

Synthesis and Spectroscopic Properties of a Boronic Acid Fluorophore for Sugar Sensing



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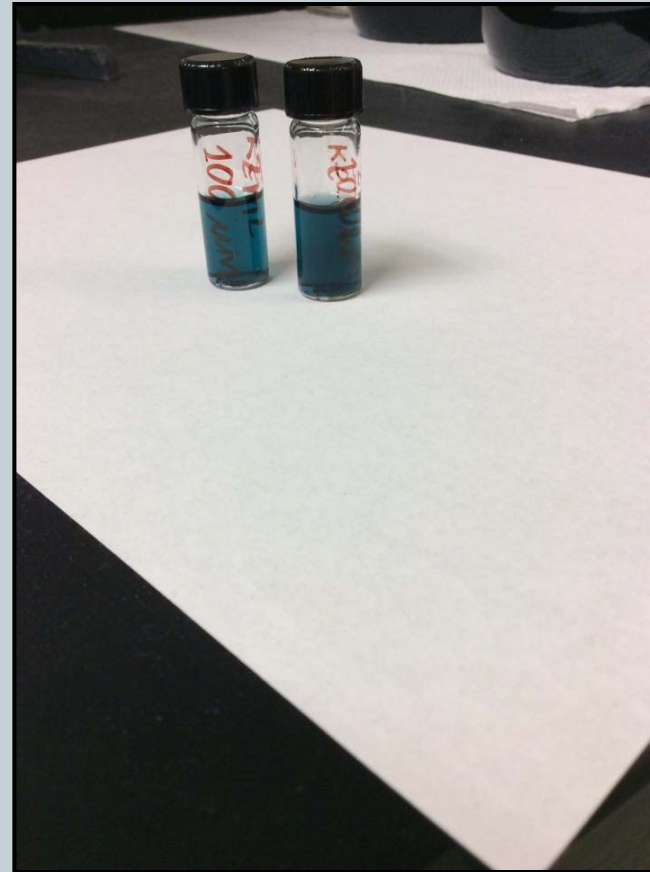
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DR. JUN JIAO
MICROSCOPY AND MICROANALYSIS REU

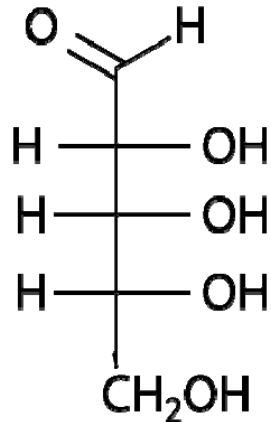
Background



- Used in the detection of specific compounds
- Characteristics
 - Absorbance spectrum
 - Fluorescence spectrum

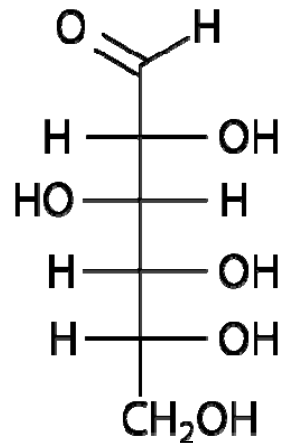


Background



D-ribose

D-glucose



- Sugars are biomarkers for certain diseases
- Fluorophores must be...
 - Sensitive
 - Specific

