

Migrant farm workers exposure to chemicals



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Migrant farm workers Exposure to Chemicals such as DDE's which contribute to

Development of Alzheimer's Disease

Background

Migrant farm workers are exposed to detrimental chemicals and studies show that there is a link in the long-term effects that these chemicals cause. Pesticides are detrimental when workers have low doses of chemicals exposed to them over a long duration of time. Chemicals are neurotoxins that have the ability to cause mitochondria dysfunction, neuronal loss as well as induce oxidative stress. Currently the research that researchers have observed is that specific pesticides such as DDT/DDE contribute to an increase of risk of developing Alzheimer's disease. Although DDT's have been eradicated in the United States some studies show that DDEs are in a sense a low dose of DDT's and have just as harmful effects overtime. Migrant farm workers who test who test positive for high serum levels of DDE's have a high risk of developing Alzheimer's disease. Studies also show that if farm workers have high levels of chemicals in their blood as well carry the ApoE E4 allele then they present even higher risk of developing Alzheimer's disease. Expressing the ApoE E4 allele has been associated with not being able to degrade proteins properly in the brain. Not degrading proteins and lipids properly leads to leads beta amyloid plaques which contribute to early onset of Alzheimer's disease. Ultimately, those exposed to DDEs will perform worse on mental state examinations and having the allele will contribute even further to low mental health scores.

Importance Severity of the Issue

The topic being investigated is how does low dose and long-term exposure to pesticides overall contribute to the risk of developing Alzheimer's disease and how it relates to the population of migrant farm workers. This research is important because migrant workers are in a field where being exposed to direct and indirect pesticides may be overlooked when dealing with pesticide safety procedures. The risk of carrying certain genes as and being exposed to pesticides should be looked at in order to decrease further the risk of early onset. More importantly when pesticides are being released the more at risk persons are those not spraying the poison but, instead those who are around it. These genetic links pesticide risk studies could help the people exposed to low doses who are not frequently protected. The research is interesting because it is overlooked. There is limited research on the link of chemical exposure when compared to Alzheimer's disease as well as other health related disease.

The more this topic is explored the more preventive measures can be made which essentially can decrease early onset of Alzheimer's disease. Chemicals such as pesticides are problematic in the workplace because of the detrimental effects they have on workers. Recent studies showed that in the United States agricultural workers had an average of 57.6 out of every 100,000 exposed to pesticides who experienced acute poisoning or illness. According to the NIH migrant farm workers face the issue of the lack of educational programs designed to improve their overall health (Philip B. Verghese, 2011). Ultimately research is essential so that the relationship between pesticides

as well as genetic factors can be evaluating better and there can be greater precautions implemented to protect workers can be implemented.

Key Findings

Pesticide Exposure, Impaired DNA Repair, and Diseases

This article is essential towards the understanding of the long-lasting damaging effects that exposure to pesticides has on the body as well as how the reactive oxidative damage occurs. Chemicals such as pesticides purpose is to reduce the number of pests as well as target any other organisms. However, when workers are introduced to these toxic chemicals they are also being introduced to the fact that pesticides generate free radicals producing reactive oxygen species which will disrupt cellular pathways by inhibiting various enzymes or receptors (Kaur, 2018). Agricultural workers are exposed frequently to these pesticides and there has been several studies that show that they have an increase in developing a multitude of diseases such as cancer, reproductive disorders, birth defects, and more recently looked into increased risk of developing Alzheimer's and Parkinson's disease (Fallahi P1, 2017).

Reactive oxidative species are free radicals that have unpaired electrons, which makes the molecule highly reactive. Free radicals are neutralized by antioxidants when pesticides are not involved however, when they are involved the relationship is damaged and free radicals become destructive to the body. Specifically, when damage occurs, the process is left causing oxidative stress which directly disrupts the cell signaling process which deemed the most important messengers in the redox signaling (Kaur, 2018).

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Oxidative stress is what leads to the development of the chronic diseases that are known to be detrimental to us today.

Cellular components become attacked by reactive oxidative species which cause the bases in DNA to be damaged significantly. DNA directly activates poly ADP which causes splitting of NAD⁺ and due to this level, it directly leads to loss of cell function. Ultimately, free radicals attack the sugars as well as the bases of DNA which contribute to the loss of nucleic acids (Kaur, 2018).

