Biomarkers in Glioblastoma

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The Study

- Transcriptomic analyses of patient peripheral blood with hemoglobin depletion reveal glioblastoma biomarkers
- In the journal of genomic medicine
- By Dan Qi, Yiqun Geng, Jacob Cardenas, Jinghua Gu, S. Stephen Yi, Jason H. Huang, Ekokobe Fonkem & Erxi Wu

Transcriptomic analyses of patient peripheral blood with hemoglobin depletion reveal glioblastoma biomarkers

- Tissue biopsies are the standard for detecting biomarkers in Glioblastoma.
- This study explores the use of peripheral blood instead, which is less invasive.
- It compares transcriptomic differences between glioblastoma patients versus control (no cancer) patients using whole blood rather than tissue.

The Challenge: Glioblastoma

- Glioblastoma is an aggressive cancer of the brain which is the most common type of adult primary brain cancer

- Despite multiple approaches of treatment, median survival time is only 15 months.

Glioma - Dana-Farber Brigham Cancer Center

Treatment and Screening

- The current treatments are invasive, surgery intensive, or insufficient due to the combative nature of glioblastoma tumors.

- Liquid biopsies have the potential to be a less invasive screening method.

The Challenge: Hemoglobin Noise

- Whole blood is not often used to detect biomarkers because of its high hemoglobin content which make up most of the transcripts in a blood sample, creating a lot of noise.

- Due to protection from the blood brain barrier, brain tumors have lower levels of biomarkers in whole blood than tumors outside of the brain.

Hemoglobin Reduction

- Globin reduction is a method that decrease the number of hemoglobin transcripts and highlights other, less common biomarkers present in whole blood. The researchers did this before sequencing the RNA that we looked at.

- Potential blood component biomarkers for glioblastoma include serum or plasma changes, circulating tumor cells, microvesicles and cell free nucleic acids.

Study Findings

- Peripheral blood samples after globin reduction had detectable biomarkers comparable to detection in tissue biopsies.
- Found biomarker candidates detectable in both whole blood and tissue biopsies.
- Some genes (and miRNAs) were upregulated while some were downregulated

Our goal

- To compare biomarkers in GBM patients compared to control patients.
- We chose patients of the same sex (male) and in a similar age range to reduce the variables. N=5 per condition
- The study's main focus was to analyze the competency of peripheral blood with hemoglobin reduction to detect biomarkers as compared to tissue samples.

Our results

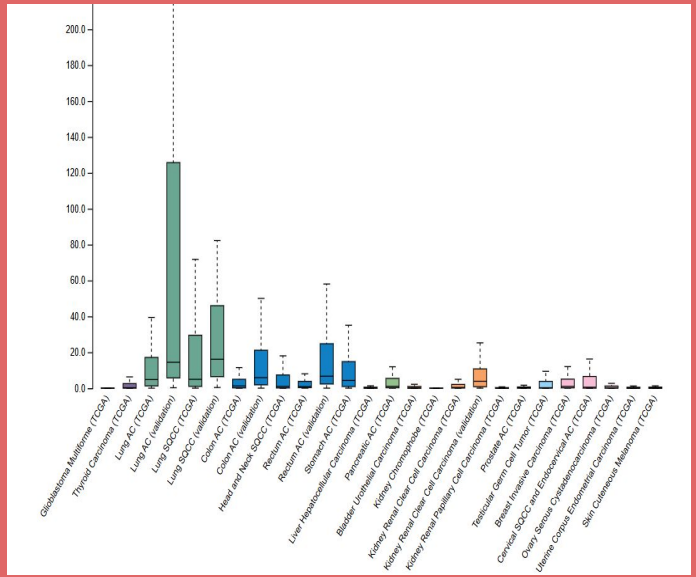
- We explored 3 potential biomarkers for gbm based on study data, 2 of which are upregulated and one which is down regulated

- Down regulated: IGHV7-4-1

- Up regulated: A1AG1 and RPL10P9

The Gene Immunoglobulin heavy variable 7-4-1 (IGHV7-4-1) is down regulated in most gbm patients compared to control patients

- Immunoglobulins are also known as antibodies
- Antibodies bind to specific molecules (antigens) on cancer cells and tag them for destruction by other immune cells. Down regulation of this gene means less antibodies.
- TCGA data also shows down regulation of IGHV7-4-1 in gbm as compared to in other cancer types

