

DNA Methylation of ONECUT2 in Prostate Cancer

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Bridge UnderGrad Science (BUGS) Summer Research Program

Abstract

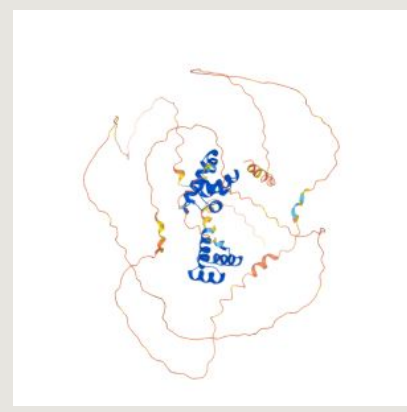
In the US, prostate cancer is the second leading cause of cancer-related deaths amongst men.^[1] Despite significant advancements in treatment, cancer tumors may, nonetheless, develop resistance to common treatments such as neuroendocrine drugs or castration in later stages of the disease, so detecting prostate cancer at its earliest stages is critical. Currently, preventative screening consists of tests for prostate-specific antigen (PSA) levels in the patient's blood, yet there exists an exceptionally high false-positive rate of 46.6%, leading to unnecessary biopsies and treatment.^[2]

Our research lab proposes the use of ONECUT2 gene methylation as a biomarker for prostate cancer. Our research suggests a strong correlation between the gene body methylation of ONECUT2 gene and prostate cancer development. Additionally, our lab is working on a drug, utilizing a ONECUT2 gene demethylation agent to potentially cure prostate cancer.

1. Siegel RL, Miller KD, Jemal A. Cancer statistics, 2020. CA Cancer J Clin. 2020 Jan;70(1):7-30. doi: 10.3322/caac.21590. Epub 2020 Jan 8. PMID: 31912902.
2. Lumberras B, Parker LA, Caballero-Romeu JP, Gómez-Pérez L, Puig-García M, López-Garrigós M, García N, Hernández-Aguado I. Variables Associated with False-Positive PSA Results: A Cohort Study with Real-World Data. Cancers (Basel). 2022 Dec 30;15(1):261. doi: 10.3390/cancers15010261. PMID: 36612257; PMCID: PMC9818944.

ONECUT2

The ONECUT2 gene encodes a transcriptional factor that is associated with prostate cancer progression. We have shown that its gene body methylation is positively correlated with its expression and prostate cancer aggression.