Overall the effects of pesticides that we use to kill insects pose significant unseen risk on human health. Over the years the rate of mortality has increased from the effects of pesticides. When chronic diseases occur, they develop over time and not instantly when compared to how DDT's affected humans before being eradicated. Pesticides effect the genetic as well as structural make up of DNA, as well as indirectly affect the mitochondria, endoplasmic reticulum as well as other factors that make up the cell (Kaur, 2018).

Roles of Apolipoprotein E in Alzheimer's Disease and Other Neurological Disorders

Researchers have shown that those having the ApoE and E4 allele are associated with higher risk of developing Alzheimer's disease. Studies have shown that those who expresses the APOE e2 allele have a decrease in onset of this disease (Philip B. Verghese, 2011). This study focuses on the relationship between the two and additional associations.

ApoE is the key lipoprotein that is responsible for the regulation of the breakdown of lipids by directing transport, delivery, and distribution from one lipid to the next (HDL)-like complexes (Philip B. Verghese, 2011). According to the NIH it is essential to maintain normal levels of cholesterol ApoE can be expressed as E2, E3, and the E4 allele (Jason R. Richardson, 2014). The amino acid differences at the positions associated with each allele could be associated with functioning properties of the gene (Verghese PB1, 2011). The most common allele found in the majority of the population is the E3 Allele and is not the high-risk allele associated with the disease. However, the E4 allele positing is associated with increased risk of developing this disease and is has been present in 50% of patients who develop the late onset of Alzheimer's (Philip B. Verghese, 2011). Those who carrier this allele has an increased risk of developing Alzheimer's by a 3-12-fold and depending if the person expresses having one or two of these alleles can shift the onset one to two decades earlier when compared to non-carriers of this allele (Verghese PB1, 2011). A crucial finding using fMRI displayed that hypometabolism was displayed more in mid-life despite if there was early onset to Alzheimer's disease or not.

ApoE E4 Status in Healthy African Americans

Research has indicated that African Americans are 1.4 times more likely to carry the APOE E4 allele when compared to any other ethnicity (Kamara, 2018) . This was an interesting factor because although migrant farm workers have been shown to represent the Hispanic population more frequently the migrant farmer population who are of African Americans decent should be aware carrying the E4 allele and being exposed to <https://assignbuster.com/migrant-farm-workers-exposure-to-chemicals/>

pesticides could possibly make them even more likely to develop Alzheimer's disease (Yu L1, 2017) (Philip B. Verghese, 2011).

Elevated Serum Pesticide Levels and Risk for Alzheimer Disease

This study focused on a total of 165 subjects 65% expressed the APOE4 allele in and had Alzheimer's disease and the other 35% carried the allele and were the control group (Jason R. Richardson, 2014). The high-risk group are those who work in agricultural workers who are exposed solvents, pesticides, as well as metals. These participants blood levels were tested and what was found was that there is an association with high levels of organochlorine pesticide otherwise called (DDE).

Researchers were able to assess pesticide levels in the brain by using the gas chromatography/mass spectrometry method which determined brain pesticide determination. In order for the results to be viable this research collected was compared to previous research from Minerva Med which analyzed Alzheimer's and the links (Cervellati C1, 2018) and the National Institute of Neurological as well as other University's that have conducted previously similar studies. Mini mental state examinations were used in the study to be able to determine the brain interaction between APOE e4 allele.

Researchers found that when DDE levels were elevated in the blood and the patient had APOE E4 allele mini mental state examination scores were significantly lower (OR, -1. 6995; 95% CI, -3. 293 TO -0. 106; =. 04 (Jason R. Richardson, 2014). Organochlorine pesticides were a limitation in that they were the only pesticide that blood levels that were tested. When comparing results to additional studies there were other toxins that displayed a

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negative effect in the blood that couldn't be analyzed during this study.

Additionally, not every patient in the study expressed nondetectable levels of DDE exposure in the body which lead to inaccurate results in those particular individuals.

Comparisons with other studied showed a link with previous levels and this research (Cervellati C1, 2018) (Yu L1, 2017). In this research the single pass protein APP was associated with sodium channels and those channels have a direct link with overexpression of DDT and APP which could lead towards higher risk association with Alzheimer's disease. Findings were in support with previous research done with DDT/DDE exposure and carried APOE E4 allele.

Testing for elevated levels of proteins could provide an avenue in the future to test workers for the genotypes they carry as well as try to have interventions to limit DDE. This is crucial because DDE exposure with or without the allele has been shown to generally have negative neurological effects (Jason R. Richardson, 2014). If targeted treatment of individuals with high exposure to DDE is confirmed, then the goal should be to create preventable measures to prevent cleavage of elevated APP protein to amyloids which would essential increase the plaques being formed in the brain which are big contributors to Alzheimer's disease.

