

# Endosulfan



*Shrutu has congenitally deformed hands and feet. Her mother was exposed to endosulfan spraying while pregnant with her. Her mother has since died of cancer. Down to Earth Magazine, Vol 9, (19), 2001.*



## Pesticide Action Network Asia and the Pacific

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January 2012

### Trade names

Thiodan and many others.

### Uses

Insecticide. Broad-spectrum organochlorine. Used on rice, cotton, tea, coffee, vegetables, fruit, nuts, and many other crops against mites, thrips, beetles, caterpillars, borers, cutworms, bollworms, bugs, whiteflies, leafhoppers, and snails.

### Classifications and risk statements

*WHO*: Class II moderately hazardous.

*EU*: harmful in contact with skin; very toxic by inhalation; very toxic if swallowed; very toxic, dangerous for the environment; very toxic to aquatic organisms, may cause long term effects in the aquatic environment.

### Regulatory status

#### International

Listed in Annex A of the Stockholm Convention on Persistent Organic Pollutants for global elimination of production and use, with exemptions for some specific pests on specific crops for 5 years.

Listed under the Rotterdam Convention on Prior Informed Consent.

#### National

Banned or being phased-out in at least 89 countries: Australia, Austria, Bahrain, Belgium, Belize, Benin, Brazil, Bulgaria, Burkina Faso, Canada, Cambodia, Cameroon, Cap-Vert, Chile, China, Colombia, Cote d'Ivoire, Croatia, Cyprus, Czech Republic, Denmark, Egypt, Eritrea, Estonia, Fiji, Finland, France, Gambia, Georgia, Germany, Greece, Guinea Bissau, Hungary, Indonesia, Iran, Ireland, Italy, Jamaica, Japan, Jordan, Kenya,

Korea, Kuwait, Latvia, Lebanon, Liechtenstein, Lithuania, Luxembourg, Malaysia, Malawi, Mali, Malta, Mauritania, Mauritius, Morocco, Mozambique, Netherlands, New Zealand, Niger, Nigeria, Norway, Oman, Paraguay, Peru, Poland, Portugal, Qatar, Romania, Saudi Arabia, Senegal, Seychelles, Slovakia, Slovenia, South Africa, Spain, Sri Lanka, St Lucia, Sweden, Switzerland, Syria, Tchad, Thailand, Tunisia, United Arab Emirates, United Kingdom, Uruguay, USA, Venezuela.

### International standards

On PAN International's list of Highly Hazardous Pesticides (2010) for global phase-out because of acute toxicity and endocrine disruption.

### Manufacture

In India (Hindustan Insecticides, Excel Crop Care, Coromandel Fertilisers), Israel (Makhteshim-Agan Industries), China.

### Residues in food

Widespread contaminant of food globally, especially fruit and vegetables, and freshwater fish; also found in honey, oil, dairy products and meat.

### Residues in humans

Common human contaminant, with residues in breast milk, blood, fat tissue, placenta, and umbilical cord blood.

### Health effects

#### Mechanism of toxicity

Blocks the receptors for the GABA neurotransmitter in nerve cells, which results in a state of uncontrolled excitation. Changes the brain levels of neurotransmitters dopamine, noradrenalin and serotonin.

## Poisonings

One of the main causes of pesticide poisoning in many developing countries. Although exact numbers are not known, over 10,000 people are believed to have been affected by aerial spraying of endosulfan in Kerala, India, with up to 1,000 dead from endosulfan-related conditions. Many more have been poisoned in neighbouring state Karnataka. Many cotton farmers have died in West Africa, especially Benin, Senegal, Mali and Togo.

Other poisonings are reported from Indonesia, Philippines, Sudan, South Africa, Colombia, Guatemala, El Salvador, Honduras, Costa Rica, Cuba, Nicaragua, USA, and New Zealand. Deaths have resulted from direct contact with spray, reuse of containers, and contaminated food, milk or drinking water. Endosulfan has been used for suicide especially in India, Sri Lanka, Turkey, and Malaysia.

## Acute toxicity

The main effect is on the nervous system causing hyperactivity and convulsions. Signs and symptoms include impaired breathing, salivation, headache, irritated eyes, nausea, vomiting, dizziness, confusion, irritability, agitation, disorientation, muscle twitching, increased or decreased heart rate, diarrhoea, weakness, loss of consciousness, kidney failure.

