International COCOA Initiative

TRAINING MANUAL

Behaviour change training on how cocoa-growing households can better protect children from exposure to pesticides

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Contents

About the training

Context

While pesticides are important to protect crops from pests that can compromise quality and yield, they also pose significant environmental and health risks. Children are particularly vulnerable to pesticide exposure due to key differences in physiology and behaviour.

First, children's **physical and cognitive development is not yet complete**. Certain protection mechanisms are not developed in children's bodies, for example, skin is more permeable to toxins; and they have lower levels of enzymes needed to detoxify the body. Also, when exposed to toxins in the environment, children absorb proportionately higher doses because of higher breathing rates, and higher rates of consumption of water and food as compared to adults.

Secondly, children's **developmentally appropriate behaviour** often exposes them to pesticides in the environment: they sit and crawl on the floor, they explore objects by putting them in their mouth, they put their hands in their mouth, they are curious and eager to explore their surroundings, they investigate their environment and objects they find in their home.

Many of the substances in commonly used pesticides are highly toxic and pose a risk of acute poisoning when inhaled or ingested. Moreover, some of the substances present in pesticides also affect human health in the long run after less intense but frequent exposure. According to the International Agency for Research on Cancer (IARC)[1], several commonly used pesticides have been classified as carcinogenic to humans, indicating a possible link to cancer development.

Children in farming households can be exposed to pesticides directly when they help with spraying on the farm, or indirectly through the presence of pesticides products in their everyday environment, including in their homes. For example, homes are often a "transit point" for pesticides between the moment of purchase and the moment of spraying, or a storage place for half-used containers. When pesticides in the household are not stored safely away from children, children's curiosity can lead to their exposure with dangerous consequences.

Furthermore, children may come into contact with toxic residues on the clothes or protective equipment worn by parents during spraying. In areas where proper disposal systems are missing, empty pesticides containers pose another risk when left untreated in the outdoor environment and picked up by children. In cases when empty containers are re-used for different purposes, including for filling food, household members risk ingesting pesticides residues, with potentially severe consequences for children's health.

Unborn and breastfed children are also at risk if their mothers are exposed to pesticides during pregnancy.

All members of farming households play a role in maintaining a safe living environment, protecting their children from potential harm. It is essential for parents and caregivers to develop awareness of the health risks pesticides pose to their children and create a safe environment, where children can thrive and explore without risking exposure to harmful chemicals. By doing so, parents can protect their children's health and well-being, while also fostering a love of learning and discovery.

Raising awareness and educating parents and caregivers about the health risks associated with pesticide exposure and promoting safer practices is essential to promote positive behaviour change and protect children

[1] Pesticides: Training For Health Care Providers, Second Edition is WHO/HEP/ECH/CHE/24.04;

from pesticides. With this in mind, ICI has developed a training module on protecting children from pesticide exposure in their everyday environment, at home and when they move around their community. This training targeted at community members who are less likely to participate in *agronomical* training programmes and who may therefore be less well informed about pesticide-related health risks is key to better protecting children from pesticides.

This manual has been tested with members of Village Savings and Loan Associations (VSLA) in farming communities in Ghana and in Côte d'Ivoire.

Objectives

This training program aims to empower members of farming communities with the knowledge and skills necessary to recognize the risks posed by pesticides to children's health and development, and to take effective measures to prevent children's exposure to harmful chemicals in all areas of their daily lives.

More specifically, this training:

- Informs about the short-term and long-term health risks for children who are exposed to pesticides, even in small doses
- Raises awareness of the different possible contact points at which children may be exposed in their everyday lives
- Helps participants adopt practical measures to protect children

Target group

This training module has been designed for Village Savings and Loans Associations with female and male members and has been pilot-tested in cocoa-growing communities in Ghana and Côte d'Ivoire.

These associations are groups of people who meet regularly to save together and take small loans from those savings. They are often made up of a diverse mix of community members who may not have received training on pesticides before, which makes them an important target group for this initiative.

However, the training module can be used for training of any other community-based group in cocoa-growing communities. It can also be used in farming communities producing other main crops where pesticides use is common.

It is recommended to encourage both partners in a couple to participate, to ensure that both parents have a common understanding of health risks and agree on priority measures to be implemented in their household.

Overview of training sessions

The training is divided into four parts: three core sessions and one follow-up session. The three core sessions can be delivered sequentially over several days or combined into a single day of training, depending on the needs and availability of the participants. The fourth session is a follow-up, ideally held at least two weeks after the initial sessions. Its purpose is to reflect on the group's progress, revisit key messages, and address any challenges encountered when applying new practices.

Each session builds on the previous one, gradually deepening participants' understanding of pesticide risks and the steps they can take to protect children in their homes and communities.

	Duration and timing	Contents
Session 1: What everyone should know about pesticides, and why we must handle them with special care	220 minutes	Which pesticides are commonly used in cocoa-growing communities? What is toxicity? What are pesticide residues? How can pesticides enter the human body?
Session 2: How to protect children from harm through pesticides	150 min minutes	What are the short-term and long-term health hazards for children exposed to pesticides? Through which contact points are children exposed to pesticides? What measures can be taken to better protect children? *At the end of this session, participants will jointly adopt a group resolution of 5 "golden rules" they promise to implement in their homes.*
Session 3: Consolidating participants' competences related to pesticides	120 minutes	How to educate your children effectively on safe behaviour related to pesticides (and other toxic substances)? How to respond to a situation of acute poisoning?
Session 4: Follow-up session: Have you implemented the 5 Golden Rules?	To be held 2-3 weeks after the completion of sessions 1-3 120 minutes	How have participants managed to put into practice the 5 "golden rules" to better protect their children? What obstacles have they faced? What additional efforts are needed to change practices in the longer term?

Training methodology

The training uses a participatory approach that encourages participants to engage in a dialogue and bring in their own knowledge and experience. By taking participants' own experience and knowledge as a point of departure, the training raises their genuine interest and motivation to learn more about pesticides and the related risks. Participants reflect about the situation in their own households and how children may be exposed and jointly set an agenda for changing behaviour. Hence, the training generates calls to action which are relevant, reflect participants' priorities, and feasible to achieve.

The training should be adapted to the participants' level of prior knowledge and lived experience. If most participants are familiar with pesticide use, whether as farmers or members of farming households, there is no need to cover basic definitions or risks in depth. Instead, the training can build on what participants already know, encouraging them to reflect more deeply on safe handling practices, overlooked exposure risks, and concrete ways to better protect children.

Recognizing participants as experts of their own context fosters mutual respect, keeps the training relevant and engaging, and creates space for shared learning and peer-to-peer exchange. This approach helps strengthen participants' confidence and ownership of the solutions identified during the sessions.

Materials needed

To deliver the training in community settings, the following materials are recommended:

- Printed posters and / or handout leaflets (see appendix)
- Flip chart with a blank flip book or blank posters to collect and organize participants' contributions
- Adhesive tape
- Marker pens
- Post-it notes (if participants wish to note their ideas down and put them up on a poster)

Additionally, ICI has developed two short films on good practices to better protect children from pesticides, which can be screened to complement the training. Please note these are not mandatory or part of the training module.

About the manual

This manual is designed to support the delivery of a participatory training programme aimed at raising awareness of pesticide-related risks and promoting behaviours that better protect children in cocoa-growing communities.

Who is this manual for

This manual is intended to assist field officers in conducting interactive training sessions with VSLA members or other community-based groups.

Field officers should have experience in community development and facilitating community-based groups. They should also:

1. Have participated in a Training of Trainers based on the present manual, so they are perfectly familiar with the contents of each session and the methods to convey these contents effectively to training participants.
2. Have acquired basic background knowledge on pesticides and the health risks they pose to children. The required background knowledge is provided in the appendix to this manual (xx) and should be read carefully by the field officer, ideally before Training of Trainers, so that questions can be clarified and knowledge deepened during the ToT. Field officers are encouraged to read additional materials to enhance their understanding of the health risks posed by different types of pesticides

How to use this manual

This manual is designed to guide you through four participatory training sessions: three core sessions and one follow-up session. Each session includes hands-on, discussion-based activities that help participants reflect on risks, share experiences, and identify solutions that fit their context.