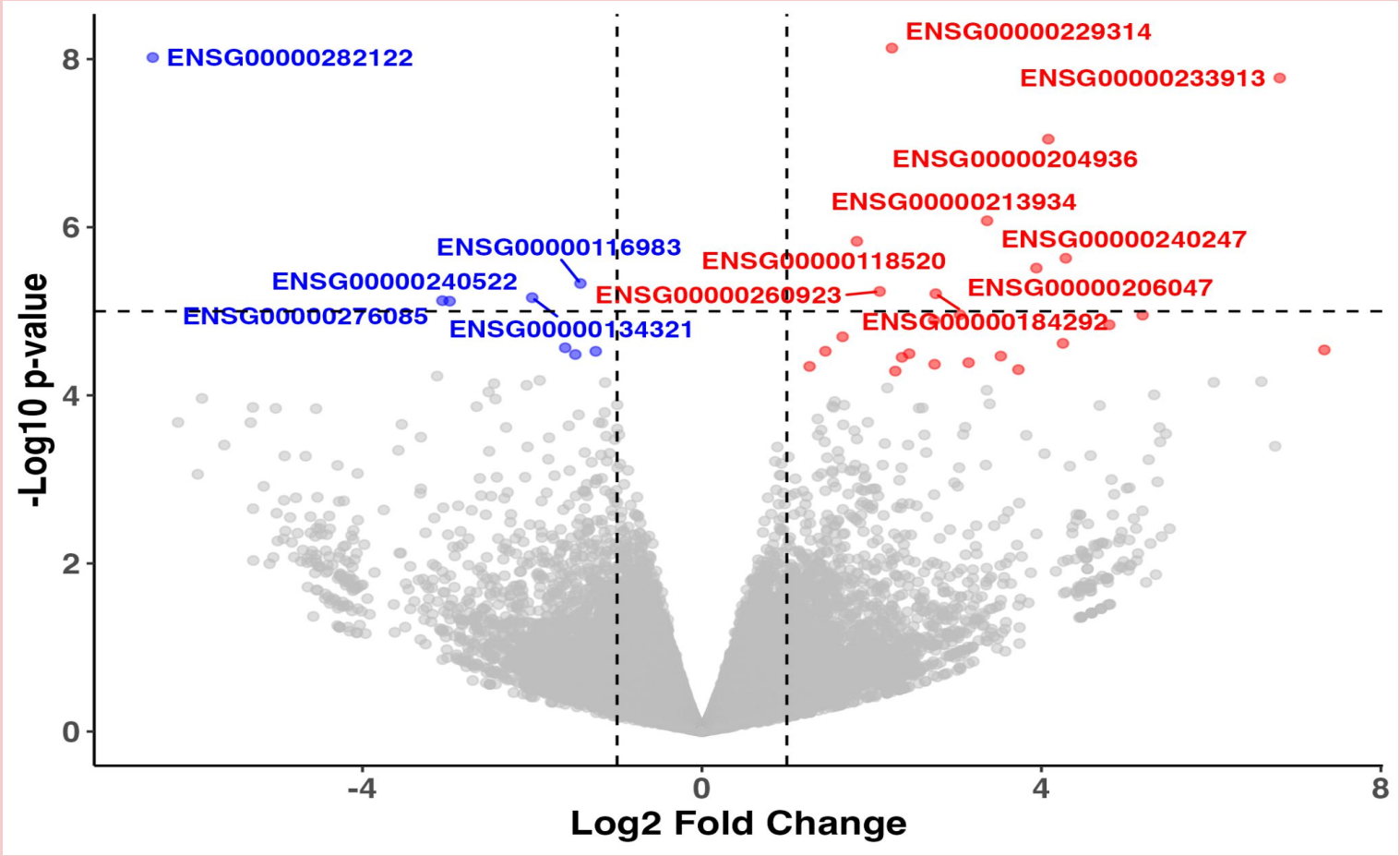


Alpha-1-acid glycoprotein

- mechanism of combative behavior in glioblastoma.
- The protein functions as a transport protein that is located outside of the cell that Also binds synthetic drugs and influences their distribution and availability in the body.
- consequently, A1a functions in modulating the activity of the immune system. The upregulation of the transport protein leads to disbursements of potential treatments.

