

# For the Inclusion of Endosulfan into the PIC Procedure of the Rotterdam Convention

## ***Statement of Concerns***

There is broad agreement that the Rotterdam Convention should serve as an “early warning system”. Regarding endosulfan, the literature and documentation available about the harm caused to humans and wildlife can no longer be seen as an “early warning” but should be viewed as a *strong* warning.

There is ample evidence that endosulfan:

- is acutely toxic and has poisoned numerous people, livestock and wildlife
- is an endocrine disruptor, threatens reproductive capacity, and increases risks of breast cancer
- is volatile and contaminates environments far from where it is used
- is persistent in the environment, and its main metabolite is even more persistent

In summary, endosulfan is recognised as being unacceptably hazardous to human health and the environment in many regions of the world. It is a leading cause of poisonings from pesticides, and in some communities has left a legacy of deformity and malfunction. Its continuing use in other regions jeopardises wildlife populations, environmental integrity and human health everywhere because of its volatility, which enables it to spread around the globe, and its persistence. Effective alternatives are available and it is already deregistered or banned in many countries.

## ***Our Recommendations***

Pesticide Action Network (PAN) International strongly recommends that:

- Endosulfan be covered by the Rotterdam Convention
- Governments that are party to the Rotterdam Convention on Prior Informed Consent (PIC) make efforts to ensure that all national bans or severe restrictions of endosulfan are notified to the PIC Secretariat
- The authorities in all countries ban the use of endosulfan
- All producers of endosulfan stop production of this highly persistent and hazardous pesticide
- Endosulfan be replaced with safer and more sustainable pest control methods

Damage to human health, wildlife and the environment can be better monitored and reduced by adding endosulfan to the PIC procedure, and avoided altogether by the world-wide elimination of this outdated and hazardous pesticide.

## **Background:**

### **Endosulfan's Threat to Human Health and the Environment**

*Endosulfan is very toxic for nearly all kinds of organisms.*

#### **■ Acute Toxicity to Humans**

The Intergovernmental Forum on Chemical Safety has identified endosulfan as an acutely toxic pesticide that poses significant public health problems for developing countries/ economies in transition.<sup>1</sup> The U.S. EPA has classified it as Category 1b - highly hazardous. It is readily absorbed by the stomach, lungs and through the skin, and all routes of exposure pose a hazard.<sup>2</sup>

Endosulfan acts primarily on the nervous system, and many cases of poisoning, including fatalities, have been reported - in Benin, Columbia, Costa Rica, Cuba, Guatemala, India, Indonesia, Malaysia, Philippines, South Africa, Sri Lanka, Sudan, Turkey, and USA. It is one of the main causative agents of acute poisoning in Central America, in southern India and other areas.<sup>3</sup>

In laboratory tests endosulfan, administered by any route, has been shown to be even more toxic to female than to male rats. Endosulfan was found among the most frequent reported intoxication incidents, adding unintentionally further evidence to its high toxicity for humans and *“Excessive and improper application and handling of endosulfan have been linked to congenital physical disorders, mental retardations and deaths in farm workers and villagers in developing countries in Africa, southern Asia and Latina America.”*<sup>4</sup>

Toxic effects are aggravated by protein malnourishment and diabetes.<sup>5</sup>

#### **■ Acute Toxicity to Wildlife**

Endosulfan is acutely toxic to wildlife, cats, dogs, honeybees, birds, amphibians, fish and aquatic insects, crustacea, molluscs, alligators, crocodiles, turtles, plankton, soil microorganisms, and arthropods.<sup>6</sup>

It has caused massive fish kills in numerous countries, including Germany, Canada, USA, Sudan, and is implicated in the worldwide decline of amphibians.<sup>7</sup>

#### **■ Endocrine Disruption**

Endosulfan is known to interfere with hormonal mechanisms at very low concentrations, and existing levels of environmental contamination pose a threat to the long-term viability of animal populations, and of chronic illness and death in humans.<sup>8</sup>

