Small Molecule Tools for Cell Biology and Cell Therapy

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In human history, bioactive small molecules have had three primary uses: as medicines, agrochemicals, and research tools. Among them, what our laboratory has done in the past was the discovery and use of research tools for biological investigations. In addition to tool discovery, our laboratory has recently become interested in exploring another application of small molecules: small molecule tools for cell therapy. Although small molecule drugs will continue to be important, cell therapy will be a powerful approach to curing difficult diseases that small molecule drugs are unable to handle. However, there are a number of potential problems in bringing cell therapy technologies to the clinic, including high cost, potential contamination, low stability, and tumorigenesis. Stable, completely defined small molecule tools, which are usually amenable to cost-effective mass production, may be able to help the clinical use of cell therapy.

Through screening chemical libraries, we have been discovering unique synthetic molecules that modulate or detect fundamental characteristics of human cells useful for cell therapy. Some of such molecules may serve as tools for cell engineering or cell therapy as well as basic cell biological research. This presentation provides a quick overview of our recent research programs with a special emphasis on the discovery and utilization of two small molecules: one for basic cell biology research, and the other for cell therapy applications.

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