



A Preliminary Assessment of Prostate Specific Antigen in Transfers Under Various Conditions

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Introduction

Prostate specific antigen (also known as PSA or p30), is a protein used as an effective marker for seminal fluid when sperm cells are not present. The ABACard® p30 test can be used for the detection of prostate specific antigen protein in levels as low as 4 ng/mL.¹ Most current research surrounding the stability of PSA over time looks at it within the female reproductive tract², where other factors are influencing the degradation of the protein over time. The aim of this study was to investigate the persistence of prostate specific antigen detection in transfer stains under various conditions.

Methods

Below are the variables for this study that were manipulated and how this was achieved. The ABACard® p30 was used for detection of PSA under each condition. Sample size was kept to 15uL under each condition test.

- **Time:** The semen stains were tested right from deposition while some were allowed to dry up to 72 hours before testing. This was tested both as transfer and non-transfer stains.
- **pH:** The pH environment was manipulated by adding 50% NaOH in water to the sample before testing.
- **Dilutions:** 15 uL of semen were serially diluted up to 1:1,000,000 in concentration and then tested.
- **Transfer Stains:** Transfer stains were created by waiting different lengths of sample drying time prior to its transfer on to the receiving substrate. Transfers were made with the use of a nitrile glove covered tube and application pressure was kept constant. Drying times ranged from 0 minutes up to 72 hours.
- **Wet versus Dry:** K-Y™ jelly lubricant was used on cotton swatches to determine the differences between wet versus dry conditions of the receiving substrate and their possible effect on the detection of PSA. These conditions were obtained for both transfer and non-transfer conditions, non-transfer consisting of the direct placement of the 15 uL aliquot onto the receiving substrate.
- **Adobe Photoshop:** Photoshop LAB mode lightness values were used for the wet vs dry conditions as well as the dilution concentrations to look at the color intensity of the test bands on the cards. LAB mode was chosen as it deals with the human perception, making it the most relevant of the different modes to this study.

Results and Discussion

Time: Waiting different amounts of time before testing yielded no significant differences in the intensity of the test band nor the rate of appearance. Longer periods of time would need to be examined in order to determine any longer term effect on PSA degradation and detectability.

pH: PSA was detectable in a range from 7 to 12 pH. Further research is necessary for more acidic conditions. Additionally, different chemicals ought to be used to determine chemical effect on PSA detection.

Transfer Stains: Under dry conditions (no K-Y™), transfer stains were nondetectable by the ABACard® p30 test, except at 24 hours where three runs reproduced positive results every time. The wet condition yielded positive results every time regardless of time as a factor. This indicates that other factors may play a role in the transfer of a stain and further research is required to determine those variables and their effect on detection.

Wet vs Dry: The wet and dry conditions exhibited no significant differences on the rate of appearance as evidenced by Figure 1 below, however the overall rate of appearance was influenced by the dilution concentration. However, the wet condition did yield stronger results in the examination of dilution concentration as shown by Figure 2, when comparing the wet vs. dry LAB values over the dilution series.