Pesticide Exposure and Risk of Alzheimer's Disease

In this study the goal was to be able to observe the relationship between pesticide exposure as well as how it may link to Alzheimer's disease. The high-risk group are gardeners and farmers because they are consistently

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exposed to pesticides. This research was vastly different from other research in the past because they use the meta-analysis approach. This approach is a statistical procedure what's combines data from multiple studies. This approach is beneficial because when one study doesn't result in strong outcomes then multiple studies can be compared which shows consistency as well as the common effect that they are all related to. When agricultural workers such as farmers and gardeners we're exposed to long-term and low-dose pesticides studies showed that this contributed to mild cognitive impairment. One study showed that individuals who have been exposed to pesticide overall express increased risk of dementia (HR = 1.38, 95%CI= 1.09, 1.76) (Dandan Yan, 2018). In vitro as well as in vivo studies we're also analyzed. DDTs were banned in the United States because of how harmful these particular pesticides are, and DDEs are not as harmful as the DDTs and we're not banned and can still contribute to early onset of Alzheimer's disease. In vitro studies showed that Dichlorodiphenyltrichloroethane otherwise known as (DDT's) play a significant role in increasing amyloid - β precursor protein in the brain (Dandan Yan, 2018).

The increase of amyloid protein in the brain can potentially cause an increase in plaques found in the brain. The plaques that form in the brain directly contribute to memory loss because they affect the way neural networks interact. The vivo studies indicated that pesticide specifically can play a role in the contribution to Alzheimer's disease by disrupting metabolic pathways involved in the homeostasis. Increased levels of amyloid beta leads to decrease in function in the hippocampus as well as reduce motor activity when tested in animals. Lastly a specific study that had significant results was looking at DDE in serum levels. What was found was that having increased levels of DDE in the blood has the impact of a 3.8-fold increase in patients with Alzheimer's disease when compared to healthy patients (Sinha N, 2018). There were limitations in all the studies such as the relationship between duration of pesticide exposure and specific occupations where not thoroughly analyzed. Overall, the study was able to show through meta-analysis that pesticides are linked to increased risk of Alzheimer's disease.

Discussion & Interpretation

Analyzing research in the occupational field of agriculture has opened my eyes to see the reality that there is a need for more research in terms of the effects of what pesticides can do and in relation to people who express the E4 allele.

Overall, pesticides are unavoidable because they are used as a to kill of bugs as well as other organisms' farmers don't want on foods however, they do pose a significant risk on the health of humans. Even though United States has mandated the use of DDTs, the reduced form of the product which is DDEs still propose significant risk to the body when exposed at low doses for a significantly long time.

The relationship between caring specific alleles such as the ApoE E4 allele has displayed that carrying this gene contributes towards higher risk of Alzheimer's disease. Being exposed to DDEs as well as expressing the E4 allele has been linked to an even higher risk of development of Alzheimer's disease. Overall, the detrimental effects of pesticides effect the body on a cellular level. Being exposed to pesticides will force DNA to act irregularly and will delay the metabolism of increasing amyloid -b precursor protein in the brain. Having the Apoe E4 allele as well as having pesticide exposure can increase plaques in the brain over time. Plaques developing in the brain makes neural networks working together more difficult and causes memory loss.

The reality is that occupational workers who are farmers are being exposed harmful pesticides and could also carry genetic risks that they are not aware of. Through they may follow guidelines addressing the health risks this may not be enough because individuals exposed might not know the additional risks they may possess by working in farms or dealing with anything agriculturally related to pesticides. Ultimately, there has to be further research done in order to have more studies out there that are also more viable.

Pesticides cause a ripple effect on everyone. The person spraying the product is exposed, the individuals around the product who are not geared properly are exposed all the way down to the consumer. Pesticide companies must revamp their products to protect workers and the future of people working in the agriculture fields. The reasoning for my recommendations is that these improvements are preventable measures to declining so many illnesses that we are faced with today. If it is evident that DDEs as well as other pesticides are killing the workers and or making them sick, then there is room for improvement there is room for change. The priority should be the employees working for the companies not the food. It has to be stressed that food is not more important than millions of workers getting diagnosed with a variety of disease or late onset of disease such as Alzheimer's that they may not have known they were more at risk for. Research has shown the harmful effects of pesticides and being more vulnerable to disease can do then there has to be implementation for change for the better of the workers for and for the better quality of life that they deserve.

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