**Introduction**

Pesticides are substances used to kill, repel, or control unwanted forms of plants, insects, and animals in agriculture. They have been used since before 2000 BC, yet have not become an issue until synthetic pesticides became widespread in the 1930s. Although pesticides aid us in providing enough food for everyone in our country, there are also some setbacks. Many research studies completed showcase the harmful effects of pesticides on both humans and the environment.

**Roundup Those Pesticides**

Pesticides are widely used in agriculture and produce. Though we don’t see them, they are still present in our lives. One of the most common pesticides is Glyphosate, which is used on much of the produce we consume. It is also the main ingredient in Roundup, a brand name herbicide that many farmers use. Since Glyphosate’s establishment in 1974, tests have confirmed its low hazard potential to mammals. However, it’s still lethal to humans and bees. In March 2015, the International Agency on Research for Cancer (IARC) deemed Glyphosateas a likely carcinogen, which is a substance that causes cancer in humans. However, this topic continues to be up to debate.

Studies have linked pesticides to immune suppression, hormone disruption, cancer, and changes in the neurological, endocrine, and reproductive systems. According to an article published by The Guardian early this year, there have been three cases of Lymphoma from Glyphosate, with thousands of other cases pending. Pesticides can also interfere with hormone levels, increase the risk of infertility, testicular and prostate cancer, and obesity. Due to this, many states have set standards and restrictions on pesticide use.

The state of California has established precautionary laws to reduce the harm of pesticides. For example, it is now illegal for growers to spray pesticides at people, even from a distance. Despite this law and numerous others, pesticides are still harmful to human health. Researchers have found that the combination of contact with certain types of pesticides, not taking prenatal vitamins, and low folic acid levels can cause autism in unborn infants or long-term neural developmental effects in the early months of pregnancy.

**Almonds, Almonds, Almonds**

Almonds, which are predominantly grown in California, have recently skyrocketed in popularity. California consumes more almond products than any other state while simultaneously producing more almonds than any other state as well. In recent decades, almonds have become popularized for their versatility and use for dairy-free alternatives. However, its popularity has led to an increase in pesticide usage. Consequently, a third of the bees who pollinated last season’s almonds died shortly after because of the almonds’ pesticides. Many beekeepers and scientists theorize that Roundup is the main culprit.

Roundup is sprayed all across California’s Central Valley, especially on almond trees, and often travels across wide areas of land. Not only is Roundup lethal to bees who are vital for pollination, but humans as well. These factors likely make almonds the most unsustainable type of nut. In addition to its negative impact on humans and animals, pesticides also have damaging effects on the environment.

**Pesticides Far & Wide**

Pesticide use affects every part of the environment, from the land and water to the air. Pesticides are one of the main contributors to the loss of soil fertility. Soil can only maintain its fertility through its populations of soil microorganisms. These microorganisms are responsible for maintaining a healthy population of bacteria and fungi that eat and decrease crop output. They are vital to keeping the soil fertile and usable. However, pesticides often kill off all microorganisms, including these essential soil microorganisms. Additionally, pesticides decrease soil’s ability to produce nitrogen, which is vital for larger crops and crop output. Pesticides kill off nitrogen-fixing bacteria that are used to retain and replenish nitrogen in the soil, resulting in smaller yields and less fertile soil.

Pesticides can also pollute oceans and groundwater used for drinking water. Whenever there is heavy rain in instances like storms, there is runoff production. Runoff carries pesticides into sewers that then enter rivers and oceans. Additionally, pesticides can seep through surfaces sprayed with pesticides and enter water-bearing aquifers (underground layers of permeable rock). Improper disposal of surface water and accidents can also allow pesticides to enter water-bearing aquifers. Groundwater is then extracted from these aquifers with a water well and later used for drinking water. Despite how the majority of humans drink water from this source, groundwater can easily be contaminated. This results in many health effects that people of all ages experience.

Pesticides also pollute the air, which is known as volatilization. When pesticides are released onto crops, they are often in liquid form. However, due to extreme heat, the liquid can vaporize into a gaseous phase and enter the atmosphere. In the atmosphere, these toxic vapors can travel very far distances until they condense and get released in liquid form once again. Even if they don’t condense, these toxic vapors can contaminate indoor air. That’s why pesticides in the gaseous phase have the potential to harm organisms on such a wide scale.

**Pesticides & Pregnancy**

Pesticides are often linked to many physical and psychological disorders. They are recognized as harmful substances that have both short term and long term health effects. One case study conducted by researchers from Int. J. Hyg. Environ. Health in California wanted to prove a theory regarding the effects of prenatal exposure to pesticides. More specifically, they studied the link between pesticide exposure during pregnancy and early childhood acute lymphoblastic leukemia and acute myeloid leukemia.

They conducted this case study by identifying children with cancer through the California Cancer Registry while using cancer-free children as controls. In a case study, a control group is needed to compare results (in this case, to compare to those with cancer). In total, they had 162 children with childhood leukemia and 9,805 children without leukemia. All of these children were born from 1998-2001. To measure pesticide use, the researchers obtained pesticide records from the California Department of Pesticide Regulation. Through the Pesticide Use Reporting system, the researchers were able to pinpoint each child’s pesticide exposure based on residential addresses at the time of birth.

The researchers found that in more rural locations, pesticide exposure and risk of childhood leukemia were both higher. In more urban locations, pesticide exposure and risk of childhood leukemia were both lower. When the researchers studied the residential addresses in rural areas, they found these locations were closer to agricultural farms. However, regardless of location, wherever pesticide exposure was higher, the adjusted odds ratio and risk of childhood leukemia were also higher. The adjusted odds ratio (AOR) is used to explain the likelihood of a situation: the higher the number, the more likely the situation. For example, they found that exposure to carcinogenic pesticides increased the AOR from 1 to 2.83, meaning it is 2.83 times more likely for childhood leukemia to develop after exposure to these pesticides.