

Metabolic Engineering @ CSB:

Platform tools and technologies for the production of complex metabolites

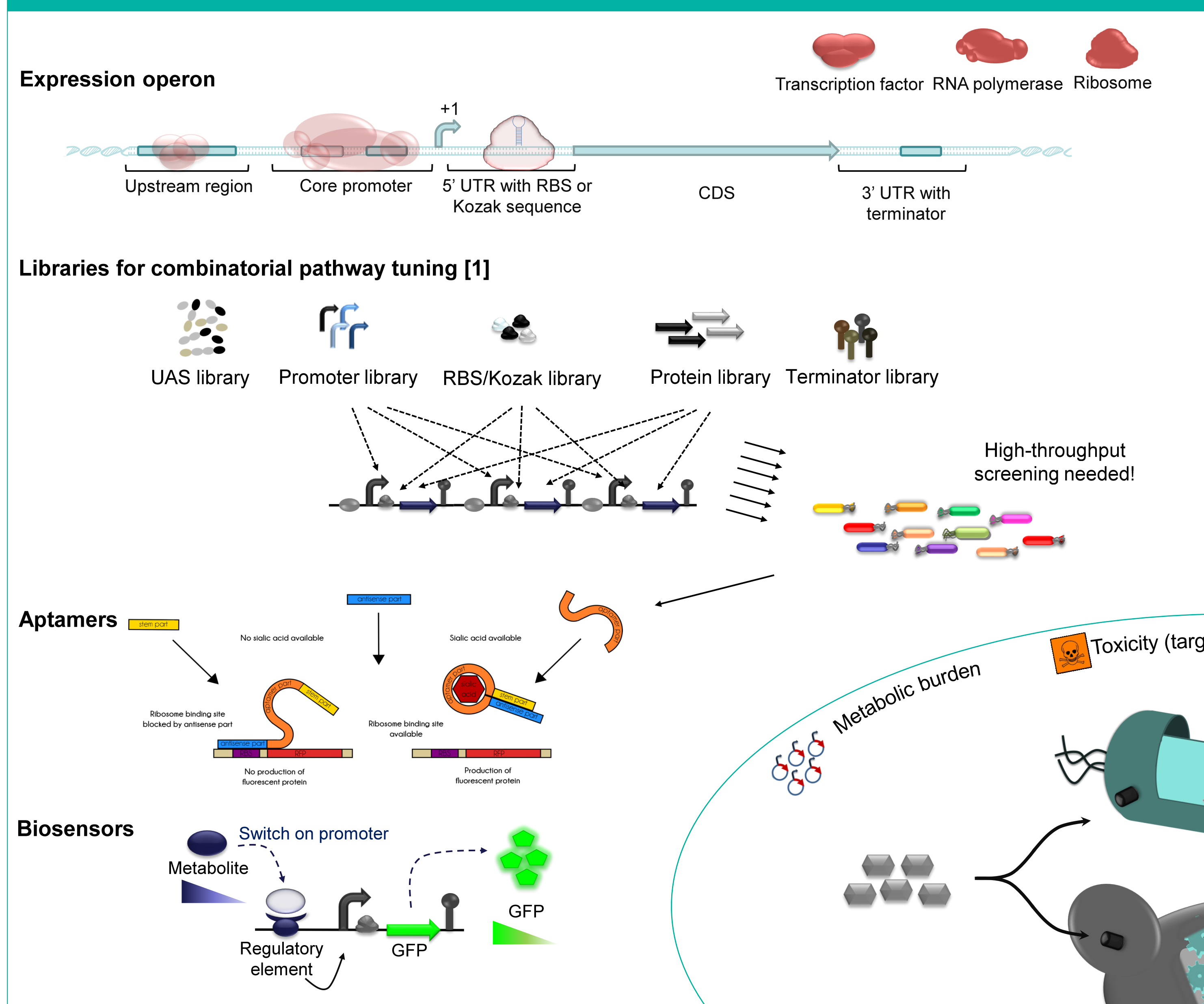
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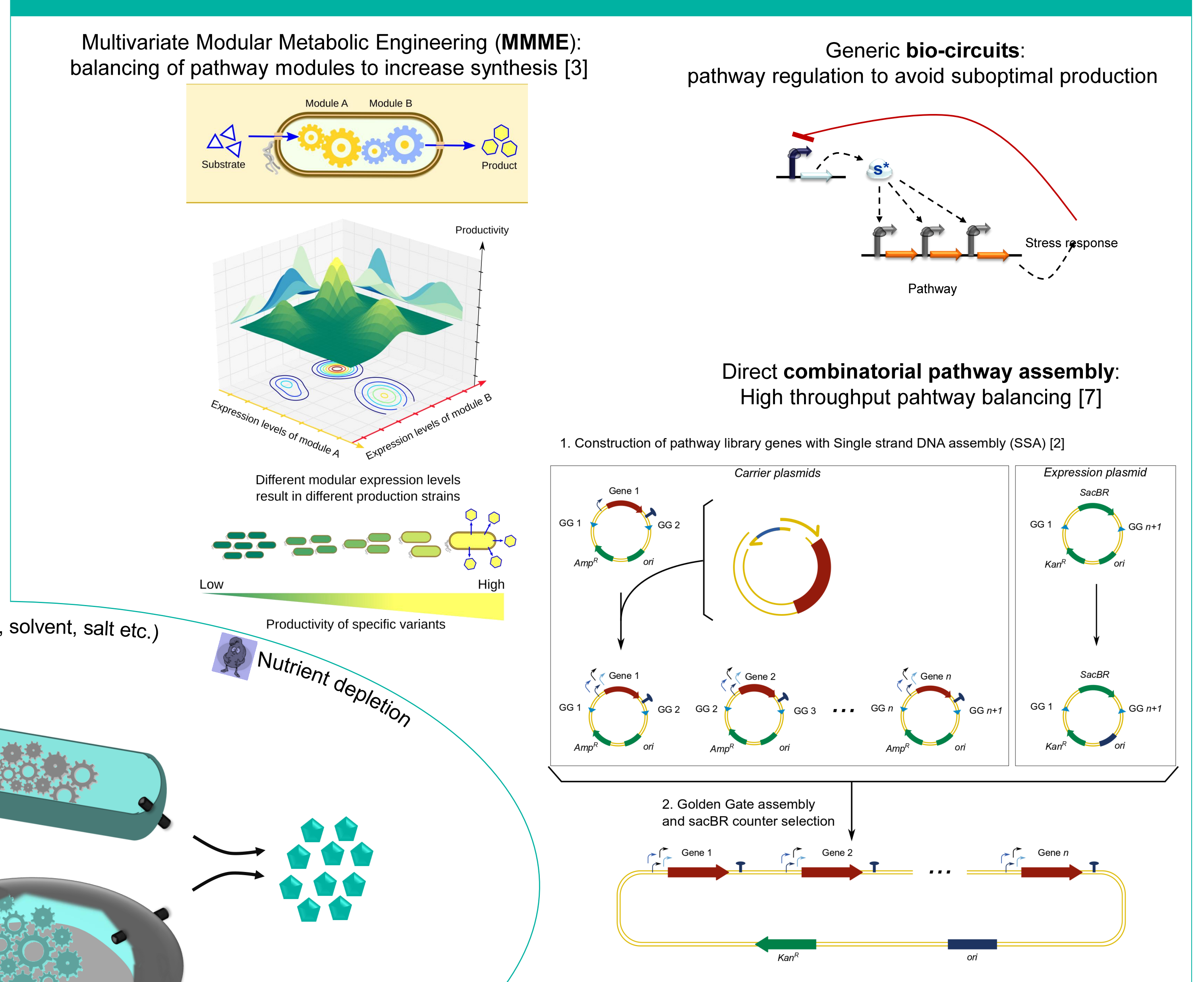
Introduction

