

Evaluation of CA19-9 glycovariant immunoassays for the detection of clinically significant prostate cancer

Introduction

Prostate cancer (PCa) is the second most common cancer in men and the second leading cause of cancer-related mortality in men who are over 50 years old.

Altered glycosylation is a hallmark of cancer. Therefore, glycovariants including cancer antigen 19-9 (CA19-9) could be used as a biomarker.

This study aimed to evaluate the CA19-9 as a putative biomarker for PCa. Additionally, the study aimed to identify the protein expression patterns in prostate cancer and find the localization of the CA19-9 glycan epitope on the proteins expressed in PCa.

Materials and Methods

A highly sensitive nanoparticle-aided time-resolved fluorescence immunoassay (NP-TRFIA) was used to evaluate CA19-9 from 569 samples. Europium-doped nanoparticles coated with lectins including MBL and MGL were used to detect the binding of the analyte (figure 1). CA19-9-CA19-9 assay was used to evaluate the functionality of the glycovariant assay (figure 1).

The protein expression patterns, and glycan epitope were discovered using affinity pull-down and mass spectrometry (figure 2). Biotinylated CA19-9-binding Fab2 fragments and biotinylated MBL were used to bind proteins in benign and prostate cancer samples.

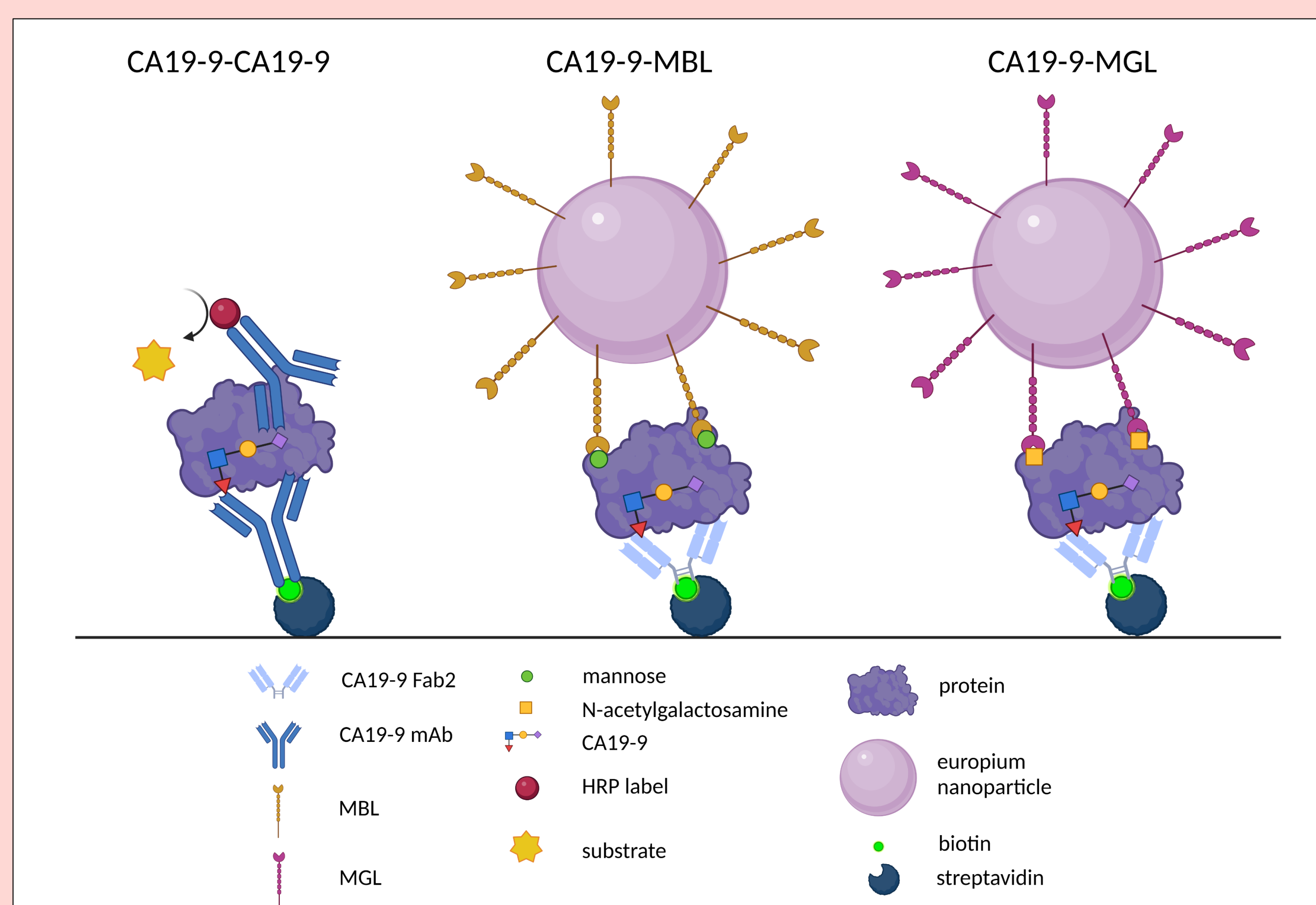


Figure 1. Detection of altered glycosylation patterns using CA19-9, MBL, or MGL. Created with BioRender.com