All activities in the training programme fall under one of three types, each colour-coded for easy reference:

Fill knowledge gaps – Activities that introduce or clarify essential information.

Demonstration exercises – Activities that show or model practical actions participants can take to reduce risks.

Group discussions – Activities that invite participants to reflect on their own experiences and co-develop ideas for change.

To help you navigate the manual easily, each session includes clearly marked sections and icons. Throughout the manual, you will find the elements:


Objectives of the session


Duration of the session


Session overview

Instructions for the facilitator on how to lead each activity


Suggested facilitator speech notes to help convey complex ideas in clear, simple language

Key messages that participants should retain

Materials needed

Key facts about the subject being taught

In addition, the appendix provides background information on pesticide-related health risks and exposure routes, intended to help facilitators respond to questions and confidently guide the sessions.

Additional resources

To support the delivery of the training, the following additional resources are available:

- **Visual aids** – A set of posters and visual tools that can be printed to use during community sessions
- **Slides for Training of Trainers** – A slide deck designed to support ToT workshops for facilitators
- Learning into Action Brief: Training community groups to better protect children from pesticides – A summary document offering practical tips for effective training delivery and recommendations to support sustainable behaviour change to better protect children from pesticides.

How to facilitate the sessions

The quality of facilitation is key to the success of this training. More than just sharing information, the role of the facilitator is to create an environment that encourages open dialogue, reflection, and learning. This means actively involving participants, building on their lived experiences, and guiding them to identify and commit to practical changes that protect children from pesticide exposure.

Five key steps to guide each session

To ensure effective knowledge transfer and retention, the following steps should be consistently applied during each session, guiding the learning process in a structured and engaging manner.

3. **Step 1: Welcome participants – connect with the group**
   Create a welcoming environment and use an energiser or check-in to build trust and engagement.
4. **Step 2: Share the topic of the session**
   Clearly present the theme and objectives of the session to focus the discussion.
5. **Step 3: Recap and reflect on the previous session**
   Invite participants to recall key points from the last session and share what they have done or observed since.
6. **Step 4: Facilitate discussion, demonstration, and key messages**
   Use participatory techniques—such as visual tools, examples, or role play—to explore the topic and encourage experience-sharing. Focus on messages that can be applied in daily life.
7. **Step 5: Close the session**
   Summarise the key learnings, encourage reflection or questions, and preview the next session if appropriate.

SESSION 1

What everyone should know about pesticides, and why we must handle them with special care

The session at a glance

Objectives

- Trainers gather participants' initial understanding of pesticides, different types and characteristics
- By the end of the session, participants…
  - understand the concept of toxicity and are aware that even invisible residues of pesticides pose risks
  - understand how pesticides can enter the human body
  - can read and understand labelling on pesticide packages

Duration – 220 minutes

Session overview

Topic	Duration	Method	Materials
The brain cup	10 mins	Demonstration exercise	
What do you already know about pesticides	25 mins	Group discussion	Flipbook or blank poster
What different types of pesticides exist, and what are they used for	25 mins	Fill knowledge gaps	Poster 1: Different uses of pesticides
Types of pesticides used in cocoa production	20 mins	Demonstration exercise	Poster 2: Common pesticides used in cocoa
What does toxicity mean	10 mins	Fill knowledge gaps	
Residue, the invisible threat	20 mins	Demonstration exercise	
How can pesticides enter the body	20 mins	Fill knowledge gaps	Poster 3: Exposure channels
How to read and understand labels and warning signs on pesticide packages	30 mins	Demonstration exercise	Poster 4: Hazard warning pictograms Poster 5: Pesticide labels

1.1 Demonstration exercise: The brain cup — 10 min

Before delving into the content of this session, start with a simple, yet thought-provoking exercise called "The Brain Cup".

Instructions to the facilitator:

1. Present two medium-sized disposable cups.
2. Fill one of the cups to the brim with water or sand, representing a "full" mind.
3. Fill the second cup half-filled with water or sand, representing a mind with room to learn.
4. Ask a participant to carefully pour more content into the full cup, illustrating the attempt to add new knowledge to a mind that believes it already knows everything.
5. Participants will observe as the content spills over, demonstrating the futility of trying to absorb new information when one's mind is closed.
6. Next, invite another participant to pour content into the half-filled cup, representing the openness to learn and absorb new knowledge.
7. Participants will note that the content does not spill over, highlighting the benefits of approaching learning with a receptive and humble mindset.
8. Share the lessons below

- ✓ The overflowing cup teaches us that a 'know-it-all' attitude can lead to missed opportunities for learning, causing valuable knowledge to be lost.
- ✓ By seeing ourselves as a half-filled cup, we recognise that we have room to learn and to absorb new knowledge and insights to benefit our household.

This engaging demonstration sets the stage for a productive and open-minded learning environment.

1.2 Group discussion: What do you already know about pesticides — 25 min

Following the thought-provoking exercise, introduce a brainstorming session, where you'll explore participants' existing knowledge about pesticides and their associated risks.

This brainstorming session aims to create a safe and interactive environment where participants feel comfortable sharing their knowledge and experiences.

Material needed:

Flipbook or blank posters, markers to note down and organize participants' contributions

Instructions for the facilitator:

1. Ask participants to share their knowledge of what pesticides are, using the following questions:

- What comes to mind when you hear the word "pesticide"?
- What different types of pesticides exist, and what do we use them for?
- What other chemicals (e.g. cleaning agents, detergents, paints, pharmaceutical drugs) are used in your environment that you know can be dangerous? Are you aware of the risks that these other chemicals pose to human health?
- Can you name some pesticide brands you have seen or used before?
- What colours or packaging do you associate with pesticides?

2. Encourage each member to contribute to the discussion, sharing their thoughts and experiences.
3. Encourage everyone to listen carefully.
4. Provide clarification without influencing responses from the participants.
5. Note key points on a flipbook or blank poster related to types of pesticides.

1.3 Fill knowledge gaps: What different types of pesticides exist, and what are they used for — 25 min

You now have a good idea of the participants' understanding of the types of pesticides and their use. Building on the previous session, help participants fill knowledge gaps by mentioning some uses of pesticides that were not mentioned during the discussion. **Garden and landscape maintenance**: To control pests (e.g., rodents, snakes and birds) in gardens, parks, and other green spaces.

Material Needed:

Printed poster on the different uses of pesticides (Poster 1)

Key messages:

- Pesticides are not only used for the protection of crops. They have other uses, both at home and in public spaces.
- All pesticides, regardless of their use, are harmful to human health.

KEY FACTS
General uses of pesticides

- **Crop pest control**: Pesticides are used to protect crops from insects, weeds, and diseases, ensuring food security and quality. They are also used to control external parasites like ticks, lice, and flies on animals, as well as to control soil-borne pests and diseases.
- **Public health**: To control disease-carrying insects like mosquitoes (e.g., Malaria, Zika) and ticks (e.g., Lyme disease).
- **Forestry**: To protect trees from insects and diseases.
- **Urban pest control**: To manage pests that transmit diseases like Malaria, Dengue fever and Yellow fever in homes, buildings, and public spaces.
- **Post-harvest protection:** To protect stored crops from pests and diseases.

1.4 Demonstration exercise: Types of pesticides used in cocoa production — 20 min

The market offers a wide range of pesticides, each serving various purposes. To tap into the participants' experiences and knowledge, ask participants to share some popular pesticides they are familiar with or have used in the past. Let them differentiate pesticides along the following lines:

- Commonly used insecticides

- Herbicides for weed control
- Fungicides for disease management
- Rodenticides for rodent control
- Other types of pesticides used in agriculture, homes, or public spaces

Enhance the discussion on pesticides with a hands-on demonstration using a poster that showcases samples of commonly used pesticides available on the local markets. The practical demonstration will engage participants and reinforce their understanding of various pesticides and their uses.

