extensive work on consumer and environmental issues.
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- **Centre for Resource Education** is a voluntary organisation based in Hyderabad working on issues related to agriculture, sustainable development, environmental protection and other related rural and urban issues.
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- **Community Health Cell** is a professional group comprising of doctors, epidemiologists and other health professionals, that specialises in offering technical support on health-related scientific studies.
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BACKGROUND

Pesticide consumption in agriculture has been on the rise in the last 10 to 15 years in India. Pesticides are used extensively in crops such as cotton, paddy, chillies, horticulture, tobacco, etc. They are also used for public health purposes, like vector control for diseases like malaria, dengue, Kala azar However, little attention is given to their long term impact on the environment and human beings.

Cotton is cultivated in more than 8 million hectares in India, concentrated in five states of Maharashtra, Gujarat, Andhra Pradesh, Punjab and Rajasthan. Cotton is a crop which is presently deciding the fate of more number of farmers in Andhra Pradesh than before. Since 1990, cotton has been the cause of suicide deaths by farmers in several districts of Andhra Pradesh, with the number of suicides increasing every year.

In 1997-98, the area under cotton cultivation in Andhra Pradesh was 7.60 lakh hectares (ha). Among the three regions of Andhra Pradesh, acreage under cotton in the coastal Andhra Pradesh was 2,28,258 ha, in Rayalaseema it was 70,061 ha and in Telangana region it was 1,51,750 ha respectively. Cotton cultivation is relatively a new phenomenon in Warangal district. The acreage under cotton has been growing steadily in the past seven years, from 1,500 ha in 1970-73 to 88,000 ha in 1997.

In the upland rain-fed conditions, cotton can be sown at any time between June to September. But if the sowings are delayed beyond first fortnight of June, yields are likely to reduce drastically. Though cotton cultivation has spread rapidly to almost all the districts of Andhra Pradesh, there is wide variation in productivity levels and economic returns from region to region and from year to year, mainly due to the agricultural practices and natural conditions. This variability is gnawing the economy of the farmers and has been the cause of distress, suicides and deaths in the villages of Andhra Pradesh, particularly in Warangal district during the past four years.

Warangal district, in the dryland region of Andhra Pradesh, has emerged as one of the main cotton growing areas in the country next to Guntur district. This year (2001-2002), cotton was sown in an area estimated to be more than 2,50,000 acres. Cotton as a crop is now considered as a boon by the farmers. According to the office of the Joint Director of Agriculture (JDA), Warangal, this district makes a substantial contribution to cotton production in Andhra Pradesh. It is only

BACKGROUND

in the last decade that Warangal has come under the Cotton Belt. Farmers, be it small, marginal or large, have shifted to cotton primarily due to expectation of good returns it brings from the agricultural market – the white gold.

However, cotton is a crop that has become synonymous with pests and pesticides right throughout the growing season from July to January. At the preliminary stage, comes the sucking insects, followed by the most common Bollworms (Green and Pink) of the *Genii Heliothis* and *Helicoverpa* which devastate cotton crops. To obviate this problem, farmers have to invest heavily on pesticides and insecticides in order to get optimum yield. Normal yield ranges from 5 – 10 quintals per acre[1] .

It is officially estimated that this crop season over 600 metric tons (active ingredients) of pesticides were used in Warangal district alone, at an estimated cost of Rs.30 crores.

The ill effects of prolonged use of pesticides are many. But three most important effects of prolonged use of pesticides are: large-scale killing of the other beneficial organisms; quick resistance development by the pests to the pesticide; and, the uncontrolled growth of the pests due to the elimination of the predators. Contamination of natural resources due to pesticide and chemicalisation of agriculture has lead to adverse impacts on ecology and environment. In recent years impact on human beings by these deadly chemicals are coming to the fore. Recent farmers deaths in Warangal district of Andhra Pradesh is one such instance.

Andhra Pradesh as a forefront State in adopting green revolution techniques of agricultural production has been the largest consumer of chemical fertilizers and pesticides for important commercial crops like cotton, green chillies, tobacco, vegetables, and grapes. Importantly, cotton has been the single most crop which requires heavy application of chemical pesticides. Such 'expensive' inputs have also been the scourge for farmers, who are already in grave financial situation due to un-remunerative prices, and pernicious policies of the government. Cotton farmers have been committing suicides in the State for the past three to four years. Warangal district has shot into limelight because of such suicides. However, recently, AP Raithu Sangham, a farmer's organisation with a state-wide network brought into limelight deaths of farmers while applying pesticides on cotton crop.

The information was brought to light by Mr. Sarampalli Malla Reddy, State Secretary of AP Raithu Sangham, who had seen the hospital records showing deaths caused by spraying of pesticides. Commissioner of Agriculture, Mr.Rajiv Sharma's oral enquiries from his department sources in Warangal confirmed this report. (Annex no. III)

To ascertain the authenticity of the report, Toxics Link and Centre for Resource Education visited the villages on 23 and 24th October, 2001, along with Mr. Damodar of Sarvodaya Youth Organisation. Information was collected from family members of the victims and also from Mr.Vasudeva Reddy of AP Raithu Sangham in Warangal district. The visit confirmed the deaths due to pesticides spraying. A copy of the report is annexed (Annex no. IV).

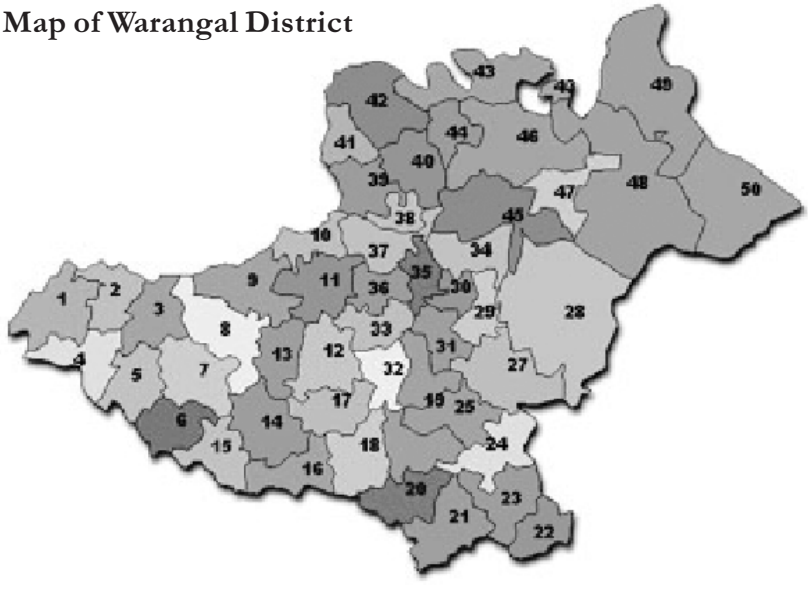
Meanwhile, the issue was sidelined as one of over-zealousness of farmers and lack of understanding about handling procedures by the government agencies. This issue, still hasn't merited the attention of the government, media or civil society. Though the victim families were entitled to compensation under '*Apathbandhu*'[2] scheme of the government, it has not been granted. Detailed forensic reports are awaited from the Forensic Lab in Hyderabad.

Preliminary discussions with farmers, local groups and journalists, revealed that there maybe similar incidences in other districts and it is an annual phenomenon, especially where cotton is produced intensively, indicating that the problem might be bigger than what is understood.

Based on the initial investigation and discussions, it was decided to constitute a fact-finding team to bring out the facts surrounding these incidents. The objectives of the visit were:

- To bring out the circumstances in which the deaths and illness had happened.
- To highlight the issue in civil society, media and government.
- To build the capacities of the local medical doctors and civil society in dealing with future occurrences.
- To enable the linking up of experiences

Map of Warangal District



Mandals in which the villages surveyed are located
11 – Hanamkonda **26** – Nekkonda **36** – Geesugonda **37** – Atmakur

Source: www.andhrapradesh.com

across India, so as to campaign for ban of hazardous pesticides.

Qualitative methods like focused group discussions, questionnaires were used while conducting field investigations to ensure uniform information collection and credibility of the investigation. The fact finding team's visit was not aimed at doing health study or in-depth scientific investigation, but to do an indicative study which would lead to a larger health study.

Dates of the visit

14th – 16th January, 2002.

Villages visited

Mogilicherla-Geesukonda Mandal; Akkam peta-Atmakur Mandal; Damera-Atmakur Mandal; Vasantapuram-Geesukonda Mandal; Mudu Thanda-Nekkonda Mandal; Pattipaaka-Sayampet Mandal.

Meetings with officials

Joint Collector of Warangal District – 15th January, 2002
Joint Director Agriculture – 15th January, 2002
Local doctors – Indian Medical Association - 16th January, 2002

Footnote:

[1] 100 kg = 1 quintal, 100 quintals = 1 tonne; 1 quintal ~ Rs.1, 500 – 2,000/-

[2] Under this scheme, rural people who die of un-natural causes are provided compensation by the Life Insurance Corporation. Every year, State government pays a fixed number of premiums to cover these compensations. It was initially intended for snake-bite related deaths, but has been extended to other causes as and when the government announces its policy.

"For the first time in the history of the world, every human being is now subjected to contact with dangerous chemicals, from the moment of conception until death."

Rachel Carson, SILENT SPRING, 1962

OBSERVATIONS

As per state government records, there are twelve confirmed deaths and forty cases of exposure, where exposed person had to undergo treatment. A systematic update and scrutiny of medical records from healthcare units in Warangal region would provide an accurate picture of the exact number of cases. This is because, based on first-hand observations from the field visits and the intensity of cotton cultivation[1], it is highly likely that there could be many more unreported exposure cases and possibly unreported deaths in the period between August to December 2001 and very large numbers could have been chronically affected. The impact levels vary widely due to poverty, social position, levels of nutrition, and physiology of the person and exposure levels.

The most baffling fact that came to light during the field visits was the time period- September and October- within which most of the deaths and exposure occurred. According to the farmers and even the government officials this phenomenon has occurred for the first time in the villages. While its now well established that deaths and illness had occurred during pesticides spraying, it still needs to be investigated whether any of the batches of pesticides were spurious or not, since different types of pesticides were applied by the affected persons.

Almost all the affected persons had some experience in spraying and have been spraying the same or different pesticides for the past many crop growing seasons. Some may have been inexperienced, but nevertheless were guided by the older experienced generation (parents). Majority of the people affected by pesticide exposure were farm labourers working for their employers, and the others were marginal farmers, with one to five acres of land holdings. The victims were from an economically insecure background, with almost no coverage for medical expenditure.