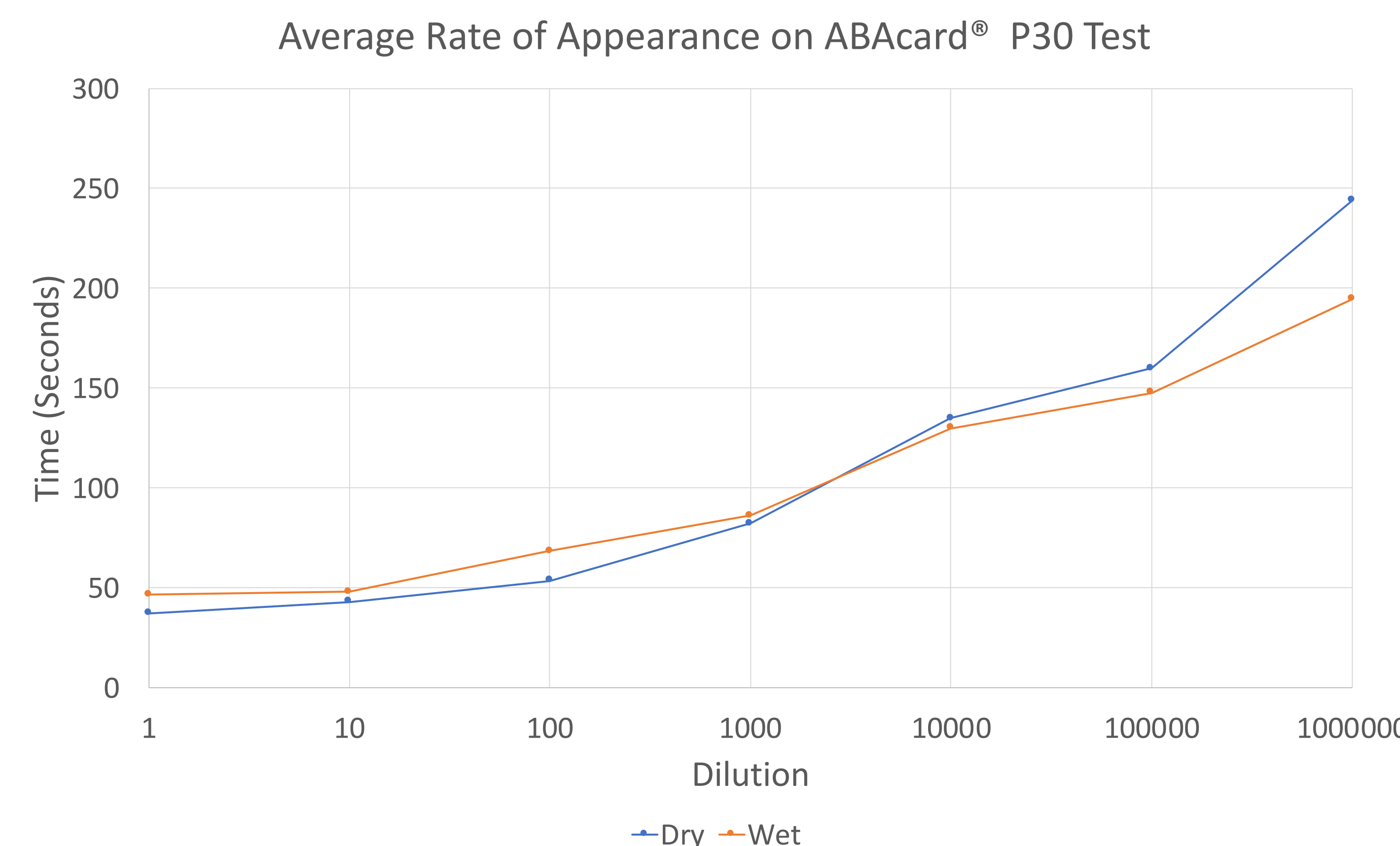


Figure One: An R² value of 0.9791 was found for the dry conditions. An R² value of 0.9783 was found for the wet condition. The p value was found to be greater than 0.05 (p>0.8953) making result differences statistically insignificant.

