Identification of MiRNAs as specific biomarkers in prostate cancer diagnostics: A combined in silico and molecular approach

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Abstract. Cancer is a class of diseases, classified by the organ of origin and characterized by uncontrollable cell growth. Our focus is on prostate cancer (PC) which starts in the prostate and is generally a walnut-sized gland located below the bladder. Approximately 4500 males in South Africa are diadnosed annually, thus making it the second most common cause of cancer death in men.

Current diagnostic methods include digital rectal examinations (DRE), prostate specific antigen test (PSA), biopsy and ultrasound however, they are invasive and lack specificity and sensitivity. Therefore, the development of a non-invasive, specific and sensitive early detection method is required. Biomarkers are biological indicators i.e. DNA, proteins and miRNA, which have recently been identified as targets for the early detection of disease.

MiRNAs are small, naturally occurring, non-coding RNA molecules directly involved in regulating gene expression at the post-transcriptional level. They offer great potential as biomarkers for cancer detection due to their remarkable stability in blood and characteristic expression in different diseases. The aim of this study is therefore to identify miRNAs as specific biomarkers for the early detection of PC.

The identification of specific miRNAs and their targets will be done using various bioinformatics techniques including programming and statistical analyses. Once identified, these miRNAs will be experimentally validated to generate expression profiles using molecular techniques. Furthermore, newly identified, experimentally validated miRNAs will be used in combination with nanotechnology to develop a diagnostic kit for the early detection of PC.