Materials needed:

- Printed poster depicting common pesticides (Poster 2)

Instructions for the facilitator:

1. Show the poster to participants.
2. Keep in mind: If there are many participants, it is advisable to move around so that everyone can clearly see and appreciate the posters.
3. Invite participants to identify the pesticides they are familiar with, including their local names (e.g., "Akate master", Acetesta Adama, Gally Adama, A-Master, "she nwura" for weed control). Encourage them to also identify the class of pesticide (e.g., herbicide, fungicide, rodenticide).
4. Add to the discussion by identifying any pesticides that the participants did not mention.

Key messages:

Recognising the types of pesticide products commonly used in your community is important because they are toxic and require special safety protocols for handling.

1.5 Fill knowledge gaps: What does toxicity mean 10 min

Explain **'toxicity'** using words and phrases in the local dialect to ensure participants understand, avoiding complex and technical jargon.

You may use this definition to explain "toxicity":

"Toxicity refers to the harmful or poisonous effects of a substance, such as a chemical, drug, or environmental pollutant, on living organisms, including humans, animals, and plants. Toxic substances can cause damage, injury, long-term health problems, or even death, depending on the level and duration of exposure."

Reemphasise that all pesticides are toxic: They have the power to kill pests, which is why they are harmful to humans. Due to the high level of toxicity of some pesticides, they are banned in different countries across the world. The Pesticide Action Network (PAN) International provides a list of banned pesticides[2]. According to the list, there are 21 banned pesticides in Côte d'Ivoire and 9 banned pesticides in Ghana.

[2]https://paninternational.org/pan-international-consolidated-list-of-banned-pesticides/.

Key messages:

- Being aware of a substance's toxicity is crucial for handling it safely and preventing accidents.
- Some toxins may not kill instantly, but can build up in your body, causing harm and health issues in future.

1.6 Demonstration exercise: Residue, the invisible threat — 20 min

Carry out a simple demonstration to enable the participants to understand how empty containers of pesticides can still contain residues.

Instructions for the facilitator:

1. Introduce the demonstration:

> "Today, we'll use a simple example to understand pesticide residue. Please join me in this interactive demonstration."

2. Ask participants to name very spicy cooking ingredients.
3. Once participants have named spicy cooking ingredients (e.g., pepper, ginger, chilli), ask a follow-up question:

> "Have you ever touched your eyes after handling spicy ingredients and felt the spiciness even after washing your hands?"

4. Let participants share their experiences.
5. After participants have shared their experience, add an explanation:

> "Even after washing your hands with soap and water, the residue of the pepper can remain on your hands for a period. The residue doesn't disappear immediately. It can still cause discomfort, even after taking precautions. It is invisible to the eye."

6. Explain the parallel to pesticides:

> "Similarly, pesticide residue can remain in empty containers of pesticides, on clothes or equipment that have been worn for spraying, on crops, or skin, just like the pepper's lingering spiciness, even after washing. Pesticide residue can persist and pose risks to human health and the environment."

7. Conclude:

> "Therefore, we must treat objects containing pesticide residues with special care and avoid that children get in touch with these."

Key messages:

- Pesticide residue can persist in empty pesticide containers, on clothes and protective equipment, and on crops and skin, even after washing.
- Residues are invisible, but we must always keep track of objects on which they may be present.
- Children may not come in contact with any objects contaminated with pesticide residues.
- Empty pesticide containers should be disposed of properly and must not be reused under any circumstances because of the presence of residue from the pesticide.

1.7 Fill knowledge gaps: How can pesticides enter the body — 20 min

In this session, participants will learn how pesticides can enter the human body when they come into contact with the skin. They will start developing awareness that any contact with even small doses of pesticides can cause harm to children's health.

Materials needed:

Printed poster on how pesticides enter the human body (Poster 3)

Instructions for the facilitator:

1. Ask participants to mention potential channels through which pesticides can enter the human body
2. Using a diagram of a human body, let participants identify the body parts related to channels through which pesticide exposure occurs
3. Make sure that each of the following points is mentioned, and that participants have fully understood the channels and mechanisms. Use Poster 3 to convey messages more effectively.
    - Inhalation (breathing in)
    - Ingestion (eating or drinking)
    - Skin contact (touching or absorbing through the skin)
    - Eye contact (getting into the eyes)

Key messages:

Exposure may occur "indirectly", when pesticides are present in your environment or used by people around you. Even if you don't handle chemicals yourself, you need to protect yourself against exposure.

1.6 Demonstration exercise: How to read and understand labels and warning signs on pesticide packages — 30 min

Emphasise that there are visual signs that can help everyone read labels on pesticides, regardless of a person's level of education or ability to read.

Use visual aids (posters or leaflets) to facilitate understanding of this session. These will allow participants to practice reading and interpreting labels.

Materials needed:

- Printed poster containing all the different hazard warning pictograms (Poster 4)
- Printed poster showing samples of pesticide labels (Poster 5)

Instructions for the facilitator:

1. Explain the importance of reading pesticide labels for safe handling and use. Emphasise the potential risks associated with misusing pesticides.
2. Explain that on a pesticide package, you can find different elements. Show a pesticide label and point out the following components:
    - Product name and type
    - Active ingredients
    - Precautionary statements (e.g., "Wear protective clothing")
    - Instructions for use
    - First aid instructions
3. Explain that to warn consumers, hazardous substances like pesticides are always marked with pictograms or icons which indicate hazard. This is important for people who cannot read, and also for children.
4. Show the poster containing the different hazard warnings (e.g., skull and crossbones, dead fish, etc.). For each pictogram, ask participants whether they know the meaning. If participants don't know, fill the knowledge gaps.
5. Practice makes perfect: Provide samples of printed labels and encourage participants to practice reading and interpreting them.

Notes for the facilitator:

- Encourage questions and discussion to ensure understanding
- Emphasise the importance of always reading the label before using a pesticide
- Encourage farmers to share their knowledge with others

SESSION 2

How to protect children from harm through pesticides

The session at a glance

Objectives

- By the end of the session, participants…
  - Understand the impact of pesticide exposure on human health, and why children are particularly vulnerable
  - Are aware of all potential ways children in their household may come into contact with pesticides
  - Identify possible measures and arrangements to better protect children in their household from exposure to pesticides
  - Feel confident to share what they've learned with family members and to initiate conversations about protective practices at home
- The group sets a resolution for 5 priority measures ("golden rules") that each participant will adopt within their homes
- Trainers gather participants' initial understanding of pesticides, different types and characteristics

Duration – 150 minutes

Session overview

Topic	Duration	Method	Materials
Health impacts of pesticide exposure on children	45 mins	Fill knowledge gaps	Flipbook or blank posters Poster 6: Effects of exposure
Possible channels for pesticide exposure at home	40 mins	Group discussion	Poster 7: Children's exposure
How to address the most common risks of children's exposure	45 mins	Group discussion	Flipbook or blank posters Poster 8: Responsible practices
The group decides on 5 golden rules for better protecting children	20 mins	Group discussion	

2.1 Fill knowledge gaps: Health impacts of pesticide exposure on children — 45 min

If the training is conducted over separate sequential sessions, begin session two by asking participants to share what they remember from the previous session.

Continue with a brainstorming activity that will help participants gain a deeper understanding of the possible health risks associated with children's exposure to pesticides. They will learn about short-term and long-term consequences and understand why children are particularly vulnerable. As in previous sections, the activity should build upon participants' existing knowledge and understanding.

Materials needed:

- Flipbook or blank posters, markers to note down and organise participants' contributions
- Printed poster on Short and long-term effects of pesticide exposure (Poster 6)

Instructions for the facilitator:

1. Start the topic with a brainstorming session about what participants already know about health risks and children's vulnerability to pesticides. Ask the question:

> "Based on what you know, what is the health impact of pesticide exposure on children?"

2. Collect the answers and note them down on a poster.
3. Continue the brainstorming by asking the following questions:

> "When a woman is expecting a child, how should she take care of herself and the child? What should she avoid?"
>
> "What are the substances which can be transferred from the mother to the child?"

4. After having listened to participants' answers, commend them for their knowledge.

Following the brainstorming session, add any other key facts that the participants did not mention or do not fully understand, using the "Key facts" summarised in the box below.

Instructions for the facilitator:

1. Correct any misperceptions.
2. Use relatable language to make participants understand this topic.
3. Show the posters on short-term and long-term effects of pesticide exposure.