Results and Discussion

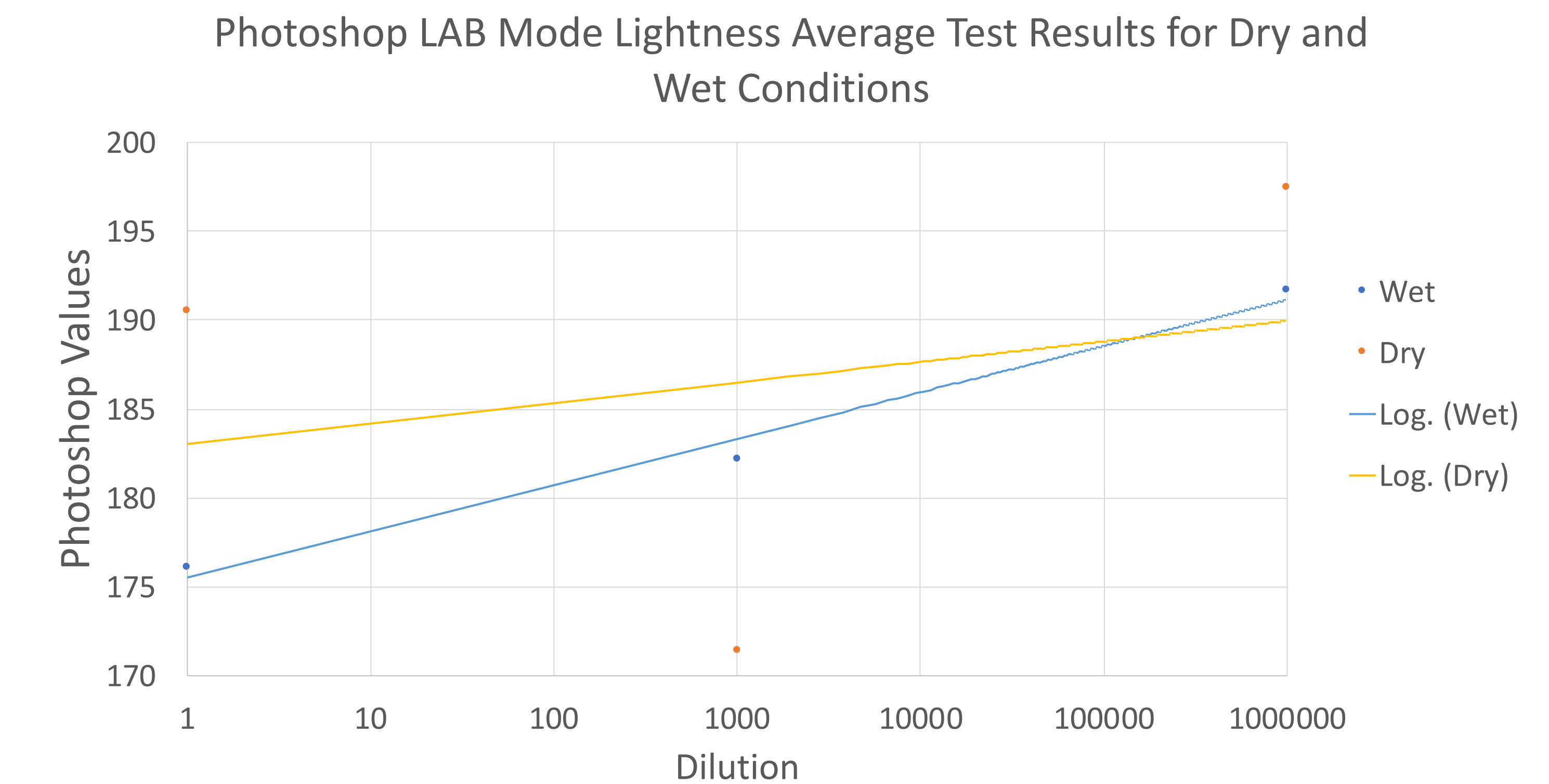


Figure Two: An R² value of 0.0659 was found for the dry conditions. An R² value of 0.985 was found for the wet conditions. The P value was found to be less than 0.05 (p<0.0054) indicating statistically significant differences in the use of wet and dry conditions.

Conclusions

Prostate Specific Antigen can withstand various conditions and still be detectable in small amounts. Further research is necessary for all the conditions examined to better statistical significance and further understanding. Additionally, a significant difference could be seen in Adobe Photoshop in the comparison of wet and dry conditions indicating that photoshop could be used in differentiation sample types. Further research would be required to determine the extent to which adobe photoshop could be used in examining results. This study adds to the knowledge of PSA transfer and its role in forensic science.

References

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2. Srettabunjong, Supawon, Parimol Betsset, Suvit Limawongpranee, and Pattama Ekpo. "The Stability of Prostate-Specific Antigen in Semen Under Various Temperatures." *Journal of Forensic Sciences* 60, no. 6 (2015): 1577-581. doi:10.1111/1556-4029.12791.

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