Pesticide management for safe food and health

Webinar

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Problem of pesticides …

Two key issues

- **Chronic toxicity** – Long-term health effects due to chronic exposure of pesticide residues in food
- **Acute toxicity** – effect on farmers' health including death while pesticide application; and accidental poisoning and suicides

CSE has over the years highlighted the need for safe use of pesticides and health concerns due to the unsafe use. It has raised the issue of pesticide contamination, gaps in regulations and pushed for policies and standards that can lead to safe food and limit the damage to public health.

Chronic toxicity through pesticide residues in food

Two studies:

1. Pesticide residues in bottled water (Feb 2003)
2. Pesticides in soft drinks (August 2003)

We highlighted:

- Similar pesticides present in bottled water and soft drinks; trends similar to those found in ground water
- Asked for stringent residue standards; exposure below **Acceptable Daily Intake** (ADI)
- Raised the issue of **poison-nutrition trade-off**. There is no business of pesticides in water/soft drinks. Soft drinks do not provide nutrition and are not essential compared to milk, so can't have pesticides

A Joint Parliament Committee was formed in 2003. First ever on such an issue. It not only vindicated CSE's findings but also recommended a series of measures that had the potential of far-reaching consequences for public health and food safety regulations in India. But unfortunately, pesticides are still poorly managed.

Acute toxicity – effect on farmers' health while pesticide application

- Pesticide poisoning while spraying is not a rare news in India. **In 2017, several farmers died and hundreds became ill** in several districts of **Yavatmal, Nagpur, Akola and Amravati in Maharashtra. Monocrotophos**, a highly toxic pesticide along with others was being used
- Toxic pesticides are also linked with deaths due to **accidental poisoning** and **suicides**. In 2013, several school children in Bihar died because of accidental poisoning of monocrotophos.

We tested pesticide residues in blood of Punjab farmers (Bhatinda and Ropar district):

- Found cocktail of pesticides. Higher level of organophosphates than organochlorines
- Highlighted that organophospates like monocrotophos can kill at low doses because of low LD50 value. It not only had high acute toxicity but also chronic toxicity than DDT (Dichlorodiphenyltrichloroethane), which is an organochlorine pesticide.
- Highlighted the issue of **chemical trespassing and body burden** and need for **bio-monitoring** to understand cumulative impact of several pesticides in the human body/tissues.

What is required to make this safer?

1. Ongoing rigorous review of pesticides

Ongoing rigorous review of registered pesticides based on new knowledge w.r.t. acute and chronic toxicity.

- **Comparative risk assessment** is critical. New product should only be registered if its acute and chronic toxicity is less than existing pesticides
- **Unsafe pesticides should be phased-out**; and replaced if limited/no options; but only with safer alternatives
- It should also help limit the **number of registered pesticides** for the same crop. Regulating more pesticides is expensive. Cleanup even more problematic. Opens door for more unknown cumulative health effects
- All industry data on toxicity should be made public; independent data to be encouraged

Example of result of review:

- **DDT** was a very popular organochlorine pesticide decades ago, but because of its persistence in the environment is allowed for limited public health applications.

In this context, the ban on 18 pesticides announced in 2018 and now the proposed ban on another 27 pesticides, is a welcome step. It is based on extensive multi-year review in view of the current science and health considerations. It's a practice world over

What is required to make this safer?

2. Ensure total exposure lower than ADI

Ensure that pesticide exposure from all food that we eat is below the acceptable daily intake (ADI)

- The **MRL** (Maximum residual limit) is **not the safety standard**. It is a **legal limit** that is allowed in a food commodity
- **Safety is defined by ADI.** ADI = MRL*exposure. It reflects how much of a pesticide is safe to have ingested daily, over a lifetime, for a particular age/bodyweight. It is about one pesticide from different food sources
- Considering the variance in diet of the Indian population, it is imperative to know what all constitutes their diet to better calculate the differences in exposure levels and modify MRLs accordingly
- **Total diet studies** to know contaminants/toxins in complete diets prevalent in different parts of India would help know the exposure.

The JPC had said that pesticides should not be registered when MRLs are not fixed and suggested regular review of MRLs based on scientific developments and revision of ADI, if any. It mentioned that "There is scope to exceed acceptable daily intake (ADI) if high MRLs have been set because ADI is a safety milestone and should not be allowed to be breached and the basic purpose of setting realistic MRLs is to ensure that we remain well within allocated ADI for that pesticide".

ADI and MRL setting

Determine ADI (acceptable daily intake)

— Tests on rats for toxicity (NOAEL)

— Safety factor: 100 times more for humans

Set MRL (maximum residues limit)

— Based on field tests on crops

— Best-possible residue

— Compare with other countries' MRL

Multiplied by diet (exposure)

TMDI (Theoretical Maximum Daily Intake) The sum of what we eat: diet by section of population

Cross check

— Ensure exposure is lower than ADI

What is required to make this safer?

3. Ban Class I pesticides

The WHO classifies pesticides by hazard. Calculated primarily based on acute toxicity through oral routes (LD50 values), class I pesticides are:

- **Extremely hazardous** (class Ia; LD50 oral = <5 mg/kg bw) or **highly hazardous** (class Ib; LD50 oral = 5-50 mg/kg bw)
- Because of low LD50 values, these pesticides can cause death and more damage at a very low dose. Have been linked with poisoning deaths while application, accidents and suicides
- The 18 pesticides banned through the order of 2018 (with few to be banned completely by Dec 31,2020) comprised **7 class I pesticides**
- The proposed ban on 27 pesticides has **3 more class I pesticides** – **monocrotophos, carbufuran and methomyl**. Monocrotophos and carburan are heavily used.
- No Class I pesticide should be allowed to be used.

What is required to make this safer?

4. Programme for bio-monitoring

Measuring toxins in human body/tissues – Bio-monitoring

- Since several pesticides are used in different foods, **the food basket is like a pesticide basket.** Apart from pesticides, we are exposed to several chemicals from different routes (including environment)
- A carefully designed **long-term national-level programme** can guide on the presence of chemicals/toxins, their exposure levels, temporal and spatial trends, emerging issues and success of policy interventions.
- Examples:
  - **HBM4EU** (Human biomonitoring for European Union) is a joint effort of 30 countries, the European Environment Agency and the European Commission. It is about evidence of the actual exposure of citizens to chemicals and the possible health effects. It is a five year project, that kicked off in 2017 and will run to the end of 2021
  - The US has a **National Biomonitoring Program** (NBP) which offers an assessment of nutritional status and the exposure of the US population to environmental chemicals and toxic substances. The **National Report on Human Exposure to Environmental Chemicals** captures data since 1999 and is last updated in 2019.

Thank you!