## Chronic toxicity

**Neurotoxicity:** in humans it has caused psychiatric disturbances, epilepsy, cognitive and emotional deterioration, congenital intellectual impairment, memory impairment, learning disabilities, seizure disorders; may promote Parkinson's disease; linked to autism.

**Genotoxicity:** considerable evidence that endosulfan is genotoxic and mutagenic.

**Cancer:** promotes tumours; has caused cancer in laboratory animals but not classified by IARC as carcinogen; is linked to cancers in Kerala including liver, brain and blood cancers.

**Endocrine disruption:** oestrogenic, causes breast cancer cells to grow,

and may cause breast cancer; interferes with mammary gland development; it is also anti-androgenic, decreases activity of progesterone, decreases testosterone.

**Reproductive and developmental toxicity:** in humans it has caused endometriosis, menstrual disturbances, male breast enlargement, delayed male sexual development, birth defects especially of hands, feet and heart, cerebral palsy, and delayed development. Brazil banned endosulfan because of reproductive and endocrine effects on farmers.

**Immunotoxicity:** suppresses immune system; promotes allergic responses.

**Other:** promotes allergies; evidence of skin diseases, ear nose and throat problems, vision impairment and loss of vision in humans; frequent illnesses.

## Sensitive populations

Females, foetuses, newborns, elderly; and people with protein-poor diet, compromised immune function, neurological disorders, liver or kidney disease, anaemia or other blood disorders.

## Environmental and agroecological effects Toxicity

Very toxic to nearly all kinds of organisms.

**Aquatic:** extremely toxic to fish and other aquatic organisms, and causes chronic effects including genotoxicity, reproductive, developmental and transgenerational effects. Has caused massive fish kills. Very toxic to some amphibia; sublethal levels interfere with pheromones, and reduce survival; implicated in frog populations' decline.

**Birds:** highly toxic to birds; bird kills reported.

**Mammals:** highly toxic.

## Agroecological disruption

**Bees:** highly toxic to bees.

**Beneficials:** toxic to many beneficial insects, and to beneficial fungi; not compatible with IPM.

**Soil organisms:** toxic to soil microorganisms and earthworms.

**Resistance:** at least 28 pests affecting at least 22 crops have developed resistance to endosulfan.

## Environmental fate and contamination

Widespread global contamination of soil, ground and surface waters, marine environment, air, snow, rainfall, the bark of trees, mountains, the Arctic and the Antarctic.

**Soil:** persistent; widespread contaminant of soil where endosulfan has been used.

**Aquatic:** widespread contaminant of ground and surface waters, marine environment, snow, rainfall.

**Air:** evaporates rapidly after spraying and travels to cold latitudes (Arctic, Antarctic, high mountains) where it distils out; common air contaminant.

**Plants:** contaminates bark of trees globally; and grasses, lichen, mosses, and aquatic plants in many countries.

**Bioaccumulation:** bioaccumulative; biomagnifies in the food chain, especially terrestrial food chains.

## Alternatives

There are many effective alternatives for all endosulfan's uses, including natural plant extracts, biological controls such as *Bacillus thuringiensis*, *Beauveria bassiana*, various parasitic wasps, and a number of mechanical and cultivation techniques including varietal selection, crop rotation, intercropping. As a result of good agroecological practices there are thriving organic cotton industries in India and Africa, and organic coffee in Latin America, replacing some of endosulfan's main uses.

## Further Information

- Endosulfan Monograph, PANAP: [http://www.panap.net/uploads/media/Endosulfan\\_01.pdf](http://www.panap.net/uploads/media/Endosulfan_01.pdf)
- Alternatives to Endosulfan in Latin America, RAP-AL: <http://www.panna.org/files/Folletto%20resumen%20Endosulfan%20ing.pdf>.
- How to Grow Crops Without Endosulfan. Pesticide Action Network (PAN) Germany: [http://www.oisat.org/downloads/field\\_guide\\_without\\_endosulfan.pdf](http://www.oisat.org/downloads/field_guide_without_endosulfan.pdf).