

Preface

RNA therapeutics are a new class of medications based on ribonucleic acid (RNA). Research has been working on clinical use since the 1990s, with significant success in cancer therapy in the early 2010s. In 2020 and 2021, mRNA vaccines have been developed globally for use in combating the coronavirus disease (COVID-19 pandemic). The Pfizer–BioNTech COVID-19 vaccine was the first mRNA vaccine approved by a medicines regulator, followed by the Moderna COVID-19 vaccine, and others.

The main types of RNA therapeutics are those based on messenger RNA (mRNA), antisense RNA (asRNA), RNA interference (RNAi), and RNA aptamers. Of the four types, mRNA-based therapy is the only type which is based on triggering synthesis of proteins within cells, making it particularly useful in vaccine development. Antisense RNA is complementary to coding mRNA and is used to trigger mRNA inactivation to prevent the mRNA from being used in protein translation. RNAi-based systems use a similar mechanism, and involve the use of both small interfering RNA (siRNA) and micro RNA (miRNA) to prevent mRNA translation and/or degrade mRNA. However, RNA aptamers are short, single stranded RNA molecules produced by directed evolution to bind to a variety of biomolecular targets with high affinity thereby affecting their normal in vivo activity.

RNA is synthesized from template DNA by RNA polymerase with messenger RNA (mRNA) serving as the intermediary biomolecule between DNA expression and protein translation. Because of its unique properties (such as its typically single-stranded nature and its 2' OH group) and its ability to adopt many different secondary/tertiary structures, both coding and noncoding RNAs have attracted attention in medicine. Research has begun to explore RNAs potential to be used for therapeutic benefit, and unique challenges have occurred during drug discovery and implementation of RNA therapeutics.

In the present book, ten typical literatures about RNA therapeutics published on international authoritative journals were selected to introduce the worldwide newest progress, which contains reviews or original researches on RNA therapeutics. We hope this book can demonstrate advances in RNA therapeutics as well as give references to the researchers, students and other related people.

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