In the thirst of modernization and industrialization man has contributed pollution to the life and ecology of plants, animals and microbes. Increased demand for food and fiber has lead to the chemicalization of agriculture and we have reached on such a stage that modern agriculture is dependent on high yielding varieties, which can only be grown under the influence of fertilizers and pesticides. Pesticides are the man made chemicals which are being used to produce enough cheap food. In India, 90,000 MT of technical grade pesticides are used annually to control pests and plant diseases. The pesticides are classified as insecticides, fungicides, weedicides, herbicides, nematodicides and rodenticides; of which insecticides constitutes 77% of the total pesticides used in different agricultural and animal husbandry practices and in public health operations.

Majority of these pesticides are beneficial when used for specific purposes, handled properly and applied as per the recommendations of the manufacturer. However, over the years, there has been a mounting fear and concern that indiscriminate and improporionate use of pesticides may lead to their residues in food chain which may exert their harmful effects in human beings and animals. In an ideal pesticide application, the chemical should fall exactly on the target and be degraded completely to harmless compounds but this never occurs and only some part of the pesticide hits the target pests while remaining drifts into the environment.

If we look retrospectively, we find that the use of pesticides started during second world war when these hazardous and toxic poisons were considered as chemical weapons. A swiss scientist Paul Muller invented DDT in the year 1939 which was
considered as a wonder chemical that kills the insects, pests and was found wonderful in malaria control programmes. But soon after the discovery of DDT, its harmful effects also came into the knowledge of the scientists. In 1944, A famous biologist found harmful effects of DDT in birds, which produced thin shelled eggs, easily broken in nests resulting into failure of reproduction and decline of bird population.

Since then pesticides are increasingly used by farmers as wonder chemicals that kills the insects, weeds, fungus and helps in getting rid of the insect transmitted diseases. In India, the insecticide consumption increased from 2000 M. T in 1955 to 90,000M tons in 1998-99 which is only 400-450 gm per hacter in comparison to Japan 12000 gm/hacter (Table-1). In spite of ban, DDT and BHC are still produced in India and we have 77% DDT and 95% BHC in India out of their total production in world.

Table :-1 Consumption of pesticides

<table>
<thead>
<tr>
<th>Country</th>
<th>Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>India</td>
<td>400 gm/ hacter</td>
</tr>
<tr>
<td>Mexico</td>
<td>750 gm/ hacter</td>
</tr>
<tr>
<td>USA</td>
<td>3000 gm/ hacter</td>
</tr>
<tr>
<td>Germany</td>
<td>3000 gm/ hacter</td>
</tr>
<tr>
<td>Japan</td>
<td>12000 gm/ hacter</td>
</tr>
</tbody>
</table>

The amount of pesticide used in India is very low in comparison to other developed nations even then we have much higher polluted food in our country, it may be because of following reasons which needs to be looked into for the control of pesticide induced problems:

1. Indiscriminate use of pesticides
2. Inproportionat use of pesticides
3. Lack of education.
4. Lack of extension activities
5. Inadequate literature supplied by the manufacturers
6. To increase production
7. To get more profit
8. Lack of safer pesticides
9. Use of banned pesticides
10. Negative role of Developed Nations
11. Man is ultimate consumer
Status of pesticide residues in India:

The presence of pesticide residues have been detected in various items and in food chain. The levels of the pesticides are found much higher than expected level because of heavy contamination of environment. A list of commodities is given in which very significant levels of pesticides are recorded (Table-2) Besides, there are human milk, fat or tissue samples screened for the presence of pesticide residues were also found to have very significant levels of harmful pesticides. The BHC has been found from 0.120 to 1.22 PPM in human fat samples. Heptachlor, an organochlorine pesticide was found to be 0.425 PPM and DDT from 0.195 to 1.695 PPM. Even human breast milk is not free from DDT, which was found to have even 2.39 PPM levels. Similarly human blood was found to have a much higher concentration of 12.00 PPM as against of 0.050-PPM safe levels (no effect levels).

