**Routes of Penetration of Pesticides in Human Body**

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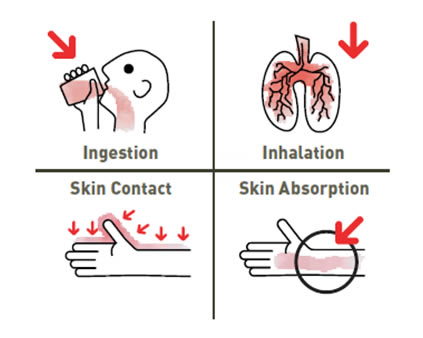
**Routes of Penetration of Pesticides in Human Body**

The danger from poisoning by pesticides entering the human organism depends to a high degree on the routes of penetration. The **kind of pesticide application conditions determines** the specificity of penetrations possibilities in the organism. According to reference data about the frequency of acute and chronic occupational and general population pesticide poisonings, the physiological routes of entry rank in an ascending order are the follows:

- *By Ingestion*;

- *By Inhalation*;

- *By Dermal penetration*.



**By Ingestion**

*1.* ***Accidental ingestion*** *is connected most often with the transfer of pesticides in nonstandard soft drinks, oil, wine or beer bottles and left at an accessible place in the farmer’s home*.

Children are often the victims in such circumstances.

The similar mistake might occur at the working place.

Acute poisoning with pesticides by *ingestion* occur also in cases of intentional *suicides* and *murder*.

*2.* ***Consumption*** *of recently sprayed fruits or vegetables without observing the necessary waiting periods is the cause for single or group poisoning.*

Pesticide poisoning occurs very often when the ambient air carries a cloud of drops from the neighbourhood plantation during pesticide spraying, most often performed by airplane. In such cases the pesticide poisoning can be due both to **consumption** of sprayed fruits and vegetables, and also to **dermal penetration**.

Heavy poisoning can also happen: when consuming vegetables from a glass greenhouse; when agriculture production is harvested earlier for the market, when using for food seeds from cereal crops or maize disinfected with mercury containing fungicides.

In order to reduce the accidental and professional pesticide poisoning by *ingestion* the basic prerequisites are:

- To **observe** hygienic requirements and norms;

- To **keep** the proper storage of pesticides;

- To **follow** strictly the rules and practices of pesticide application;

- To **avoid** meals at the places of preparation of pesticide solutions;

- To **prohibit** eating, drinking of water, smoking during the application of pesticides.



The Basis for prevention of pesticide poisoning by *ingestion* is to **observe in the pesticide application manuals the data for:**

- Degradation of the active pesticide ingredient in the soil, water and treated plants (fruits, vegetables, fodder) both for producers and customers of agricultural products.

- Available regulations for the MPC (maximum permissible concentration) for each pesticide in the main food products, for customers of agricultural products.

An important condition is to observe the waiting periods on the package labels.

**By Inhalation**

Fine powder preparations (wettable powder) enter the respiratory system at the time of transfer to other vessels in windy weather and in case of dry treatment of seeds with powders. The highly toxic pesticides are sod in granules to reduce the dangers.

During spraying with water solutions the main part of the aerosol drops are of size greater than 4-5 microns. They settle in the nasal cavities and in trachea, so the relative share of aerosols that reach the lungs is small.

**Poisoning by inhalation of pesticides is described in cases of:**

Danger from intake by the respiratory system exists**:**

**-** when working in a direction opposite to the wind;

- when finding oneself in a cloud created by an airplane spraying.

- while working with pesticides in closed premises: disinfection of seeds or transplants, stores for food and fodder, spraying in glasshouses, cleaning spilled powder-like preparations in trucks or pesticide stores.

All the upper described cases prove the obligatory use of a respective mask, and other equipment according the instructions on the label of the preparation.

**Lethal poisonings** caused by **inhalation** could be due also to *Fumigants*:

- when the necessary respiratory and other protective measures are not used,

- when their fitness is not checked,

- when the people around are not warned,

- when toxic active substances pass unimpeded in inhabited premises, which neighbour the fumigated stores or glasshouses.

Without a protective mask the penetration of pesticides by inhalation is easy…



**By Dermal Penetration**

Dermal Toxicity:

Comparison of the inhalation route of penetration with dermal route of penetration show the leading importance of the dermal one. In some cases the exposition **through the skin** is 100 to 1000 times higher as compared to that **through the respiratory system**.

Excessively high concentrations of the working solutions of pesticides are more dangerous, while the danger of penetration through a dermal contact is higher when the application is by a hand sprayer in comparison to application by tractor or an airplanes.

**Local Dermal Effect of Pesticides**

The local dermal effects are dependant on the type of pesticide used in each particular case of application. The three main dermal effects are: **Skin Irritating Effect**, **Sensory Irritation Effect** and **Skin Sensitizing effect**.

**Skin Irritating Effect**. High concentrations of herbicides or fungicides irritate the **skin** and the **mucous membrane of the eye*s*** and **the respiratory tract**. These changes occur in the first hours after careless application, such as: spilling and soiling the clothes, spraying with high concentrations of active substances, windy weather, penetration into the gloves or boots.

At the places of contact ***the skin reddens***, ***swells*** and in the heavier cases ***appear blisters***. The ***feeling of heat and irritation increases, causing pain***. In serious cases ***ulcers may appear***, which heal very slowly.

The risk of **Skin Irritating Effect** is eliminated by careful reading of the instructions for use, wearing special clothes, gloves and other protective measures.

**Sensory Irritation Effect.** In cases of careless preparation of working solutions of some insecticides of the group of synthetic pyrethroids, during spraying in glasshouses and stores without ventilation, spraying against the wind, the penetration into the organism occurs and causes ***a feeling of skin burning and irritation around the eyes, the nose and the cheeks.***

The feeling appears 1-4 hours after spraying and is not accompanied by visible changes of the skin, as reddening or swelling. However it increases after washing with water and soap, cleaning with alcohol or exposition to the sun. After 8-10 hours it passes without any serious sequels.

In case the irritation is unbearable good effect can be produced by medicines for skin application, containing *Anaesthezin* and *Viamin E acetate*.

**Skin Sensitizing Effect.** Changes related to hypersensitivity for some pesticides are rare, but could be the reason for stopping the work with them.

The chemical of some active ingredients is the reason for the formation of specific anti-bodies in the worker’s organisms. Most often the anti-bodies are cellular, but in some cases serum anti-bodies are also produced. A considerable part of the fungicides and insecticides are known as professional allergens.

Dermal changes take place several months to 2-3 years after the use of plant pesticides. They begin with *itching* around the neck, ears, nose, cheeks, between the fingers of the hand, the arm up to the elbow. *Pappulae* appear, also small *blisters* and *ulcers*, *acute and chronic eczema* on places as around neck, breast, waist, hips, back of the feet. The skin is swollen and red. The epidermis peels off. The complaints are accompanied by respiratory disturbances, like suffocating cough, spastic bronchitis, astma. Also complaints of oedema, tears and feeling of burning in the eyes.

According to statistical data 25 million people receive an incidental poisoning by pesticides worldwide every year, ranging from headache to death.



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