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XENOBIOTICS AND THEIR TYPES

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Abstract

This study focuses on the correction of xenobiotics accumulated in the организма of cattle living in technogenic (industrial) areas through the use of chlorella, with the aim of improving their productivity.

Keywords

Metabolism, xenobiotics, toxicity, bioflavonoids, correction, synthetic compounds

Introduction

In recent years, under the influence of unfavorable environmental factors worldwide, a decrease in the natural resistance of farm animals has been observed. In particular, in technogenic regions, xenobiotics (toxic substances) accumulate in the bodies of livestock. These compounds may exert carcinogenic, mutagenic, allergic, and damaging effects on vital organs and systems, leading to increased disease incidence and decreased productivity.

The rapid development of modern society and the expansion of urban ecosystems are accompanied by the growth of industrial enterprises, which contributes to environmental pollution and the spread of xenobiotics.

General Concepts of Xenobiotics

Xenobiotics are chemical compounds that are foreign to a living organism and are not naturally produced within it. The term originates from the Greek words *“xenos”* (foreign) and *“bios”* (life). These compounds are often synthetic and created by humans for various purposes, such as pesticides, pharmaceuticals, and industrial chemicals.

It is estimated that more than 200,000 environmental chemicals are classified as xenobiotics. Most of them undergo metabolic transformation, primarily in the liver, to facilitate their elimination. However, some xenobiotics are excreted unchanged, while others accumulate in the body due to slow or incomplete metabolism.

The metabolism of xenobiotics is influenced by several factors, including age, sex, genetic characteristics, and enzyme activity. When these substances enter the body—through inhalation or ingestion—they are transported via the bloodstream to various organs. The liver and kidneys are particularly vulnerable, as they play a key role in detoxification and excretion processes.

Toxicity and Biological Effects

Xenobiotics can cause various pathological changes in both humans and animals. Some are highly toxic even at low concentrations, such as cyanides, which inhibit cellular respiration. Others may bind to DNA, RNA, or proteins, causing cytotoxic or mutagenic effects.

Certain xenobiotics can also trigger immune responses, act as carcinogens, or disrupt normal physiological processes. Due to their chemical stability, some compounds—known as recalcitrant xenobiotics—persist in the environment for long periods and contribute significantly to pollution.

Common examples include pesticides, industrial chemicals, and certain pharmaceuticals. These substances may enter the food chain and contaminate animal products such as milk and meat, posing risks to both animal and human health.

Role of Bioflavonoids in Correction

Bioflavonoids are natural plant-derived compounds with low toxicity and significant biological activity. They are known to stabilize cell membranes, neutralize free radicals, and enhance cellular repair mechanisms.

Due to these properties, bioflavonoids are considered effective agents for reducing the harmful effects of xenobiotics. They help detoxify the organism and improve resistance to toxic substances.

Experimental studies have shown that the accumulation of heavy metals (such as zinc and copper salts) in animal organs can increase dramatically under toxic exposure. However, the use of certain plant-based preparations has demonstrated a reduction in these concentrations, indicating their protective and corrective effects.

Xenobiotics in Animal Production

In livestock production, xenobiotics may originate from veterinary drugs, pesticides, and environmental contaminants. These substances can accumulate in animal tissues and products, and are not always fully eliminated during processing.

Therefore, many countries regulate the permissible levels of xenobiotic residues in food products and implement strict controls at early stages of production to ensure food safety.

Conclusion

Environmental pollution and toxic substances have significant negative impacts on living organisms, including humans, animals, and plants. Xenobiotics can induce antigenic reactions and exhibit carcinogenic, mutagenic, and embryotoxic effects.

Thus, studying methods to reduce their accumulation—such as the use of chlorella and bioflavonoids—is essential for improving animal health and productivity, especially in industrial regions.