My Project



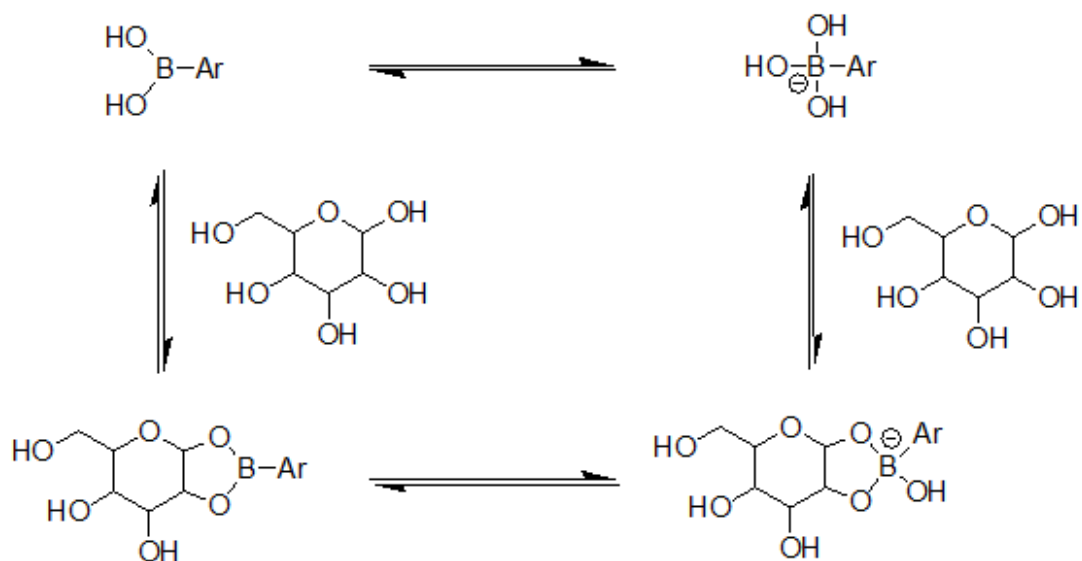
- **Synthesis of RBB1**
- **Analysis of spectroscopic properties**
 - Choosing a solvent system
 - Evaluating sensitivity towards various sugars



