Team Project Part 1: Proposal

Project Title: A module of human peripheral blood mononuclear cell transcriptional network containing primitive and differentiation markers is related to specific cardiovascular health variables

Executive Summary: Peripheral blood mononuclear cells (PBMCs), including rare circulating stem and progenitor cells (CSPCs), have important yet poorly understood roles in the maintenance and repair of blood vessels and perfused organs. Our hypothesis was that the identities and functions of CSPCs in cardiovascular health could be ascertained by analyzing the patterns of their co-expressed markers in unselected PBMC samples. Because gene microarrays had failed to detect many stem cell-associated genes, we performed quantitative real-time PCR to measure the expression of 45 primitive and tissue differentiation markers in PBMCs from healthy and hypertensive human subjects. We compared these expression levels to the subjects' demographic and cardiovascular risk factors, including vascular stiffness. The tested marker genes were expressed in all of samples and organized in hierarchical transcriptional network modules. An index of gene expression in one of these modules (metagene), defined as the average standardized relative copy numbers of 15 pluripotency and cardiovascular differentiation markers, was negatively correlated (all $p<0.03$) with age ($R2=-0.23$), vascular stiffness ($R2=-0.24$), and central aortic pressure ($R2=-0.19$) and positively correlated with body mass index ($R2=0.72$, in women). The co-expression of three neovascular markers was validated at the single-cell level using mRNA in situ hybridization and immunocytochemistry. The overall gene expression in this cardiovascular module was reduced by 72±22% in the patients compared with controls. However, the compactness of both modules was increased in the patients' samples, which was reflected in reduced dispersion of their nodes' degrees of connectivity, suggesting a more primitive character of the patients' CSPCs. In conclusion, our results show that the relationship between CSPCs and vascular function is encoded in modules of the PBMCs transcriptional network. Furthermore, the coordinated gene expression in these modules can be linked to cardiovascular risk factors and subclinical cardiovascular disease; thus, this measure may be useful for their diagnosis and prognosis.

Paper Outline: PBMCs were isolated from 26 healthy subjects and 20 hypertensive patients by density gradient centrifugation. Total RNA was extracted from ~ 10^6 cells, reverse transcription was done using 150 ng RNA, and the real-time PCR was done in duplicate for each sample.

Link to the Dataset: https://www.ncbi.nlm.nih.gov/geo/download/?acc=GSE56327

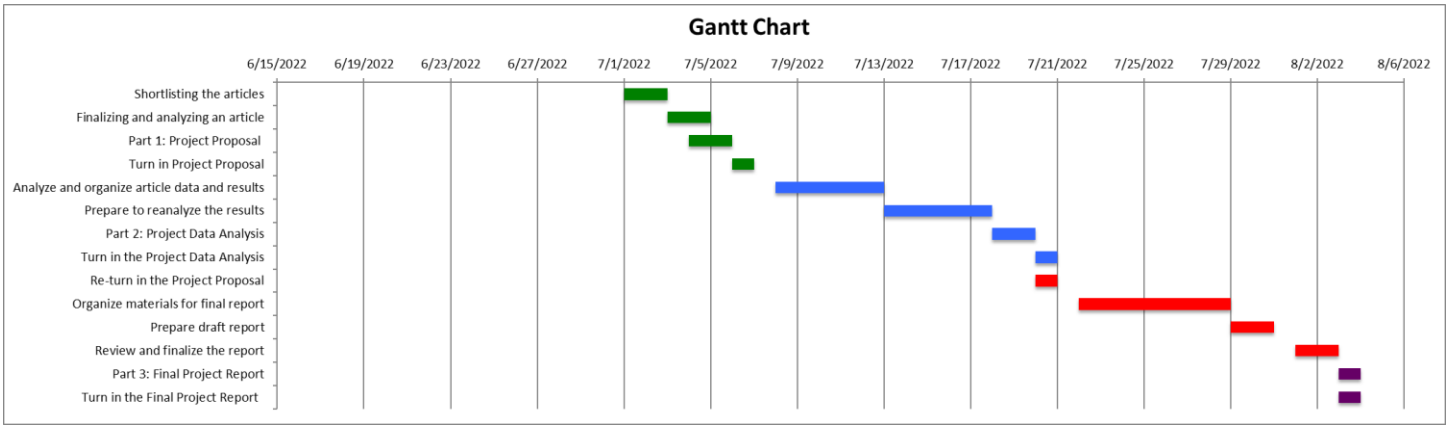
Team Members:

Team Members
1. Jonathon Garnsey
2. Sayed Muhammad Saifuddin

Task Assignment Matrix:

Task Name	Start	End	Duration (days)	Contributor
Shortlisting the articles	7/1/2022	7/3/2022	2	John & Sayed
Finalizing and analyzing an article	7/3/2022	7/5/2022	2	John & Sayed
Part 1: Project Proposal	7/4/2022	7/6/2022	2	John & Sayed
Turn in Project Proposal	7/6/2022	7/7/2022	1	John & Sayed
Analyze and organize article data and results	7/8/2022	7/13/2022	5	John
Prepare to reanalyze the results	7/13/2022	7/18/2022	5	Sayed
Part 2: Project Data Analysis	7/18/2022	7/20/2022	2	John & Sayed
Turn in the Project Data Analysis	7/20/2022	7/21/2022	1	John
Re-turn in the Project Proposal	7/20/2022	7/21/2022	1	Sayed
Organize materials for final report	7/22/2022	7/29/2022	7	John & Sayed
Prepare draft report	7/29/2022	7/31/2022	2	John & Sayed
Review and finalize the report	8/1/2022	8/3/2022	2	John & Sayed
Part 3: Final Project Report	8/3/2022	8/4/2022	1	John & Sayed
Turn in the Final Project Report	8/3/2022	8/4/2022	1	John or Sayed

Task Duration Table or Gantt Chart:



Group Contract:

Group Name	*Team 8*
Group Members & Roles	*List the Names of your group members and their roles.* Roles are helpful to build on the strengths of the team/group members. There are many models for teams and roles, feel free to edit these roles as necessary for your group. Leader – *Sayed, John* strength in organizing, may organize the Discussions (or chats), create a schedule, facilitate the conversation, etc. Needs to rotate among all group members. Recorder - *Sayed, John* strength in typing and summarizing, may take notes about what is discussed, makes sure notes are added to group discussion space, submits assignments, etc. Editor – *Sayed, John* strength in grammatical areas and how documents/ presentations work, makes sure that group's product is grammatically correct, follows the guidelines, etc. Connector – *Sayed, John* strength in networking people, ideas, etc., helps leader keeps track of time, sends group emails to the instructor, etc. Additional Group roles as needed - provide a description of group member responsibilities.
Participation	Members must share information, resources, and their unique ideas and perspective. Every member is responsible to participate in any weekly meetings or complete postings by a specific deadline for threaded discussions. Please answer the following: How will you handle situations where a member is not participating? Be specific in your plan.

	Address group member via method of communication prior to getting professor involved.
Communication	What tools will your group use to collaborate? Name the tools/technology you plan to use regularly and how you plan to contact your members this way. Email, text, online meetings, and in-person if needed. Because of the asynchronous class, meeting in-person is difficult so instead we will communicate, when available, through the most convenient methods.

	How often will you be getting together physically or virtually? What is your weekly/daily schedule for group contact? Daily/Weekly at our earliest convenience. Not hearing from a group member for a few days is respectable and even expected. A week or more without communication is not expected.

Decisions	How will the group make decisions? Describe the process that your group will make decisions for writing your paper, completing the case study, and creating your PowerPoint presentation. Splitting the work up evenly and taking on tasks that fit our strengths. Will the group be polled, and differences explored? Describe the method for settling differences of opinion. What are the specific steps that will be taken? Any differences of opinion will be freely voiced. All options will be considered and the best one will be executed. When should the group ask for instructor input or help? Describe the situations that might need instructor assistance and the method you plan to use to contact the instructor. How long will you wait before contacting the instructor? Group should seek instructor help if at a roadblock or guidance is desired at earliest convenience as to not get caught up in a problem. Asking too many questions is better than asking none.

Conflicts	How will the group handle differences of opinion and conflicts? Describe the specific methods you plan to use if there is a difference of opinion in your group. How will you decide on the final product? Any conflicts should be able to be handled within group, professor can be brought in to mediate if necessary.

Date: 7/5/2022 Signatures of all group members:

Sayed Saifuddin

John Garnsey

References

Leni Moldovan, M. A. (2014, April 23). A Module of Human Peripheral Blood Mononuclear Cell Transcriptional Network Containing Primitive and Differentiation Markers Is Related to Specific Cardiovascular Health Variables. *PLOS ONE. 2014; 9(4): e95124.* doi:10.1371/journal.pone.0095124

Medicine, N. L. (n.d.). *GEO Datasets*. Retrieved from NCBI: https://www.ncbi.nlm.nih.gov/gds/?term=GSE56327[Accession]