

EDITORIAL

MicroRNAs: the future of genomic science?

The microRNAs (miRNAs) are small, non-coding RNA molecules of around 22 nucleotides found in animals, plants and some viruses. They have a role in RNA silencing and post-transcriptional regulation of gene expression, modulate almost all biological processes and are essential for maintaining cellular homeostasis. Dysregulation of miRNA expression has been associated with aberrant gene expression, leading to a wide range of pathological conditions.

Encoded by eukaryotic nuclear DNA in animals and by viral DNA in viruses that have a genome based on DNA, miRNAs function as a result of base-pairing with complementary sequences on messenger RNA (mRNA) strands. This results in 'silencing' of the mRNA molecules by cleavage of the mRNA strand, destabilisation through shortening of its poly(A) tail, or less-efficient translation of the mRNA into proteins, or a combination thereof.

MiRNAs resemble small interfering RNAs (siRNAs), but differ in that they are derived from regions of RNA transcripts that fold back on themselves to form short 'hairpins'. It is thought that the human genome encodes more than 1000 miRNAs, and that they are abundant in many cell types, targeting some 60% of the genes of humans and other mammals.

The ubiquity of miRNA occurrence is reflected in the current literature, which reports a wide range of potential biomarker applications for this highly conserved molecule. These are exemplified by work in areas such as cardiology, respiratory medicine and transplantation.[1–4] However, bearing in mind the potential for base-pair mismatching between mRNAs and miRNAs, various roles as biomarkers in cancer hold considerable promise, as demonstrated, for example, in tumours of the liver,[5] cervix [6] and prostate.[7]

The focus on miRNAs and cancer continues in this issue of *BJBS*, with work reported on the role of miRNA-124 in

pancreatic adenocarcinoma,[8] miRNA-21 in osteosarcoma,[9] and miRNA-146a in gastric cancer.[10] Clearly, this highly conserved molecule may facilitate diagnosis and better treatment for patients with cancer and in a wide range of other disparate medical conditions.

References

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