KEY FACTS

What everyone in your community should know about the health risks associated with pesticide exposure

In utero

A foetus's life and survival depend on its mother during pregnancy. Maternal exposure to pesticides or other harmful substances at any stage of the pregnancy (especially within the first 3 months) can have devastating effects on the foetus's health.

Pesticide exposure can result in birth defects, developmental delays, cancer risk, growth restrictions and immune system dysfunction.

Pesticide exposure during pregnancy can change the life of a child even before they are born.

Infancy and Early Childhood

Pesticide exposure is like a hidden danger for our children. When we fail to safely secure pesticides within the home environment, we leave our infants exposed to this danger. Even small amounts can affect their growth, brain development, and health. Imagine the chemicals like bad spirits that can follow our children and make them sick, sometimes many years after exposure.

When our children are exposed to pesticides, it's like giving them a heavy burden to carry. It can make them more likely to get sick, struggle in school, and even affect their future.

Children's bodies are more vulnerable to pesticides exposure as compared to adults due to several reasons:

- Higher absorption rates: Toxins enter children's bodies and organs more easily than adults. For example, children's skin is thinner and more permeable, and their digestive system absorbs substances more readily. Children also have higher metabolic rates, which means they process substances faster, potentially leading to greater accumulation of toxins
- Developing organs: Children's organs, such as the liver and kidneys, are still developing and are less capable of detoxifying and excreting harmful substances.
- Body weight: The same dose of a toxin represents a larger proportion of a child's body weight compared to an adult, leading to higher *relative* exposure.
- Behavioural factors: Children's age-appropriate behaviours lead to their increased exposure, such as playing on the ground, putting objects in their mouths, exploring their environment and unfamiliar objects for curiosity.

These factors combined make children particularly vulnerable to the harmful effects of toxins.

Health consequences in the short term can be following:

- Digestive symptoms:
  - Colic
  - Hypersalivation
  - Nausea
  - Vomiting
  - Diarrhea
- Neurological symptoms:

    - Headache
    - Dizziness
    - Ecstasy
    - Shivering of body parts
    - Convulsion
    - Uncontrolled urination
    - Coma
- Skin conditions:
    - Itching
    - Pimples
    - Burns
    - Skin rashes
- Eye conditions:
    - Tearing
    - Tingling
    - Red eyes
    - Blurred vision
- Respiratory conditions:
    - Cough
    - Nosebleed
    - Asthma
    - Asphyxia
- Consequences related to maternity
    - Bleeding
    - Miscarriage
    - Preterm delivery

Health consequences in the long term can be following:

- Cancer: Increased risk of different types of cancer, like blood cancer, brain cancer, and breast cancer.
- Brain and nerve problems: decreased muscle tone, memory loss, Parkinson's disease, Alzheimer's disease
- Reproductive and developmental issues: Problems with fertility and hormone imbalances, recurrent stillbirths, mentally or physically disabled children.
- Breathing problems: Long-term breathing issues like asthma, chronic lung disease, persistent irritant cough.
- Organ damage: Damage to important organs like liver, lungs, kidneys, and brain.

<u>Teenagers</u>

Teenagers are equally vulnerable to pesticide exposure due to their rapid growth and development. The harmful effects of pesticide exposure on teenager are equally severe as those on infants and young children

Educate your teenagers about pesticide risks and involve them in safety practice at home.

Key messages:

- Protecting children's health starts when they are still in their mother's womb.
- Children lack the experience and understanding to recognize dangers. Their curiosity and desire to explore can lead them into unsafe situations, so it is our responsibility as parents/guardians to make the home environment safe for children. This includes keeping them safe from any exposure to hazardous pesticides in any situation.
- Children's bodies are more vulnerable to pesticides than those of adults.
- Some of the health consequences of children's exposure to pesticides occur immediately, while others occur only in the medium or long term.

2.2 Group discussion: Possible channels for pesticide exposure at home 40 min

Once participants understand the risks pesticides pose to children, guide them in assessing potential household exposures and support the group in developing practical actions to prevent such exposure.

Introduce the topic with a brainstorming exercise.

Materials needed:

Printed poster on Common situations of children's exposure to pesticides (Poster 7)

Instructions for the facilitator:

1. Ask participants to brainstorm ways children in their households might come into contact with pesticides. Emphasise that they should think beyond the farm and consider exposure in and around the home, in the community, on the way to school, during playtime, and so on.
2. Encourage each participant to contribute to the discussion, sharing their thoughts and experiences.
3. As a participant describes a particular exposure situation, ask the rest of the group to raise their hands if children in their household have experienced something similar.
4. Write down the types of exposure and the number of hands raised for each on a poster. This will allow you to assess the prevalence of each experience within the group.
5. Ask about how women (including pregnant and lactating mothers) can come into contact with pesticides at home.

To make the discussion more dynamic and ensure that participants think through all possible contact points, ask the following questions:

- How do you and other adults in the family handle pesticides when children are around?
- Who in your household is involved in handling pesticides?
- What safety measures do you currently take when handling pesticides?
- What role do children play in the preparation of pesticides before spraying?
- When a family member has done spraying on the farm, where do they take the spraying equipment for cleaning? Where is it stored?

- Are your children involved in cleaning spraying equipment?
- When a family member has done spraying on the farm, where do they take off protective equipment or change clothes? Think through the journey of any clothing, shoes and protective equipment worn during spraying – would children come in contact at any point during that journey?
- Where do you store pesticides at home?
- Can children easily access pesticide storage areas?
- Are pesticides stored near children's play areas or toys?
- Do adults in the family wash their hands before handling food or drinking water?
- Can pesticides contaminate food, water, or cooking utensils?
- Can children accidentally ingest pesticides or contaminated soil?
- Where do pesticide containers go when they are empty? Are they reused for any other purpose? Think back about what you learned about residues – is there any risk that children get in touch with residues?
- Do children play with pesticide containers or equipment?

These questions can help participants identify potential pathways for children's exposure to pesticides and brainstorm strategies to minimise risks and ensure a safer environment.

Once participants have reflected and discussed how children in their households may be exposed to pesticides, check whether the channels of pesticide exposure in the box below have been mentioned. These are particularly relevant for babies and infants within the home environment. For any of these points which has not been mentioned by participants, bring them to their attention to complement their awareness. Use the poster to convey the messages more effectively.

KEY FACTS
Channels of exposure

- Airborne drift: Pesticide particles can become airborne and be inhaled by infants.
- Residue on surfaces: After fields have been sprayed, pesticides remain on plants for several days. Pesticides can
- also leave behind residues on floors, furniture, and other surfaces, which infants can touch or put in their mouths.
- Contaminated dust: Pesticides can settle in dust, which infants can inhale or ingest while crawling or playing.
- Food and water: Pesticide residues can contaminate food and water, including breast milk or formula.
- Second-hand exposure: Infants can be exposed to pesticides brought into the home on clothing, shoes, or objects, including toys.
- Improper storage: Improperly stored pesticides can leak or spill, contaminating the environment. Toxic vapours can rise from half-used packs.

- Pest control treatments: Indoor pest control treatments, such as spraying or fogging, can expose infants to pesticides.

2.3 Group discussion: How to address the most common risks of children's exposure — 45 min

Following the group discussion on common contact points through which children are exposed to pesticides, continue the conversation on preventing these exposure risks. Identify at least three frequent contact points and ask participants to suggest practical and feasible measures to address them to ensure children are better protected.

Materials needed:

- Flipbook or blank posters, markers to note down and organise participants' contributions
- Printed poster on Responsible practices to protect children and pregnant women from pesticide exposure (Poster 8)

Instructions for the facilitator:

1. Pick one contact point through which children are exposed to pesticides that several participants have mentioned, and ask participants to think about the following question:

   "What could be done to avoid this contact point? How can home arrangements be improved, and how would adults have to change their practices to protect children from this particular risk?"

   Refer to the box below for an example of a group discussion.

2. Depending on the participants' suggested solution, provide feedback and commend. If needed, give additional explanations of how this could be done and why indeed it would be a good idea. If the suggested solution is not recommended for any reason, suggest an alternative without embarrassing any participant.