Symptoms and health effects reported by farmers:

Early symptoms included dizziness, fatigue, runny nose or eyes, salivation, nausea, intestinal discomfort, sweating, changes in heart rate, chest pain and respiratory congestion, central nervous system stimulation and depression,

dermatitis, diarrhoea, visual disturbances, hepatic and renal injury, insomnia and mood changes, mucous membrane irritation, muscle twitching and shivering, abdominal pain and anorexia, vision problems, joint pain, hormonal disturbances, paralysis, peripheral neuropathy and weakness. In acute cases, paralysis, seizures, loss of consciousness, and death have been reported.

Medical treatment for the affected persons was mostly limited to oxygen supply and glucose drips. All the victims approached nearby private practitioners (local RMPs - Registered Medical practitioners) initially. Acute cases were referred to MGM Hospital in Warangal. Atropine was administered. One Doctor in Sayampet mandal headquarters (for about 20 villages) reported that he had more than 140 cases in the months of September and October. He also received patients in near fatal condition, who died soon after admittance in his clinic. Lesser fatal cases were treated for about a period of three days and then discharged. He confirmed that the MGM Hospital received many acute exposure cases in the same period.

Post mortem reports of 8 deaths were also examined. All the reports mention that major organs showed 'congestion' which, according to doctors, is a clear indication of exposure and poisoning cases.

Pesticides handling and spraying practices

Victims and other affected farmers have been mostly using a standard mixture of 50 ml (rarely more) pesticide for every filling of the back-pack sprayer tank (16 Litre capacity). Most of them use manual sprayers, while some use motorised versions. Farmers have been using Methyl Parathion (Metacid), Cypermethrin, Endosulphan, Chlorpyriphos, Ekalux, Quinalphos, Avaunt and Tracer on cotton crops.

The following are the pesticide spraying and handling practices:

- Normally, the pesticide is diluted in water in a separate container and the spray tank is continuously filled while the spraying is done. Usually the filling of the spray tank is done by women workers.
- Spraying is either done with a piece of cloth covering mouth and nose or without any covering. No other protection or safety measures are used.
- Mixing of two different pesticides is very common practice amongst framers.
- On a field visit, the team chanced upon motorised spraying activity. The person spraying walks ahead and is constantly exposed to the spray he moves into it by the time it settles. The helper (male or female) also moves into the sprayed area, as they continuously fill the tank. Thus, both the persons are exposed. Surprisingly, the jet blast brought the spray shower right to the point where the team was standing (about 8 feet away) and the strong odour persisted in the entire vicinity – this could definitely have a serious impact on the entire agro-ecosystem [2], killing organisms beneficial to farming. There is a strong possibility that in some cases the persons affected were helpers earlier, and have now 'graduated' to spraying (needs verification). ***In such a situation, the exposure is of a chronic and continuous nature.***
- As the cotton crop is pesticide intensive, the quantity and toxicity of pesticide used increases as the season progresses. Farmers' expenditure consequently keeps increasing.
- In the latter part of the season the mature cotton crop equals the average height of a farmer. So the intensity of the spray would be maximum and also at face-level.
- Women farm workers are at a risk of higher exposure as they fill the tanks while spraying as well as while plucking the cotton crop right after spraying. Sometimes within three to fours hours of spraying.
- The canopy of the plant is thicker because of the full growth, which prevents quicker dissipation of the toxic spray. While 'slower' dissipation is desired to kill the pests, it poses health hazard for the person spraying pesticides.
- After pesticides exposure related deaths occurred in the villages, some of the farmers have started experimenting with tractor-mounted spraying to decrease the exposure to

The sprayer and his helper using a motorised backpack sprayer without wearing any protective gears to spray the cotton crop in the middle of noon. The strong spray jet reached the point where the Team was standing.

the workers. But this crude method of spraying can pose grave dangers not only to the farm workers but also the surrounding area, as the pesticides will be spread widely over a larger surface area.

Ironically, while investments on seeds and pesticides have increased exponentially with the introduction of new types of seeds, and pesticides like Avaunt and Tracer, the cotton yield is gradually decreasing. As farmers purchase their agricultural inputs, including pesticides, in credit systems there is a strong possibility of farmer deaths by suicides, simply because of increase in debt margins and poverty levels.

The state government is yet to take serious cognisance of the tragic deaths and instead seems to be placing the onus of the problem on a mere case of improper handling and lack of adequate precautions. **It is to be noted that these farmers have been using pesticides over a long period of time and are not new to its applications.** In a meeting with the Joint Collector, Warangal district, the team was assured of more educational programmes for the farmers not merely on pesticide use but also on alternative non-chemical and biological methods. In reality, the fact that pesticides are highly toxic substances and its usage in general needs a serious rethinking at various levels of governance, right up to the policy level.

Conclusions

A highly grievous situation persists in the districts of Warangal caused by chemical pesticides. Farmers are dying in increasing numbers and deaths are immediate or gradual. After more than ten years of continued usage, the consequences are now being made obvious by these incidences in this cotton-growing season from September to March 2001. Particularly every September is going to be crucial, because spraying and consequent deaths are also going to be severe. Although, the exact causes of death and causalities (especially in the months of September and October) has not been arrived at, the circumstances of death seem to give a clear indication of the fact that pesticide spraying has affected large numbers farmers in many parts of Warangal district. After analysing the various reasons of causation offered by the different stakeholders the team believes that the above statement is the most plausible explanation.

Chemical pesticides are gradually becoming ineffective against pests and as a result the toxicity level of the chemicals are being increased. Placing emphasis on the experience of the medical community in Warangal, it is expected that such exposure cases are bound to increase every year. And, ominously, most people are not aware of their 'threshold' levels.

An in-depth health study needs to conducted, not only in Warangal but also in neighbouring Guntur district, where pesticides consumption is highest in the country. This assessment should include health impacts on women and children in particular and should also encompass other specific social sections like farm labourers and marginal farmers. Such an assessment should also include socio-economic impacts of affected families and the strategies adopted by these families to cope with the additional burden of managing their livelihoods caused by the deteriorating health conditions and death of the men folk.

Complacency is prevalent in the Government, agricultural research institutions and pesticide companies. It is urged that the Government and pesticide companies provide all forms of support to help the families overcome these tragic deaths.

In view of the negative impact of pesticides, there is a growing need for ecologically safe and sustainable methods of agriculture, promotion of organic cotton production and integrated pest management, which would make farming less pesticide-intensive.

On the basis of preliminary investigation by the team, taking into account two to three deaths and more than 5 to 10 cases of exposure in villages visited and increase in the acreage under cotton this year to all *mandals* in the district, it is estimated that there could be more than 500 deaths in Warangal district, and more

There could be more than 500 deaths and more than 1000 exposed in the period between August to December 2001 in Warangal district

than 1000 exposed in the period between August to December 2001. This needs to be further investigated to get the correct estimates.

Priorities to ensure prevention of further causalities

- Initiation of education and counselling programmes for farmers and farm labourers in Warangal district on organic agriculture (especially cotton) in association with the civil society and government institutions.
- A detailed investigation into similar experiences elsewhere in the country and a formulation of a comprehensive national pesticide policy that would focus on rational use of pesticides, control and strict monitoring of accessibility to such dangerous chemicals and gradual phase-out of chemical pesticides.

Footnote:

[1] Cotton this year is now being cultivated in all the mandals of Warangal district. However, the intensity is more in mandals near Warangal town and other major urban centres.

[2] The absence of birds was noticed. However, the impacts on ecosystem need a more in-depth investigation.

FIELD NOTES

On its field trip, the fact-finding team came across various new information and findings which are narrated in this section. It was apparent from the visit that the situation on the ground was graver than reported in the media and by the government agencies.

Village: MOGILICHERLA, GEESUKONDA MANDAL

Moglicherla is a relatively large village with a population of more than 1000 families. Almost 90 percent of agricultural land in this village is under cotton crop. In this village, the fact-finding team's interactions were facilitated by the Sarpanch, who accompanied them to the houses of all the victim families. The team talked to family members of two persons who died due to pesticide exposure. Both of them were farm labourers and have been working in the fields of their employers.

Bela Shankar, *a victim, was 22 years old. He had about one year of experience in spraying. On the fateful day, he sprayed Cypermethrin for about 4 hours. Experiencing stomach pain and general weakness he returned home. The following day he was found unconscious on the bed. He was taken to the hospital and died there after two days.*

Discussions with villagers

Sarojana*, 35 yrs: Posses their own land. She accompanies her husband to the cotton field and assists him while he does spraying. She gets frequent fevers. After spraying for about 1-2 weeks she gets fever, skin rashes and spots. Does not have any gynaecological problem.*

Shantha, *70 yrs (mother-in-law of Sarojana): Posses 10 acres of land which have been distributed amongst the three sons. Initially used to grow paddy and maize but have now shifted to cotton. Never used pesticides earlier, however have started using it because neighbours are using it. Feels that women used to be much healthier earlier than now, they could work longer in the fields but now young women these days have no stamina. There has hardly been any cotton this year, no cotton flowers, as the plants were attacked by the bollworm.*

Hanumaiah, *45 yrs (Sanjana's husband and Shantha's son): Has rashes on his legs—doesn't know the reason. If he works in the field and sprays for three hours he feels sick. Sprays weekly for 7 months. The pesticides are used in the following order – Monocrotophos, Chloropyriphos, Curacron, Endosulphan. These days new pesticides used are Avaunt (Dupont) and*

Tracer (DeNocil). Purchases pesticides from local shop in the village, no safety instructions are given by the shopkeepers. Company representa-tives come to advertise a pesticide but give no instructions on safety and handling.

***N Rajitha**, 25 yrs: Had a miscarriage after going to the maize field and working the whole day. She was three months pregnant at that time. Doesn't have any gynaecological problem since then. Had a normal delivery before her second pregnancy.*

***Suraya**, 30 yrs:Family owns 5 acres of land. Showed the 35 bags of cotton lying in his store. Because of low rates, nothing has been sold. Has been growing cotton for 12 yrs. Usually wraps cloth around the face while spraying.*

***Radha**, 29 yrs (Suraya's wife): She has two sons and one daughter. While pregnant, she had appendicitis and had to be operated. She said she had sores in her uterus and uterus had to be removed.*

***Madhavi**, 13 yrs, (Radha's daughter): Has irregular menstruation cycle. She works in the fields, also helps during spraying and uses no protective gear. After spraying sessions she feels dizzy.*

***Samakka,** 40 yrs, (Suraya's brother's wife): Helps Suraya in the fields. Her husband divorced her because she couldn't conceive after their first child. Tried to have kids for almost 2 yrs after their son's death. Accompanied her husband to the field. They had shifted to cotton crop because of lack of water. She used to help during spraying pesticides and still helps her brother-in-law. They used to spray continuously. After the recent death in the village government officials came and gave instructions on proper handling and spraying of pesticides. Claims that masks are worn now.*

Usually the menfolk mix the pesticides for spraying and don't use hands but sticks to mix them. Daily labourers get Rs 70 per day. Death and exposure occurred only in September because farmers resorted to more spraying due to the massive pest attack.

