History Of Pesticides Timeline

A SHORT HISTORY OF PUBLIC HEALTH PESTICIDES

Looking back over one hundred issues of PPC, it's clear that the products in our toolkits have changed considerably. We asked Alex Wade, from member company PelGar International, to look back at rodenticides and insecticides over the last century.

RODENTICIDES
INSECTICIDES

1900

~1900s

Insecticides have been used for thousands of years. Some of the earliest forms of these persisted into the 19th century with the use of powdered chrysanthemum. German merchant Johann Zacherl and his son were pioneers in the use of powdered chrysanthemum in the late 1800s within the field of public health pest control (such as it was). This father and son team from Germany created one of the first powdered chrysanthemum factories in Vienna, and it still stands today.

With the dawn of the 1900s, significant research went into refining which components of the chrysanthemum plant were responsible for the insecticidal activity. The release of this landmark research to the industry and the rest of the world was forestalled by the First World War.

1910

1920s

At the start of the 1920s, most rodenticides were either based on heavy metals such as arsenic or acute poisons such as strychnine and Red-Squill. Although they were highly effective, they came with significant drawbacks.

The acute nature of these rodenticides caused the rapid development of bait shyness. Additionally, a lack of a reliable antidote to these compounds meant that non-target poisonings of people and animals were often fatal.

1920

1930 to 1940

In 1939 a chemist called Paul Muller, working in Basel, Switzerland began a comprehensive screening programme of organochlorine compounds in the hopes of finding a treatment for the control of moths. It was during this screening process a compound, which had been previously described in 1874 as dichlorodiphenyltrichloroethane, now more commonly referred to as DDT, was chosen as an ideal candidate.

DDT proved to be a phenomenal broad-spectrum insecticide, providing lasting residual control while being relatively cheap to synthesise and formulate. It was these characteristics which won Muller the Nobel prize in Physiology and Medicine and then soon saw the US military, as well as many others, replace their existing pyrethrum products with the newly developed DDT.

1930

Late 1940s

Warfarin was developed as a stable form of the naturally occurring anticoagulant dicumarin.

After the depression of the 1920s, cattle farming became integral to the recovery of the United States. With the great importance of cattle and their health, the emergence of a new disease with no apparent associated pathogen was of great concern.

Farmers soon realised that there was a link between affected cattle and a type of feed made from sweet clover, specifically sweet clover that had begun to spoil. Researchers from the University of Wisconsin found that it was fungus present in spoiled hay and silage which resulted in the bonding of usually harmless molecules into potent anticoagulants called dicumarins.

Researchers soon stabilised and synthesised this process, giving rise to the invention of Warfarin.

1940

1940 to 1950s

Despite DDT's successes, work persisted into the understanding and refinement of pyrethrum and its constituent components. A chemist by the name of LaForge and his team worked on unravelling the active components of Pyrethrum. There were two groups of three compounds working in synergy to make Pyrethrum an effective insecticide. LaForge's team went further than that and worked on synthesising these components in the lab; the result of this work was the creation of the first of the synthetic pyrethroids, Allethrin.

As the popularity of DDT waned with increasing concerns over its environmental impact, the popularity of the synthetic pyrethroids such as Allethrin, and later Permethrin and Cypermethrin, increased. This led to continual refinement of new compounds, increasing their efficacy and stability with great success over the next several decades.

1950

1950 to 1960

Over the next several decades, multiple first-generation anticoagulants developed. A range of Indandiones, such as diphacinone, were developed in the 1950s providing effective control of both rats and mice.

However, in the 1960s, resistance to Warfarin and many of the other first-generation anticoagulants started to appear in house mice. Towards the end of the '60s there was an almost total failure in the ability to control mice with Warfarin and other similar first generations.

1960

1960s

The need for a new and novel chemical control was needed, with industries looking in part to molecules which had previously been considered pharmaceutical failures due to their inherent toxicity to rodents.

One of the products which were formulated in this period was a chemical called Alpha-naphthyl thiourea (ANTU) which was trialled in Baltimore to control the overwhelming numbers of rats there.

In laboratory tests ANTU proved a promising candidate and, when used in small scale field trials, was an effective bait for controlling rats. Unfortunately, when the trial was expanded to include larger areas, it became apparent that incomplete or partial treatments which caused sub-lethal dosing soon led to a rapid tolerance forming in these populations, resulting in Baltimore removing the product from use.

1970 to 1990

Alongside the refinement of the pyrethrins to the synthetic pyrethroids, significant research went into several other groups of insecticides. The organophosphates such as Azamethiphos and Chlorpyrifos, the carbamates such as Bendiocarb, and towards the end of the 20th century the neonicotinoids such as Acetamiprid and Imidacloprid.

