AG2PI SEED GRANT - PROJECT FINAL REPORT

PROJECT NAME	**Developing a costeffective method for collecting informative, population-level molecular phenotypes**

PROJECT PRINCIPAL INVESTIGATOR	TODAY'S DATE	PROJECT START DATE	DATE OF COMPLETION
Troy Rowan	6/20/2023		6/1/2023
TEAM MEMBERS (co-PI, co-I, personnel)		COLLABORATORS	
Jon Beever, Kurt Lamour, Liesel Schneider		Trevor Freeman, Ruwaa Mohamed, Sonia Moisa	

ACCOMPLISHMENTS

Please provide a short summary of the conclusions (both successes and failures) made from your project. Include a description of how this project will provide benefits to the agricultural genome to phenome community and, possibly, to a broader audience. You should include both qualitative and quantitative details, as necessary, to support your conclusions. Include a short accomplishment statement in non-technical language and do not include names.

This is not a technical report. Please keep to no more than 6-8 sentences (e.g., 1-2 sentences per point, above).

Our project set out to test a method for performing population-scale collection of gene expression data, with the ultimate goal of supplementing predictions with intermediate "-omics" data. At the recommendation of the AG2PI review board, we decided to test and compare both a targeted RNA-Sequencing method (as proposed) and 3' RNA-Sequencing. The targeted RNA-Seq approach was a major challenge, largely due to difficulties in automating primer design. As such, despite its low cost (<$10/sample), primer design challenges and comparatively low levels of information make it a sub-optimal approach for future G2P work focused on quantifying population scale gene expression. This seed grant initiated work in our lab exploring methods for further reducing the cost of 3' RNA-Seq through automation and miniaturization. We found 3' RNA-Seq to be an excellent option for cost-effective (<$30) gene expression quantification. We also observed that we can call hundreds of thousands of genetic polymorphisms that can be used with imputation to simultaneously generate genotypes for individuals when paired with an imputation reference panel. An assay like this that provides gene expression and an imputed genotype would be an enormous tool for industry-applicable G2PI initiatives, particularly in the beef industry where individual animals are long-lived and valuable.

(HINT: You can expand sections as necessary by pulling down on the square in the lower right corner of each box)

Products

Please list any products from this project. This may include (but not limited to) publication, concept/white paper, workshop, conference presentation, website, publicly available data or pipelines, etc. Reminder: you are required to make your prodcuts available to the broader stakeholder community using standard USDA practices, open source, FAIR, or other models. Metrics may include number of participants or times accessed, etc. Include links to recordings, DOI, etc. when possible. For presentations and posters, provide authors, date, location and presentation title.

ACTIVITY / PRODUCT	**DESCRIPTION (include URL, if applicable)**	**OUTCOME / METRICS**
Poster Presentation	Troy Rowan – AG2PI Conference (Kansas City, MO - June 15th, 2023)	Lead PI Troy Rowan presented outcomes of the work to members of the AG2PI community at the program's conference in Kansas City, MO.
Oral Presentation	Ruwaa Mohamed – UT Genome Science & Technology Colloquium (Knoxville, TN - March 9th, 2023) https://docs.google.com/presentation/d/1ZQL8191T-ZwzhAnebNWtEV7L2ikUgr-HyLyrleDm5XI/edit?usp=sharing	Graduate student Ruwaa Mohamed presented ongoing work to the University of Tennessee's Genome Science and Technology program.
Poster Presentation	Ruwaa Mohamed – Gordon Research Conference & Gordon Research Seminar (Ventura, CA - February 12-16, 2023) https://drive.google.com/file/d/1pTMR8WnXboMH-XKTPM6MqavrNRgPxRPX/view?usp=drive_link	Graduate student Ruwaa Mohamed presented this poster at the Gordon Research Seminar (to graduate students and postdocs) and Gordon Research Conference (to full set of attendees). This conference had around 100 attendees from across species (human, agricultural, and model organism).
Poster Presentation	Ruwaa Mohamed – UT Beef & Forage Center (Knoxville, TN - December 20, 2022)	Presented outcomes and implications of AG2PI project with producers and stakeholders throughout the state of Tennessee. This presentation reached approximately 75 individuals

Audience

With whom has this work been targeted to and shared? Please describe how this project and its products have been disseminated to a community of interest. Include any outreach activity or information sharing as well as training or professional development opportunities provided in this project.

We have shared the outcomes and products of this research project with various interested audiences. In particular, the information generated by our work has been important in communications with researchers interested in adding gene expression quantification into their research projects. Support staff and faculty in UT's Genomics Center for the Advancement of Agriculture have used this information to initiate multiple genomics projects across species. Results were featured at various research-focused presentations in university seminars (UFL, UNL, University of Guelph) and conferences (Gordon Research Seminar & Conference). Finally, as we are always interested in how G2P tools might be used in industry applications, we highlighted this work at the UT Beef and Forage Center's research and recommendations meeting. This is an important meeting of academics, extension personnel, and industry stakeholders.

CONTINUATION OF WORK

Next steps

How do you/your team plan to continue moving this project forward? Include how AG2PI can assist in your forward momentum.

We plan to continue generating 3' RNA-Seq data for the 400 stocker animals with health and vaccination records to test the efficacy of gene expression in phenotype prediction. We are also planning to offer this miniaturized and automated 3' library prep + sequencing as a service to other academic groups at UT and other institutions. At present our cost of preparation and sequencing are as low as anywhere, so we hope to initiate and support more G2P work in the future. In the future we'd love to be able to share some of this information through AG2PI channels.

The work performed during the performance period of this seed grant is currently being summarized into a paper that will be submitted in the coming months