General observations:

Post-use pesticides cans (plastic and metal) in every household is being used for various purposes – for carrying water to toilets, washing face and hand, storing water, cleaning house etc. Also used as oil lamps. The empty cans after the pesticides have been used, are filled with cow dung and kept for one week and then washed and used. The villagers claim that the cow dung acts as a cleansing agent and absorbs the left over pesticides. The cans are later sold off to local waste dealers in exchange for onions.

Village: AKKAMPETA, ATMAKUR MANDAL

1500 acres of land in the village is under cultivation, of which most of it is under cotton. Earlier chilli, maize and groundnut were grown, only in the last 30 years there has been a shift to cotton. Water is scarce. The primary source of water for the village is from Sriram Sagar, but the infrastructure to supply water to the village is non-existent. To add to the woes is the prevalence of duplicate seeds in the market. (Farmers mentioned names of some of the seed companies - Bunny seeds, Bishma and Excel).

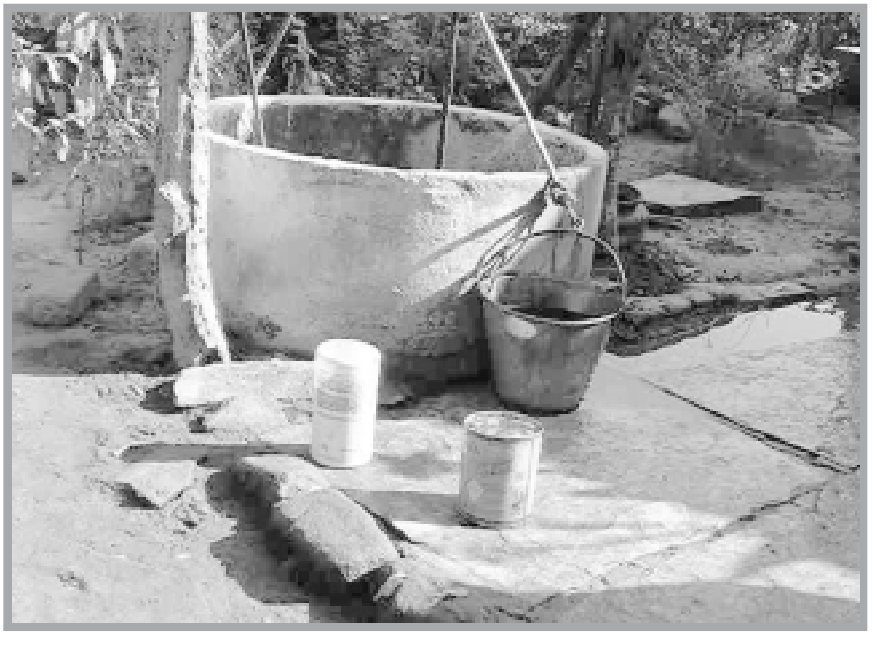
Most commonly used pesticides include, Methyl parathion (Metacid – a Bayer product), Cypermethrin, Endosulphan, Chlorpyriphos, Ekalux, Quinalphos and Avaunt. Farmers reported that Avaunt usage caused flower buds to be stunted, attracted "white mosquitoes" and crops turned reddish.

Focused Group Discussion with both men and women of the village. (Approximately 50 people)

The victim, Enakunthala Ravi, was a migrant labourer and his death occurred while spraying Metacid. He has left behind a wife with a child, and no other assets. He died in the hospital while under treatment. Ravi's wife makes beedis. Ravi was a farm labourer and had been spraying for last 10 years. But this year was the first time he sprayed Metacid. After spraying for an hour, he came back home, fell unconscious and was taken to the MGM hospital at Warangal. He was under treatment for one day and died the next day. Ravi's symptoms were: vomiting, tongue thickness, giddiness, shivering.

Spraying-related health problems

After spraying activity, vomiting sensation, itching, fever, uneasiness in stomach, and tongue thickening was exhibited. General weakness and a continued feeling of weakness since the last 10 years, inability to lift heavy objects, loss of appetite. Particularly after spraying Ekalux, farmers found it difficult to stand in direct sunlight. In some cases masks are used, however



Empty pesticides cans are used as water containers for washing face, hand, in toilets, sweeping floors, as oil lamps in the kitchens and later sold off to local waste dealers in exchange of onions.

sweat washes the chemicals into while spraying.

Discussions with villagers

***Narsaiya**, 27 yrs, male: Being a farm labourer, he has been working in the field and spraying pesticides for about 5-6 years. On that particular day, he was applying Ekalux continuously for a day and he felt drowsy and sick and was treated in the hospital for 6 days.*

Observations amongst the older generation

In the earlier years there were no significant health problems. But recently, complaints regarding body itching, and poor vision (possibly also due to old age) have been increasing. The 'new' pests attacking cotton are "rose coloured worms" and the buds on the cotton plants show spots. There has been a decrease in milk yield from cattle. The farmers attribute it to pesticide spraying (it is believed that the cattle consume pesticide-laden fodder or graze near farms where pesticides are being sprayed which has led to lower milk yields). Pesticides used earlier were Gamaxene (BHC) and Sevin.

Other findings

- Farmers observed that pests are growing resistant to pesticides.
- The agriculture officer gave instructions for safe spraying only after the death of a farmer in September.
- Usually farmers emulate what the other farmer (or neighbour) does and the choice of pesticide is also by word-of-mouth. The instructions written on the labels are not followed.
- Companies whose representatives come to the village during cropping season are Bayer, Dhanuka, Rallis, Nuvacron, Voltas, Excel and Dupont.
- Usually pesticides are mixed and applied. For instance, Monocrotophos + Chlorpyriphos or Monocrotophos + Cypermethrin
- Either pesticide shopkeepers tell them to mix pesticides or they do it themselves from experience or practice what their neighbours do.

Interestingly, four farmers have shifted away from pesticide-intensive cotton farming and are adopting biological control of pests and non-chemical methods of pest management. According to them, this method has shown significant control over pests and has yielded about 5 to 6 quintals per acre. Further, the investment that went into bio-control methods such as NPV (refer later sections) was a mere Rs.600 per acre which is just 10% of the investment made in pesticide intensive methods (Rs. 6000 per acre). This initiative by one farmer seems to be catching on to the other farmers present at the discussion. They were strongly considering these methods in the next season.

Discussions with women

8-10 women within the age group of 20-52 yrs (though majority of the women present were above the age of 40 yrs) took part in the discussion.

- Majority were married before attaining the age of puberty, had children at the early age of 15 yrs and usually have more than 3 children
- They drink traditional home-made potion of chillies, ginger, and milk before and after the delivery for strength and better lactation.
- Breast-feeding was done for a period 1-3 years
- Menstrual cycles resumed 1-2 years after delivery (condition known as amenorrhoea[5]), though all of them said they started menstruating by the age of 12/13yrs.
- Most women work in the cotton fields and are present during spraying.
- Most women complained of heavy white discharge, which could be due to some problem in the uterus or Urinary Tract Infection. This can be ascertained only after thorough health investigation.

***Mangala**, 40 yrs, Midwife: Mangala has overseen the delivery of over 100 babies. She thinks its normal not to menstruate for 6 months to a year after delivery and added that there are a fewer normal deliveries these days. There is more pain and bleeding during delivery. Her knowledge about miscarriages was limited and she said she wasn't aware of any.*

A highly grievous situation persists in the districts of Warangal caused by chemical pesticides. Farmers are dying in increasing numbers and deaths are immediate or gradual

FIELD NOTES

Village: DAMERA, ATMAKUR MANDAL

A slightly better developed village where two deaths and 15 poisoning cases were reported. It is believed that some of those who recovered are however not able to lead a completely normal life.

Wife of Pidugu Sammaiah *(45 yrs)*
The family owned five acres of land and the victim had quite a few years of experience in spraying pesticides. On the fateful day, Sammaiah sprayed Curacron for about two hours. After resting for a while, he started feeling uneasy and giddy. After a bath, his situation worsened and he vomited and had frequent motions. He was taken to the nearest hospital, where he was given oxygen and administered IV fluids. There was not much improvement in his condition and so the next day he was hospitalised in MGM Hospital in Warangal. Three days into treatment he died.

Father of Penta Komaraiah *(25 yrs): He is yet another victim who was a farm labourer working on yearly contract. While he was spraying Profenophos he was exposed and died. He is survived by his wife and three children. His employer tried to alleviate the suffering by providing some cash compensation.*

Discussions with villagers

There were several other youngsters who underwent treatment for the symptoms they developed while spraying. All these incidents were reported in the month of September. Normally all of them sprayed by using a towel to cover their mouth and nose, with no other protective clothing or precaution. They were spraying single pesticide without mixing with any other and usually followed the normal dilution procedures (20 to 50 ml per spray tank of 16 litres of water).

Village: VASANTAPURAM, GEESUKONDA MANDAL

The village has a population of about 3000 people and the land under cultivation is about 500 acres. Crops cultivated are cotton (90%), chilli, groundnut, and maize. In a general group discussion at the Sarpanch's office, it was found that, though there were no deaths, cases of exposure and consequent treatment were many (10 cases). Further, doctors' prescriptions revealed that most of the poisoning cases occurred within a gap of a few days in mid-September (around the 19th).

Group discussion with victim's families and farmers in progress. Most victims were experienced sprayers and have been spraying for 4-5 years.