Protein: One cut domain family member 2

Biopsy Diagram

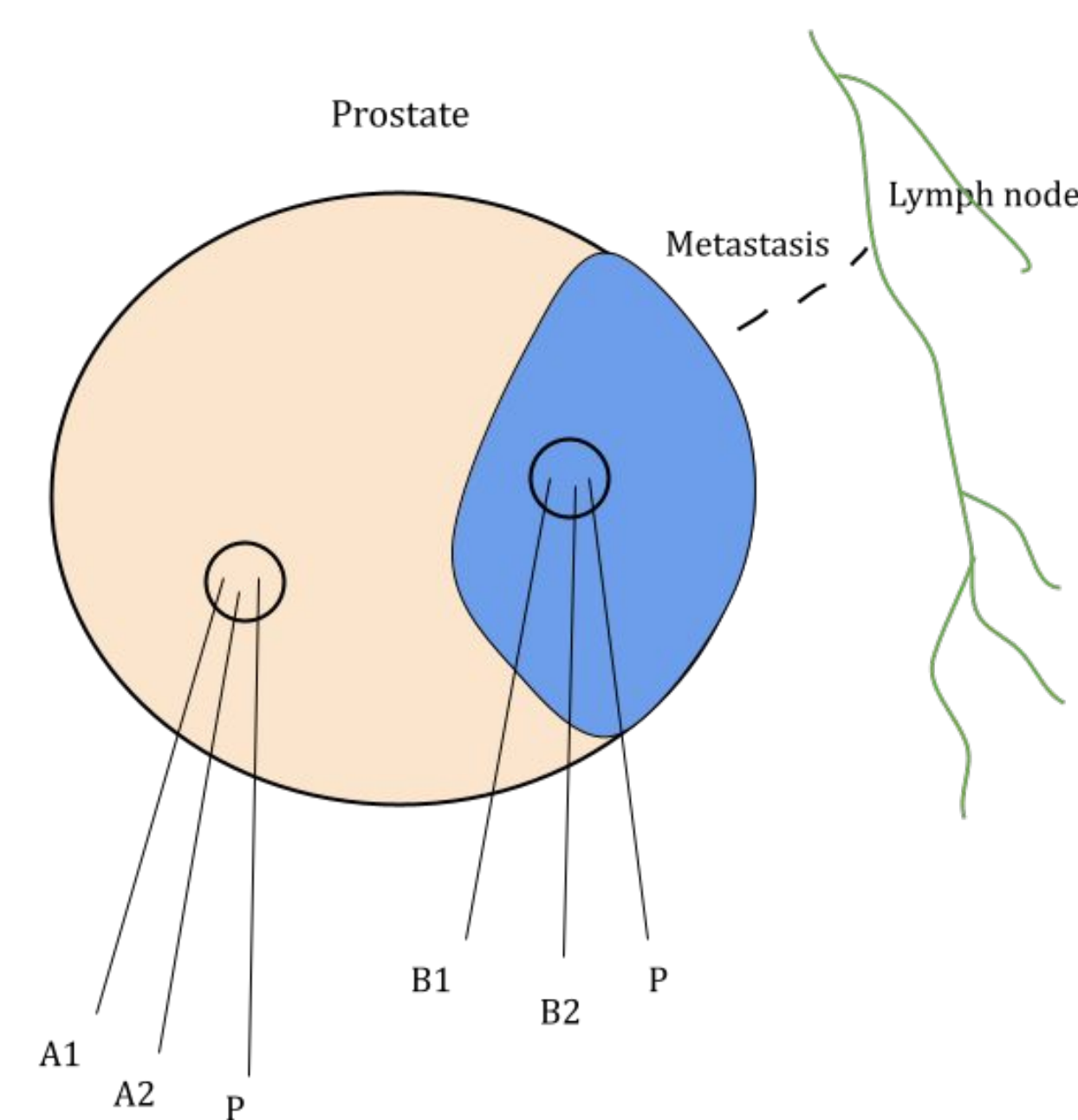
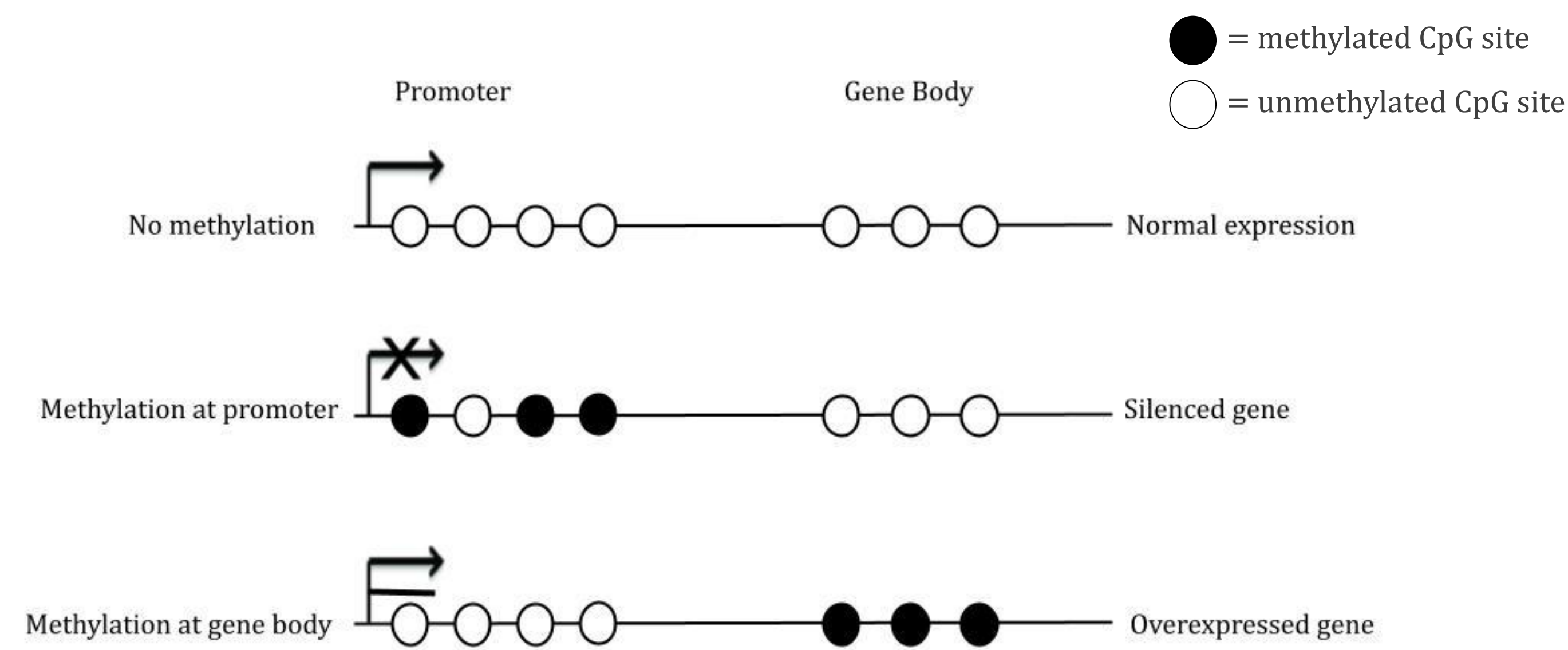