RPL10P9 Ribosomal Protein L10 Pseudogene 9

- This pseudogene was one of the most expressed (upregulated) gene found in GBM patients when compared to the control patients.
- We think that these gene which is found in the extracellular vesicles produced by GBMs, promotes the growth of the cancer cells
- Research is Yet to be done on these particular gene and it’s contribution to cancer growth.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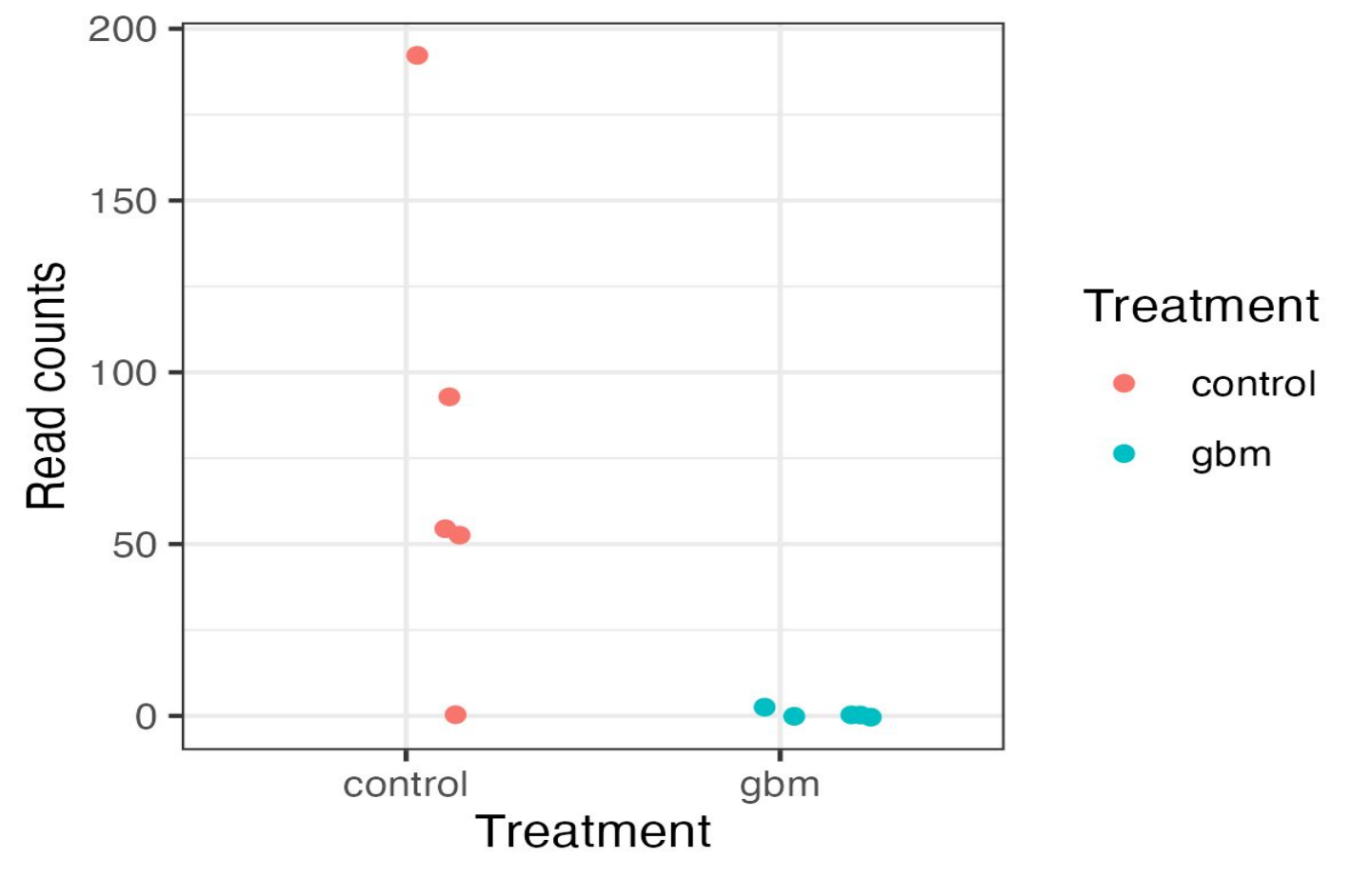
IGHV7-4-1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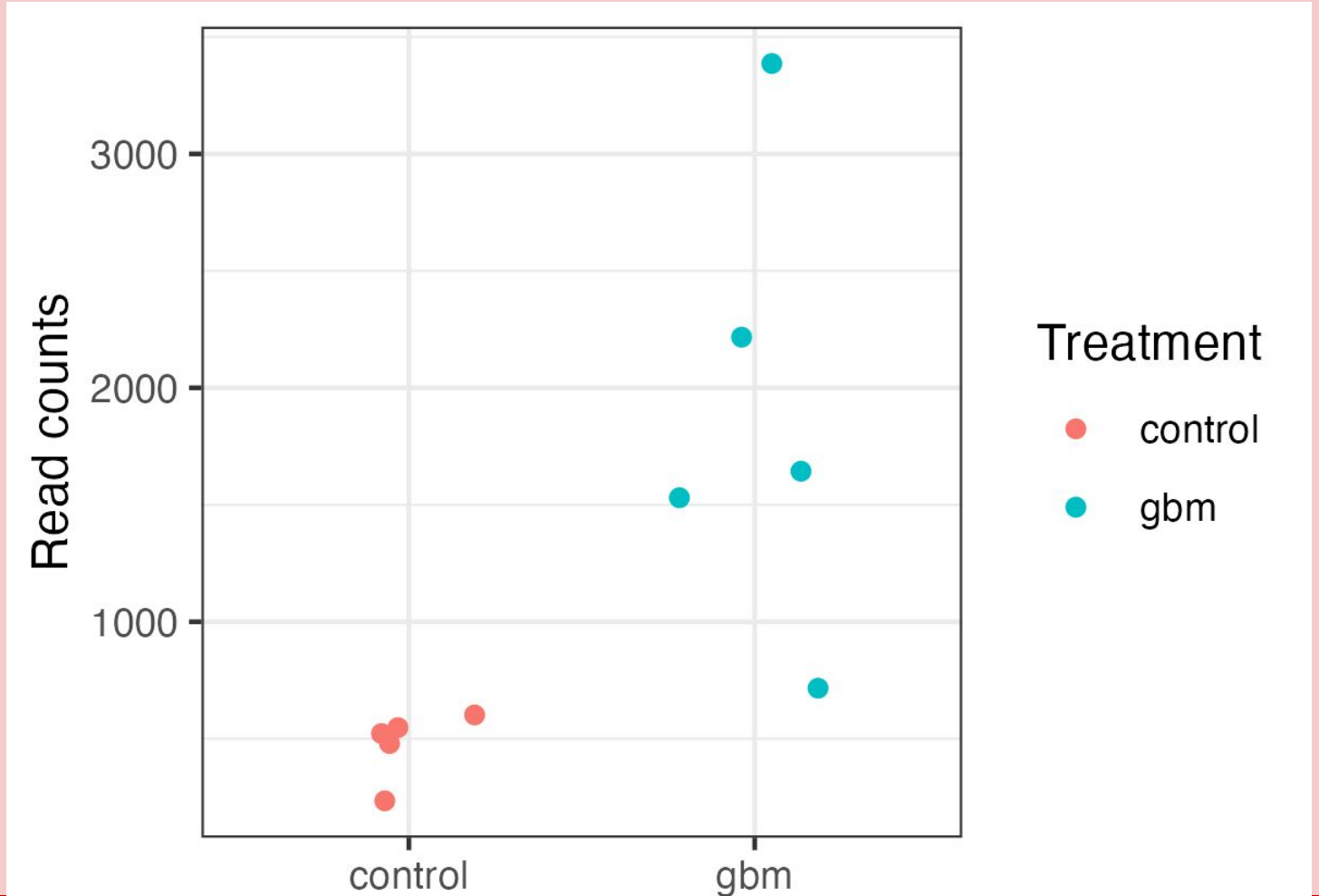
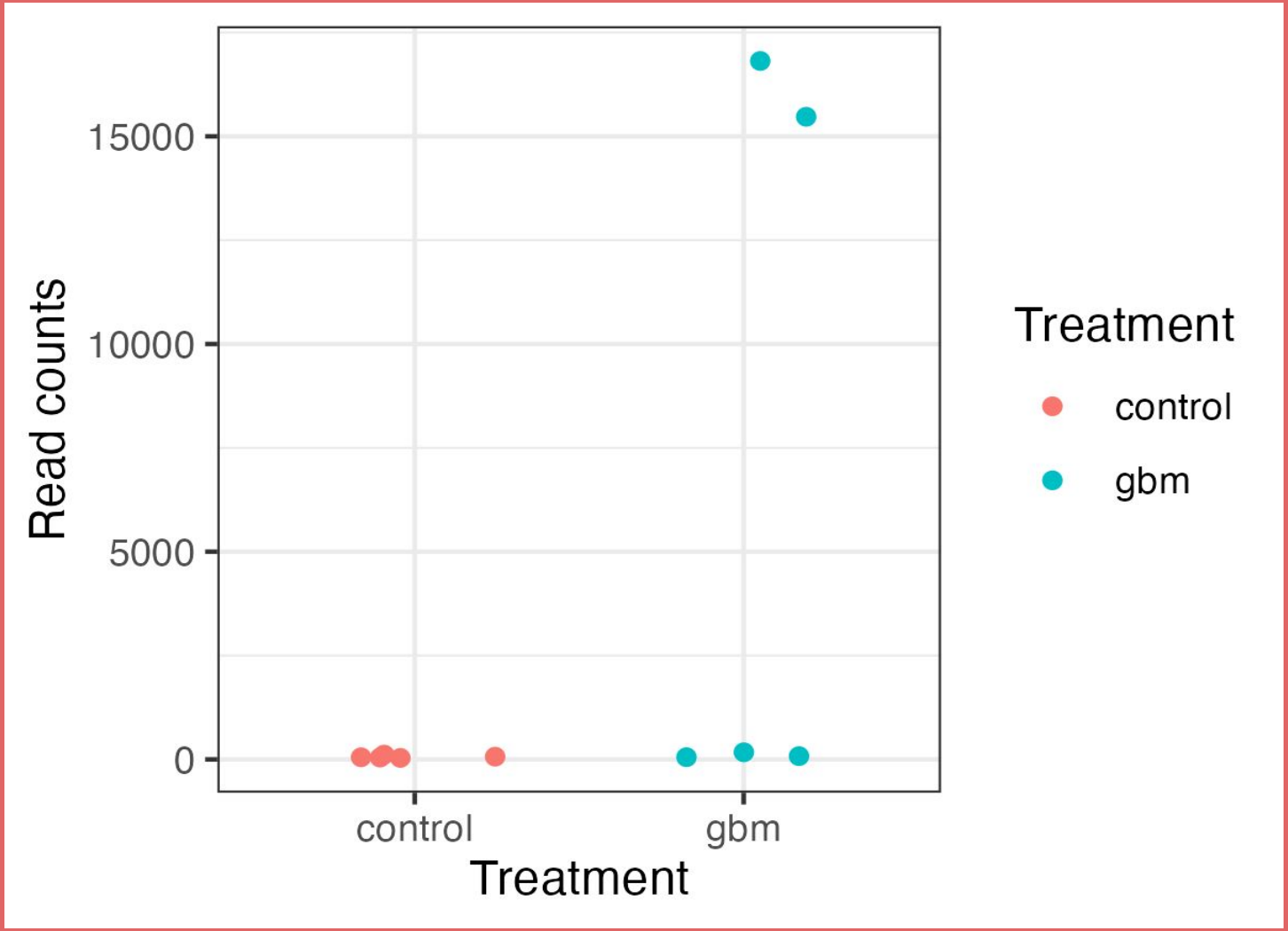


RPL10P9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Sources and Acknowledgements

- Transcriptomic analyses of patient peripheral blood with hemoglobin depletion reveal glioblastoma biomarkers | npj Genomic Medicine
- Glioma - Dana-Farber Brigham Cancer Center
- Monoclonal antibody drugs for cancer: How they work - Mayo Clinic
- Expression of IGHV7-4-1 in cancer - Summary - The Human Protein Atlas

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Questions?