Discussions with villagers

Father of Ravi *(25 yrs): Ravi had been spraying for 3 days continuously from 10 am-4 pm and was using a mixture of Curacron and Ekalux. Ravi used goggles and helmets while spraying. As he was literate he could read the instructions on the labels. On the 4th day of spraying he fell sick with headache, fever, shivering and he was admitted to the hospital and discharged after one day. He fell sick again within a couple of days and was again admitted and remained unconscious. For 2 days he was administered many injections (probably of atropine). He remained in hospital for 10 days. Though he could recognise people, he did not talk. Parents assumed he was dying and informed relatives. However, surprisingly, he finally started talking, but incoherently and in a delirious fashion. Back at the village, he behaved very abnormally for 2-3 days and even beat up people. Now he is normal. Ravi's father is emotionally disturbed and vows to avoid pesticides in future. He also mentioned that at the time his son was in hospital there were more than 130 similar cases in the month of September 2001 alone. Others in different villages corroborated this account.*

Nindaiah *(32yrs): For 10 years he has been spraying pesticides and has 2 acres of land on which he grows cotton. Exposure occurred in August. He went to the field at 9 am and was using a mixture of Ekalux and Acetaph. After 2 hours of spraying came back for a meal. He felt drowsy and started nauseating. Other symptoms were shivering, a burning sensation in the stomach, itching, muscular twitching, and watery eyes. He was admitted at the MGM hospital and was treated for 4 days. (Expenses incurred in the hospital Rs. 1500). He still feels weak. Normally he uses face protection with a piece of cloth while spraying. No agriculture officer gives instructions on safe handling or spraying of pesticides, sometimes shopkeepers tell them. After the cases were reported the agriculture officer provided instructions for washing hands and warned not to smoke while spraying.*

Babu Rao *(30 yrs): Owns 4 acres of land and grows cotton and has also been spraying pesticides for last 6 years. Exhibited symptoms of exposure after using Metacid and Acetaph mixture. Symptoms included vomiting, shivering and nausea. Underwent treatment at MGM hospital for 4 days. After discharge he was on medication for 10 days. Doctors advised him not to go out into the sun for 15 days even though fully recovered. After the incident, he is practising tractor mounted spraying (others in the village follow suit, however using tractors for*

spraying purposes destroys atleast 2 rows of cotton)

***Narasaiah** (45 yrs): He is an agricultural labourer who was affected after spraying for 3 hours. As he started feeling sick the landowner asked him to go home and wash. After returning home he couldn't talk and his tongue became thick. Underwent treatment at the MGM hospital for 3 days. He couldn't recognise people during this period and was on medication for 15 days. Now he practices tractor mounted spraying.*

General discussion

The Sarpanch commented that due to hot conditions, people sweat while spraying and pesticides gets absorbed in the body. Now, most farmers in this village are spraying pesticide from a tractor-mounted sprayer with some protection gear for their head. This means they would lose several rows of cotton plants and have to expend more on renting a tractor. They feel this is a necessary expenditure. To a question about the efficacy of such methods, they replied in the circumstances that is the only 'solution'.

Discussions with women

5 women in the age range: 19 years (unmarried grand daughter) to 75 years.

- All of them married around 12 yrs and started having children at the age of 14 -16 years.
- One of them, Manimma (37 years) had her first child at the age of 21 years.
- Most of the women in the village work in the field and are mainly involved in plucking cotton. Cotton is plucked right after or one day after the spraying is done.
- Many women have gynaecological problems, uterus sores; uteruses have been removed in many women (needs verification)
- Bhagya (33 years), complained of chest pain and pain in the breast after spraying and has been feeling sick for last 2-3 years.

Village: MUDU THANDA, NEKKONDA MANDAL

This is a lambada hamlet and the victim was a farm labourer working in the land of another farmer in the nearby village. While he was spraying, he developed extreme symptoms of giddiness and was unconscious on the farm itself. He gained consciousness after two days in the hospital, but died afterwards. He has left behind his old parents, wife and children. His father is now wary of pesticide usage on cotton and others in the hamlet are also contemplating avoiding pesticide usage but said they don't have a choice.

Village: PATTIPAAKA, SAYAMPET MANDAL

Pattipaka is a large village where one person **Pendasala Bikshapati** (28 yrs) had died after spraying on 2 acres of land owned by the family. He died even before he was taken to the hospital.

***Bikshapati's father**: He informed that his son died in October while using a mixture of Monocrotophos and Ekalux. He had spraying experience since 17yrs of age, but this was the first he was affected. He was spraying since morning (10 am) on the fateful day and around 4 pm felt sick and fell down near the farm and was taken to a private nursing home.*

There were 2 other cases – a labourer and a farmer – who were affected after spraying for about 2 to 4 hours.

***Malla Reddy**, the farmer, is suffering from nervous disorders. In addition, sometimes he behaves like an Alzheimer's patient, failing to remember what he says or does. He has serious nervous system related disorders. He is 28 and is impotent. Interesting, this was the first case of impotency that was reported. There might be many more such unreported cases.*

General observations

- No instructions were given before the incidents, only after deaths, agriculture officers came to the village.
- Nobody wears masks or any protective gears while spraying.
- For last 15 years, cotton is being grown in the village and normal height of cotton is 3-4 feet, but this year it is 5-6 feet. The yield however is very low.

Villagers in Mudu Thanda, scared after death of a farm labourer are contemplating shifting to non-pesticide agriculture

Women complained of gynecological problems-miscarriages, uterus abnormalities, menstrual irregularities, problems in conceiving; giddiness; pain in legs and joints, cited cases of breast cancer.

Discussions with women

About 40-50 women were present at the discussion and aged between 18-60 years.

- All women go to the field to pluck cotton during and after spraying. While spraying they also fill the spray can with water from behind.
- General health problems include drowsiness, pain in legs, joints, eyesight problems, and headache. A perennial feeling of illness persists, even while not spraying.
- Women talked about many miscarriages occurring in the village[6] and instances of breast cancer. Women go to the field while pregnant. One woman was present who was treated for breast cancer and her left breast had been removed. Women said there were 3 other cases of breast cancer in the village. A total of 4 breast cancer cases in a population of 6000.
- Women complained of sores in the uterus. Women reported that many of them had to get their uterus removed. Numbers of such case not known.
- Women complained about abnormal white discharge.
- Women talked about not menstruating from 6 months-2 years after delivery.
- Two women complained about problems in conceiving.
- Every time after spraying, women have to take injections in the evening. But this could not be verified.
- According to the women there were 130 exposure cases in this village.

Shobha *(18 yrs): A case of miscarriage. When she was 3 months into pregnancy, she worked in the field filling water in the sprayer. After coming home from the field she had miscarriage. She has miscarried twice within a short time period.*

Padma *A woman with 2 children who did not menstruate after delivery of her first child and after conception of the second child. She has painful menstruation and spends Rs. 50-100 every month on medicines.*

Mangla *(25yrs): She hasn't started menstruating after 1 and half years of her delivery. Has lot of pain every month but no periods. She feels drowsy, and has often lost consciousness.*

Meetings with Government Officials

Discussions with Mr. Muralidhar Rao, Joint Director of Agriculture, Warangal and Mr. Shankaraiah, Pesticides Controlling Officer, Office of the JDA.

Warangal district contributes 34% of the cotton crop (1,73,000 ha) produced from Andhra Pradesh, while Guntur district contributes the maximum. Therefore it is not very surprising that Andhra Pradesh consumes the maximum amount of pesticides in the country. Given this fact, the JDA office claimed to have taken steps to warn against pesticide over-usage by running a campaign to create awareness amongst farmers on the dangers of spraying pesticides, especially between 10.00 am to 4.00 pm. Further, the farmer clubs in each village have been supplied with a set of protective gear and 1000 such sets and many pamphlets on precautions have been distributed to the farming communities. All these steps have been taken after the September - October incidences, according to the officials.

According to Mr. Muralidhar Rao, the main reasons for these deaths in this particular year are as follows:

- Tremendous increase in acreage under cotton
- Increase in plant height – it is explained that inadequate rains have caused the failure in blooming of the cotton buds and this has resulted in the growth hormones increasing the plant height more than a couple of feet than the normal height of 3½ feet. Owing to this farmers have to spray at eye level which would blow the chemical back on their faces when sprayed in the opposite direction of the wind.
- Drastic increase in daytime temperatures – this would have in some way affected the farmer when spraying at midday.
- Spraying under the influence of liquor, *gutkha* (chewing tobacco) or cigarettes.

Mr. Shankaraiah, Pesticides Controlling Officer, said the department does periodic testing of samples of pesticides taken from various outlets. Companies whose products fall short of standards (variations in the main active ingredient) are penalised. This year, 10 samples were found to be 'misbranded' and the respective companies have requested re-analysis of the samples. The process is still on.

As far as the general trend with respect

to pesticide use was concerned, Mr. Shankaraiah said that there is a definite increase in use over the last few years. Notably farmers are even prepared to purchase expensive pesticides in the promise of a pest-free crop and high yields. (See annex. VI & VII)

Discussions with doctors from the Indian Medical Association, Warangal

The team met with local Doctors through the Indian Medical Association at Warangal and sought clarifications on a number of issues. There was general consensus on the nature of such pesticide exposure deaths in the rural parts of Warangal. Doctors said that they were now noticing increasing number of abnormal babies being born and convulsions in children. Doctors were of the opinion that the problems of women (miscarriages, cancer, and menstrual cycles, cysts, etc.) could be due to exposure to pesticides, but could not be confirmed without a proper health investigation. They added that pesticides could be an aggravating factor to many a health problems seen in the rural farming communities. They were unanimous in saying that pesticides are harmful to nature and human beings, and as such alternatives have to be found for such practices.

Some key points mentioned by the IMA representatives:

- Everyday the Mahatma Gandhi Government Hospital gets about 8–10 cases with symptoms of pesticide poisoning.
- Increased cases of convulsions in children aged between 5-12 yrs in rural areas of Warangal — termed "Warangal Convulsions" - since its a unique health problem being observed in the region.
- Increased number of deformed babies (limbs) being born (IMA maintains records of this and has offered to share information)
- Gynaecological problems in women like heavy white discharge are common in the area due to unhygienic conditions and consequently fungal infection
- Sores in the uterus can be due to ulcer in cervical, cervical erosion.
- Amenorrhoea is normal for lactating women even up to 2 years if she is breast-feeding regularly.
- Chronic (and sometimes acute) exposure to organophosphate pesticides could lead to Amenorrhoea and subsequent infertility.
- Anaemia in women aggravates the health problems when they are exposed to pesticides.
- IMA has offered assistance on any future health studies by sharing information.
- IMA is prepared to release a press statement on the hazards of pesticide use.

Discussion with Mr. Jalapathi Rao, Agricultural Research Station (Bio-control Laboratory), Warangal

The Agricultural Research Station at Warangal specialises in developing hybrid pest-resistant varieties for paddy and other crops. Significantly, it also hosts the region's biological control laboratory, which researches into non-chemical, alternative methods of pest control.

The types of biological control used include:

- Nuclear PolyhedroVirus (NPV)
- Trichograma (egg parasite)
- Trichoderma viridi (bio-fungicide)

The **NPV method** involves the use of a preparation from the bollworm insect wherein farmers supply the bollworms infesting the fields, which is converted into a paste-like extract. This paste when applied to the cotton crop would attract the pest which consumes it and gets killed. This is a non-chemical process and is an ideal 'win-win situation' where the farmer barters his pest for more of the extract, doubly benefiting in pest control.