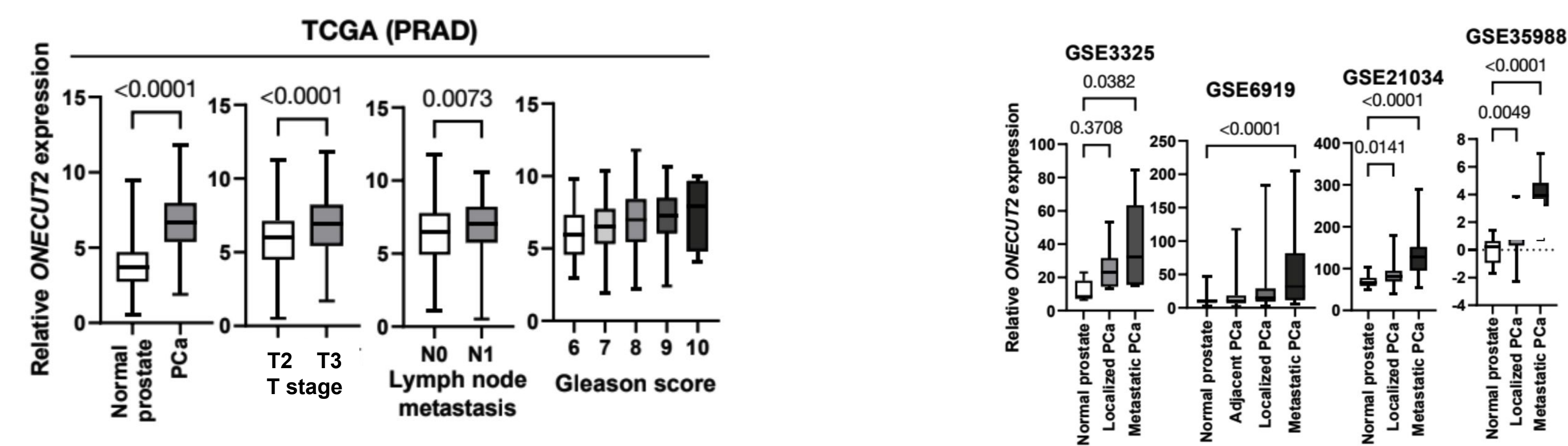
Figure of a biopsy procedure for prostate cancer diagnosis (A and B are used for testing DNA methylation, while the third needle is given to pathologists)

