

# Human Health and Pesticides



In this presentation, we will discuss several pesticide and human health related topics.

# Outline

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- Pesticides are important!
- Health benefits
- Health dangers
- How people are exposed
- Pesticides and the body
- Specific illnesses/injuries due to pesticides
- How to prevent and identify exposure



First, we will learn how pesticides are important in modern agriculture and how there are health benefits associated with pesticide use. Then we will move on to the dangers connected to pesticide exposure, the ways in which exposure occurs, and how pesticides enter the body.

There are specific health conditions which may be traced to pesticide use. We will go over a few examples before discussing ways to prevent and identify pesticide exposure.

## **Pesticides are important!**

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- Pesticides are a valuable tool in modern agriculture.
- Component of Integrated Pest Management
- Many pesticides can be used safely, but like all tools, care must be taken when using.

Pesticides have become a valuable tool in the modern agriculture: fungicides are used to prevent disease on crops, insecticides minimize certain types of insect damage, and herbicides are used to manage weeds that would otherwise compete with crops for valuable resources. Pesticides have helped crop producers in the United States grow more now than ever before (Whitford, Pike, etc.).

Pesticides are also an important part of the “toolkit” of management options that comprises Integrated Pest Management. See Management Options in the Soybean Field Guide 2<sup>nd</sup> Edition on pages 12 and 13. Beginning on page 23 in the Corn Field Guide, foliar fungicide, herbicide, and insecticide use decisions are outlined.

Many pesticides can be used safely and effectively when labeled instructions are followed. Like all available tools, however, care must be taken when using.

## Health benefits

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- Bacteria killed by chlorine in drinking water
- Bacteria spread in hospitals managed by disinfectants
- Disease carrying insects repelled by insecticides

Data from: Whitford, F., Pike, D., Hanger, G., Burroughs, F., Johnson, B., and Blessing, A. The Benefits of Pesticides A Story Worth Telling. Purdue Extension. PPP-70. Purdue University.

Several human health benefits result from safe use of pesticides.

Chlorine is used to kill bacteria that may be present in drinking water supplies, reducing water borne sickness in humans.

In hospitals, disinfectants are used to combat bacteria spread.

Insects may carry human pathogens such as the West Nile virus, malaria, and other diseases. A chemical known as DEET is useful for repelling disease spreading insects.

## Health dangers

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- There are also dangers associated with pesticides. These include *acute* and *chronic* effects.
- Acute
  - Headache, nausea, skin irritation, rash, etc.
- Chronic
  - Cancer, reproductive and nervous system problems, organ damage

Data from: Whitford, F., Edwards, C. R., Neal, J. J., Martin, A. G., Osmun, J., Hollingworth, R. M., and Blessing, A. Pesticides and Personal Safety. PPP-20. Purdue Pesticide Programs. Purdue University Cooperative Extension Service.

There are also many dangers associated with the application of pesticides.

Dangers are grouped in two categories: acute and chronic.

**Acute** effects of pesticide exposure become evident closely following an exposure event. These include headache, nausea, skin irritation, rash, and other conditions.

**Chronic** effects of pesticide exposure become apparent over time, or after repeated exposure to a pesticide. Chronic exposure may result in cancer, reproductive and nervous system problems, and organ damage.

## How are people exposed to pesticides?

- During application
- Preparing for application (mixing)
- Drift
- Consuming foods with residue
- Drinking contaminated water
- Residues brought into the home



There are many ways that pesticide exposure may occur.

A very noticeable way that an individual can be exposed to a chemical is during application. Oftentimes pesticides may be inhaled or spray droplets may land directly on an applicator, causing lung and skin contamination.

Before application, a pesticide may be mixed and diluted with water and placed in the proper application equipment. This process can be particularly dangerous as there is potential for exposure to a concentrated form of the pesticide.

The wind may move pesticide spray particles away from intended targets. This is called drift and results in possible unintended human exposure to spray particles.

Sometimes, applied pesticides may remain on food that is consumed.

Pesticide contamination can also be found in water. Water that moves over or through the soil may wash or leach pesticides into underground water tables and rivers, lakes, and streams. Pesticide drift may cause surface water contamination.

Contaminated applicator clothing and dirt brought into the home may also be a source of pesticide exposure indoors (From: Pesticide Residues in the Homes of Farm Families. Alavanja, M. C. R., Blair, A., Sandler, D. P., Hoppin, J., and Thomas, K. Agricultural Health Study.).

