# Summary: Aligning Microbial Fitness with Engineered Photoautotrophic Product Formation

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The search of sustainable sources to produce commodities like biofuels, chemical products or bioplastics among others led to the development of “cell factories”[1]. One of the organisms used to study this processes is Cyanobacteria, which is a photosynthetic bacteria capable to fix carbon obtained from the CO2 in the atmosphere.

In spite of different compounds that were successfully produced in the laboratory using Cyanobacteria, many of them never could be efficiently produce at industrial scale, one of the reasons is due to genetic instability[2] . Recently new strategies were developed using metabolic engineer to tackle this problem[3]. The basic idea behind this approach is that the organism fitness have to be aligned with the formation of the desired product because of higher burden over the cells  led to the fixation of suppressor mutations. Many of this mutations can affect genes responsible in the product formation [4].

The production of specific targets connected with the growth of the organism is known as *growth coupled production (GCP).* Several in silico and experimental methods were tested in bacteria to implement growth couple production. One computational approach  based on Genome-scale metabolic modeling (GSM)[5]  shows that many targets can be produced using GCP approach.

The compounds has to be involved in the pathways responsible of the formation of biomass precursors. This can be done removing the metabolic pathways that the cell use to re-establish side metabolites that there are formed in anabolic pathways[6].

As its shows in *Wei Du et al.,2018* one cell factory was produced using the algorithm FRUITS that ensure that the target formation is growth-couple and also can find the modifications needed in the metabolic network. This was followed by experimental validation of target products.

The results of the first growth couple cell factory shows a promising perspective for the future of sustainable sources of production using cell factories.

## References

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