CHAPTER 5

ENDOCRINE DISRUPTING EFFECTS OF PESTICIDES: FROM EXPOSURE TO HEALTH RISKS

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INTRODUCTION

Pesticides have become indispensable tools in modern agriculture, contributing substantially to crop protection, improved yields, and global food security. Since the mid-20th century, with the discovery of dichlorodiphenyltrichloroethane (DDT) and the expansion of the Green Revolution, the use of pesticides has proliferated worldwide. Alongside their benefits, however, concerns have grown regarding their environmental persistence, bioaccumulation in the food chain, and potential impacts on human health. Among these concerns, the ability of pesticides to disrupt the endocrine system has emerged as one of the most critical public health challenges.

The endocrine system governs a wide range of physiological processes including growth, reproduction, metabolism, and neurodevelopment and is finely tuned to respond to minimal hormonal changes. Endocrine-disrupting chemicals (EDCs), including several classes of pesticides, can mimic or antagonize natural hormones, alter receptor signaling, and interfere with hormone biosynthesis, metabolism, and degradation. Such disruptions may have profound effects on reproduction, thyroid function, neurodevelopment, and long-term metabolic health.

In this chapter, we explore the endocrine-disrupting properties of pesticides by examining exposure routes, underlying molecular mechanisms, and associated health consequences. The discussion integrates historical perspectives, regulatory considerations, and mechanistic insights from both animal and human studies. Particular attention is given to major pesticide groups—organochlorines, organ-

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