## Pesticides and the body

- Three routes of pesticide entrance into body:
  - Skin
    - Absorbed during contact with skin or eyes
    - Body parts absorb at different rates
  - Mouth
    - May be very serious
    - Can occur when pesticides are stored improperly
  - Lungs
    - Can enter bloodstream quickly, damage respiratory tissue
    - Powders and small droplets/mist inhaled

Data from: Schulze, L. D., Ogg, C. L., and Vitzthum, E. F. Signs and Symptoms of Pesticide Poisoning, EC2505. University of Nebraska Cooperative Extension EC97-2505-A. [Http://www.ianr.unl.edu/pubs/Pesticides/ec2505.htm](http://www.ianr.unl.edu/pubs/Pesticides/ec2505.htm).

In the previous slide we discussed ways in which pesticides can end up in places besides their intended targets. Now we will go over the how pesticides actually enter the body once they come into contact with humans.

There are three routes by which a pesticide can enter the body.

When **skin** or eye contamination occurs, pesticides may be absorbed into the body. Absorption rates are different for different parts of the body. For example, the forearm and palm absorb pesticides slower than the forehead, scalp, and ear canal. The genital area will absorb pesticides more than 10 times as fast as the forearm. This is why it is important to wash your hands after handling pesticides before using the restroom.

Contamination that occurs through the **mouth** can be very serious and most often happens when pesticides are stored improperly (e.g., in unlabeled or food storage containers). Clearing pesticide application equipment (e.g., a spray nozzle) with your mouth can be another source of contamination.

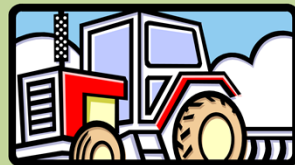
Pesticide exposure through the **lungs** may also be serious as chemicals can enter the bloodstream quickly and damage respiratory tissue. Powders, as well as small droplets and mist, can be inhaled.

Next we will examine specific diseases and health problems associated with pesticides.

# Prostate cancer

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- What is prostate cancer?
- Risk factors for prostate cancer include farming.
- Risk increases for pesticide applicators by
  - 41% in commercial applicators
  - 27% in private applicators



Data from: Alavanja, M. C. R., Blair, A., Sandler, D. P., Hoppin, J., and Thomas, K. Prostate Cancer and Agricultural Pesticides. Agricultural Health Study. 2003.

Prostate cancer is a common cancer among men in Iowa and throughout the United States. This cancer affects the prostate gland and causes tumor growth.

There are several risk factors associated with its occurrence and among them is farming as an occupation. In fact, the risk of prostate cancer increases for commercial and private pesticide applicators by 41% and 27%, respectively, when compared to the rest of Iowa's population.



## Retinal degeneration

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- What is retinal degeneration (RD)?
- RD and fungicide application may be related
- RD and insecticide application may be related



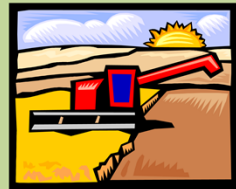
Data from: Alavanja, M. C. R., Blair, A., Sandler, D. P., Hoppin, J., and Thomas, K. Retinal Degeneration in Licensed Pesticide Applicators. Agricultural Health Study. 2002.

The retina is a layer of tissue that is located inside of the eye. Retinal degeneration is when the retina becomes injured. The injury can result in diminished vision or blindness.

The risk of retinal degeneration may be related to the application of certain fungicides and organochlorine insecticides.

## Parkinson's disease

- Risk of Parkinson's disease, when a certain combination of pesticides were applied near homes in California, increased 75%.
- Younger people have higher risk when exposed.



Data from: Costello, S., Cockburn, M., Bronstein, J., Zhang, X., and Ritz, B. Parkinson's Disease and Residential Exposure to Maneb and Paraquat From Agricultural Applications in the Central Valley of California. 2009. American Journal of Epidemiology. Vol. 169, No. 8. DOI: 10.1093/aje/kwp006. <http://aje.oxfordjournals.org>. Accessed 26 March 2010.

Parkinson's disease is a degenerative disease of the brain cells.

A study indicated that the risk of Parkinson's disease, when a certain combination of pesticides were applied near homes in California, increased by 75%.

Risk also was higher when exposure happened to younger people.

# Thyroid disease

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- Thyroid disease increased in women married to pesticide applicators.
- Certain pesticides correlated with increased risk.