Why boronic acid?



SACCHARIDE-INDUCED HYBRIDIZATION CHANGE



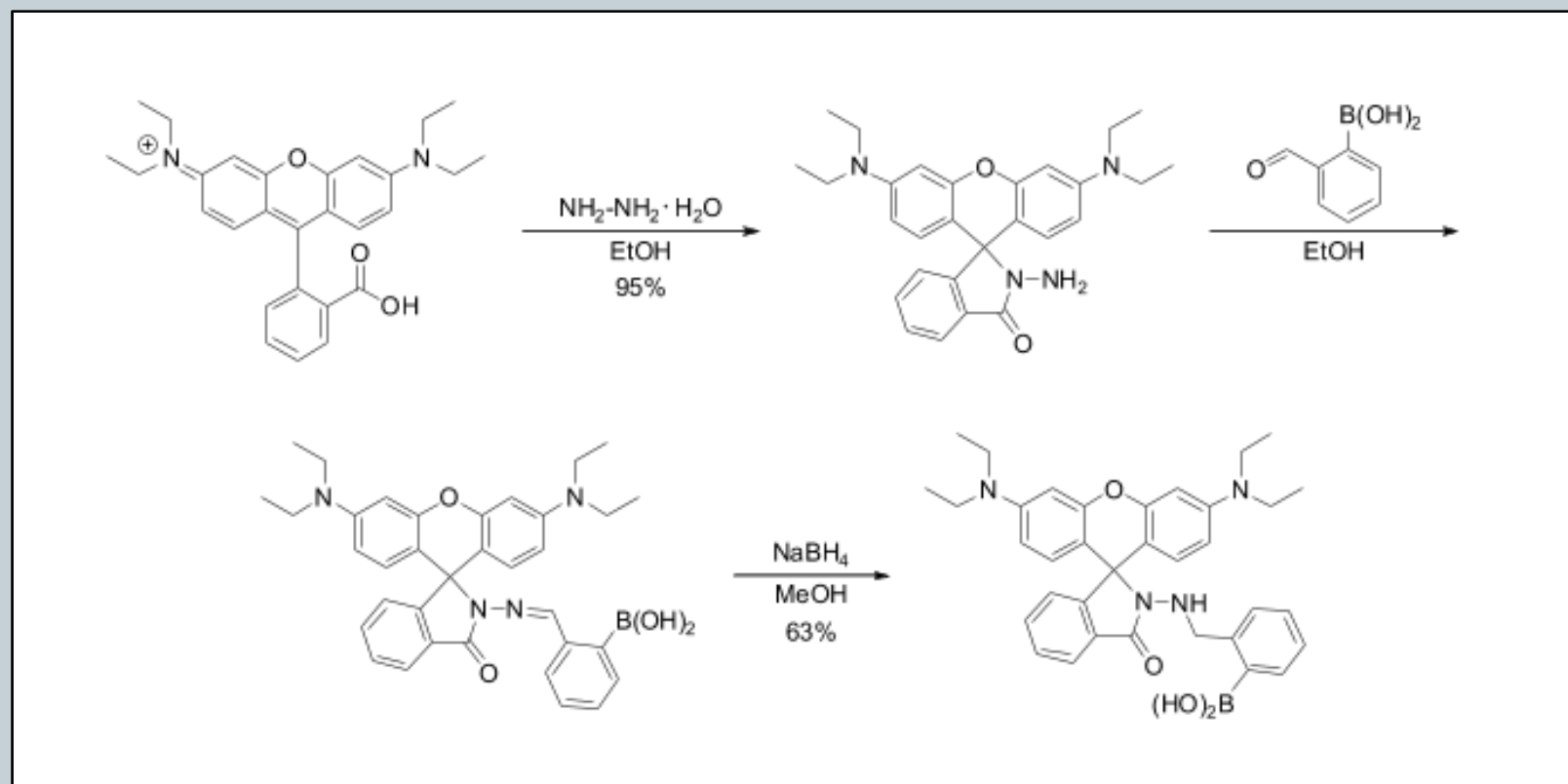
Lorand, J. P.; Edwards, J. D. *J. Org. Chem.* **1959**, 24, 769.

