


# Chapter 8

## Leveraging the Pharmaceutical Area Through Multidisciplinary Synergy: From Prescription to Disintegration

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## **Leveraging the Pharmaceutical Area Through Multidisciplinary Synergy**


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### **ABSTRACT**

*The environmental implications of pharmaceutical industry drawn the attention of environmental scientists, prompting multidisciplinary collaborations toward sustainable solutions. Driven by the urgent need to combat the environmental persistence of pharmaceuticals, scholars across diverse disciplines including pharmaceutical sciences, biotechnology and chemical engineering are collaborating to develop effective solutions. Biotechnology uses microbes' natural breakdown power, while chemical engineering creates ideal conditions for efficient drug removal. In this work, a transdisciplinary approach was employed to study a model system comprising ibuprofen and laccase enzyme. By empowering researchers with a comprehensive understanding of multidisciplinary approaches, the project seeks to optimize reaction conditions for maximized drug degradation efficiency, contributing to environmental protection and cleaner water sources.*

### **1 INTRODUCTION**

Ever since the establishment of the first pharmaceutical company in 1885, many pharmaceutical companies and drugs have arisen from then. In fact, the Food and Drug Administration (FDA) has documented over 19000 pharmaceutical drug products in the market (FDA, 2018). The exposure of pharmaceuticals to the environment or drug pollution is an inevitable scenario that is rapidly emerging around the globe.

With environmental drug persistence a rising concern, a concerted effort to foster collaboration across pharmaceutical sciences, biotechnology, and engineering, holds the promise of developing environmentally friendly drug degradation methods. This chapter opens with an exploration of the global pharmaceutical landscape and various drug types. It then delves into how specific biotechnologies can be harnessed for drug degradation. This exploration highlights the critical elements of engineering in developing efficient processes for real-world application. Overall, this chapter

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