3. Once you have collected some suggestions from participants, ask participants to think about the following question:

   "Who would be mainly responsible for putting this solution into practice?"

4. Once you have clarified the what and the who, ask another follow-up question:

   "Would this solution be feasible for everyone? Are there any obstacles which might make it difficult to put this solution into practice?"

5. Make sure that everyone is involved in the brainstorming and note the suggested solutions down.

EXAMPLE
Pesticide storage at home

If multiple participants have indicated that their children might be exposed to pesticides stored inside or around the house, you can ask the group:

- What alternative storage solutions could there be? How could the home arrangements be improved to better protect children from stored pesticides?
- Who would be mainly responsible for making this change?
- Would this solution be feasible for everyone? Are there any obstacles which might make it difficult to store pesticides more safely as suggested?

Stress the importance of safely storing unused or partially used pesticide containers, both to prevent accidental exposure as children explore the house and to prevent exposure to toxic fumes.

Following participants' brainstorming for possible solutions, share the following practical advice for storing pesticide containers:

1. Secure location: out of reach of children, livestock and pets.
2. Well-ventilated area: Away from living spaces and food storage.
3. Locked cabinet or container: Preventing unauthorised access.
4. Original packaging: Keep pesticides in their original containers so that they cannot be confused with other substances.
5. Dry and cool place: Protecting pesticides from moisture and extreme temperatures to avoid the containers from starting to leak.
6. Away from food, water and cooking area: Preventing contamination.
7. In a designated area**:** Designate a specific area in the home for pesticide storage, far from the reach of children.

Special caution must be given to the following:

- Avoid using pesticide containers for storing food items such as salt, sugar, oil, and cooking spices in the kitchen.
- Avoid using plastic pesticide containers as drinking cups, drinking basins for pets and livestock, money storage boxes, jewellery boxes (money/susu box).
- Follow instructions on how to dispose of pesticide containers and packages.

Note to the facilitator:

You should frame the discussion in a way that avoids any stigmatisation or blaming participants for unsafe practices; it is important to reflect openly about what needs to be improved.

Maybe start by saying, "For all of us, there is a lot of room for improvement in our everyday habits. We are here to find out how we can make our homes safer and change our habits. Me too, I also make constant efforts to improve my practices. Let's discuss where our starting point should be."

The list of safety rules below and Poster 8 on "Responsible practices to protect children and pregnant women from pesticide exposure" can be used to provide input to the discussion. However, do not give it all away. Instead, encourage the group to come up with their suggestions first.

EXAMPLE
A list of possible safety rules to be respected by everyone in the household

- Children may never play in the area where pesticide spraying is going on.
- Children should never not to consume food or drinks near areas where pesticides were applied.
- Children must stay indoors with windows and doors closed when pesticides are being sprayed around the compound. If spraying is being done around the home environment, children should be made to stay 15 meters away from the area being sprayed.
- After spraying, children should not enter the sprayed area for several days.
- Empty pesticide containers should be eliminated immediately and never reused for other purposes. No other substances may be filled in empty pesticide containers. Children may never play with empty pesticide containers.
- After having played outdoors, children should always wash their hands with soap and water before eating a meal. They should also wash their hands several times over the course of the day.
- Toys or other objects children like to play with should be kept away from areas where pesticides are being sprayed.

Pregnant and breastfeeding women need to minimise exposure to pesticides by:

- Not engaging in the spraying of pesticides
- Avoiding areas where pesticides are being applied
- Avoiding the use of pesticides at home.
- Washing hands several times per day, especially after working outdoors
- Eating organic produce when possible
- Washing vegetables with running water or soaking them in saltwater to remove pesticide residue.

2.3 Group discussion: The group decides on 5 golden rules for better protecting children — 30 min

Following the discussions, the group will collectively identify and agree upon five key behavioural changes, or "golden rules", for better protecting their children against exposure to pesticides. All participants shall commit to implementing these in their own household. It is important that the group decides collectively on these.

Note to the facilitator:

When setting rules for participants to adopt changes, it is crucial to follow the suggested participatory approach, based on the following insights from research on behaviour change (*):

1. Having fewer rules is more effective than having many, as it makes them easier to remember and follow.
2. When we set the rules ourselves, we are more likely to feel ownership and commitment to the change.
3. Making a group commitment to these rules strengthens adherence and provides mutual support among members of the group.

Instructions for the facilitator:

1. Explain to the group that what they have learned until now is a lot, but they now need to set priorities and choose 5 measures they can easily adopt to better protect their children's health.
2. Explain the 3 behaviour change insights above (*) in simple language.
3. Ask participants to reflect and suggest 5 concrete measures, or "golden rules" which are
   - A priority because they prevent contact points, which are particularly harmful
   - Realistic and can be adopted by everyone
4. Allow the group to discuss without introducing your own ideas. Provide feedback on the proposed measures. If a measure does not align with the two criteria mentioned, politely explain and request an alternative suggestion from the group.
5. When a suggested rule fits the above criteria, let the group vote whether they want to adopt it. If the group has adopted it, note it down on a poster – see box below.
6. Limit the "golden rules" to 5. If the group insists they want to have more, tell them they should start with the 5 most important ones, and then they can add more in the next session.

How to document the five "Golden rules"

After the group has identified and agreed upon the five "Golden rules", you should write them on a poster using a table as shown below. In the first column, you should write the rule, and then participants could sketch the proposed behavioural change in the second column.

5 Golden Rules	Sketch of behavioural change/measure to be taken
1.	
2.	
3.	
4.	
5.	

EXAMPLE
Easy rules to adopt

- I will change the storage place for pesticide containers to ensure they are not stored in living areas, bedrooms and kitchens; and that children cannot reach them.
- I will eliminate all empty pesticide containers which are inside and around my house.
- I will educate my children on the risks pesticides pose, teach them to always stay away from sprayed fields and tell them they are not allowed to touch the containers.
- I will come to an agreement with my husband that we will not send the children to buy pesticides.
- I will ask my husband to spray my fields when I am pregnant or while I am breastfeeding.
- …

SESSION 3
Consolidating participants' competences related to pesticides

The session at a glance

Objectives

By the end of the session, participants…

- Feel encouraged to teach their children how to identify and recognise pesticide containers, and to stay away from them
- Understand that parents and caregivers hold the primary responsibility for ensuring children's safety
- Are familiar with the components and purpose of personal protective equipment (PPE) used during pesticide application, and understand its limitations in fully preventing exposure
- Know how to respond appropriately in cases of acute pesticide poisoning

Duration – 120 minutes

Session overview

Topic	Duration	Method	Materials
Empowering children to recognise and avoid contact with pesticides	45 mins	Group discussion	Poster 9: Safety rules
Safety protocol when applying pesticides	30 mins	Demonstration exercise	
Home Emergency Procedure	45 mins	Fill knowledge gaps	

3.1 Group discussion: Empowering children to recognise and avoid contact with pesticides — 45 min

Engage participants in a discussion to highlight the importance of educating children in their household about the dangers of pesticides and other agrochemicals. Emphasise that this education should be age-appropriate, with different objectives and methods for children depending on the child's age.

The session begins with an interactive brainstorming exercise to assess participants' current attitudes and practices regarding educating their children on safety rules at home.

Materials needed:

Printed poster on Safety rules for your children (Poster 9)

Instructions for the facilitator:

1. Start the session by asking if participants have children in their household within the following age groups: 0-3 years; 4-7 years; 8-11 years; 12-17 years.

2. Ask participants to share their experience using the following discussion questions:

- Have you ever taught your children about the dangers in your home?
- Based on your experience, what is the most effective method to teach children safety rules?
- Are your children able to recognise pesticide packages?
- From what age can children learn to recognise warning signs on packages?

3. Ask those who have taught their children about safety rules to share their experiences:

- What prompted the discussion, and how have they trained their children? Which methods have proven to be most effective?

4. Encourage each participant to contribute to the discussion, sharing their thoughts and experiences.

5. Wrap up by reinforcing and expanding participants' understanding of how children can learn safe behaviour based on the key messages below.

