

A Meta-Analysis to Elucidate the Link Between Tocopherol Acetate and Lung Illnesses of Vape Users**A) Rationale**

Vaping is the act of inhaling and exhaling the aerosol, often referred to as vapor, which is produced by an e-cigarette or similar device. The term is used because e-cigarettes do not produce tobacco smoke, but rather an aerosol(1) (Joselow) , often mistaken for water vapor, that actually consists of fine particles. Many of these particles contain varying amounts of toxic chemicals, which have been linked to cancer, as well as respiratory and heart disease (2). Tocopheryl acetate, also known as vitamin E acetate is an ester of acetic acid and α -tocopherol. It is a specific form of vitamin E that is often found in skincare and dietary supplements which means that it is safe for human consumption. Vitamin E is known for its antioxidant properties. Antioxidants help to protect your body from damaging compounds called free radicals. Normally, free radicals form when your body converts food into energy (3) (Seladi-Schulman). On the other hand, it does not seem to be safe for inhalation (4) (Abbott and Maloney). The problem with adding it to vaping liquids is that there is not enough data on the effects of inhalation and the toxicity associated with it. Research shows that lipids (oils) in the lungs are highly toxic and have been associated with lung injury (5)(Mitton). Tocopherols, which vitamin E acetate is, stick fast to the fluid in the lining of the lungs known as lung surfactant. Lung surfactant enables oxygen to transfer from air into your body. The Vitamin E acetate oil can become "like honey" and stick to the vaper's lungs. This substance facilitates the transfer of oxygen from air breathed into the lungs to the rest of the body. Tocopherols block this form of exchange and this results in the death of lung cells which causes damage that triggers an immune system response in the body that resembles lipoid pneumonia. With smoking this effect occurs.

Alpha-tocopherol is Vitamin E, a fat-soluble vitamin and is an important antioxidant. It acts to protect cells against the effects of free radicals, which are potentially damaging by-products of the body's metabolism (6).

Gamma-Tocopherol (γ -tocopherol) is needed in only small amounts and are available in the foods that you eat. Vitamin E prevents a chemical reaction called oxidation, which can sometimes result in harmful effects in your body. It is also important for the proper function of nerves and muscles (7).

The purpose of this meta-analysis is to make the many (young) adults currently vaping aware of the toxins they are putting into their bodies. Many are unaware of the effects of smoking on the lungs; also, you never know what chemicals you can be allergic to. For example, tocopheryl acetate seems to be giving most people who use vaping allergic reactions. We know this from people speaking out on what tocopheryl acetate does to them; however, it is often adults who proactively get tested to see what exactly was affecting them from the e-cigarette. Most teenagers are uneducated and unaware about this topic and have no clue on what can harm them. Thus, this project aims to address young adults - We can save lives if people just knew more about what they're inhaling; so our mission is to prevent more kids from dying and to stop the children who use vape now.

B) Research Question(s), Hypothesis, Expected Outcome

1. How does Tocopheryl acetate affect the human body?
2. What is Tocopheryl acetate made up of?
3. What's in Tocopheryl acetate that causes people to receive allergic reactions from it
4. How harmful can Tocopheryl acetate be

Null Hypothesis (H0) - Tocopheryl acetate is a chemical found in e-cigarettes; however, it has no physiological effects on the functioning of alveolar cells/tissues/.

Alternate Hypothesis (Ha) - Nicotine, although in a different form?, is in fact the major causative factor related to vaping illnesses.

Expected Outcome - Tocopheryl acetate adheres to the pneumocyte (lung surfactant) cells of the alveoli, inhibiting normal physiological function,

C) Procedure

A systematic review and meta-analysis will be conducted. Electronic databases will be searched using key search terms to identify relevant information and up-to-date findings. Studies performed on the ingredients found in vaping and physiological effects will be included in this analysis. Primary observational studies and studies with experimental designs will be included. Interviews and blogs may also be included.

Risk and Safety:

None associated with a meta-analysis

D) Bibliography

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NO ADDENDUMS EXIST