Recent Reviews:

James, T. D.; Shinkai, S. *Top. Curr. Chem.* **2002**, 218, 159

Wang, W.; Gao, X.; Wang, B. *Curr. Org. Chem.* **2002**, 6, 1285.

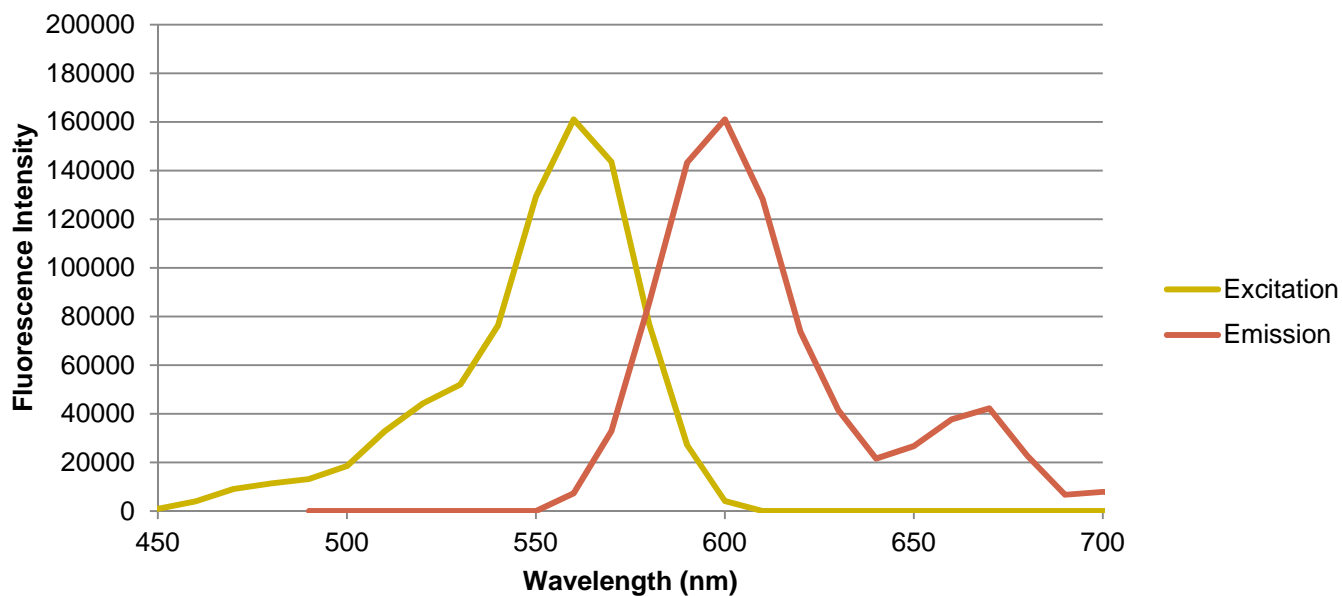
RBB1 Synthesis



RBB1 Fluorescence Spectra



**RBB1 Maximum Excitation-Emission Spectra
DMSO-HCl (1:9)**



Solvent System Experiments

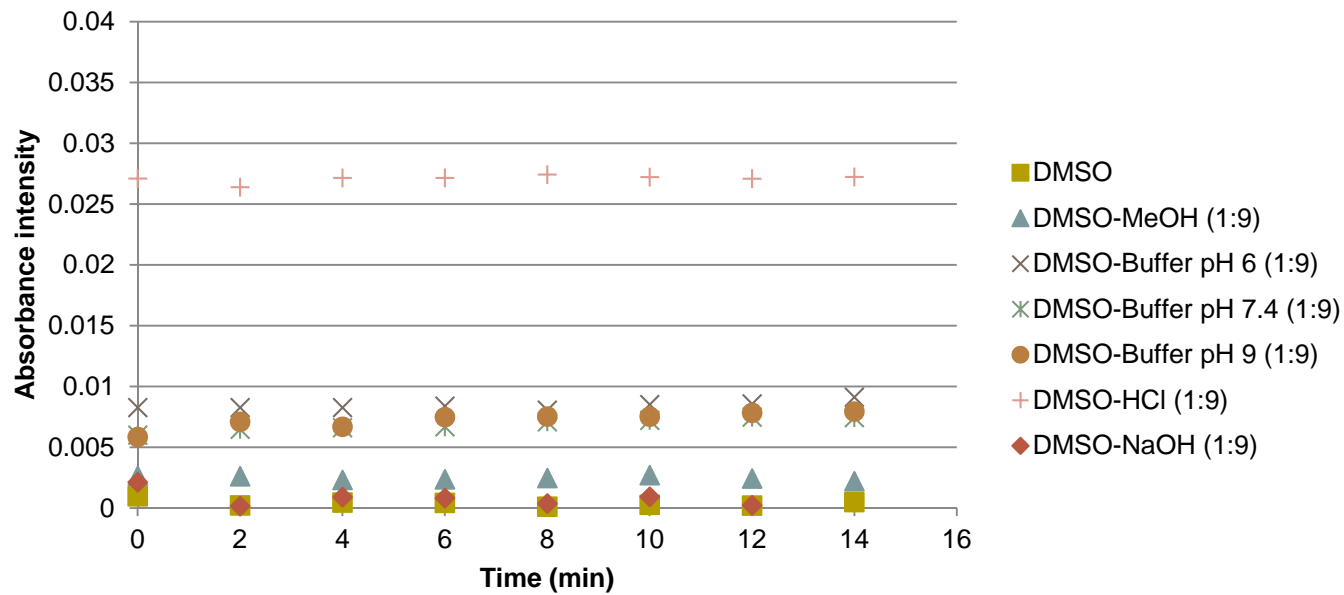


- **Tested in 7 systems**
 - DMSO
 - DMSO-MeOH (1:9)
 - DMSO-Buffer pH 6 (1:9)
 - DMSO-Buffer pH 7.4 (1:9)
 - DMSO-Buffer pH 9 (1:9)
 - DMSO-HCl (1:9)
 - DMSO-NaOH (1:9)