Key messages:

- Children's ability to understand and retain information depends on their age. Teaching should be tailored to their developmental stage.
- Parents and caregivers hold the primary responsibility for protecting children's health and well-being. This includes keeping pesticide containers out of reach and creating a safe home environment.
- Children can only be expected to recognise and avoid dangerous substances once they reach a certain level of maturity and understanding.
- Brightly coloured or flashy pesticide packaging can attract children's curiosity. While curiosity is a healthy part of learning and development, it must be guided and managed to keep children safe.
- Children should be taught to recognise hazard symbols on packaging and understand that these mean: "Do not touch."
- Use clear, simple language when teaching safety rules, and repeat messages regularly to reinforce understanding.
- The most effective way to teach safe behaviour is to model it. Children learn by observing the actions of adults around them.

3.2 Demonstration exercise: Safety protocol when applying pesticides — 30 min

Even if participants do not apply pesticides themselves, they should be familiar with standard safety procedures for pesticide preparation and application.

During this session, you will demonstrate how to use Personal Protective Equipment (PPE) correctly and emphasise the importance of washing hands thoroughly after any contact with pesticides.

Materials needed:

Personal Protective Equipment (PPE) examples (e.g., Gloves, face mask, googles, Wellington boots)

Instructions for the facilitator:

1. Ask a participant to bring a bucket of water, a pail, and soap for handwashing. Preferably, ask someone who lives close to the meeting venue.
2. Show a full set of personal protective equipment (PPE) to the group.
    - chemical-resistant gloves
    - rubber boots
    - eyewear
    - mask
    - protective clothing like coveralls or a chemical-resistant suit
3. Present each item individually and ask one participant to show how it should be worn. Correct if needed.
4. For each item, explain why it is important

E.g., “Wearing a nose mask to prevent inhalation of potential pesticide fumes from the container. Wearing gloves to prevent skin contact with pesticides or contaminated surfaces. Etc.”

5. Describe the basic requirements needed for it to function properly

E.g. “It needs to fit; it needs to properly cover your face; it may not have holes; etc.”

6. Emphasise the fact that PPE only helps to reduce exposure to pesticides; it cannot provide complete protection. Especially for children and pregnant or breastfeeding women, the protection provided through PPE is by no means sufficient.
7. At the end of the demonstration, mandate handwashing for all members to demonstrate that this should be part of the routine whenever pesticides are handled.

Key messages:

- PPE is essential to help protect the person who does the spraying.
- Only when PPE is functional and worn correctly, it can be effective.
- No equipment can guarantee 100% safety from pesticide exposure. Especially for children and pregnant or breastfeeding women, the protection provided through PPE is insufficient. Children and pregnant or breastfeeding women may never handle or apply pesticides, not even with PPE.

3.3 Fill knowledge gaps: Home emergency procedure 45 min

Explain to participants how to respond immediately to a situation when a person has been directly exposed to pesticides. First, teach them the immediate symptoms of pesticide poisoning, and then, teach them how to react. Encourage participants to share their own experiences, and emergency procedures they have followed in the past.

Instructions for the facilitator:

1. Ask participants to mention symptoms which may occur when a person has been exposed directly to pesticides.
2. Write them down on a poster (include only those that are part of the list in the Key Fact box (1) below).
3. Complete the list with those that have not been mentioned from the list in the Key Fact box (1) below.
4. Following the collection of symptoms, go on to explain to participants the immediate response protocols described in the Key Facts box (2) below.

KEY FACTS (1)
Symptoms of direct exposure to pesticides (Signs of pesticide poisoning)

- Headache
- Dizziness or weakness
- Nausea or vomiting or ex**cessive salivation**
- Stomach cramps or diarrhoea
- Eye irritation or tearing
- Respiratory problems (coughing, wheezing, sneezing)
- Slow or rapid heartbeat
- Loss of coordination or balance
- Abdominal pain or tenderness
- Burning sensations in the mouth, throat, or eyes
- Sweating
- Skin irritation or burning
- Thirst
- Dry throat

KEY FACTS (2)
Safety protocols

Spills and leaks

In the event of a leak or spillage, you should do the following.

- Do not touch or try to clean it up
- Tell an adult immediately
- Move and stay away from the spill area
- Wash hands with soap and water after being in the vicinity of the spill.
- Avoid spreading the pesticide to other areas or objects.

First aid

If you suspect that a child has been exposed to pesticides or is experiencing symptoms of poisoning, this is what should be done:

- Wash hands and face

- Remove contaminated clothes
- Do not leave the child unattended.
- Send someone to look for medical help.
- Follow the instructions given by the medical professional.

SESSION 4

Follow-up session: Have you implemented the 5 Golden Rules?

The session at a glance

Objectives

By the end of the session, participants…

- Feel proud of the changes they've made in their habits, practices and home arrangements to prevent their children's exposure to pesticides, no matter how small.
- Identify remaining barriers to fully adopting protective practices and feel encouraged and motivated to keep improving.
- Feel supported to carry out the changes, knowing they are part of a group working toward the same behavioural changes, and feel committed to reminding one another of the importance of protecting children's health.
- Feel empowered to share knowledge with family members and the community to prevent exposure and ensure collective safety.

Duration – 120 minutes

Session overview

Recap
Experience sharing
Challenges and possible solutions
Peer-to-peer support

After completing the three sessions, organise a follow-up session within one to three weeks to evaluate progress and offer additional guidance.

During the follow-up session, ask participants to share their experiences and successes with the group, highlighting the changes they have made to their daily habits and home environments as a result of the group's collective resolutions.

Instructions for the facilitator:

1. **Recap**

   Recap the group's resolutions, using the poster with the 5 golden rules from session 2.

2. **Experience sharing**

   Invite participants to share their personal experiences on how they have implemented changes in their everyday habits and home environment following the group's resolution.

   Encourage each participant to share their experiences.

3. Challenges and possible solutions

1. Ask each participant to share their personal challenges and experiences in implementing the group's resolutions in their own homes. It's ok if some members do not have any experience to share.
2. Invite members to suggest practical, locally relevant solutions, applying the skills and knowledge gained from Session 1-3, to address these challenges, tapping into their collective knowledge and expertise.
3. Summarize the main points (re-echoing)
4. Add value to the ideas shared (adding up)
5. Expand on the suggestions to create a more comprehensive solution

4. Peer-to-peer support

Divide the group into two sub-groups:

Group 1: Participants who have demonstrated a strong understanding of how to better protect children from pesticides.

Group 2: Participants who require additional guidance and support to reinforce their understanding and application of the concepts.

Pair-up members of group 1 and 2 preferably members who live not too far from each other.

Appoint a 'Community Safety Champion' who will lead and support efforts to protect children from pesticides, serving as a go-to expert in the community.

Highlight the community safety champion's role as a resource person and leader in the community.

Clarify the champion's responsibility to provide ongoing support and guidance.

References

The contents of this training draw from the following resources, which are also recommended as background reads for facilitators to deepen their understanding of the topic:

1. WHO, 2024: Pesticides: training for health care providers, second edition. In: WHO training package for the health sector: children's health and the environment. URL: https://ceh.unicef.org/introduction-childrens-environmental-health-course UNICEF, 2018: Understanding the impact of pesticides on children. A discussion paper. URL: https://www.unicef.org/childrightsandbusiness/media/356/file/Understanding-the-impact-of-pesticides-on-children.pdf
2. https://www.who.int/health-topics/children-environmental-health.
3. https://apps.who.int/poisoncentres/

APPENDIX I: Relevant background information for facilitators

The information provided below was adapted from World Health Organization's (WHO) training manual[3] for health care providers on pesticides.

Herbicides: Background information

Herbicides are chemicals used to kill unwanted plants. They are commonly used in agricultural, residential, school and community settings where children and adolescents live, work and play.

Although herbicides typically target plant-specific biological pathways that are not present in mammals, they can still harm humans at the cellular level. The International Agency for Research on Cancer (IARC) has classified some commonly used herbicides as possibly or probably carcinogenic to humans. For example, glyphosate, the active ingredient in many commonly used herbicides, such as Roundup, was classified as probably carcinogenic to humans (Group 2A carcinogen) by IARC in 2015.