Table-2. Pesticide residues in food chain

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Items</th>
<th>Pesticide residues detected</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Soil and water</td>
<td>Permethrin, cypermethrin, fenvalerate,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>deltamethrin, DDT, Aldrin, Dieldrin, BHC,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Heptachlor, Lindane, Endosulfan</td>
</tr>
<tr>
<td>2</td>
<td>Air</td>
<td>DDT, BHC</td>
</tr>
<tr>
<td>3</td>
<td>Fodder (Lucerne)</td>
<td>Monocrotophos, Phosphomidon, Endosulfan</td>
</tr>
<tr>
<td>4</td>
<td>Cattle feed</td>
<td>Cypermethrin, DDT, BHC</td>
</tr>
<tr>
<td>5</td>
<td>Pasture &amp; Hay</td>
<td>DDT, Aldrin, Dieldrin, BHC, Heptachlor., Lindane</td>
</tr>
<tr>
<td>6</td>
<td>Rice, wheat flour, oils</td>
<td>DDT, BHC</td>
</tr>
<tr>
<td>7</td>
<td>Dairy Products, Baby milk</td>
<td>DDT, BHC, HCB, PCB, Heptachlor</td>
</tr>
<tr>
<td></td>
<td>powder, Butter, Ghee, Cow/</td>
<td></td>
</tr>
<tr>
<td></td>
<td>buffalo milk</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Meat, Eggs</td>
<td>DDT, heptachlor, PCB, Carbaryl</td>
</tr>
<tr>
<td>9</td>
<td>Liver, Kidneys, Hair, skin</td>
<td>Cypermethrin</td>
</tr>
<tr>
<td>10</td>
<td>Vegetables</td>
<td>Endosulfan</td>
</tr>
<tr>
<td>11</td>
<td>Adipose tissue of man</td>
<td>BHC, DDT, PCB, HCB, Heptachlor, Aldrin</td>
</tr>
<tr>
<td>12</td>
<td>Human breast milk</td>
<td>BHC, DDT, Aldrin, Heptachlor, HCH</td>
</tr>
<tr>
<td>13</td>
<td>Blood of man</td>
<td>BHC, DDT, Aldrin, Heptachlor, HCH</td>
</tr>
<tr>
<td>14</td>
<td>Tea, Coffee</td>
<td>BHC, DDT, Ethion, Quinalphos, Tetridiphon, Chlorpyriphos</td>
</tr>
</tbody>
</table>

The primary concern of the chronic low dose toxicity in man and animals is related to the carcinogenic, teratogenic, mutagenic, immunotoxic, immunopathological
and/or neuropathic effects of pesticides. The perusal of literature in this regard reveals the studies directed towards only one or two pesticides while in nature, when a large number of pesticides are present and their combined effect has not been measured; which of course will give very dangerous view. Various Pathological effects of low doses of pesticides in animals and man are as under.

1. Immunopathological effects:
   a) Acquired Immunodeficiency
   b) Autoimmunity
   c) Hypersensitivity
2. Carcinogenic effects
3. Mutagenicity
4. Teratogenicity
5. Neuropathy
6. Nephropathy
7. Hepatotoxicity
8. Hepatotoxicity
9. Reproductive Disorders

Strategies to combat with pesticide residues:

1. The farmers should be advised about the harmful effects of pesticides so that they should minimize the use of pesticides in crops. They should judiciously use the pesticide in terms of their quantity and frequency.

2. It should be assured that the pesticides produced in country should be distributed proportionately so that the indiscriminate and improportionate use can be avoided.

3. All emphasis must be laid on the development of Bio-pesticides like viral, bacterial or fungal pesticides or pesticides of botanical origin like Neem or Tulsi, which can be used in crops to kill the insect pests without polluting the environment.

4. The harmful pesticides like some organochlorines, organophosphates and carbamates must be banned strictly in India, their production, import or use should be completely banned.

5. To reduce the effect of pesticide residues, some herbal preparations should be developed which can overcome the immunopathological, neuropathic or nephropathic effects, there are many herbs mentioned in our Indian ancient literature, which can be scientifically validated to prevent and control the harmful effects of pesticides. This will certainly give a new direction to the world not to depend on synthetic things.
REFERENCES


Pesticide induced pathological alterations in animals and man

R.S. Chauhan

National Fellow
Department of Pathology
College of Veterinary sciences
G. B. pant University of Agriculture and Technology
Pantnagar- 263145
Pesticide induced pathological alterations in animals and man
In the event of default by the employee, we undertake to recover the Equated Monthly instalments and other dues as intimated by LIC Housing Finance Ltd. From time to time from the salary / other dues of the above employee and remit the same to LIC HFL.

Place: For and on behalf of

Date (Name of the employer & seal)