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**Title: Tracing Single-Cell Lineage in Human Tissues**

Lineage tracing is fundamental to study developmental biology and to understand how we, as multicellular organisms, initially develop from a single cell. Understanding this process will give us new insights into how diseases occur and how to grow tissues or organs in a dish. Currently, there is no high-resolution and cost-effective lineage tracing method that can be applied to human tissues. Here, I propose the development of a new single-cell lineage tracing technology to overcome these challenges. First, I will improve the lineage-mapping resolution and reduce the sequencing cost by producing DNA probes to enrich highly mutated regions in the genome. Next, I will validate the accuracy and resolution of the new method by using an ex vivo cell culture tree model with a known lineage. Finally, I will apply this method to reconstruct the phylogenetic tree in various human tissues. If successful, this new method will represent the most cost-effective and highest-resolution lineage tracing method to date. This will lead to the generation of many detailed human tissue lineage maps and provide us new insights on human development, disease progression, and tissue engineering that are important for the advancement of regenerative medicine.