Chapter 1

Antibody Mimetics, Peptides, and Peptidomimetics

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Abstract

In spite of their widespread applications as therapeutic, diagnostic, and detection agents, the limitations of polyclonal and monoclonal antibodies have enthused scientists to plan for next-generation biomedical agents, the so-called antibody mimetics, which offer many advantages compared to traditional antibodies. Antibody mimetics could be designed through protein-directed evolution or fusion of complementarity-determining regions with intervening framework regions. In the recent decade, extensive progress has been made in exploiting human, butterfly (*Pieris brassicae*), and bacterial systems to design and select mimetics using display technologies. Notably, some of the mimetics have made their way to market. Numerous limitations lie ahead in developing mimetics for different biomedical usage, particularly for which conventional antibodies are ineffective. This chapter presents a brief overview of the current characteristics, construction, and applications of antibody mimetics.

Key words Antibody mimetics, Protein engineering, Monoclonal antibodies (mAbs), Therapeutics, Diagnostics

1 Introduction

A revolution has been made in the biological science through the development of the hybridoma technique to generate monoclonal antibodies (mAbs) [1]. In the meantime, advancements in genetic engineering revolutionized the methods to select, humanize and produce recombinant antibodies. The accomplishment of fabricating antibody fragments in different host systems (e.g., bacteria and yeast) and selection technologies, such as phage and ribosome display, permitted the production of antibody-based reagents for varied applications. On the other hand, animal-sourced antibodies faced some challenges such as ethical concerns to use animals for experiments, the penetration difficulty for large sized antibodies in solid tumors, immunogenicity [2], presence of six hypervariable loops that are difficult to manipulate at once, if generation of a large synthetic library is required [3], complex multi-chain architecture and glycosylation of the heavy chains [4]. Besides, some studies reported that, some antibodies have lost their activity when

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