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Prospects of optical biosensors for emerging label-free RNA analysis

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Highlights

- We describe the main types of RNAs and current challenges for their specific and sensitive detection
- We review conventional methods for RNA analysis and discuss how optical biosensors could overcome many of their limitations
- We review current applications of optical biosensors to RNA analysis and highlight advantages/disadvantages of this technique for quantification and identification of RNA targets in biological samples

Abstract

RNA is critical in countless cellular processes, and researchers are constantly discovering new types and attributing them different roles. Consequently, a growing interest in efficient RNA analysis has arisen. However, RNA detection is complicated and generally requires the use of labels. Major efforts are being devoted to conceive new approaches for RNA analysis with no need of markers. Optical biosensing is a highly sensitive approach that circumvents many of conventional methods' limitations. Lately, label-free applications with optical biosensors have been developed for short as well as for long RNAs. The low limits of detection at the pM level enabled by optical biosensors, together with a fast analysis, their reusability and the label-free scheme of operation, clearly highlight them among the most promising next-generation RNA screening platforms. This review covers the most relevant optical biosensor platforms and their potential for enabling sensitive and label-free RNA analysis.

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