CHAPTER I
INTRODUCTION

1.1 Background

Biological drugs, or biologics, is a substance derived from living organisms, such as humans, animals, or microorganisms, that is used in the prevention, diagnosis or treatment of cancer and other diseases. There are many kinds of therapeutic agents that can be categorized as biologics, including monoclonal antibodies, recombinant proteins, hormones, vaccines, blood products, and advanced therapies such as stem cell and gene therapy (Malaviya & Mehra, 2018). The difference between biologics and chemical drugs fundamentally lies in their origin, structure, production process, and regulatory considerations. While chemical drugs are typically small molecules with stable structures and synthesized through chemical processes that are easy to be characterized and replicated, biologics, on the other hand, are large molecules with heterogeneous structures and are produced in living cells, making them highly sensitive. The production process of biologics involves complex methods and advanced biotechnological techniques, such as extraction, fractionation, cell culture, genetic engineering, fermentation, and cloning (Vulto & Jaquez, 2017). In the biologics production process, small changes in cell lines, fermentation conditions, or purification methods can affect the overall safety and efficacy of the final product. Moreover, even products with the same or identical amino acid sequences can have different kinds of folding, glycosylation, or other modifications. Due to the sensitive nature of biologics, the production process requires strict quality control, cold chain storage, and extensive regulatory evaluation, whereas for chemical drugs, it generally only requires simpler stability tests and shorter approval pathways (Vulto & Jaquez, 2017). Currently, biologics have become a solution for various chronic and life-threatening diseases, such as cancer, autoimmune disorders, and metabolic diseases. The cost of biologic therapies is relatively high due to the complexity of the biologic production process. This limits patient access to biologics globally. However, the expiration of patents on several originator biologics, meaning the biologics that was first developed and marketed by an innovator company with a specific active ingredient and patented, has led to the emergence of biosimilars worldwide (Kabir et al., 2019; Amaral et al., 2024).

Biosimilars are biologics products with high similarity to their reference (originator biologics), without clinically significant differences in safety, purity, or potency, and have been approved for use by the relevant regulatory authorities. While generic drugs are exact copies of their originator chemical drugs, biosimilars are not exact copies of biologics. The complexity of living cells used in biologics production makes it impossible to produce biologics that are identical to the originator biologics. Therefore, instead of focusing on the exact structure of the product, biosimilars developers must demonstrate comparability through comprehensive analytical, preclinical, and clinical studies (Tinsley et al., 2018). Regulatory authorities, such as the European Medicines Agency (EMA) and the Food and Drug Administration (FDA),

have established specific pathways for biosimilars approval, emphasizing similarities in quality attributes, pharmacokinetics, efficacy, and safety (Iskit, 2025).

The rapid growth of the global biosimilars industry is driven largely by the growing demand for cost-effective alternatives to biologics. EMA, as the pioneer in biosimilars regulation development and commercialization, approved the world's first biosimilars product, somatropin, in 2006. Since then, dozens of other biosimilars, including monoclonal antibodies, erythropoietin, filgrastim, and insulin glargine, have entered the European market (Amaral et al., 2024). Europe currently has the most established biosimilars regulatory framework, with a stepwise approach to demonstrating similarity through analytical characterization, non-clinical studies, and confirmatory clinical trials (Kabir et al., 2019). In addition to improving patient access to biologics therapies, the availability of biosimilars in Europe has also significantly reduced the cost of the healthcare system. In 2023, biologics accounted for 40% (€87.6 billion) of the total spending on medicines in the European Union, and this is forecast to continue increasing. In the USA, biologics account for 38–40% of all pharmaceutical spending (Kvien et al., 2025).

With a large population of 280 million and the largest economy in Southeast Asia, Indonesia offers a significant market for biosimilars. Compared to more mature markets such as Europe and the US, the biosimilars sector in Indonesia is currently in its infancy. The domestic pharmaceutical industry has demonstrated increased investment in biopharmaceutical capabilities, including recombinant protein production and vaccine development. Furthermore, the Food and Drug Monitoring Agency of Indonesia (*Badan Pengawas Obat dan Makanan, BPOM*) has adopted biosimilars development guidelines based on international standards, such as those of the World Health Organization (WHO) (Andri Wardiana & Ratih Asmana Ningrum, 2016). However, despite the increasing demand for biosimilars, domestic production remains very limited. Currently, only a few pharmaceutical companies are involved in the development of biosimilars in Indonesia. Given the significant potential and the limited involvement of pharmaceutical companies in biosimilars production in Indonesia, this study aims to identify and analyze the key barriers hindering biosimilars development in the country. By exploring regulatory, economic, technological, and human resource constraints, this study seeks to inform and provide recommendations for biosimilars industry development policies and strategies. The findings of this study will contribute to the broader discourse on biosimilars adoption in emerging markets and support efforts to improve access to affordable and high-quality biologics therapies in Indonesia.

1.2 Problem Statement

Amidst the growing national demand for affordable biologics therapies (biosimilars), limited domestic capacity to competitively supply biosimilars has become a major challenge for the Indonesian biopharmaceutical sector. This research addresses the following key questions: What are the key challenges throughout the development and commercialization lifecycle of biosimilars products in the Indonesian biopharmaceutical sector, and how are these challenges perceived and prioritized by key stakeholders in the industry?

There were a total of 28 questions given to the informants from industry. These questions were divided into four sections: Informant Profile, Company Profile, Challenges in Biological and Biosimilar Product Development, and Government Support and Regulation. Meanwhile, for informants from the government, there were 11 questions focused on Government Regulatory Support and Challenges, as well as Efforts to Improve Regulatory Conditions.

1.3 Research Objectives

This study aims to achieve the following objectives:

1. Identify and categorize the key challenges currently faced by Indonesian pharmaceutical companies on biosimilars development.
2. Provide strategic insights and recommendations to government agencies and domestic biopharmaceutical companies to effectively mitigate these key challenges, thereby enhancing the country's self-sufficiency and market competitiveness in the supply of biosimilars.