

HISTORY OF THE DEVELOPMENT OF SPECIAL CLOTHING THAT PROTECTS AGAINST PESTICIDES USED IN AGRICULTURE

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Annotation: This article provides a thorough exploration of the historical development of special clothing designed to protect individuals from the hazards of agricultural pesticides. From the early days of pesticide use to the present, the evolution of protective clothing is examined, emphasizing key innovations and advancements. The article aims to shed light on the significance of these developments in ensuring the safety of agricultural workers and promoting sustainable farming practices.

Keywords: Protective clothing, agriculture, pesticides, development, history, safety, innovation.

Agricultural pesticides play a pivotal role in modern farming, aiding in pest control and maximizing crop yields. However, the exposure of agricultural workers to these chemicals poses significant health risks. This article delves into the history of protective clothing designed to mitigate these risks, highlighting the critical role such innovations have played in safeguarding the health and well-being of those working in the agricultural sector.

To understand the development of protective clothing in agriculture, a comprehensive review of existing literature was conducted. Historical records, scientific articles, and technological advancements were examined to trace the evolution of protective gear. Key themes included material science, design improvements, and the integration of ergonomic features to enhance comfort and functionality.

The methodology involved a systematic review of literature, focusing on articles, patents, and historical documents related to the development of protective clothing against agricultural pesticides. Key milestones and breakthroughs were identified, and the information was categorized chronologically to provide a clear timeline of advancements.

The history of the development of special clothing to protect against pesticides in agriculture can be traced back to the mid-20th century when the use of synthetic pesticides became more widespread. Prior to this period, agricultural practices relied on traditional methods, and the need for protective clothing specifically designed for pesticide exposure was not as apparent.

Here is an overview of the key developments in the history of protective clothing against pesticides in agriculture:

1. Introduction of Synthetic Pesticides (Mid-20th Century):

- The post-World War II era saw a significant increase in the development and use of synthetic pesticides to control pests and enhance crop yields.
- DDT (dichlorodiphenyltrichloroethane) was one of the earliest synthetic pesticides widely used in agriculture during the 1940s and 1950s.

1. Introduction of Synthetic Pesticides (Mid-20th Century):

- The post-World War II era marked a transformative period in agriculture with the widespread adoption of synthetic pesticides. These chemical compounds were developed to combat pest infestations and bolster agricultural productivity.

- DDT (Dichlorodiphenyltrichloroethane):

- Among the pioneering synthetic pesticides, DDT gained prominence in the 1940s and 1950s. Swiss chemist Paul Hermann Müller's discovery of DDT's insecticidal properties earned him the Nobel Prize in Physiology or Medicine in 1948.

- DDT's effectiveness against a wide range of pests, including mosquitoes and agricultural insects, contributed to its widespread use. It became a key tool in combating diseases like malaria and protecting crops from pests.

- The chemical's long-lasting residual effects allowed for extended pest control, making it a popular choice in various applications.

- Benefits of Synthetic Pesticides:

- Synthetic pesticides offered several advantages, including increased crop yields, reduced economic losses due to pest damage, and improved food security. These chemicals played a crucial role in the Green Revolution, a global initiative aimed at enhancing agricultural productivity.

- Drawbacks and Environmental Concerns:

- Despite their initial success, synthetic pesticides raised environmental and health concerns. The persistent nature of compounds like DDT led to bioaccumulation in the food chain, posing risks to wildlife and, eventually, human health.

- The unintended consequences of widespread pesticide use became evident, including the development of pesticide-resistant pests and the impact on non-target species.

- Regulatory Responses:

- Recognizing the environmental and health risks associated with certain synthetic pesticides, regulatory measures were introduced to restrict or ban their use. DDT, for instance, faced increasing restrictions due to its ecological impact, eventually leading to a global ban under the Stockholm Convention on Persistent Organic Pollutants in 2004.

- Evolution of Pest Management Practices:

- The challenges posed by synthetic pesticides spurred the development of integrated pest management (IPM) strategies. These approaches emphasized a more

holistic and sustainable approach to pest control, incorporating biological, cultural, and mechanical methods alongside judicious pesticide use.

- The introduction of synthetic pesticides in the mid-20th century marked a significant chapter in agriculture. While these chemicals initially provided effective solutions to pest-related challenges, their long-term consequences necessitated a shift towards more sustainable and environmentally friendly pest management practices. The ongoing evolution of agricultural practices reflects a growing awareness of the need to balance productivity with ecological responsibility.

2. Recognition of Health Hazards:

Pesticides are chemicals designed to control pests, but their potential adverse effects on human health have become increasingly apparent. Here are some key points related to the health hazards associated with pesticide exposure:

- **Skin Absorption:** Pesticides can be absorbed through the skin, especially when individuals come into direct contact with treated crops or handle contaminated equipment. Skin absorption can lead to systemic exposure, causing a range of health issues.