Around this time saw the development of a new and novel application method for insecticides, the use of gel baits designed for insects. These baits were extremely effective at controlling species such as cockroaches, but also proved highly effective against insect populations which partake in trophallaxis, such as ants. The communal feeding of hive living insects made them especially vulnerable to these insecticidal baits using these newly developed insecticides.

The success of the synthetic pyrethroids soon led to the rise in global resistance to these compounds in multiple species of insects.

Synergists such as Piperonyl Butoxide, which had previously been used to augment natural pyrethrins since the 1940s, were combined with synthetic pyrethroids to better combat resistance and to increase their efficacy.

1970

1980

1970 to 2000

Burgeoning resistance to the first generations and the drawbacks associated with the acute rodenticides led formulators to revisit and improve upon Warfarin. The first of these newly dubbed second generation anticoagulants (SGARs) was Difenacoum in 1975.

Over the coming decades, dozens of second-generation anticoagulants were screened and developed, but only five of these made it to the Public Health markets. Difenacoum, Bromadiolone, Brodifacoum, Flucoumafen and then later Difathiolone proved so efficacious that they soon came to dominate the rodent control markets.

Yet, much as they did with the first generations, rodents began to adapt to the pressures of the SGARs. Resistance loci were starting to form and, with the turn of the 00s, starting to show stable and persistent populations of rats exhibiting practical working resistances to some of these molecules.

1990

1990s

Insect growth regulators (IGRs) also started to become more widely used towards the end of the 20th century. The development of IGRs such as pyriproxyfen were first formulated to treat whitefly and other pests of crops in the mid-'90s. They soon found a place in the public health markets as a useful tool for the control of pests such as fleas, as well as proving an invaluable device for breaking resistances in populations of insects showing hereditary resistances to conventional insecticides.

2000

2000 to 2020

Most recently, concern over the environment and the impacts rodenticides are having on it, was the driving force behind an industry piloted stewardship scheme headed by the Campaign for Responsible Rodenticide Use (CRRU).

Coinciding with stewardship also came new legislation which implemented greater distinctions between professionals and general public users, by way of limiting the size of packages available to the general public, as well as an upper limit on the strength of the products in parts per million (PPM).

2010

2000 to 2020

In the last several years, the labels for insecticides have changed dramatically with the Biocidal Products Regulations (BPR). This regulation has sought to harmonise classifications and terminologies across the EU of all products within their respective categories.

These changes meant that labels became progressively more prescriptive in their language but allowed for greater ease of understanding of the labels and allowed for easier comparison of products within the same categories.

2020

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History of pesticides timeline reveals a fascinating journey that intertwines human ingenuity with agricultural practices. From ancient civilizations to modern-day innovations, the evolution of pesticides has played a crucial role in boosting crop yields and controlling pests. Understanding this timeline not only sheds light on agricultural advancements but also highlights the ongoing quest for sustainable practices in the face of environmental challenges.

The Ancient Beginnings

The history of pesticides is not a modern phenomenon; rather, it dates back thousands of years. Early agricultural societies recognized the need to protect their crops from pests and diseases.

1. Ancient Civilizations

- Egyptians (circa 1500 BC): The ancient Egyptians used a variety of natural substances to protect their crops. They employed mixtures of sulfur and other compounds as early forms of pest control.
- Chinese (circa 1000 BC): The Chinese were among the first to use plant-derived insecticides, such as the extraction of chrysanthemum flowers to produce pyrethrum, which is still used today.
- Greeks and Romans: These civilizations also utilized various materials, including ash and crushed plants, to deter pests. The famous Roman scholar Pliny the Elder documented several natural remedies in his writings.

The Middle Ages to the Renaissance

As agriculture evolved through the Middle Ages, so did the methods of pest control.

2. Herbal Remedies and Innovations

- Medieval Europe (500-1500 AD): Farmers relied heavily on herbal remedies and natural pesticides. Common plants like rue, garlic, and tobacco were used to ward off pests.
- Renaissance (14th-17th Century): The period marked a renewed interest in science and natural philosophy. Although agricultural practices remained traditional, the foundation for scientific exploration was laid, setting the stage for future developments in pest control.

The Birth of Modern Pesticides

The 19th century witnessed significant advancements in the field of chemistry, which paved the way for the development of synthetic pesticides.

3. Early Chemical Pesticides

- Paris Green (1867): This arsenic-based compound was one of the first synthetic insecticides developed. Initially used to control pests in agriculture, it also found a place in the realm of urban pest control.
- Bordeaux Mixture (1885): Created by French chemist Millardet, this fungicide combined copper sulfate and lime to combat downy mildew in vineyards and is still relevant today.

The 20th Century: A Pesticide Revolution

The 20th century marked a turning point for pesticides with the introduction of numerous synthetic compounds that transformed agricultural practices.