Endosulfan clearly exhibits oestrogenic properties, causing the proliferation of human breast cancer cells and increasing the risk of breast cancer.<sup>9</sup> It significantly increases the ratio of 16-hydroxyestrone (the tumour promoting oestrogen) to 2-hydroxyestrone (the non-genotoxic oestrogen) resulting in increased breast cancer cell proliferation, development, and promotion.<sup>10</sup> It interferes with mammary gland development by affecting mRNA transcriptional activity.<sup>11</sup> It also causes changes to intracellular oestrogenic signalling at very low picomolar to nanomolar concentrations (e.g.  $10^{-10}$  M), which causes rapid secretion of prolactin that in turn causes cell proliferation.<sup>12</sup> Breast cancer risk is also increased by endosulfan's effect on the immune system - as it induces death of T-cells important in tumour

suppression - and because it is genotoxic and mutagenic.. Results of carcinogenic studies are equivocal, but a number suggest that endosulfan may be genotoxic and mutagenic.<sup>13</sup>

Endosulfan can bind to progesterone receptors, increasing the risk of miscarriage.<sup>14</sup> It also inhibits testicular synthesis of androgens, and alters sex ratios.<sup>15</sup> Impacts on male reproductive health include reduced sperm quality and count, testicular damage, delayed sexual maturity, and decreased penile length.<sup>16</sup>

#### ■ **Other chronic effects**

In laboratory studies, endosulfan damages red blood cells, thyroid, kidneys, liver, muscles, and the developing foetus. It is hepatotoxic, genotoxic, mutagenic, clastogenic, a tumour promoter, and inhibits immune function.<sup>17</sup> It has produced malignant neoplasms and lymphosarcomas in rats.<sup>18</sup> Behavioural and neurological changes have been observed.<sup>19</sup>

Endosulfan has resulted in congenital birth defects, reproductive health problems, cancers, loss of immunity, neurological and neurobehavioural problems amongst exposed villagers in Kerala, India.<sup>20</sup> Limb deformities have been seen in salamander larvae.<sup>21</sup>

#### ■ **Persistence**

Endosulfan is volatile and persistent and there is evidence of widespread human, environmental and food chain contamination around the world.

The half-life of combined residues of endosulfan (alpha- and beta-endosulfan, and endosulfan sulfate) varies from 9 months to 6 years with persistence increased by acidic conditions.<sup>22</sup>

The half-life in water varies from 35-187 days.<sup>23</sup>

Endosulfan sulphate is the main degradation product. It is as toxic as the parent compound but of greater persistence.<sup>24</sup>

Residues of endosulfan have been detected in the environment in areas far distant from where it has been used: in air in the Arctic and Mt Everest regions, lichen, snow-water and lake-waters, rainfall and snow samples in Californian mountains, and remote European mountain lakes.<sup>25</sup>

Residues have also been found in air including indoor air, rain, lakes, rivers, stream sediments, groundwater, well water, spring water, municipal water supplies, marine water and sediment, prawn ponds, lagoons, estuarine and river sediment, soil, tree bark, aquatic plants, fish, crocodile eggs, and other biota. It has been found in Argentina, Australia, Azerbaijan, Benin, Belize, Canada, Chile, China, Columbia, Costa Rica, Europe, Ghana, Greenland, Guatemala, Honduras, Hong Kong, India, Israel, Jamaica, Madagascar, Malawi, Malaysia, Mexico, New Zealand, Nigeria, North America, Pakistan, South Africa, Spain, Sudan, Tanzania, Uganda, and Zambia.<sup>26</sup>

Residues have also been found in food around the world, including Australia, Benin, Brazil, Colombia, Côte d'Ivoire, Croatia, Cyprus, Canada, Finland, Ghana, India, Italy, Kenya, Kuwait, Madagascar, New Zealand, Nigeria, South Africa, Tanzania, Turkey, Uganda, USA. They were found in dairy foods, meat, chicken, vegetable oil, peanuts, seeds, fruit, and many different vegetables.<sup>27</sup>

In Europe endosulfan has been among those pesticides with the highest frequency of MRL exceedances identified by the European Commission.<sup>28</sup>

