

# Unlocking the complexities of human kidney and heart disease

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# **Unlocking the Complexities of Human Kidney and Heart Disease: An Integrative Single Cell and Spatial Analysis**

By Christoph Kuppe

1. High-throughput Single-cell RNA sequencing uncovers the complex molecular and cellular heterogeneity of human kidney mesenchymal cells - *this thesis*
2. Single-cell ATAC sequencing profiles the open chromatin and allows to study gene regulation of kidney disease initiation - *this thesis*
3. The transcription factor TBX3 regulates the gene-regulatory network at the transition of non-stressed to stressed cardiomyocytes - *this thesis*
4. Open-accessible single-cell and spatial human data from myocardial infarction tissue represents a valuable resource for novel therapeutic developments - *this thesis*
5. The ability to map and align single-cell genomic data is becoming increasingly important as datasets grow larger and more complex, with new modalities being measured at varying temporal and spatial resolutions - *Klein et al. Mapping cells through time and space with moscot, bioRxiv, doi.org/10.1101/2023.05.11.540374*
6. Current horizontal data integration techniques use a set of common features, thereby ignoring non-overlapping features and losing information. - *Ghaznfar et al. 2023, Nat. Biotech.*
7. A cell's environment can affect its function through gene expression regulation, often via external cues arising from local cell-to-cell communication - *Magouloupoulou et al. 2023, Annu.Rev.Genom.Human.Genet. 24:5-1-5.17*
8. The laws of physics are the canvas God laid down on which to paint his masterpiece - *Dan Brown.*
9. Not only is the Universe stranger than we think, it is stranger than we can think. - *Werner Heisenberg.*
10. To study the phenomenon of disease without books is to sail an uncharted sea, while to study books without patients is not to go to sea at all. - *Sir William Osler (1849-1919).*