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### 主要研究領域

#### 代謝工程與合成生物學

- 生質能源與材料
- 代謝途徑和網絡之設計
- 微生物與可再生資源之應用
- 利用定向進化來提高生產系統之效率

### Main Research Interests

#### Metabolic Engineering and Synthetic biology

##### ▪ Design of synthetic pathway for biobased chemical

Formation of a strong design principle targeting the host's natural physiology and metabolic network solidifies the basis to control and drive carbon flux into the desirable pathway. Thus, exploration of unique fundamental principles under different production system will be an important aspect in my laboratory. In particular, my research will aim to diversify substrate utilization and pathway chemistry to optimize product yield and expand the chemical repertoire in both *in-vivo* and *in-vitro* systems.

##### ▪ Assembly of novel pathway in unique hosts

We will apply synthetic/molecular biology and metabolic engineering techniques to re-wire cell's natural metabolism and construct novel production platforms that are of interest to the energy, biotechnological and medical fields. We will explore the innate capability of different heterotrophic and autotrophic microorganisms and tailor the production system according to their characteristics. Efficiency of carbon conversion will also be investigated and enhanced.

##### ▪ Directed evolution of production system

Development of selection and screening platforms for the directed evolution of pathway, enzyme, and regulation to achieve novel functionalities and improve process efficiency will be a main theme in my research. Coupled with systems biology tools, this will provide useful insight into cell's adaptive process.

### 代表作 (Selected Publications)

- Chen GS, Siao SW, **Shen CR\***. "Saturated mutagenesis of ketoisovalerate decarboxylase V461 enabled specific synthesis of 1-pentanol via the ketoacid elongation cycle", *Scientific Reports* 2017, 7
- Liang KM, **Shen CR\***. "Engineering cofactor flexibility enhanced 2,3-butanediol production in *Escherichia coli*", *Journal of Industrial Microbiology & Biotechnology* 2017, 44(12):1605-1612.
- Liang K, **Shen CR\***. "Selection of an endogenous 2,3-butanediol pathway in *Escherichia coli* by fermentative redox balance", *Metabolic Engineering* 2017, 39:181-191.
- Chang PC, Chen GS, Chu HY, Lu KW, **Shen CR\***. "Engineering efficient production of itaconic acid from diverse substrates in *Escherichia coli*", *Journal of Biotechnology* 2017, 249:73-81.
- Wen, R.C., **Shen, C.R.\***: Self-regulated 1-butanol production in *Escherichia coli* based on the endogenous fermentative control. *Biotechnology for biofuels*, 9:267, 2016.
- **Shen, C.R.**, Lan, E.I., Dekishima, Y., Baez, A., Cho, K.M., Liao, J.C., "Driving Forces Enable High-Titer Anaerobic 1-Butanol Synthesis in *Escherichia coli*", *Appl Environ Microb*, 77:2905-2915, 2011.
- Huo, Y.X., Cho, K.M., Rivera, J.G.L., Monte, E., **Shen, C.R.**, Yan, Y.J., Liao, J.C., "Conversion of proteins into biofuels by engineering nitrogen flux", *Nature biotechnology*, 29:346-U160, 2011.