## ■ **Bioaccumulation**

The U.S. EPA considers endosulfan as having a high potential to bioaccumulate in fish, and hence may affect animals higher up the food chain.<sup>29</sup> It has been found in trout from lakes in North America, and in fish in Benin, Nigeria and Uganda.<sup>30</sup> The European Union has banned importation of fish from Tanzania, Uganda and Kenya due to high levels of endosulfan.<sup>31</sup>

Residues have been detected in human umbilical cord blood, placental tissue, breast milk, fat, blood and urine - in Colombia, Canada, Denmark, Egypt, India, Indonesia, Japan, Nicaragua, Pakistan, Spain, and Sub Saharan Africa.<sup>32</sup>

## **Regulatory status, government programmes and action**

Many countries have already banned or restricted the use of endosulfan because of human health and environmental impacts.

Endosulfan is banned in Bahrain, Belize, Cambodia, Columbia, Germany, Kuwait, Netherlands, Oman, Pakistan, Philippines, Qatar, Saudi Arabia, Singapore, St Lucia, Sri Lanka, Sweden, Syria, Tonga, United Arab Emirates. Malaysia banned endosulfan in April 2005, with a phase out period that concluded in August 2005.

It is restricted in Australia, Bangladesh, Canada, Denmark, Dominican Republic, Finland, Honduras, Iceland, Indonesia, Iran, Japan, Korea, Kazakhstan, Lithuania, Norway, Panama, Russia, Serbia & Montenegro, Thailand, Taiwan, USA, UK, Venezuela.

In India in 2006, the government of Kerala State announced relief and remediation to a community whose health has been badly damaged by endosulfan spraying.<sup>33</sup> An unusually large number of illnesses occurred among the people within the cashew plantations in the villages of Kasargod where aerial spaying of endosulfan has been ongoing for 26 years. The occurrence of these illnesses has been found due mainly to endosulfan<sup>34</sup>.

In the overall conclusion to Directive 91/414/EEC, the EU decided not to include endosulfan in Annex I of Council Directive 91/414 which practically means a ban of all plant protection products containing endosulfan in all EU member states. Under the EU Biocide Directive 98/8/EC, endosulfan was not notified for inclusion. This means that biocides containing the active ingredient endosulfan can be marketed in the EU at present but not beyond the phasing out period laid down in the directive. In the framework of the EU water policy endosulfan was identified as a priority hazardous substance in "Annex X - List of priority substances in the field of water policy" of Decision No 2455/2001/EC of the European Parliament and of the Council of 20 November 2001, amending Directive 2000/60/EC<sup>35</sup> Endosulfan has been included in the OSPAR List of Chemicals for Priority Action (update 2002). In addition endosulfan is on the list of priority substances agreed by the Third North Sea Conference (Annex 1 A to the Hague Declaration).

In the UNEP-GEF Regional-based Assessment of Persistent Toxic Substances (PTS), it is rated as:

- Indian Ocean region - "regional concern"
- North American region - "regionally specific PTS"
- Mediterranean region - "local concern"
- Sub Saharan Africa - PTS of highest concern after DDT
- E&W South American - emerging concern
- European region - proposed possible priority hazardous substance
- SE Asia and S Pacific region - regional concern, with long-term effect on the structure of the aquatic ecosystem
- Central America and Caribbean - one of the most important PTS of emerging concern.



## ***Suffering at field level***

According to the Rotterdam Convention on Prior Informed Consent (PIC) and the International Code of Conduct on the Distribution and Use of Pesticides (Art. 3.5 and Art. 5.2.4), the conditions of use in developing countries are an important indication of the potential health risks to workers posed by the use and exposure to pesticides. Under current conditions of use in developing countries safe use of endosulfan is not possible, and poses an unacceptable threat to the health of workers and small scale farmers. Documentation of adverse effects of endosulfan use under conditions of use in developing countries are being made available by PAN and show detailed evidence that endosulfan needs to be covered by the Rotterdam Convention.<sup>36</sup>

## ***Alternatives***

The existing bans in countries which formerly used endosulfan products demonstrate that alternatives to endosulfan are available, especially if attention is not only given to chemical alternatives but to alternative pest management strategies as they are developed in integrated pest management systems or biological agriculture.

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