Systems Biology of Acetogenic Bacteria

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Acetogenic bacteria are considered to be the most efficient microorganism for fixing C1 compound as they gain energy from operating the pathway, in contrast to the other C1 compound-fixing bacteria that spend energy during the uptake. Acetogenic bacteria are present in 23 different genera with over a hundred strains isolated from diverse habitats. The Wood-Ljungdahl pathway in the microorganism converts C1 into acetyl-CoA, which is an important cellular precursor that is converted into biochemicals. Despite the potential to reduce C1 compound in the atmosphere and industrial waste gases, lack of a systemic understanding, complex layers of regulation system, and inefficient electron delivery has limited the construction of a cellular factory optimized for producing the desired chemical. To overcome the limitation, molecular level insight has been obtained via genome-scale analyses. The results revealed functional genes required for C1 compound fixation and their regulatory systems. Integration of the information-rich data types with genome engineering technologies will facilitate the construction of optimal C1 fixing and biochemical-producing cellular factories.