The **Trichograma sp**. feeds voraciously on the eggs of the bollworm. The Trichograma is cultured in the laboratory and its eggs (coated on chart paper) are left in the farm. When the eggs hatch, the hatchlings feed on the eggs of the

Official excuse *"Spraying under the influence of liquor, gutkha (chewing tobacco) and cigarettes".* The issue is being sidelined as one of over-zealousness of farmers and lack of understanding about handling procedures by the government agencies

bollworm thereby controlling their populations.

Trichoderma viridi is a fungal pathogen (disease-causing) whose formulation can be directly applied to the field by mixing it with farmyard manure to effectively control cotton pests.

In Practice

In Atmakur mandal and in a few other areas, some farmers have taken to such methods and have seen the benefits. Further, the investment in such form of biological pest control is merely 10% of the investment made on chemical application (refer earlier section on individual villages)

Footnote:

[1] **Amenorrhoea** is the absence of menstrual periods. Primary amenorrhoea is the condition of never having had a period by the latest age at which menstruation usually starts (18 years); secondary amenorrhoea is the cessation of menstruation after at least one period. Some causes are pregnancy; menopause; breast-feeding; excessive dieting or anorexia, starvation, heavy athletic training, especially during early adolescence, a congenital defect of the genital tract, hormone imbalance, cysts or tumours; chronic illness, chromosomal abnormalities, stress, or emotional factors.

Often amenorrhoea is caused by a combination of several of these factors. Since amenorrhoea is frequent symptom of infertility, medical textbooks and practitioners pay considerably more attention to it than to pre-menstrual problems or painful periods, although the latter two are far more common (*Pp 283**). After giving birth, it takes time for the body to begin ovulating and menstruating again. The length of time it takes depends on whether a woman is breast-feeding or not; it will take longer for women who breast-feed than for women who do not. *(Pp 308, Our bodies, Ourselves - For the new century, A Book by and For Women; The Boston Women's Health Book Collective; 1998 edition**

[2] A study conducted by University of North Carolina, February 2001, found that foetal deaths are almost twice as likely among pregnant women in California farming communities who live near areas where certain pesticides were sprayed. Deaths appeared to be a result of exposure during the first trimester of pregnancy. These findings are relevant to developing countries where regulation of chemical application is less stringent and where even more dangerous chemicals banned in the developed world are still used in agricultural disease control. *The State of World Population 2001, Footprints and Milestones: Population and Environmental Change, PP 46, United Nations Population Fund (UNFPA)*

Annexure I

Statement showing the persons who are hospitalized due to improper spraying
Source: Joint Director Agriculture, Warangal District

S.No.	Name of the farmer	Village	Mandal	Date of Admission	Discharge
1.	Nagaboina Ravi	Dharmaram	Geesugonda	27-9-01	02.10.01
2.	Manda Ravi	Kuntapalli	Sangam	24-9-01	30-9-01
3.	Durishetty Srinivas	Damera	Atmaku	26-9-01	—
4.	Changati Ilaiah	Mamnoor	Hanamkonda	26-9-01	—
5.	Manda Mogili	Mutyalapalli	Atmakur	26-9-01	—
6.	Mir Ameeruddin	Seetampet	Hasanparthy	26-9-01	—
7.	Allam Narsingam	Neerkulla	Atmakur	26-9-01	—
8.	Yedla Suresh	Kothapeta	Hanamkonda	26-9-01	28-9-01
9.	Telledla Sambaiah	Lingamadugupally	Atmakur	25-9-01	—
10.	Kammapati Nagaraju	Mutyalpalli	Atmakur	25.9.01	—
11.	Nagarapu Kumaraswamy	Neerukulla	Atmakur	26-9-01	—
12.	Sola Cheralu	Ashalapalli	Sangam	25-9-01	28-9-01
13.	Tella Rajkumar	Venkatadripet	Ghanpur (S)	28-9-01	01-10-01
14.	Md. Aleemuddin	Chandraiahpalli	Geesgonda	28-9-01	—
15.	Gujila Rajeswar Rao	Venkatapur	Atmakur	29-9-01	—
16.	Gundekari Raju	Mulkalagudem	Hanamkonda	29-9-01	2-10-01
17.	Mundrathi Ashok	Pulukurthy	Atmakur	29-9-01	2-10-01
18.	Kaderi Raju	Rampur	Dharmasagar	24-9-01	27-9-01
19.	Ankasarapu Kishan	Pulukurthy	Atmakur	24-9-01	27-9-01
20.	Mancha Raju	Mulkalagudem	Hanamkonda	3-10-01	4-10-01
21.	Badapu Pandu	Malkapur	Ghanpur(S)	5-10-01	—
22.	S. Vijaykumar	Koppula	Parkal	5-10-01	—
23.	Ambati Ganesh	Damera	Atmakur	4-10-01	—
24.	Botla Kirankumar	Mogilicherla	Geesgonda	4-10-01	6-10-01
25.	Nala Veeranna	Katrapalli	Sangem	4-10-01	—
26.	Madugula Kumaraswamy	—do—	—do—	3-10-01	—
27.	Meda Suraiah	Neerukulla	Atmakur	5-10-01	—
28.	Dandu Swamy	L.Madgupalli	—do—	5-10-01	7-10-01
29.	Kanukunta Bixapathi	Oglapur	—do—	2-10-01	5-10-01
30.	Kotaboina	Kumaraswamy	Chintanekonda Parvatagiri	2-10-01	5-10-01
31.	Ellula Ravi	Vunikicherla	Dharmasagar	4-10-01	6-10-01
32.	N. Veeranna	Katrapalli	Sangem	4-10-01	6-10-01
33.	G. Sreenu	Gundenge	Gudur	3-10-01	6-10-01
34.	Bonth Kishan	Kileshaour	Ghanapur	3-10-01	5-10-01
35.	Shalura Lingamurthy	Gavicherla	Sangem	4-10-01	6-10-01
36.	Veesam Vijayakumar Reddy	Hasanparthy	Hasanparthy	5-10-01	6-10-01

S.No.

continued...

ANNEXURE I

Name of the farmer	Village	Mandal	Date of Admission	Discharge
37. Iannu Balaraju	Kuntapalli	Sangem	7-10-01	—
38. Bhukya Sukya	Muskarpalli	—do—	7-10-01	—
39. Kashapaka Sambaiah	Yellapur	Hasanparthy	7-10-01	—
40. Pyndla Venkanna	Kakkiralapelli	Wardenapet	7-10-01	—
Deaths				
41. Pidugu Sammaiah	Damera	Atmakur	6/9/01	
42. Penta Komuraiah	Damera	Atmakur	8/9/01	
43. Moodu Hatya	Chandragonda	Nekkonda	17/9/01	
44. Enakathala Ravi	Akkampeta	Atmakur	19/9/01	
45. Musuku RajiReddy	Upparigudem	Kodakanda	25/9/01	
46. Thumma Arogya Reddy	Parkashreddypally	Hanamkonda	16/9/01	
47. Korukonda	Yella Goud	Alankaripet	—	26/9/01
48. Pendial Bixpathi	Pattipaka	Sahaympet		21/10/01
49. Seeraboina Gummaiah	Gunjedu	Kothagudem		20/10/01
50. Chunchunagaiah	Viacherla	Gudur		31/10/01
51. Mutuku Anjaiah	—	Zafargadh		11/10/01
52. Gaddala Raju	Vanamala Kanparthy	Hanamkonda		15/12/01

Annexure II

The Andhra Pradesh Farmers Association has submitted the following list of deceased farmers to the District Collector.

Name	Village	District (mandal)
Penta Komaraiyya	Damera	Atmakur
Pidugu Samaiya	Damera	Atmakur
Enukatala Ravinder	Akkamseta	Atmakur
Bela Shanker	Mugulicherla	Eesugonka
Tumma Arogya Reddy	Prakashreddypeta	Hanmakonda
Potareju Sabaiyya	Dasaripalle	Narsampeta
Muudu Hatiya	Gollapella	Nekkonda
Komakonda Yella goud	Alankanipeta	Nekkonda
Neelam Saraiya	Aasu vella	Sangem
Ragula Aamlayya	Kattuvalla	Sangem
Mere Rajinder	Aasuvalla	Sangem
Bhara Vushpa	Chelpuru	Mulughu Ghanalka
Kodichinnanarasaiyya	Evuru	Gudur
Raji Reddy	Utturugudan	Kodakondla
Kare Srinivas	Hasanvarte	-
Chinnasamaiyya	Elur Nagaram	-
Tejavat Jagura	Perumarla Sankeesa	Dornakal
Mettuka Anjayya	JaffarGard	Jaffergad
Veerakaluna Samaiya	Gunjedu	Gudur
Pendiala Biskshapati	Pattipaaka	Saayampeta

Annexure III

List submitted by Andhra Pradesh Farmers Association (Raithu Sangam) as part of a Memorandum to the Chief Minister

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AP Raithu Sangham submitted a memorandum to the Chief Minister of Andhra Pradesh, dated 25th September, 2001, about deaths of farmers while spraying pesticides, due to the widespread attack on cotton crop by pests. The list of farmers who died was given, all in Warangal district:

1. Penta Komaraiah, Age 30, Village Damera, Mandal, Atmakur, date of death 8.9.01
2. Pidugu Sammaiah, 45, Damera, Atmakur, 8.9.01
3. Enukuthala Ravi, 25, Akkampeta, Atmakur, 19.9.01
4. Sambasiva Rao, Vasnthapuram, Gisukonda, 19.09.01
5. Mudu Hatya, 28, Chandrakonda, Nekkkonda, 16.09.01
6. Thumma Arogya Reddy, 40, Prakashreddypeta, Hanmakonda, 16.09.01

Farmers under treatment in Mahatma Gandhi Hospital in Warangal:

1. Garige Ramamurthy, Damera, Atmakur, 8.9.01
2. Gudem Yellaiah, Damera, Atmakur, 8.9.01
3. More Rajender, 24, Ashokapalli, Sangem, 11.09.01
4. Malothu Dalya, 34, Vanchanagiri, Gisukonda, 6.09.01
5. Mandala Rajender, 20, Penchikalapeta, Atmakur, 6.9.01
6. Sanga Srinu, Vanchanagiri, Gisukonda, 6.09.01
7. Dasari Kumaraswamy, 40, Pallarguda, Sangem, 29.08.01
8. Musuku Raji Reddy, 35, Upparagudem, Kodakondla, 13.09.01
9. Marripalli Ravi, 22, Devannapeta, Hasanparthy, 23.09.01

Apart from this there are others under treatment in different hospitals. They were spraying Curacron, Asetaph, Thiodene and others. Most of these were agricultural labourers. Cotton crop is spread over 4,34,200 acres in Warangal this year, while normal acreage is only 3,26,000 - an addition of more than 1,00,000 acres

Annexure IV

Findings of the Preliminary Visit – October, 2001
Cases of deaths and pesticide poisoning in villages in Warangal district

Mode of application of pesticide is largely uniform and is done by means of a 16L capacity hand pump - 50ml of pesticide diluted in 16L water.