Solvent System Experiments



RBB1 Maximum Absorbance over Time in Various Solvent Systems



Sugar Sensitivity Experiments



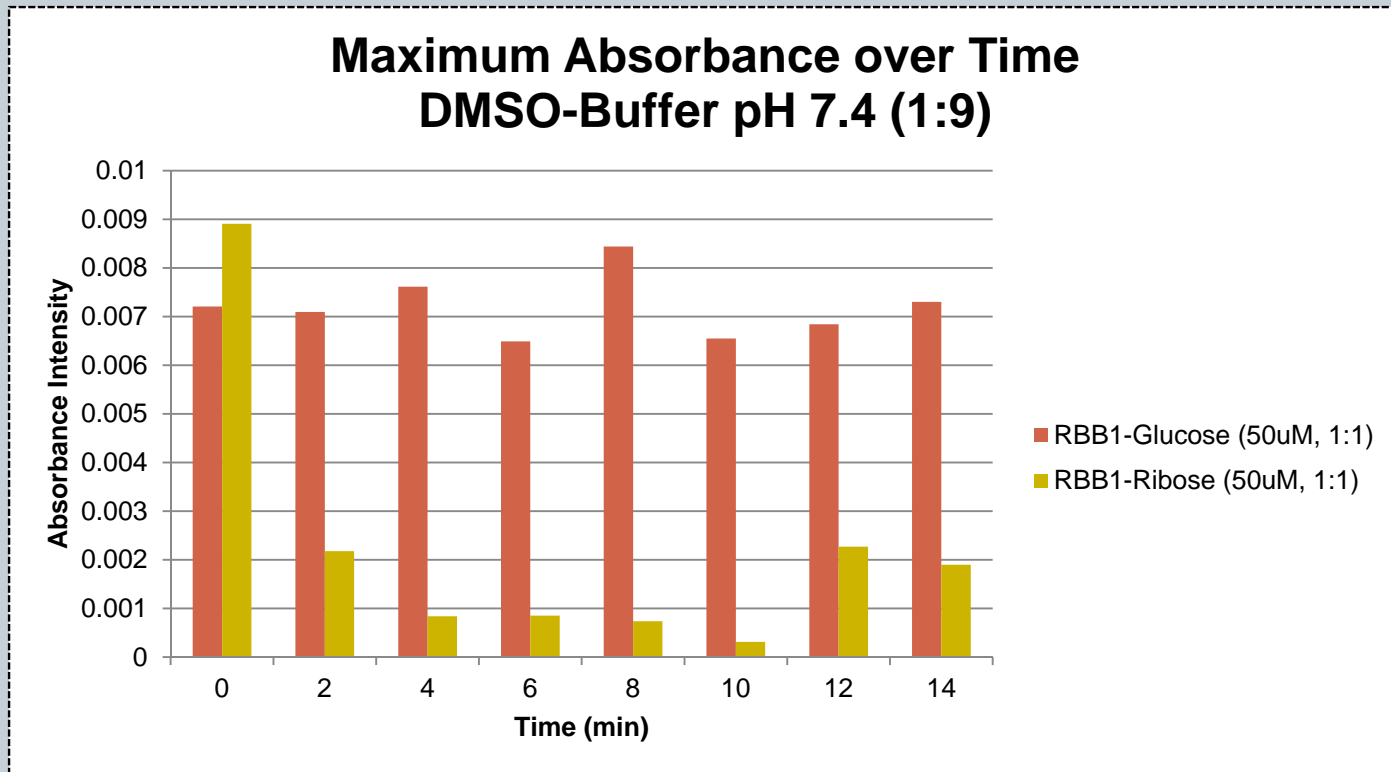
- **Solvent systems tested**

- DMSO-Buffer pH 7.4 (1:9)
- DMSO-Buffer pH 6 (1:9)
- DMSO-Buffer pH 9 (1:9)