Herbicides can be acutely toxic. Paraquat, for instance, can cause death if ingested even in small quantities. 2,4-dichlorophenoxyacetic acid), another commonly used herbicide in both agricultural and domestic contexts, has also been linked to health risks, and its use is expected to rise globally.

Despite being banned in countries, many herbicides remain in use around the world. For instance, while banned in 58 countries, Paraquat remains widely used in others, according to the most recent Pesticide Action Network (PAN) International report. Similarly, atrazine, banned as of May 2022 in 44 countries, is still used widely in many countries around the world including Brazil, India and the United States of America.

Herbicides are used widely in agricultural practices and can contaminate farmlands and water sources, including freshwater and drinking water. People can also be exposed to herbicides in other ways as they are not only used in farming. In residential settings, parks, schools and other community settings, herbicides such as glyphosate are often used for cosmetic purposes to destroy unwanted plants, many of which pose no threat to humans.

Pesticide composition and formulations

Pesticides are made as formulations that contain both active and inactive (co-formulants) ingredients. The active ingredient is used to control target organisms and is generally the focus of the most rigorous toxicological regulatory tests performed on mammals. Inactive ingredients, sometimes referred to as co-formulants or inert ingredients, are chemicals added to pesticide formulations to improve their application, function and longevity. Because inactive ingredients are often considered proprietary information, they may not be listed, or required to be listed, on product labels. The photo below shows the label of a broad-spectrum, domestic insecticide listing only the active ingredient (deltamethrin).

[3] World Health Organization. (2024). Pesticides: training for health care providers, 2nd ed. World Health Organization. https://iris.who.int/handle/10665/375858. License: CC BY-NC-SA 3.0 IGO

Both active and inactive ingredients, as well as their combination in proprietary formulations, can be hazardous to human health. Some 'inactive ingredients' may be more toxic than their 'active' counterparts. Toxicity of inactive ingredients is often not studied to the same degree as that of active ingredients. Some regulators require testing and approval processes for all ingredients included in pesticide formulations; however, other regulators do not complete such testing, despite evidence indicating that pesticide formulations can more toxic than their active ingredients.

Highly Hazardous Pesticides

While all pesticides are inherently toxic, Highly Hazardous Pesticides (HPP) carry an increased risk of acute or chronic harm to human health and the environment.

The Food and Agriculture Organization of the United Nations (FAO) and the World Health Organization's (WHO) International Code of Conduct on Pesticide Management defines HHPs as those that have one or more of the criteria listed below:

- Classes Ia (extremely hazardous) or Ib (highly hazardous) of the WHO Recommended Classification of Pesticides by Hazard.
- Suspected carcinogenicity: Categories 1A and 1B according to the Globally Harmonized System on Classification and Labelling of Chemicals (GHS).
- Suspected mutagenicity: Categories 1A and 1B according to the GHS.
- Reproductive toxicity: Categories 1A and 1B of the GHS.
- Listed by the Stockholm Convention on Persistent Organic Pollutants in Annexes A and B.
- Listed by the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade in Annex III.
- Listed under the Montreal Protocol on Substances that Deplete the Ozone Layer.
- Pesticide products with active ingredients and formulations that have shown a high incidence of severe or irreversible adverse effects on human health or the environment.

The fate of pesticides in the environment

Like many chemicals, pesticides move readily through the environment, cycling through air and water and travelling around the globe via wind and ocean currents. Pesticides in water can evaporate, deposit via precipitation, and move through groundwater or surface runoff into local waterways, ultimately ending up in oceans. Chemical properties of pesticides, such as volatility and solubility, along with local environmental conditions, including soil erosion, dust, rainfall and runoff, can all affect the quantity of pesticides that make their way into water. Pesticides can be carried via long-range atmospheric transport to regions far from the area where they were applied and can be deposited as snow and ice. For instance, in a 2021 study, pesticides were found in ice cores from polar ice sheets in the Arctic and Antarctica. Pesticide pollution in groundwater can result in contamination of drinking water.

Children and pesticides

Multiple sources and routes of exposure

Pesticides are ubiquitous in air, dust, soil, water and food. They are also found in consumer products, such as mosquito repellents and products for pets, or in indoor environments as residues on surfaces. Depending on the source and context, children can have multiple routes of exposure to pesticides including inhalation, ingestion, dermal and transplacental.

- Inhalation: Children may inhale pesticides found in ambient and indoor air, respirable droplets, spray from consumer products such as insect repellents, or contaminated dust from contaminated indoor environments. Once inhaled, pesticides can reach the alveoli in the lower respiratory tract and can be absorbed into the bloodstream.
- Ingestion: Children may ingest pesticides unintentionally, which can result in acute poisoning. Pesticides can also be ingested in low levels from food and water sources, and through non-nutritive ingestion of contaminated soil and dust, especially in younger children.
- Dermal: Some pesticides can be absorbed through the skin. Children have larger skin surface area for their body size relative to adults, increasing the potential for pesticide exposure via the skin. Normal childhood behaviours, such as crawling in grass or on floors where pesticides may have been sprayed also increase their likelihood for dermal exposure.

Some chemicals used in pesticide products can cross the placenta; consequently, exposing the foetus in utero.

Children's unique vulnerability

As with many environmental hazards, children are often at increased exposure and vulnerability to pesticides for several reasons.

1. Children have different and unique exposures to pesticides compared to adults.
    - Some pesticides can cross the placenta, exposing the developing foetus to chemicals experienced by the mother. **Prenatal** exposure to certain pesticides may be linked to significant health effects in children, such as some paediatric cancers and adverse neurodevelopmental outcomes.
    - **Preconception** exposure to some pesticides has also been associated with some paediatric cancers.
    - As many pesticides are lipophilic, they can also pass into **breastmilk**. The presence of pesticides in breastmilk is not sufficient to outweigh its benefits. Exclusive breastfeeding up to the first six months, and continued breastfeeding with complementary foods for two years and beyond, is recommended by the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) as the best source of nutrition for children.
    - Children have a **shorter stature** and crawl and play close to the ground. This means they may have increased exposure to pesticides that settle onto or near the ground where they play, such as grass, soil and dust.
    - Children also have natural **exploratory behaviours**, such as high rates of hand-to-mouth and object-to-mouth behaviours. These behaviours may increase their exposure to pesticides that have settled on dust, soil or objects. A review published in 2017, examined pesticide metabolite levels in children living in agricultural settings and concluded that the greatest frequency of pesticide metabolite levels occurred in toddlers, was slightly lower in infants, and was lowest among older children.
2. Due to their dynamic developmental physiology children may be subjected to higher levels of pesticides found in air, water and food.

- As they are anabolic and rapidly growing, children breathe more air, eat more food and drink more water per unit of body weight than adults. Therefore, pesticide pollution in air, food and water can result in higher internal doses in children compared to adults.
- Children and foetuses also have bodily systems that are going through vital maturing processes and windows of vulnerability. Many pesticides are recognized as toxic to children and can cause irreparable harm to many systems and organs. Of particular concern in children is the developing central nervous system. Exposure to some pesticides during the prenatal period has been associated with adverse neurodevelopmental outcomes in young children.

3. Children have longer life expectancies. Consequently, they have more time to manifest a disease with a long latency period and longer to live with toxic damage from pesticide exposure.

4. Finally, children depend upon the adults in their lives to provide a safe environment in which to grow, learn and thrive. Children living in communities that use pesticides in various settings are at risk of exposure. Infants and young children are not able to read warning labels or remove themselves from hazardous situations. Children do not have the capability or economic means to avoid pesticide exposure from food by purchasing organic produce. Children have limited agency to affect the political decisions made at local, national and international levels that can change the use of pesticides in their environment. Children trust the adults in their lives to nurture and protect them through actions and decisions until they can protect themselves through their own individual, collective and political action.

Children and acute pesticide poisonings

Children and adolescents are affected by acute unintentional and intentional pesticide poisonings.

There are several factors that can contribute to **unintentional pesticide poisonings** in children. Pesticides may be stored inappropriately. For example, old pesticide containers may be reused to store water and food. In some low and middle-income countries (LMICS), pesticide solutions in soft drink bottles and other unlabelled containers have been reported for sale at public stands and stores. Pesticide products may also be unlabelled or incorrectly labelled. Even if labelled appropriately, pesticide warnings may not be understood by children who cannot read and follow directions for use. Pesticide products used in the home may be stored where children can easily reach them.

