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Bacterial Survival Through RNA: Mastering Rapid Gene Control

Bacteria survive changing environments by quickly adapting to stress. They do this using advanced genetic controls based on RNA. This review explains how RNA systems help bacteria react fast. RNA is highly flexible. Its structure can change in response to the environment. This makes it perfect for rapid and precise gene regulation. We first cover the basics of how RNA folds into functional shapes. We then analyse key regulatory methods. These fall into three main types: small noncoding RNAs, riboswitches, and RNA modifications. These tools let bacteria control gene expression with high precision. They are vital for managing virulence, antibiotic resistance, and immune evasion. The role of long non-coding RNAs is also explored. These molecules bind to DNA, proteins, and other RNAs. They act as major control hubs during infection for both the pathogen and the host. Finally, we assess new technologies pushing the field forward. Understanding these RNA mechanisms is key to developing new treatments for bacterial infections.

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