4. The Rise of Synthetic Pesticides

- DDT (1940s): Dichloro-Diphenyl-Trichloroethane was synthesized and became widely used during World War II for its effectiveness against malaria-carrying mosquitoes. Following the war, it was adopted in agriculture, leading to significant crop yield increases.
- The Green Revolution (1940s-1960s): This period saw a surge in agricultural productivity, with chemical fertilizers and pesticides becoming commonplace. The introduction of high-yield crop varieties, irrigation, and mechanization reshaped farming practices worldwide.

5. Environmental Awareness and Regulation

- Rachel Carson's "Silent Spring" (1962): This groundbreaking book raised public awareness about the negative effects of pesticides, particularly DDT, on the environment and human health. It sparked a pivotal shift in how pesticides were viewed and regulated.
- Establishment of Regulatory Agencies: In response to growing concerns, governments established regulatory bodies. The U.S. Environmental Protection Agency (EPA) was created in 1970, leading to stricter pesticide regulations and safety evaluations.

Late 20th Century to Present

As the 21st century approached, the focus of pest management began to shift towards sustainability and integrated approaches.

6. Integrated Pest Management (IPM)

- Concept Development (1970s-1980s): IPM emerged as a holistic approach that combines biological, cultural, and chemical practices to manage pests. This method emphasizes the use of natural pest predators and crop rotation to reduce reliance on chemical pesticides.
- Biopesticides: The late 20th century saw a rise in the development of biopesticides derived from natural materials. These include substances from plants, bacteria, and fungi, presenting a more environmentally friendly alternative to synthetic chemicals.

Current Trends and Future Directions

The landscape of pest management continues to evolve, shaped by technological advancements and environmental concerns.

7. Advances in Technology

- Genetically Modified Organisms (GMOs): Crops engineered for pest resistance have gained traction, reducing the need for chemical pesticides. This approach raises important discussions about biodiversity and ecological impacts.
- Precision Agriculture: Utilizing data analytics and technology, farmers can apply pesticides more efficiently, minimizing waste and environmental impact.

8. Sustainable Practices and Future Challenges

- Organic Farming: The demand for organic produce has led to a resurgence in natural pest control methods. Organic farmers often rely on crop rotation, beneficial insects, and organic-approved substances to manage pests.
- Regulatory Changes: As scientific understanding of pesticides grows, regulations continue to adapt. New research into the long-term effects of pesticide use is shaping future policies.

Conclusion

The **history of pesticides timeline** reflects a dynamic interplay between agriculture and technology. From ancient herbal remedies to modern synthetic options, the journey of pesticides has been marked by innovation and challenges. Today, as we grapple with the environmental impact of these substances, there is an urgent need to balance agricultural productivity with sustainability. The future of pest management lies in embracing integrated approaches, advancing technology, and fostering a deeper understanding of our ecological systems. By learning from history, we can work towards a more sustainable agricultural future.

Frequently Asked Questions

What was the first recorded use of pesticides in history?

The first recorded use of pesticides dates back to 2500 BC in ancient Sumer, where people used sulfur compounds to control insects.

When was arsenic first used as a pesticide?

Arsenic was first used as a pesticide in the 19th century, particularly in the 1860s, for controlling pests in agriculture.

What major pesticide was developed in the 1940s and is still widely known today?

DDT (dichloro-diphenyl-trichloroethane) was developed in the 1940s and became widely known for its effectiveness against mosquitoes and agricultural pests.

How did World War II impact the use of pesticides?

During World War II, the demand for pesticides increased significantly for military applications, leading to advancements in chemical formulations and production.

What was the significance of Rachel Carson's 'Silent Spring' published in 1962?

'Silent Spring' raised public awareness about the environmental and health impacts of pesticides, particularly DDT, leading to a shift in regulatory approaches.

When did the U.S. Environmental Protection Agency (EPA) begin to regulate pesticides?

The U.S. Environmental Protection Agency (EPA) began regulating pesticides in 1970, establishing standards for their safety and environmental impact.

What is integrated pest management (IPM), and when did it emerge?

Integrated Pest Management (IPM) emerged in the 1960s as a holistic approach to pest control that combines biological, cultural, and chemical practices to minimize pesticide use.

What was the impact of the 1996 Food Quality Protection Act?

The 1996 Food Quality Protection Act strengthened regulations on pesticide residues in food, emphasizing the protection of children and vulnerable populations.

What are neonicotinoids, and when did they become popular?

Neonicotinoids are a class of neuro-active insecticides that gained popularity in the 1990s for their effectiveness in controlling pests while being less harmful to mammals.

What is the current trend regarding pesticide use and organic farming?

The current trend shows a growing preference for organic farming practices that minimize or eliminate synthetic pesticide use, driven by consumer demand for healthier and environmentally friendly products.

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