The expression of miRNAs cannot only be measured in tissue or cell culture samples; they are also present in body fluids, like urine, blood, or even milk. Some of those circulating miRNAs are already known to be specific disease markers, especially for different forms of cancer. In the field of cardiovascular research, several microRNAs in serum have been found to improve the diagnosis of acute coronary syndromes on top of the clinical gold standard high-sensitive cardiac troponin. To be used as a routine biomarker for ACS, the speed of the quantification of microRNAs must be increased. The current PCR-based quantification of miRNAs takes much too long to affect decision-making in acute life-threatening conditions such as acute coronary syndrome and is thus unlikely to replace or even complement cardiac troponin assays.

Some level of caution should be taken into consideration when assessing the usefulness of circulating RNAs as biomarkers, as recent studies report on the importance of the origin of biomarkers and their impact on biomarker specificity. For example, a significant proportion of miRNAs derived from red and white blood cells have been found to be present as contaminants in plasma preparation. In addition, inherent differences in biological samples and the methods of collecting and analyzing them can dramatically affect the detection and quantification of miRNAs and other (noncoding) ncRNAs. To identify true disease-specific circulating RNAs, the approaches used for quantification of these RNAs should be optimized and validated for accurate quantification of circulating RNAs (Roosbroeck et al. 2013).

3.6 lncRNA

Noncoding RNAs with a length of more than 200 nucleotides belong to the group of long noncoding RNAs (lncRNAs). Long noncoding RNAs have only just recently been identified to play a major role in gene regulatory pathways for a wide spectrum of human disease conditions, including multiple cancer models. Presently there are already numerous regulatory (and other) roles for which lncRNAs have been identified to be responsible for, though such roles can be classified as either positive or negative expressions of gene regulation at either one of the transcriptional or posttranscriptional levels (Ayers 2013).

In biomarker research, the group of lncRNAs is coming into focus, especially in cancer research. Due to its regulatory functions, different potential lncRNA biomarker candidates are already available. One of the first identified lncRNAs, H19, is a biomarker for tumors of the esophagus, liver, bladder, and colon and for metastases in the liver. A loss of methylation in its promoter region leads to a strong upregulation of this lncRNA, indicating the presence of tumor tissue. Similar to miRNAs, lncRNAs are also detectible in body fluids, although they are less stable than microRNAs.

One FDA-approved diagnostic assay for prostate cancer is based on the detection of the long ncRNA PCA3 in urine samples of patients at risk for prostate cancer. The Progensa™ PCA3 test from Gen-Probe Inc. uses the transcription-