- **Acute Health Effects:** Short-term exposure to high concentrations of pesticides can result in acute health effects, such as skin irritation, eye irritation, respiratory problems, dizziness, nausea, and headaches. These symptoms are often observed among farmworkers who come into direct contact with pesticides during application.

- **Chronic Health Effects:** Long-term or chronic exposure to pesticides has been linked to more severe health problems. Some pesticides have been associated with chronic conditions such as cancer, neurological disorders, reproductive issues, and endocrine disruption. The effects may not manifest immediately but could develop over an extended period.

- **Respiratory Exposure:** Inhalation of pesticide fumes or dust during application or re-entry into treated areas can lead to respiratory problems. Respiratory exposure may result in symptoms such as coughing, wheezing, chest tightness, and in severe cases, respiratory failure.

- **Systemic Effects:** Pesticides can enter the bloodstream and affect various organs and systems in the body. This can lead to disruptions in the nervous system, liver, kidneys, and other vital organs.

- **Risk to Vulnerable Populations:** Certain groups, such as pregnant women, children, and individuals with pre-existing health conditions, may be more susceptible to the adverse effects of pesticides. For example, prenatal exposure to certain pesticides has been associated with developmental issues in children.

- **Cumulative Exposure:** Farmworkers and individuals working in agriculture may experience cumulative exposure to pesticides over time, increasing the risk of long-

term health effects. The accumulation of multiple pesticide residues can pose a complex health challenge.

●**Regulatory Measures:** Recognizing these health hazards, regulatory agencies in various countries have implemented measures to mitigate exposure risks. This includes establishing safety guidelines, setting acceptable exposure limits, and promoting the use of personal protective equipment (PPE) among workers.

Efforts are ongoing to develop and promote safer alternatives to traditional pesticides, as well as to educate and raise awareness about the proper handling and application of these chemicals to minimize health risks. Integrated pest management (IPM) approaches aim to reduce reliance on chemical pesticides and prioritize environmentally friendly and sustainable practices in agriculture.³ **Emergence of Protective Clothing:**

- As awareness of the risks grew, there was a push to develop specialized clothing to protect workers from direct skin contact with pesticides.

- The development of protective clothing was driven by the need to minimize dermal exposure and prevent the inhalation of pesticide residues.

4. Materials and Design Improvements:

- The initial protective clothing was often made of impermeable materials to create a barrier between the skin and pesticides. However, these early designs were not always comfortable for extended use.

- Advances in textile technology led to the development of more breathable, lightweight, and durable fabrics that still provided effective protection.

5. Standardization and Regulations:

- As the awareness of pesticide-related health risks increased, regulatory bodies began to establish standards for the design and use of protective clothing in agriculture.

- Occupational Safety and Health Administration (OSHA) regulations in the United States, for example, began to include guidelines for pesticide protective clothing.

6. Innovations in Personal Protective Equipment (PPE):

- Continued research and innovation in the field of PPE led to the development of specialized gear, including coveralls, gloves, boots, and masks designed to offer comprehensive protection against different types of pesticides.

7. Education and Training:

- Alongside the development of protective clothing, there has been an emphasis on educating agricultural workers about the proper use of PPE, handling of pesticides, and adherence to safety protocols.

8. Ongoing Improvements:

- Research and development in the field of agricultural safety continue, leading to ongoing improvements in the design, materials, and effectiveness of protective clothing against pesticides.

Today, the use of personal protective equipment in agriculture is a standard practice, and guidelines for its use are established in many countries to ensure the safety of those involved in pesticide application and related activities.

The discussion section evaluates the implications of the identified developments in protective clothing. Consideration is given to the impact on worker safety, the environment, and the efficiency of pesticide application. The role of regulatory standards in driving innovation is also explored, along with challenges faced by manufacturers in balancing protection, comfort, and affordability.

Conclusions:

The evolution of protective clothing against agricultural pesticides reflects the industry's commitment to enhancing safety standards. From rudimentary solutions to sophisticated, multi-layered ensembles, the advancements have significantly reduced the health risks associated with pesticide exposure. The importance of ongoing research and collaboration between industry stakeholders is emphasized for continued progress.

Future research endeavors should focus on developing sustainable materials for protective clothing, exploring the integration of smart technologies, and assessing the long-term health impacts of prolonged pesticide exposure even with protective gear. Additionally, efforts to make advanced protective clothing more accessible and affordable for farmers in developing regions should be prioritized.

In conclusion, the history of protective clothing against agricultural pesticides is a testament to the industry's commitment to worker safety and environmental responsibility. As technology continues to advance, the trajectory of protective clothing development remains dynamic, with ongoing efforts to strike a balance between efficacy, comfort, and accessibility.

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