Data from: Goldner, W. S., Sandler, D. P., Yu, F., Hoppin, J. A., Kamel, F., and LeVan, T. D. Pesticide Use and Thyroid Disease Among Women in the Agricultural Health Study. 2010. American Journal of Epidemiology. Vol. 171, No. 4. DOI: 10.1093/aje/kwp404. <http://aje.oxfordjournals.org>. Accessed 26 March 2010.

The thyroid gland is responsible for metabolism and growth functions in humans and other animals. Thyroid disease can include hyperthyroidism (an overactive thyroid) and hypothyroidism (an underactive thyroid).

An examination of the women involved in the Agricultural Health Study revealed that thyroid disease increased in women married to pesticide applicators and that organochlorine insecticides as well as certain fungicides and a herbicide were associated with this increased risk.

## How to prevent exposure

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- Follow label directions
- Wear personal protective equipment
- Apply pesticides during the right environmental conditions
- Spray only when you need to



There are many ways to prevent exposure to pesticides during application.

First, follow labeled directions. Each pesticide comes with an instruction sheet, called a label, which gives general information about the pesticide including the proper clothing to wear during application, what pest and crop the pesticide can be used for, and the first aid for accidental exposure.

Wear the recommended Personal Protective Equipment during pesticide mixing, application, and clean-up, as well as when re-entering a field that has been sprayed before the re-entry interval is up.

Certain environmental conditions can increase risk of pesticide exposure. For example, when strong winds are blowing, pesticides may drift into areas not intended to be sprayed or onto an applicator.

Spray only when needed. This will not only reduce the risk of applicator exposure, but will save time, fuel, and reduce the risk of environmental contamination.

# Personal Protective Equipment

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There are several kinds of Personal Protective Equipment and different pesticides require different kinds of protective equipment to be worn during mixing, application, clean-up, and field re-entry.

The basic equipment is long pants, a long sleeve shirt, close-toed shoes, eye protection, and gloves but many pesticides require much more than that and can include entire body protection, rubber boots, two pairs of gloves, and specialized breathing equipment.

Be sure to check the label of a pesticide to determine the correct Personal Protective Equipment to wear.

## Pesticide exposure symptoms

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- Dependent upon pesticide, amount, and type of exposure
- Range from skin irritation, headache, and nausea to incontinence, seizures, and death
- Can be confused with other illnesses

Data from: Schulze, L. D., Ogg, C. L., and Vitzthum, E. F. Signs and Symptoms of Pesticide Poisoning, EC2505. University of Nebraska Cooperative Extension EC97-2505-A. [Http://www.ianr.unl.edu/pubs/Pesticides/ec2505.htm](http://www.ianr.unl.edu/pubs/Pesticides/ec2505.htm).

The symptoms of pesticide exposure vary among the different kinds of pesticides, the amount of pesticide a person has been exposed to, and also the type of exposure (e.g., inhalation, skin absorption, swallowing).

There is a range of symptoms which includes skin irritation, headache, and nausea to incontinence, seizures, and death.

It can be difficult to determine pesticide poisoning as symptoms may be confused with those of other illnesses.

## What to do in case of emergency

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- If serious conditions such as convulsions, difficulty breathing, or unconsciousness occur, call 911.
- The label supplied with the pesticide should have instructions on administering first aid.
- For first aid help, the Poison Control Center can be reached at 1-800-222-1222.

Data from: United States Environmental Protection Agency. Pesticides: Health and Safety. 2009.  
[Http://www.epa.gov/pesticides/health/emergency.htm](http://www.epa.gov/pesticides/health/emergency.htm).

If a pesticide related emergency occurs, there are several things a person should do to seek aid.

First, if the symptoms involve convulsions, difficulty breathing, or unconsciousness, call 911.

The label supplied with the pesticide should have instructions for administering first aid to an exposed person. The label should also be available for emergency personnel.

For assistance with first aid, the Poison Control Center can be reached at 1-800-222-1222.

## Conclusions

- Pesticides are an important tool in modern agriculture.
- Consider both the *risks* and *benefits*.
- Caution must be taken when using pesticides.
- Follow the label for correct application.
- Wear personal protective equipment.
- Be safe and watch out for the safety of others!

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In conclusion, we have learned that pesticides are an important tool in modern agriculture, but the risks and benefits of using pesticides must be considered before an application takes place.

Since we know that there are dangers associated with pesticide use, caution must be taken when using. This includes during mixing, application, clean-up, etc.

Safe practices are outlined on the label that comes with each and every pesticide. Follow the label for correct and safe application.

The label also indicates the right kind of equipment and clothing that will keep you safe during an application.

Be safe and watch out for the safety of others when using pesticides!

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