Background: Single-cell RNA sequencing

Purpose

The purpose of this lab is to introduce single-cell RNA sequencing, how it works, and how it is different from bulk RNA sequencing.

Learning Objectives

1. Compare and contrast single-cell and bulk RNA-seq
2. Explain what a UMAP plot is and why it is useful for single-cell RNA-seq

Introduction

While bulk RNA sequencing allows us to examine gene expression in a tissue as a whole, newer technologies enable us to look at gene expression in individual cells, opening up new avenues for scientific research. This tutorial will explain the basics of single-cell RNA sequencing and discuss how it compares to bulk RNA-seq. It will also introduce you to UMAP plots - a common method for exploring single-cell sequencing data.

Activity 1 - Biotechnology: scRNA-seq

Estimated time: 15 min

Instructions

1. Watch this video (video)(slides) introducing single-cell RNA-seq.

Questions

Which of the following steps are typically involved in bulk vs. single-cell RNA-sequencing? A) Obtain/dissect sample B) Separate cells C) Select for mRNA D) Convert to cDNA List the steps involved in each technique.
Bulk RNA-seq:
Single-cell RNA-seq:

Which of the following scientific questions can be investigated using bulk vs. single-cell RNA-sequencing? • Compare gene expression between healthy and diseased samples • Investigate gene expression changes as an embryo develops • Compare gene expression between different cells within a tissue For each scientific question, state whether it can be investigated with bulk, single-cell, or both, and briefly explain your answer.
Healthy vs. diseased:
Embryo development:
Compare cells:

Activity 2 - Introduction to UMAP plots

Estimated time: 10 min

Instructions

1. Watch this video (video)(slides), which explains what a UMAP plot is and why it's useful for single-cell RNA-seq.

Questions

Explain why UMAP plots are useful for looking at single-cell RNA-seq data

Footnotes

Resources

- Google Doc

Contributions and Affiliations

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