The development of microbial bioprocesses for the production of complex metabolites is one of the major research targets of the Center of Synthetic Biology. Currently, many of these complex molecules are obtained via labor-intensive and environmentally unfriendly processes, typically yielding low titers and mixtures of products. However, most applications require a pure and well defined product. This is where industrial biotechnology provides an economically very interesting alternative. The CSB creates custom optimized microbial production hosts such as *E. coli* and several yeasts, by merging cutting-edge technologies such as metabolic engineering, synthetic biology and system biology. It focuses on the development of novel tools and methods to fine tune metabolic pathways for the biosynthesis of chemically complex metabolites. These novel tools and technologies include several DNA parts libraries as well as efficient and rapid methods for (combinatorially) constructing synthetic pathways, transferring them into prokaryotic or eukaryotic microbial systems, and screening them in a high-throughput fashion. We apply these tools and methods to create custom designed microbial cell factories for the production of useful chemicals from renewable resources, in particular for the production of specialty carbohydrates and natural products. These molecules, or their direct precursors, have a myriad of applications in -among others- pharmaceuticals, food additives and cosmetics. With this overview of in-house technologies and recent achievements, we want to show how we do our part to smoothen the transition of our fossil-fuel based economy to a more bio-based economy.

Parts Libraries



Tools



Targets

Applications

Specialized natural products

Flavonoids

- Cosmetics**
 - Skin disease
 - Anti-aging
 - Anti-inflammatory agents
- Pharmaceutical**
 - Antidepressant
 - Diabetes
 - Cystic Fibrosis
- Food**
 - Anti-oxidant
 - Anti-inflammatory

Terpenoids [4]

- Pharmaceutical**
 - Medicine
 - Antimicrobial effect
- Food**
 - Flavor (enhancer)
 - Sweetener [5]
- Fragrance**
 - Consumer goods
 - Perfumes
- Chemical**
 - Insect repellent
 - Biofuel

Chitosans [6]

- Human health**
 - Drug delivery
 - Wound healing
 - Antimicrobial effect
- Animal health**
 - Animal well-being
 - Growth promotion
 - Feed uptake & conversion
- Plant health**
 - Plant strengthening
 - Growth promotion

Sialic acid

- Neurological activity**
 - Parkinson disease
 - Alzheimer's disease
- Antiviral activity**
 - Influenza
 - HIV
- Cancer treatment**
 - Lung cancer
 - Other cancers
- Anti-adhesive activity**
 - Rheumatoid arthritis
 - Septic shock

References

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 [7] Coussement et al. (2017). *ACS synth. Biol.* 6(2) 224-232

Acknowledgments

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