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(54) Title: REITERATIVE SHORT READ SEQUENCING INSIDE A CELLULAR SAMPLE

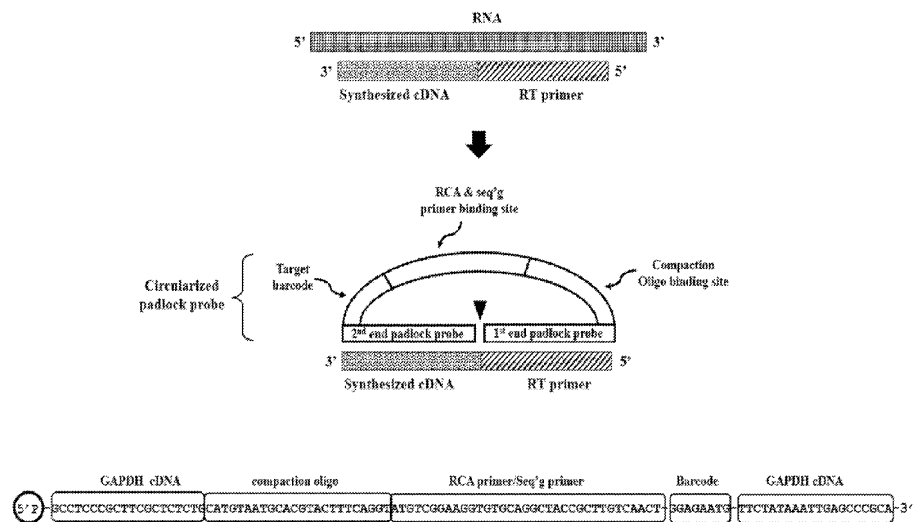


FIG. 1

(57) **Abstract:** The present disclosure provides methods for conducting *in situ* multiplex and multi-omics detection and identification using coded padlocks probes. The methods comprise simultaneous use of RNA-specific padlock probes and polypeptide-specific padlock probes to detect both RNA and polypeptides in a cellular sample. Both types of probes include a barcode that unique identifies the RNA or polypeptide that that padlock probe detects. Both types of probes also include a batch-specific sequencing primer binding site to enable sequencing a desired subset of concatemer template molecules. Use of the batch-specific sequencing primers reduces over-crowding signals and images, to produces optical images that are intense and resolvable. By conducting multiple rounds of sequencing on the same cellular sample using different batch-specific sequencing primers enables multiplex and multi-omics sequencing to reveal numerous target RNAs and their encoded polypeptides.

[Continued on next page]

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