DNA Methylation

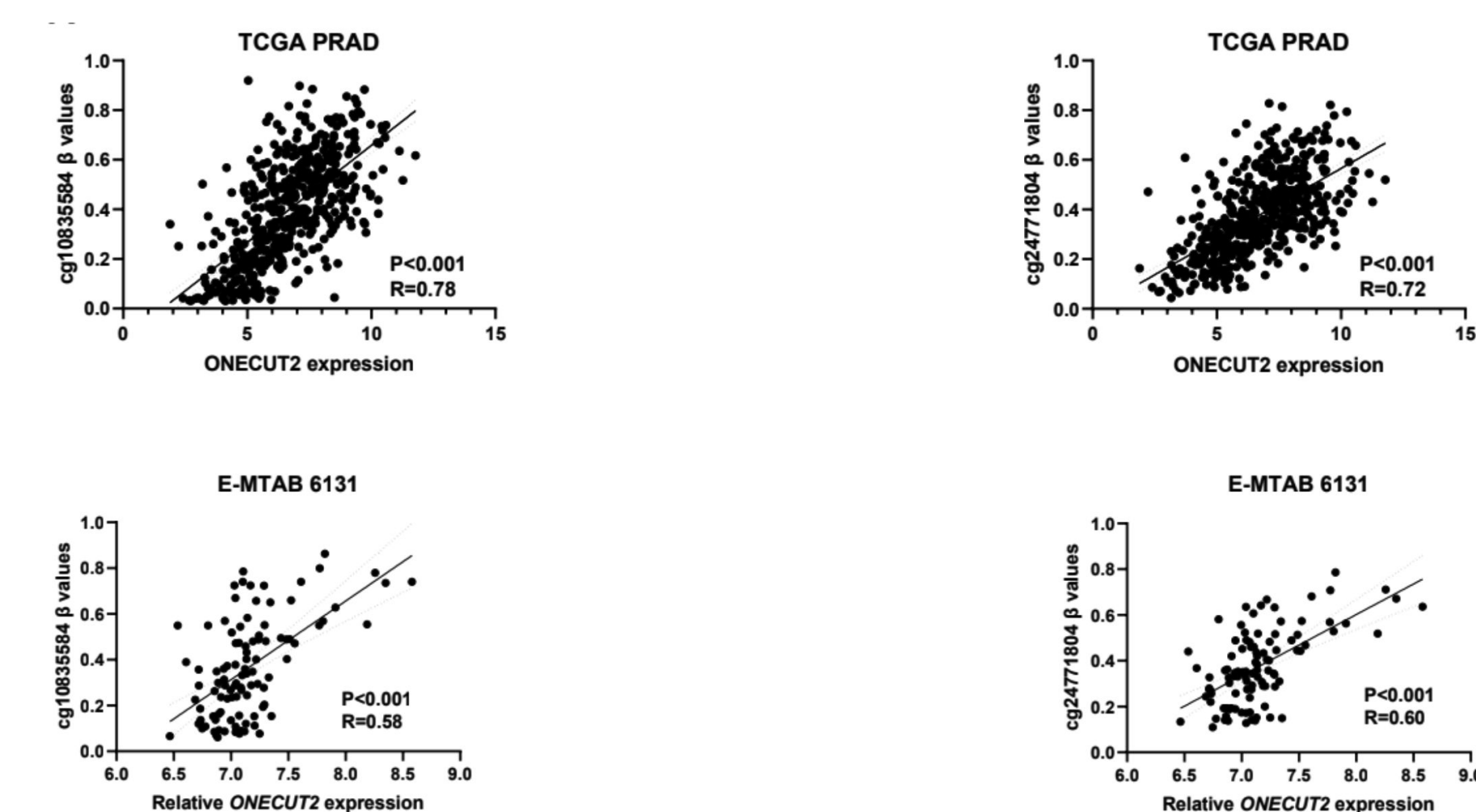


Gene body Methylation / Expression / Cancer Stage

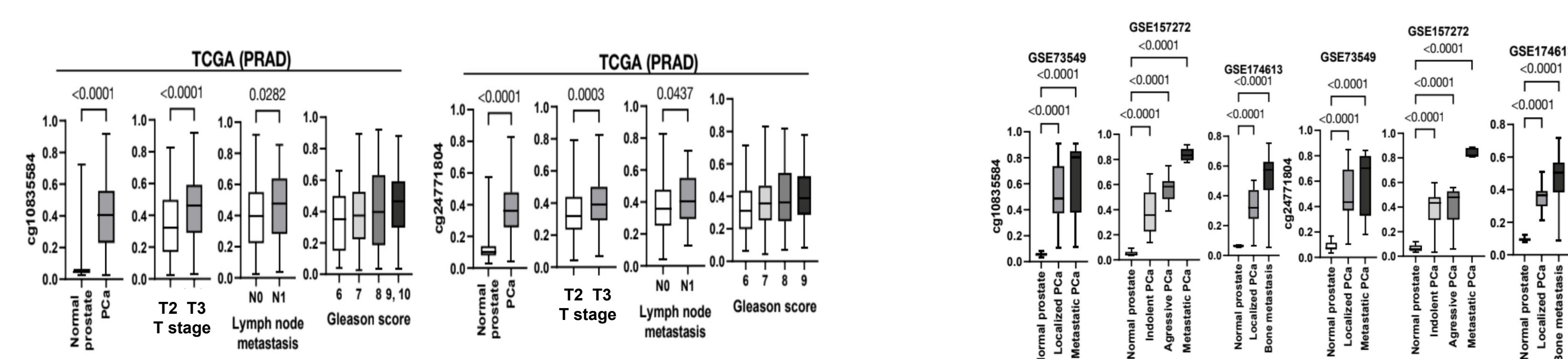
Relationship between Cancer Stage and ONECUT2 Expression