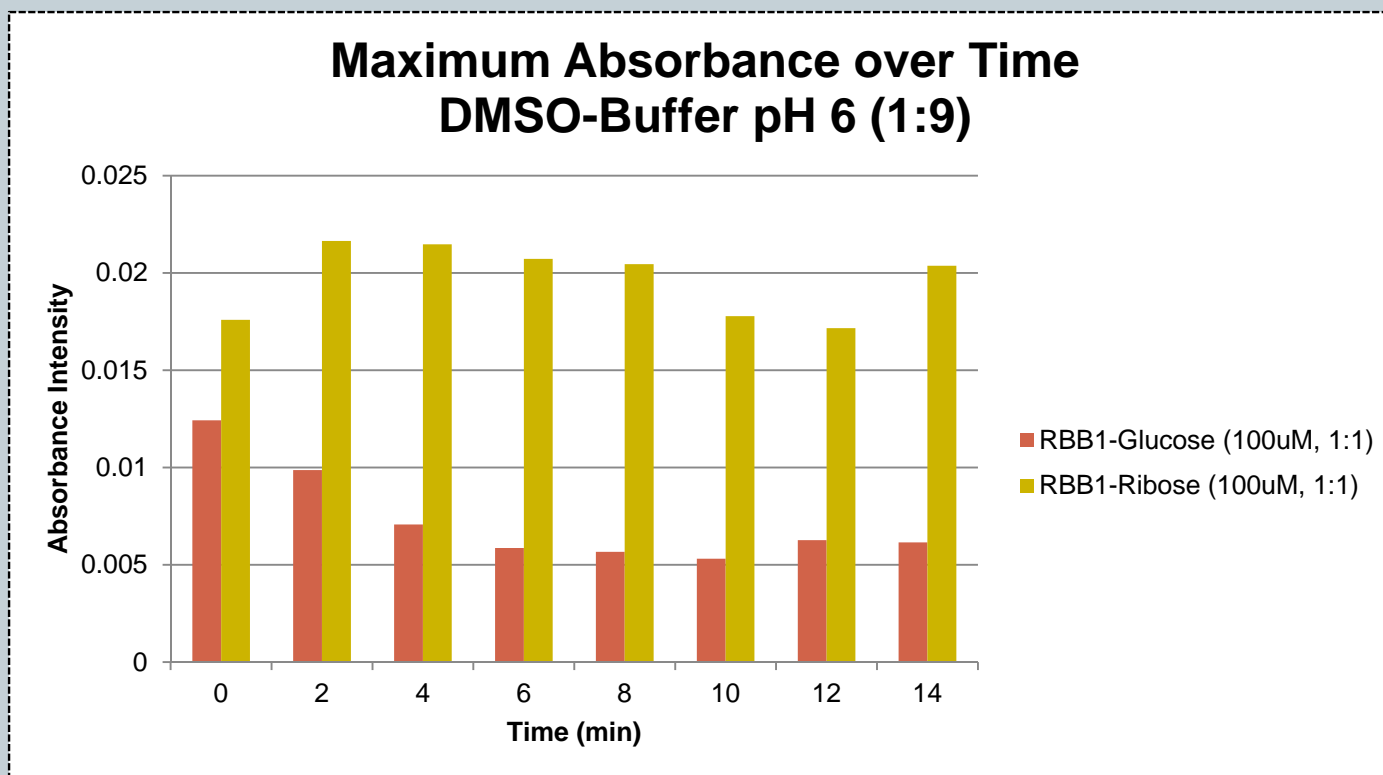
- **Sugars tested**

- Ribose
- Glucose

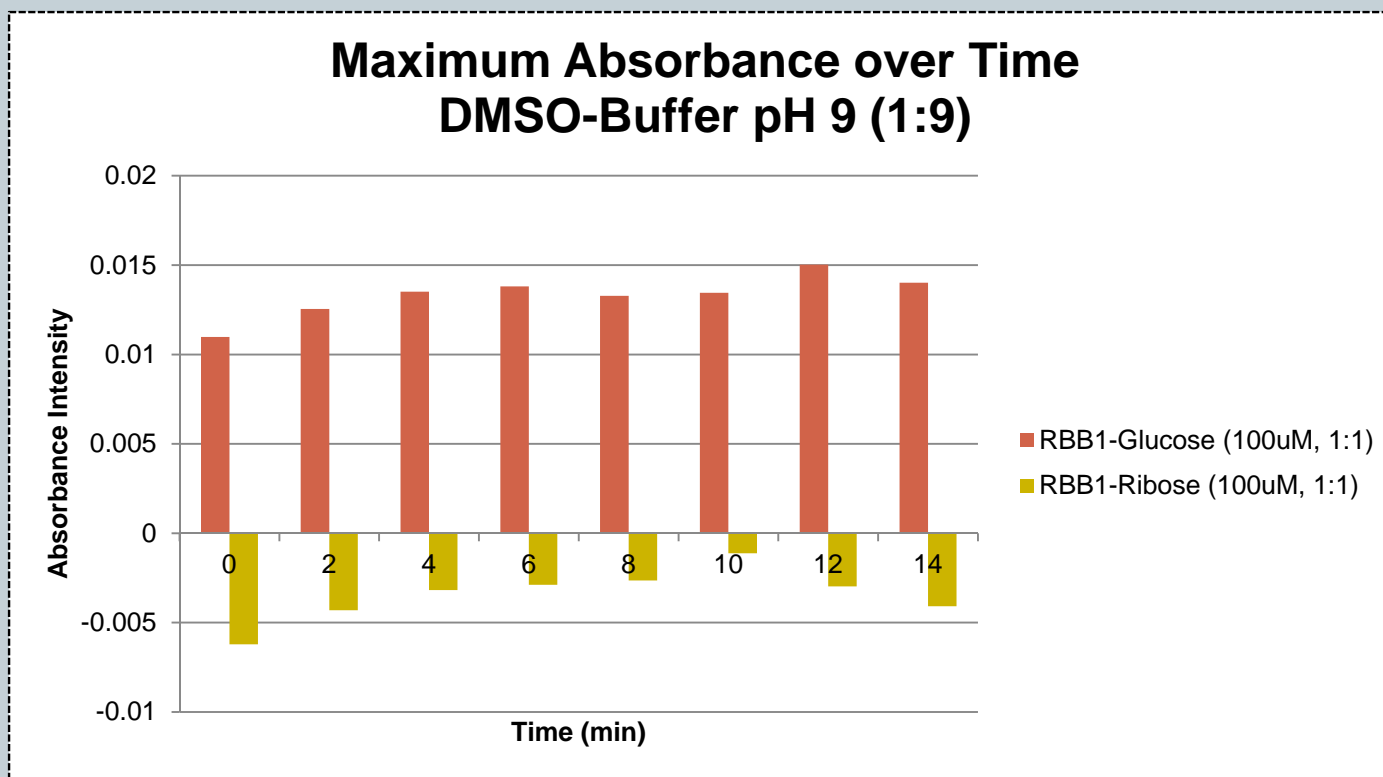
DMSO-Buffer pH 7.4 (1:9)



DMSO-Buffer pH 6 (1:9)



DMSO-Buffer pH 9 (1:9)



Conclusions



- **RBB1 is selective for...**
 - Glucose in DMSO-pH 7.4 (1:9)
 - Glucose in DMSO-pH 9 (1:9)
 - Ribose in DMSO-pH 6 (1:9)

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