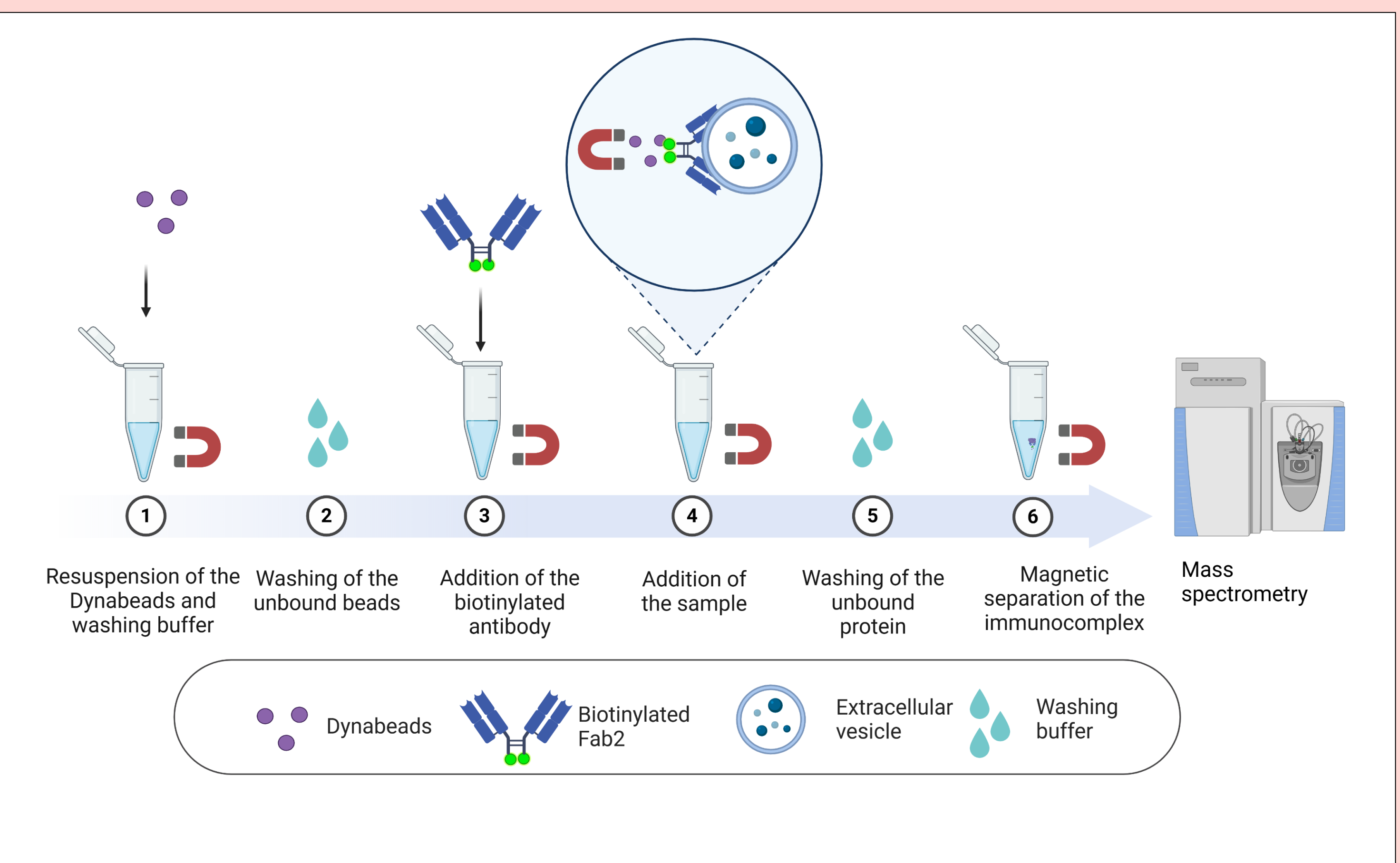


Figure 2. Affinity pull-down. Created with BioRender.com

Results

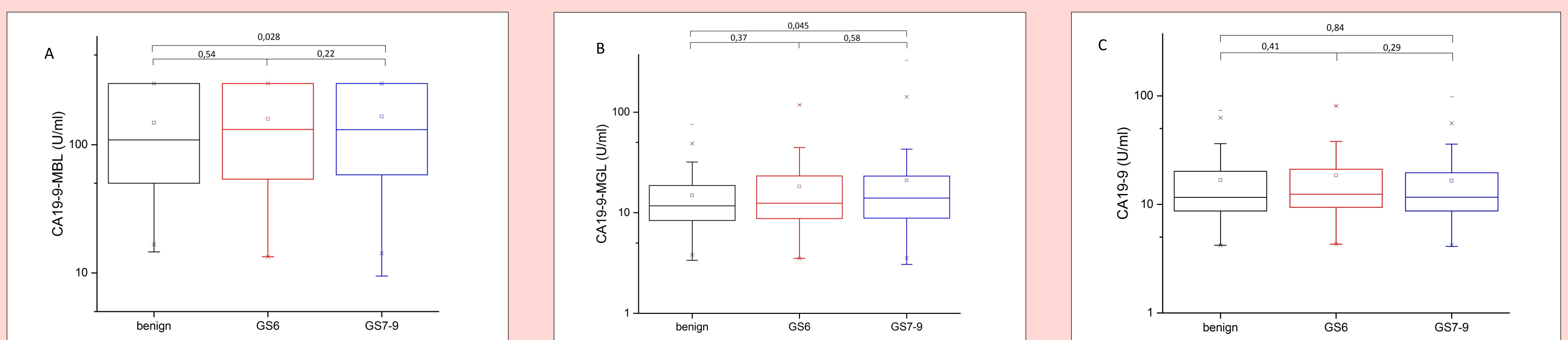


Figure 3. CA19-9 concentrations of benign, Gleason score 6 and Gleason score 7-9 where binding of the samples was detected using MBL (A), MGL (B), or CA19-9 (C).

CA19-9-MBL (figure 3A) and CA19-9-MGL (figure 3B) assays enabled statistically significant discrimination between benign and PCa (Gleason score 7-9) samples. As expected, the CA19-9-CA19-9 assay did not show discrimination between benign and PCa samples (figure 3C).

Specific proteins unique to prostate cancer samples were identified using affinity pull-down and mass spectrometry.

Conclusions

In summary, CA19-9 is a potential biomarker for identifying patients with well-differentiated PCa. In addition, further investigations of the proteins expressed in benign and prostate cancer samples should be conducted.

References

- Butler, W. & Huang, J. (2021) Glycosylation Changes in Prostate Cancer Progression. *Frontiers in Oncology* 11.
- Miller, K. D., Nogueira, L., Devasia, T., Mariotto, A. B., Yabroff, K. R., Jemal, A., Kramer, J. & Siegel, R. L. (2022) Cancer treatment and survivorship statistics, 2022. *CA: A Cancer Journal for Clinicians* 72: 409–436.