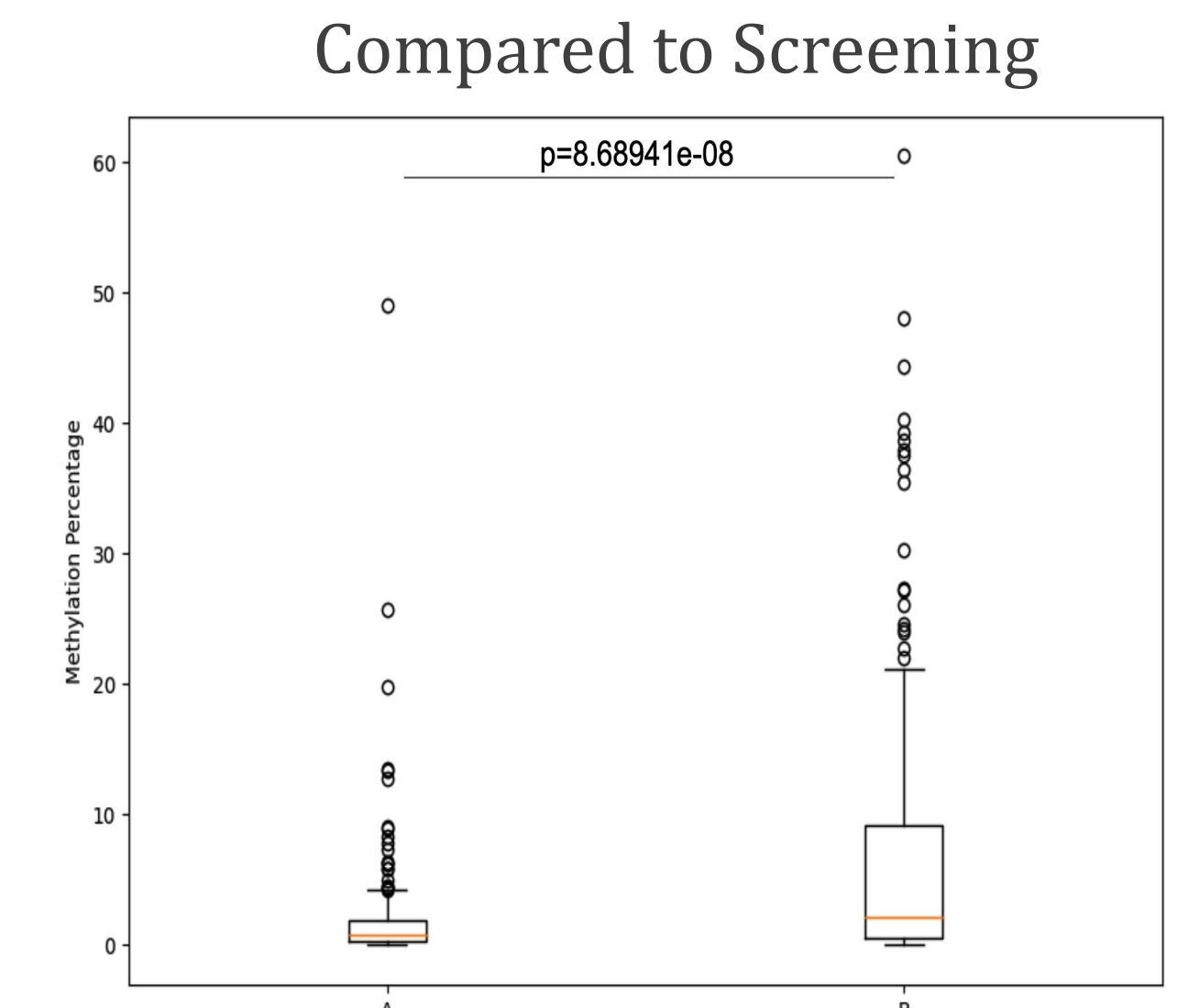
Relationship between ONECUT2 Expression and Gene Body Methylation