1. Pidugu Samiah – 40 yrs – death within 12 hrs. (Wife questioned)
Pesticide – CURACRON
Symptoms – uneasiness, giddiness, vomiting
Local doctor administered glucose and advised to be taken to city.
History – Agricultural labourer, not his own land. He has been performing pesticide spraying activity for the past 15 years. Previously very healthy. No major health problems. Normally use upto 5L of the pesticide for a season. Spraying activity is done for 5 hrs and once a week. This is carried on for an average of 10 times in a season (common practice everywhere). Landlord buys and supplies pesticides.

2. Penta Kumariah – 25 yrs – death within 24 hrs. (Father questioned)
Pesticide – PROFENOPHOS
Symptoms – uneasiness, giddiness, vomiting, complained about eye irritations.
History – Own land. Has been spraying for 5-6 yrs. Healthy person, married, with one child.

3. Pasula Yelliah – 35 yrs – treated and discharged.
Pesticide – EKALUX
Symptoms – similar to above. Lost consciousness.
History - has been spraying for 15 yrs. Landlord supplies the chemical.

4. Krisnamurthy – 22 yrs – discharged after treatment
Pesticide – ENDOSULPHAN & DIVAP (DICHLORVOS)
Symptoms – similar to above
History - has been spraying for 1 yr. Landlord supplies the chemical.

5. UlliRao Raju – 20 yrs – death after 2 days of treatment
Pesticide – QUINALPHOS (Suquin) & CYPERMETHRIN
Symptoms – uneasiness and vomiting.
History – agricultural labourer. Bought chemicals by himself. One year of spraying experience.

6. Ennukuthala Ravi – 25 yrs – death after 2 days of treatment
Mode of application of pesticide – hand pump 16L capacity
50ml of pesticide diluted in 16L water.
Pesticide – METHYL PARATHION (Metacid)
Symptoms – uneasiness and vomiting.
History – Agricultural labourer. They themselves purchased chemicals. Has been spraying for past 5 yrs.

Observations
The post-mortem report does not show anything significant to give a direct cause-effect relationship. A chemical analysis of certain vital body tissues like those of liver and stomach are being carried out by forensics. Results are awaited. The pesticides used by the farmers are wide –ranging. Farmers purchase pesticides from various shops. It is believed that certain companies also come to the village to promote their products. The criterion that the farmers chose their pesticides is by word of mouth. One farmer tries a new concoction and if it works well, then he spreads the word around. Farmers do not know the significance in spraying towards the wind direction, but innocently spray against the wind, which blows the chemical back on to their faces.

Doctors opined Organophosphate pesticide inhalation would cause bronchospasm (lung congestion and breathing difficulty), which would be the cause of death.

Annexure V

Basic Data on Pesticides

Pesticides	Manufacturing Companies	Est. Actuals (1999-00) (MT)	Forecast (2000-01) (MT)
Methyl parathion	All India Medical Co (India), Bayer India, Rallis India Ltd,	850	800
Cypermethrin	United Phosphorus Ltd, Aimco Pesticides Ltd., Heranba Industries Ltd, Sanjay Insecticides Ltd, Dhanuka Pesticides Ltd, Rallis India Ltd, Sulphur Mills Ltd, Meghmani Organics Ltd, Gharda Chemicals Ltd.	1700	1200
Endosulfan	Excel Industries, Aimco Pesticides Ltd, Ankar Industries Pvt Ltd, Sulphur Mills Ltd. AgrEvo Ltd	4400	4500
Chlorpyriphos	Ficron Organics Ltd, Aimco Pesticides Ltd, Lupin Agrochem India Ltd, De Nocil, Mistu Industries Ltd, Vantech Pesticides Ltd, Siris India Ltd, Tantech Agrochemicals, Gharda Chemicals Ltd, Rallis India Ltd, Sulphur Mills Ltd, National Organic Chemicals Ltd.	4300	4000
Ekalux	Novartis		
Quinalphos	Novartis, United Phosphorus Ltd Aimco Pesticides Ltd, Ankar Industries Pvt Ltd, Sulphur Mills Ltd. Dhanuka Pesticides Ltd	3500	3500
Avaunt	Dupont		
Tracer	De Nocil, Mumbai.		

Sources:

1. Demand pattern of pesticides for (technical grade) for agriculture, Pesticide Association of India, Estimate 2000 and forecast 2001.
2. www.pmfai.org
3. www.indiainfoline.com

Annexure VI

Growth in demand for different pesticides

Nature of pesticide	1995-96 (MT)	1996-97 (MT)	1997-98 (MT)	1998-99 Est. (MT)	% growth 1998-99
Chlorpyriphos	1400	1800	2500	3000	20.0
Cypermethrin	1100	1150	1200	1300	8.3
Endosulphan	5500	4300	4200	4200	Nil
Ethion	1160	1000	1850	2000	8.1
Fenvalerate	1350	1300	1500	1500	Nil
Malathion	1500	1200	1000	1200	20.0
Monocrotophos	6900	6500	7500	7500	Nil
Methyl Parathion	2400	1700	2000	2100	5.0
Phorate	3900	3600	3600	3600	Nil
Phosphamidon	2100	2000	2400	2400	Nil
Quainalphos	2500	2200	3000	3000	Nil
Mancozeb	5000	6000	5500	6000	9.1
2,4-D	850	800	800	1400	75.0
Isoproturon	2500	2600	2700	2500	7.4
Paraquat	1400	1400	1400	1600	14.3
Aluminium Phosphide	900	1050	865	900	4.0

Source: Pesticide Association of India

Annexure VII

Cost of some of the commonly used pesticides

Pesticide name	Manufacturer	Quantity	Price	Required amount for spraying
Avaunt	Dupont	200 ml 500 ml 1000 ml	Rs 670 Rs 1625 Rs 3125	Required 200 ML for 1.5 acres of land
Tracer	DeNocil	100 ml	Rs 1021	Required 100 ML for 1.5 acres of land
Metacid	Bayer	1 litre	Rs 300	Required half litre per acre
Endosulfan	-	1 litre	Rs 200	-

Source: Information provided by local pesticide shopkeeper.

The shopkeeper buys his pesticides stock from the big pesticides distributor in Warangal called Vasavi Fertiliser. He said that the date expired pesticides are sent back to the distributor who in turn sends it back to the manufacturers.

Annexure VIII

Toxicity Profile

METHYL PARATHION

Methyl parathion is an insecticide that comes in two forms, white crystals or a brownish liquid. It smells like rotten eggs and is similar to nerve gas.
Source: *Agency for Toxic Substances and Disease Registry (ATSDR). 1992. Toxicological profile for Methyl Parathion. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.*

Methyl parathion, sometimes called "cotton poison," is a chemical pesticide that should be used only in open fields to control insects. Most commonly, it is used on cotton, soybean and vegetable fields.
Source: *Illinois Department of Public Health - http://www.idph. state.il.us/public/hb/hbmeth.htm*

Exposure to high doses of methyl parathion by inhalation or dermal contact can cause human fatality. When inhaled at lower doses it can cause runny nose, chest discomfort, among other effects. Eye contact with it can lead to pupil constriction and blurred vision. Prolonged exposure to moderate levels may result to impaired memory and insomnia.
Source: *compilation by Ike Val Iyioke, Institute of Environmental Toxico-logy, Michigan State University, http://www.iet.msu.edu/Tox_for_Journ/Chemicals/Methyl.htm)*

Methyl parathion was originally developed by the German Pesticide Company Bayer. It is a non-systemic pesticide that kills pests by acting as a stomach poison. It is used to control chewing and sucking insects in a wide range of crops, including cereals, fruit, vines, vegetables, ornamentals, cotton and field crops (1). Methyl parathion is generally applied as a spray, mainly as an emulsifiable concentrate formulation. The recommended application rates are 15-25g of active ingredient per 100 litre (2).

Usage

The basic manufacturers of methyl parathion are All India Medical Co (India), Bayer India, Bayer Mexico, Cheminova (Denmark), Rallis India and Sundat (Singapore)(3). In 1993, other production facilities existed in Brazil, the former East Germany, China and the former USSR. Although not used in the UK, methyl parathion is widely used throughout the world, and is registered in at least 38 countries (4).

Information on global sales and production data are not widely available. For the financial year 1995-96, India produced an estimated 2,200 tonnes of technical grade methyl parathion (5).

Cheminova, a major producer, sells US$ 15 million per year in the US, one of its key markets for this product (6). Overall the company recorded a 10% rise in sales in 1996. Its forecasts for future growth in methyl parathion have however been affected by an agreement to withdraw certain formulations in the US (see below)(7).

Acute toxicity

The World Health Organization classifies methyl parathion as a class Ia 'extremely hazardous' pesticide (8). It is highly toxic by inhalation and ingestion, and moderately toxic by dermal adsorption (it is also readily adsorbed through the skin). The oral LD50 in rats is 2.9 mg/kg, in mice is 33.1-119.5 mg/kg, in rabbits is 19-420 mg/kg and dogs is 50 mg/kg (9). The dermal rat LD50 is 44-67 mg/kg.

Like other organophosphate insecticides, methyl parathion is a cholinesterase inhibitor (see the Organophosphates fact sheet PN34 pp 20-21). When inhaled, the first adverse effects are a bloody or runny nose, coughing, chest discomfort and difficulty breathing. Skin contact may cause localised sweating and involuntary muscle contractions. Following exposure by any route, other systemic effects may begin within a few minutes, or be delayed for up to 12 hours. These may include pallor, nausea, vomiting, diarrhoea, abdominal cramps, headache, dizziness, eye pain, blurred vision, constriction or dilation of the pupils, tears, salivation, sweating and confusion. In severe cases, poisoning will affect the central nervous system, producing in-coordination, slurred speech, loss of reflexes, weakness, fatigue, and eventual paralysis of the body extremities and respiratory muscles. Death may be caused by respiratory failure or cardiac arrest (10).

Chronic effects

Effects reported in workers repeatedly exposed to methyl parathion include impaired memory and concentration, disorientation, severe depressions, irritability, confusion, headache, speech difficulties, delayed reaction times, nightmares, sleepwalking, drowsiness and insomnia (11).

There are no epidemiological studies on effects related only to methyl parathion exposure (12).