Globally, there is a significant number of unintentional poisonings every year. A systematic review in 2020 estimated approximately 385 million cases and 11 000 deaths globally are due to unintentional acute pesticide poisonings every year, with the greatest number occurring in southern Asia. Data on paediatric pesticide poisoning are limited. The 2020 systematic review used data from the WHO mortality database and estimated that 16.6% of the annual deaths reported to the database due to unintentional acute pesticide poisoning occurred in children under 15 years of age.

Acute exposure: Examples of symptoms and syndromes of poisoning

Acute poisonings can have a range of different symptoms and syndromes depending on the pesticide. The list below provides some examples of common pesticides that children may be exposed to and some examples of characteristic signs and syndromes following acute poisoning. It should be noted that this table it not exhaustive and symptoms can depend on dose of exposure, route of exposure and age of the patient.

Some commonly used pesticides and characteristic signs and syndromes of acute poisoning include:

Substance	Symptoms
Organophosphate insecticides	Cholinergic syndrome (headaches, muscle twitching and weakness, tremor, incoordination, hypersecretion, nausea, diarrhoea, vomiting), respiratory depression, seizures
Carbamates	Cholinergic syndrome (headache, tremor, muscle twitching, incoordination, abdominal pain, nausea, salvation, vomiting, diarrhoea), severe symptoms can include cardio/respiratory depression
Paraquat	Cyanosis, jaundice, pulmonary fibrosis, acute renal failure, caustic injuries (bloody diarrhoea, stomatitis, abdominal pain)
Warfarin	Bleeding nose or gums, haematuria, melena, ecchymosis (appear several days after ingestion)

Children with suspected acute pesticide poisoning of any kind should immediately be referred to a health care provider. Poisons centres can help in recognition of the pesticide involved in a poisoning incident and provide advice on diagnosis and treatment.

Children and chronic pesticide exposure

Since pesticides are very common and can pollute air, food, water, soil, and dust, children are often exposed to small amounts of these chemicals every day. Research has shown that even very small amounts of pesticide can influence the functioning of different organs in the body. For example, being exposed to pesticides during pregnancy or early childhood may cause brain development disturbance, lungs functioning defect, hormone levels irregularity, and may even be associated with some childhood cancers. These long-term health effects are very difficult to study because exposure is hard to measure accurately, and it may take years for health problems to appear. Yet, there is accumulating proof that low-level pesticide exposure during pregnancy and early childhood is related to the development of health problems.

Neurological effects

There is substantial evidence indicating that exposure to pesticides poses significant risks to the development of children's nervous systems. This exposure may contribute to challenges in learning, motor skills assessments, and potentially behavioural issues.

Studies indicate that exposure to certain pesticides during pregnancy may lead to delays in learning, motor skill development, and social behaviour issues in newborns. A review of research from 1973 to 2019 suggests that prenatal exposure to these pesticides is linked to developmental problems in toddlers and young children. There is less evidence that postnatal exposure to these pesticides affects development, suggesting that exposure before birth may be the most critical period.

Researchers are also trying to find out if pesticides are among the causes of major childhood disorders like autism and ADHD. It is true that there has been an increase in the number of autism cases, but this is mainly due to better diagnosis. Environmental factors such as pesticides could, however, be a contributing factor. The 2019 review indicated that pesticides may have some link to the development of autism and ADHD, and it also stressed the importance of how genes and environment interact.

Cancers

Many commonly used pesticides are known or suspected to cause cancer. Studies suggest that exposure to pesticides can increase the risk of childhood cancers such as leukaemia and brain tumours. Research has linked the use of certain home and garden pesticides to higher rates of these cancers. Reviews found that indoor insecticides and herbicides increase leukaemia risk, and both prenatal and postnatal exposure to pesticides are linked to brain tumours in children.

Besides, there is the fear that being exposed to pesticides for a long time may cause cancer in the future. Despite the difficulties in the research, the results show that minimizing the children's contact with pesticides is vital for their well-being.

Respiratory effects

The research on the influence of pesticides on children's respiratory health is still short, mainly in low- and middle-income countries. Nevertheless, a recent review has reported some disturbing links between pesticide exposure and respiratory problems in children.

A review published in 2020 showed that majority of studies (79%) found a relationship between pesticide exposure from agriculture and respiratory issues in children, primarily asthma. This review did not consider studies on pesticides used in homes. Interestingly, the long-term study of California's CHAMACOS project revealed that kids who were exposed to some pesticides in their early years had a lower lung function by age 7.

Another review from 2022, which was about children living in areas where large amounts of agricultural pesticides are used, stated that 18 out of 25 studies found a link between pesticide exposure and respiratory problems like asthma, wheezing, and infections among the children.

Endocrine system effects

Some pesticides could be harmful to the endocrine system, which is responsible for many important body functions by way of the hormones it releases. Rachel Carson's book Silent Spring in 1962 brough this issue into public attention when the author described how DDT affected bird eggs. To date, there is increasing evidence that some pesticides can interfere with our endocrine system.

The endocrine system comprises organs like the testes, ovaries, thyroid, and pancreas which are responsible for regulating the hormonal levels. Chemicals that interfere with this system are referred to as EDCs or endocrine disrupting chemicals. It is interesting to note that in some cases, smaller amounts of these chemicals could be even more dangerous than bigger ones. Along with atrazine, chlorpyrifos, and glyphosate which are commonly used pesticides, it has been discovered that they can also potentially disrupt endocrine functions.

As a result of exposure to EDCs, the brain, thyroid function, and sexual development can be adversely affected in children. For example, a 2020 review showed that exposure to some chemicals such as DDT could lead to changes in thyroid hormones of newborns.

Although further studies are necessary to completely clarify whether pesticide exposure might be associated with other problems such as obesity, it is evident that adopting measures to minimize children's exposure to these substances is crucial for their health and growth.

Other childhood health effects

There is ongoing research on the various ways that pesticides affect the health of children, and the latest results are emerging.

- **Skin irritation:** Pesticides can cause skin irritation or allergic reactions. A lot of different herbicides and fungicides can make the skin red, sore, or itchy. While there's limited research on how chronic pesticide exposure affects children's skin, some studies have found links between high levels of certain pesticides

and skin rashes. A 2022 review did not find strong evidence connecting pesticides with more serious skin conditions like eczema, though this review included only a few studies.

- **Birth outcomes:** Scientists are still investigating the effect that pesticide exposure could have on birth outcomes. The emphasis has particularly been on substances such as DDT and chlorpyrifos. Some studies point out that exposure to a high concentration of pesticides during the pregnancy may lead to low birth weight, preterm birth, and other birth issues. To illustrate, a study of more than 500,000 births in the farming regions of the U.S. revealed that high levels of pesticides increased the chances of the problems by 5-9%. Further studies are required to figure out which particular pesticides are harmful and the amounts of exposure that are indeed risky.

Poison Centres[4]

Poison centres are specialized medical facilities that provide expert advice and support for the prevention, diagnosis, and management of poisoning cases.

Poisons centres are essential for managing chemical-related health issues, like pesticide poisoning. They are instrumental in assisting countries towards compliance with international health regulations by means of tracking the pesticide exposure, monitoring of the cases of poisoning, and keeping the databases with the desired detail information about the different kinds of pesticides. This information is vital for diagnosing and treating pesticide poisoning since over 1000 different pesticides are used globally.

Poisons centres also notify governments agencies about serious poisoning incidents and track trends in pesticide toxicity. There are fewer specialized poisons centres in low- and middle-income countries (LMICs). Poisons centres also notify government agencies about serious poisoning cases and track trends in pesticide toxicity. However, there are fewer poisons centres in low- and middle-income countries (LMICs), and in 2023, only about half of WHO member countries had a poisons centre. Many regions, including parts of Africa, the Eastern Mediterranean, and some small island nations, lack adequate poisons centre coverage.

[4] https://apps.who.int/poisoncentres/

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