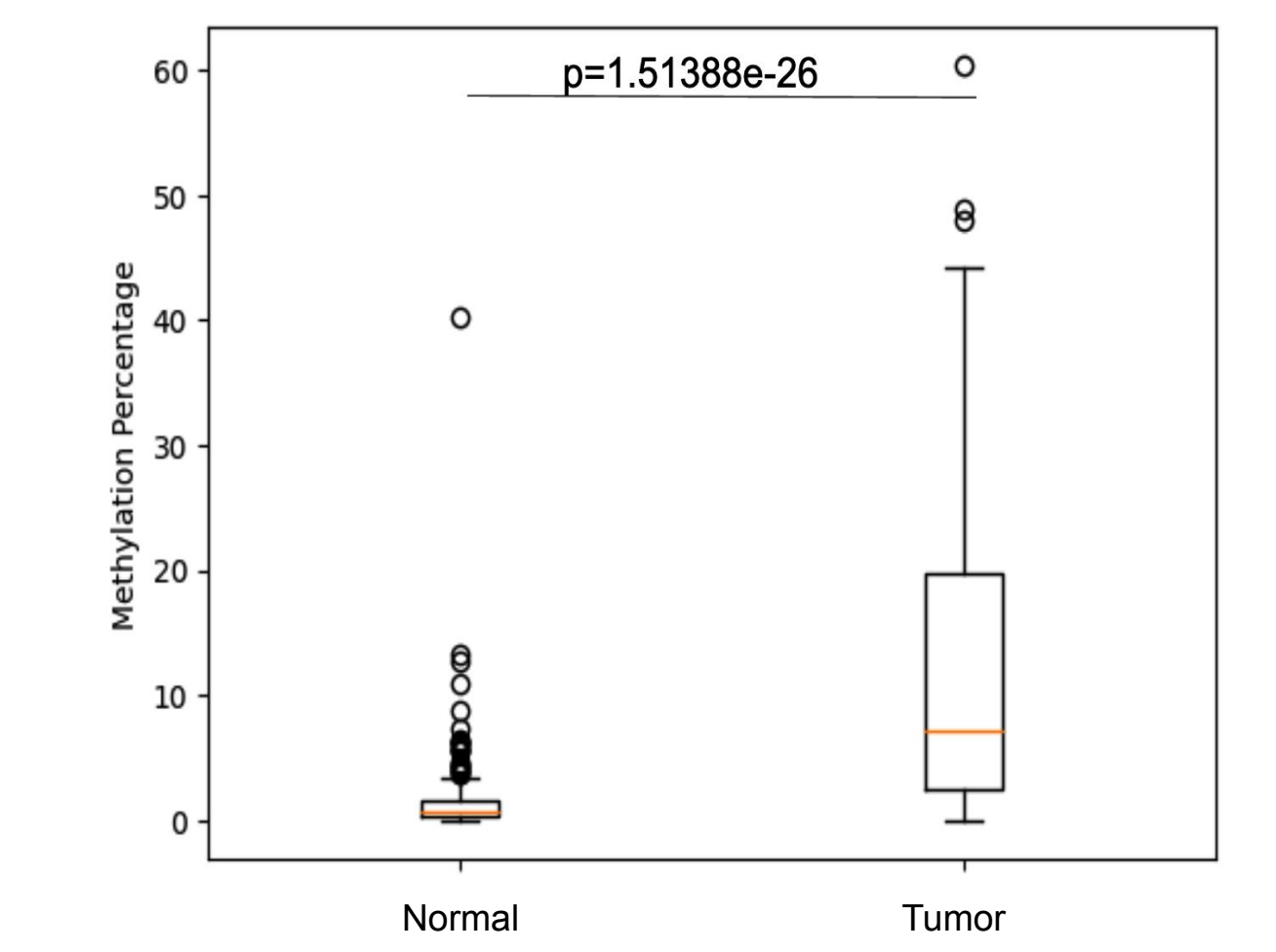
Relationship between Cancer Stage and Gene Body Methylation