Cancer

The International Agency for Research on Cancer evaluated methyl parathion in 1983, and concluded that the available data do not provide evidence that methyl parathion is carcinogenic to experimental animals. No data on humans were available (13).

Mutagenicity

Mutagenicity tests have been both positive and negative. The results of most of the *in vitro* studies with both bacterial and mammalian cells were positive (14).

Food

The WHO recommended that more definitive studies should be conducted on residues of methyl parathion in fresh foods(15). Residues are regularly detected in a range of fruit and vegetables. In the UK during 1995, researchers found residues in imported celery, dessert grapes and oranges, all below maximum residue limits (16).

Fate in the environment

Methyl parathion has a half-life in aqueous solution of 175 days (17), and 10 days to two months in soils (18). The rate of degradation increases with temperature and with exposure to sunlight. When large concentrations of methyl parathion reach the soil, as in an accidental spill, degradation will occur only after many years (19).

The US Environmental Protection Agency (EPA) may have detected 4-nitrophenol, a methyl parathion breakdown product, at very low levels in drinking water wells. The EPA is uncertain and cannot quantify the amount or frequency of 4-nitrophenol in drinking water because the analytical technique is not reliable (20).

Methyl parathion is unlikely to bioaccumulate.

Wildlife

Methyl parathion is highly toxic for aquatic invertebrates with most LC50s ranging from <1 µg/litre to about 40µg/l (21). In 1992, a massive bird kill occurred in Costa Rica after it was applied by plane in a cotton field (22). Methyl parathion has been implicated in the deaths of waterfowl in Spain and the acute poisoning of fish, birds, cattle and wild animals in the Sudan (23).

Hazards in developing countries

Conditions in developing countries make it extremely difficult to associate a particular active ingredient with a poisoning incident.

In the early 1950s the manufacturers introduced a powder formulation of methyl parathion which caused problems because of the poor conditions of use in developing countries. Methyl parathion became the mainstay of pest control in cotton, and very quickly there were hundreds of poisonings from this single product, and reportedly dozens of fatalities (24).

In Oarana State, Brazil, pesticide incidents compiled by the Toxicological Information Centre and Health Clinics noted 1,243 incidents involving methyl parathion between 1982-1991(25).

There is evidence that methyl parathion is not used safely in Central America. Research carried out in 1996 shows that methyl parathion caused a number of documented poisonings among agricultural labourers involved in Nicaraguan cotton production. In some cases they have ended up in hospital with classic OP poisoning (26).

Cheminova, the Danish manufacturers of methyl parathion, says it only sells to developing countries if they carry out 'safe farming'. However, researchers on the ground in countries like Guatemala and Nicaragua say methyl parathion is rarely used safely.

- The WHO has set out a number of safety remarks for methyl parathion use:
- Methyl parathion may only be used by trained personnel;
- A field sprayed with methyl parathion may not be entered for 48 hours after application;
- Methyl parathion may not be sprayed by hand;
- people may not be used as markers when spraying from the air (27).

There is evidence that these recommendations are broken in developing countries (28).

Problems in the US

Recently, there have been a number of important US prosecutions involving methyl parathion. Over 1,500 homes and businesses in Mississippi and Ohio were sprayed with methyl parathion by unlicensed operators. Methyl parathion is not permitted for use indoors in the US. The authorities had to relocate over 1,100 people in temporary accommodation, and clean up costs could reach US $50 million. In addition, local vets reported deaths of household pets due to methyl parathion exposure (29).

These events led the US EPA to cancel the registrations of emulsifiable concentrate formulations. These came into effect on 30 April 1997, following a voluntary agreement with the US registrants, led by Cheminova. Cheminova is to carry out a public education programme on the proper use of the insecticide (300).

Mississippi case

On 13 March 1997, Dock Eatman, Sr of Moss Point Mississippi was convicted by a jury of illegal spraying of the insecticide methyl parathion in homes and other buildings in the Pascagoula (Miss.) area in 1995 and 1996. Eatman did not have a licence for commercial pesticide application. This insecticide is only approved for outdoor agricultural use. Eatman faces a maximum of 21 years in prison and/or up to US $2.1 million in fines. This case is being investigated by the EPA's Criminal Investigation Division, the FBI and authorities from the state of Mississippi (31).

Ohio case

Lutellis Kilgore of Elyria Ohio, was also charged on 21 March 1997 with illegal use of methyl parathion. He allegedly applied the insecticide in a manner inconsistent with its label to more than 60 properties without an application certificate. The spraying led to a US $20 million publicly-funded clean up of the affected properties. Kilgore faces a maximum of one year in prison and/or a fine of up to US $100,000 for the illegal application and five years in prison and/or a fine of up to US $250,000 for making false statements to federal investigators (32).

Restrictions

Methyl parathion is banned in Indonesia, Sri Lanka and Tanzania, and is severely restricted in Colombia, Korea, China and Japan. It is one of five pesticides identified for inclusion in the Prior Informed Consent Procedures of the Food and Agriculture Organisation on the grounds of causing problems under conditions of use in developing countries.

Conclusions

As a hazardous OP pesticide, methyl parathion is regularly misused in developing countries. The measures taken recently in the US should help to reduce potential problems, but they merely highlight the difficulties of using such a product in conditions like Central America, where protective clothing and training are often lacking or ineffective. As a result, methyl parathion should be more severely restricted in developing countries.

***Source**: PESTICIDE ACTION NETWORK - http://www.pan-uk.org/pestnews/actives/methylpa.htm)*

CHLOROPYRIFOS

Chlorpyrifos is an organophosphorus insecticide that has been widely used in the home and on the farm. In the home, chlorpyrifos has been used to control cockroaches, fleas, and termites; it has also been an active ingredient in some pet flea and tick collars. On the farm, it is used to control ticks on cattle and as a spray to control crop pests. In 1997, chlorpyrifos was voluntarily withdrawn from most indoor and pet uses by the manufacturer, DowElanco.

Chlorpyrifos is a white crystal-like solid with a strong odor. It does not mix well with water, so it is usually mixed with oily liquids before it is applied to crops or animals. It may also be applied to crops in a microencapsulated form. Chlorpyrifos is the active ingredient of various commercial insecticides including Dursban® and Lorsban®.

Environment Fate

Chlorpyrifos enters the environment through direct application to crops, lawns, domesticated animals, and in the home and workplace. Chlorpyrifos may also enter the environment through volatilization, spills, and the disposal of chlorpyrifos waste.

Chlorpyrifos that has been applied to the soil generally stays in the area where it has been applied because it sticks tightly to soil particles. Because of this, there is a low chance that chlorpyrifos will be washed off the soil and enter local water systems. Also, since it does not mix well with water, if it does get into the natural waters, it will be in small amounts and will remain on or near the surface and will evaporate. Volatilization is the major way in which chlorpyrifos disperses after it has been applied. Once in the environment (soil, air, or water), chlorpyrifos is broken down by sunlight, bacteria, or other chemical processes.

Exposure

You can be exposed to chlorpyrifos in many places because of its wide range of uses. You can be exposed to it in your home or office if chlorpyrifos has recently been used to control household pests such as fleas or cockroaches. Exposure can also occur outside your home if chlorpyrifos has been applied to the ground around the foundation to control termites. Chlorpyrifos degrades rapidly in the environment; however, low levels may persist for long periods of time after it has been applied either inside or outside the home. Opening windows before and after chlorpyrifos spraying rapidly lowers airborne levels in a house.

You can also be exposed to chlorpyrifos in a farm setting. The greatest risk occurs soon after a crop has been sprayed, because that is when its levels will be the highest. However, chlorpyrifos rapidly degrades and becomes bound to plants and the ground. The EPA recommends a 24-hour waiting period before entering fields where chlorpyrifos has been applied. In addition, there is the risk of exposure to chlorpyrifos when it is being prepared for use. Care should be taken to ensure that only a licensed applicator sprays chlorpyrifos, and that unnecessary or unprotected individuals remain away from the site of application during the spraying.

Chlorpyrifos can also be found at some waste disposal sites, so exposure to higher levels than what is commonly found after home or commercial use may occur there.

Chlorpyrifos can enter your body through your mouth, lungs, and skin. After being eaten or drunk, chlorpyrifos quickly passes from the intestines to the bloodstream, where it is distributed to the rest of the body. It can also enter the body through the lungs by breathing chlorpyrifos sprays or dust. When chlorpyrifos enters the body this way, it passes quickly into the blood. It may also enter your body through the skin, but the chances of being exposed to harmful levels of chlorpyrifos this way are not as great as with inhalation and oral exposure, because the amount that gets through the skin is relatively small (less than 3% of what was put on the skin). Dermal exposure of infants represents a greater health risk than with adults because of the texture of infant skin and because infants laying or crawling on an area sprayed with chlorpyrifos may have a greater amount of their skin exposed to chlorpyrifos. Infants crawling on areas recently sprayed with chlorpyrifos may also be exposed to greater amounts of chlorpyrifos through inhalation of its vapours.

Health effects

To protect the public from the harmful effects of toxic chemicals and to find ways to treat people, who have been harmed, scientists use many tests.

One way to see if a chemical can harm people is to learn how the chemical is absorbed, used, and released by the body; for some chemicals, animal testing may be necessary. Animal testing may also be used to identify health effects such as cancer or birth defects. Without laboratory animals, scientists would lose a basic method to get information needed to make wise decisions to protect public health. Scientists have the responsibility to treat research animals with care and compassion. Laws today protect the welfare of research animals, and scientists must comply with strict animal care guidelines.

In people, short-term oral exposure (one day) to low (milligrams) levels of chlorpyrifos can cause dizziness, fatigue, runny nose or eyes, salivation, nausea, intestinal discomfort, sweating, and changes in heart rate. Short-term oral exposure to much higher (grams) levels of chlorpyrifos may cause paralysis, seizures, loss of consciousness, and death. Reports in people also show that short-term exposure to chlorpyrifos may cause muscle weakness weeks after the original symptoms have disappeared. Other effects of exposure to chlorpyrifos include changes in behaviour or sleeping pattern, mood changes, and effects on the nerves and/or muscles in the limbs (which may appear as odd sensations such as numbness or tingling, or as muscle weakness). The EPA has not classified chlorpyrifos for carcinogenicity (Class D). ***Source:*** *Agency for Toxic Substances Disease Registry, www.atsdr.cdc.gov.*

ENDOSULFAN

Endosulfan, commonly known by its trade name Thiodan, is an insecticide. It was first introduced in the 1950s. It is now out-of-patent, but AgrEvo (formerly Hoescht) is still the most important producer world-wide. Endosulfan is widely used, and is an important cause of

pesticide poisoning in many countries. It is also extremely toxic to fish and other aquatic life.