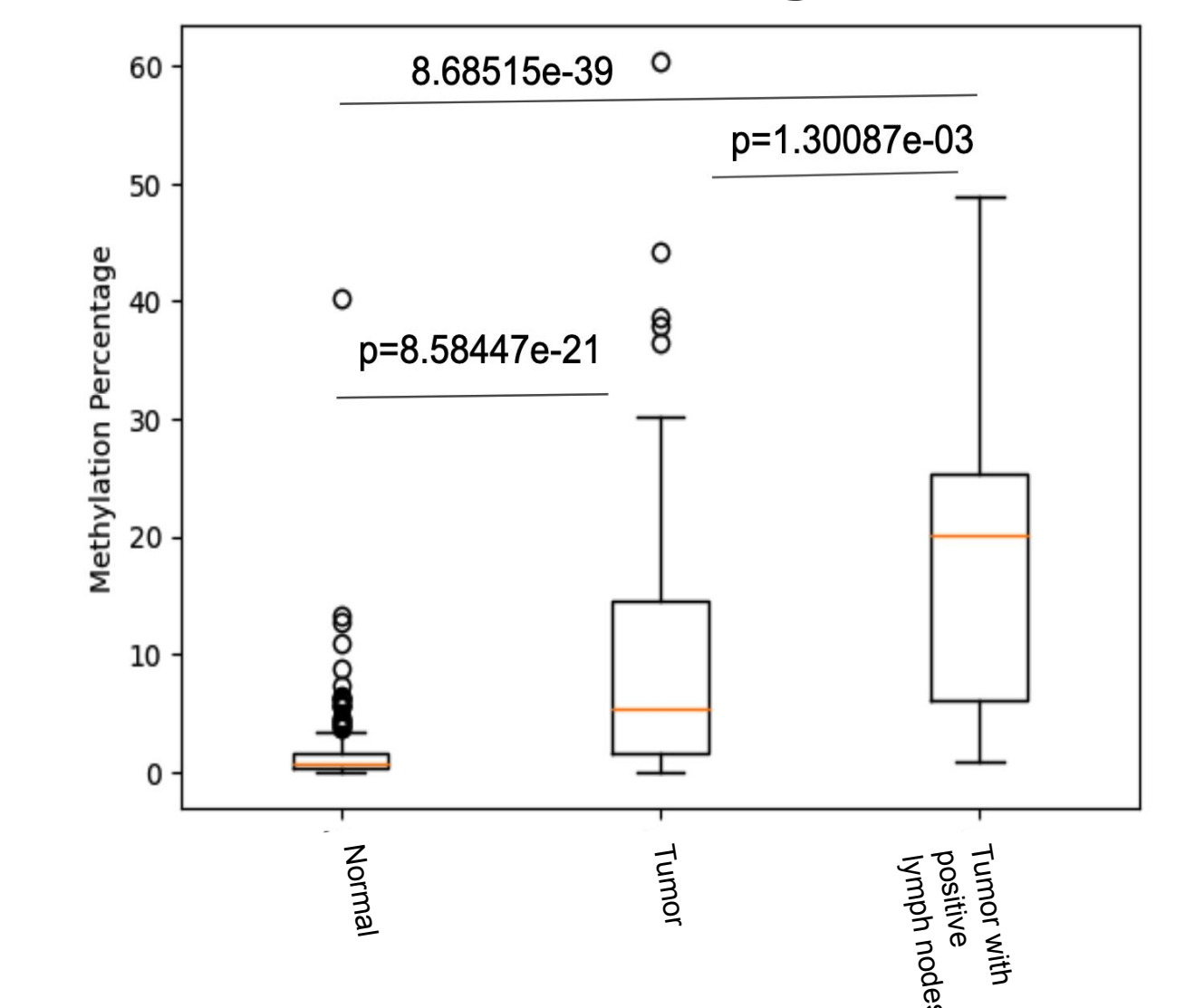
Gene Body Methylation Percentage



Compared to Pathologist's Results



Tumor Stages



Conclusion

The gene body methylation of ONECUT2 is strongly correlated with its expression level and the patient's prostate tumor stage. Further, we find that it is a potential biomarker for prostate cancer diagnosis. In the future, our research lab plans to investigate in potential markers in liquid biopsies and a potential drug treatment of prostate cancer through the demethylation of the ONECUT2 gene.

CONTACT US

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