Endosulfan is one of the class of compounds called organochlorines. This class of chemicals is the most important of the persistent organic pollutants or POPs. There is now a move for a world-wide ban on POPs because of their link to cancer and long-term subtle effects on hormones, the immune system, and reproduction. Unlike other POPs which travel across the globe, endosulfan tends to remain in the region of its use. Yet it has been found in high concentrations in many areas around the world because it is so widely used. The information below describes the environmental and health properties of endosulfan, and shows why it should be banned world-wide.

Short-term toxicity

There is concern over the acute toxicity of endosulfan. The World Health Organization (WHO) classifies endosulfan in Category 2 (moderately hazardous). The U.S. Environmental Protection Agency (US EPA) classifies it as Category Ib (highly hazardous) pesticide. It is readily absorbed by the stomach, by the lungs, and through the skin, meaning that all routes of exposure can pose a hazard.

Numerous cases of both suicidal and occupational poisonings have been reported. Proper protective clothing (safety goggles, gloves, long sleeves, long pants, respirator) is needed to prevent poisoning when handling endosulfan. *(IPCS,1988)* Before it was banned in the Philippines in the early 1990s, endosulfan had become the number one cause of pesticide poisonings. *(NPCIC,1991)* Another concern, especially in developing countries, is that people with diets low in protein may be more sensitive to the effects of this pesticide. *(ATSDR,1993)*

Long-term toxicity

Although the short-term toxicity of endosulfan is of immediate concern, there are also long-term effects to consider. There is some indication that endosulfan can have adverse effects on the immune system at low levels of exposure. *(ATSDR,1993)* There is mounting evidence that organochlorine compounds can act as hormones. These compounds, including DDT, PCBs, and endosulfan, may also be part of the cause for the decrease in the quality of semen, an increase in testicular and prostate cancer, an increase in defects in male sex organs, and increased incidence of breast cancer which has been observed in the last fifty years. *(Hileman,1994; Soto,1993)* Endosulfan has also been found to cause mutations. *(ATSDR,1993)*

TOLERANCE & EXPOSURE LEVELS

HEALTH EFFECTS:

SHORT TERM: Organo-chlorines interfere with the transmission of nerve impulses, disrupting the nervous system particularly,

Central Nervous System. They can induce changes in the liver enzymes and affect the synthesis of proteins and fats. (3) Workers have reported symptoms of malaise, vomiting, dizziness, weakness, confusion, dull headache, anorexia and abdominal discomfort.(5)

Other acute exposure effects to organo-chlorines include behavioural and EEG disturbances, cardiac arrhythmias, central nervous system stimulation and depression, dermatitis, diarrhoea, visual disturbances, hepatic and renal injury, insomnia, mucous membrane irritation, respiratory difficulties and muscle twitching. (3)

LONG TERM: Chronic exposure to organo-chlorines may result in abdominal pain and anorexia pain, visual disturbances, hepatic and renal degeneration, joint pain, insomnia, mental ch hormonal disturbances, paralysis, peripheral neuropathy, splenomegaly, tremor and weakness.(3)

CARCINOGENICITY

MUTAGENICITY: Some experimental mutagenicity has been observed at high doses of endosulfan.(1) Endosulfan was mutagenic in bacterial and bone marrow tests.(5)

REPRODUCTIVE EFFECTS:

BIO-ACCUMULATION: When administered to rats orally, endosulfan is metabolised to alphahydroxy-endosulfan and endosulfandiol, which are then excreted in the urine. (2)

Suspected Effects: Endosulfan is suspected of being a carcinogen, Teratogen and causing embryotoxicity.

Environmental Effects

Endosulfan is also a concern for environmental reasons: it is highly toxic to fish. Safe levels of endosulfan in water are measured in parts per trillion, e.g. European Union maximum acceptable level is 0.001 ug/l. *(PRC, 1994)* Endosulfan can cause fish kills even when used at recommended application rates. Because of this, endosulfan should not be sprayed over marshlands or bodies of water. Caution should also be observed when spraying near ditches, canals, rivers, streams, ponds, and lakes. *(IPCS, 1988)* Endosulfan is persistent in soil, and its major degradation product, endosulfan sulfate, is as toxic as endosulfan. *(ASTDR,1993)*

Source: PAN Asia & the Pacific – *http://www.poptel.org.uk/panap/pest/pe-end.htm*

Annexure IX

Why No One Can Say - "Pesticides Are Safe" *Mary H. O'Brien*

PESTICIDES ARE DESIGNED to kill certain unwanted organisms, whether plant or animal. They often do more poisoning than they are supposed to, however. A pesticide that seems at first to be quite "safe" often turns out to cause damage no one foresaw. This is because there are so many different ways pesticides can cause damage.

1. A Pesticide may kill more than the pest. Lest than one out of 1,000 kinds of insects are pests, and yet most insecticides kill many kinds of insects, including those that help control the pest species. By living weight, soil organisms account for half of all living matter on earth and yet the effects of pesticides on soil organisms may be the least-researched area of pest control. Earthworm populations are dramatically decreased by most carbamate pesticides, for example. Fish are sensitive to poisons that contact their gill surfaces, so pesticides in water in amounts of only a few parts per billion (ppb) often kill fish. Fish-kill is often an expected consequence of pesticide runoff from agricultural fields. Mammals and birds are poisoned when they ear poisoned insects and animals or poisoned baits intended for other animals. Finally, human beings are all to frequently victims of pesticides.

2. A pesticide may remain a long time in the environment. Organochlorine pesticides (e.g., DDT, heptachlor, chlordane) are among the most persistent of pesticides, but other kinds of pesticides, such as the dipyridyl herbicide paraquat and the carbamate fungicide benomyl, may also persist for long period. These pesticides can accumulate over the years in soil, pond bottoms, to be taken up later by plants or released by soil organisms to poison further. For example, the half-life of the organochlorine pesticide toxaphone is 15 years in soil, meaning that 15 years after toxaphene is applied to soil, one-half of the pesticide will remain in the soil. After 30 years, one-fourth will remain.

3. A Pesticide May Travel Far. Pesticides may travel via air, soil, water, dust or organisms to affect living organisms far from where they were applied. Persistent organochlorine pesticides have been shown to travel thousands of miles after being sprayed before coming down in rain or snow. Certain pesticides also travel through food webs. Organochlorine pesticides are stored in the fat of animals and then accumulate in the bodies directly from contaminated water.

4. A Pesticide may turn into another poison. Almost nothing is know about many of the other changes a pesticide undergoes in the environment, but several are known to break down into even more hazardous compounds. For example, the organochlorine heptachlor is changed into heptachlor epoxide, a toxic poison, inside plants and animals. Parathion becomes another compound four times more toxic when it contracts oxygen. The organophosphate insecticide acephate turns into another pesticide, methamidophos, inside plants, animals and sediments. Methamidophos itself is used to kill birds that feed on crops and is more toxic to birds than acephate.

5. A Pesticide may become more poisonous in the presence of other chemicals. Sometimes the toxic effect of one pesticide is dramatically increased in the presence of another pesticide or chemical. The toxicity of many pairs of organophosphate pesticides, for instance, is increased when they are combined. This effect is called *synergism.* Non-pesticide chemicals can also interact with pesticides. The toxicity of malathion, for instance, is greatly increased by a common industrial plasticizer, TOTP, even when malathion exposure occurs two weeks following the use of TOTP.

6. A Pesticide may poison by methods entirely different than those intended. Since most pesticides are designed to kill pests quickly, their long-term effects on humans, such as cancer, genetic damage, and birth defects, are all unintended side effects, Phenoxy herbicides, for example, are designed to kill *plants* by causing them to grow quickly, but they also poison *animals* by damaging their livers and are suspected of causing cancer in humans.

7. A pesticide may poison in such a way that it is hard to recognize that the poisoning is taking place. Several pesticide carriers (i.e. part of the formulated pesticide that is not the active ingredient) have been shown to increase the toxicity of viral diseases in mice. If a human became ill with a virus after exposure to a pesticide, it would be very difficult to prove that the pesticide had played a role. And researchers are only now beginning to learn that exposure to certain organophosphate pesticides may cause permanent damage to the brain, resulting in sleeplessness, memory loss, irritability, and other symptoms frequently not associated with pesticide poisoning.

8. Pesticide damage may show up long after the pesticide has left the body. Like X-rays, pesticides that are capable of causing genetic damage or cancer can initiate the damage in whatever period they are actually in

the body. For example, the phenoxy herbicide 2,4-D is rapidly eliminated from the body, but several cases are known in which individuals briefly exposed to 2,4-D on their skin developed nerve damage in their arms and legs several weeks later.

9. A pesticide may be dangerous even if all label directions are followed. A pesticide, by definition and design, is intended to destroy at least some form of life. Some uses and storage practices are safer than others and therefore recommended on labels. But the product itself remains hazardous. Even following the label exactly cannot guarantee it will cause no harm. In the U.S., it is illegal to print a label that claims a pesticide is "safe" or "harmless" for this reason. With pesticides manufactured, formulated, or exported into developing countries, the uncertainties multiply. And even if accurately labelled when shipped, a pesticide may be repackaged later in a way that fails to protects handlers and users.

10. A pesticide may cause damage that was never investigated before it was registered or not discovered during toxicological testing. Testing standards in the U.S. are the most complete and stringent in the world, yet even these are very inadequate. For example, in the United States, almost all pesticides are conditionally registered, which means that not all required health tests have been completed and reviewed before they are allowed on the market. In 1983, only four out of over 600 active ingredients had been registered with all required tests. Only 38 percent of the pesticides on the market in the United States have been tested for cancer causing ability as required by law (i.e. passing two tests). Only 30 to 40 percent have been tested for birth defects, and less than 10 percent have been tested for genetic damage. In addition, studies of certain pesticide effects, such as those on children and other especially vulnerable groups, or effects on the body's immune system, are not required and are almost never done. Thus countries whose pesticide regulatory schemes have relied on U.S. data have inadequately tested pesticides on the market as a result.

Although there is no such thing as entirely safe pesticides, many safe alternatives to pesticides are presently available, and many more are under investigation. While far more research in this area is still needed, there is already a beginning international movement by farmers away from heavy dependence on synthetic chemical pesticides and fertilizers, toward less toxic, more sustainable agricultural practices. Household pests too can frequently be controlled by a variety of techniques emphasizing a thorough understanding of the pests' life cycles and habitats. Individuals and groups working to develop and publicize alternatives to unsafe pesticides needs support from everyone, regardless what country they live in, for it is all the earth's inhabitants that benefit from their efforts to "detoxify" our planet.

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