

CLAIMS

1. A microorganism comprising a heterologous enzyme that converts succinyl-CoA to 3-oxoadipyl-CoA and a heterologous enzyme that converts 3-oxoadipyl-CoA to β -ketoadipate.
- 5 2. The microorganism of claim 1, wherein the enzyme that converts succinyl-CoA to 3-oxoadipyl-CoA is 3-oxoadipyl-CoA thiolase (EC 2.3.1.-).
3. The microorganism of claim 1, wherein the enzyme that converts 3-oxoadipyl-CoA to β -ketoadipate is β -ketoadipate-CoA transferase (EC 2.8.3.6).
4. The microorganism of claim 1, wherein the enzyme that converts 3-oxoadipyl-CoA to
10 β -ketoadipate is thioesterase (EC 3.1.2.20).
5. The microorganism of claim 1, wherein the enzyme that converts 3-oxoadipyl-CoA to β -ketoadipate is phosphate butyryltransferase (EC 2.3.1.19) and butyrate kinase (EC 2.7.2.7).
6. The microorganism of claim 1, wherein the microorganism further comprises a native or heterologous enzyme that converts fumarate to succinate.
- 15 7. The microorganism of claim 6, wherein the enzyme that converts fumarate to succinate is fumarate reductase (EC 1.3.1.6).
8. The microorganism of claim 6, wherein the microorganism further comprises a native or heterologous enzyme that converts succinate to succinyl-CoA.
9. The microorganism of claim 8, wherein the enzyme that converts succinate to
20 succinyl-CoA is succinate:CoA ligase (EC 6.2.1.5).
10. The microorganism of claim 6, wherein the microorganism further comprises native enzymes that convert acetyl-CoA to fumarate.
11. The microorganism of claim 1, wherein the microorganism further comprises a native or heterologous enzyme that converts α -ketoglutarate to succinyl-CoA.
- 25 12. The microorganism of claim 11, wherein the enzyme that converts α -ketoglutarate to succinyl-CoA is oxoglutarate dehydrogenase (EC 1.2.4.2).
13. The microorganism of claim 11, wherein the microorganism further comprises native enzymes that convert acetyl-CoA to α -ketoglutarate.
14. The microorganism of claim 1, wherein the microorganism further comprises a native
30 or heterologous enzyme that converts β -ketoadipate to adipic acid.
15. The microorganism of claim 1, wherein the microorganism is a C1-fixing microorganism.
16. The microorganism of claim 1, wherein the microorganism is a Wood-Ljungdahl microorganism.

17. The microorganism of claim 1, wherein the microorganism comprises a Wood-Ljungdahl pathway that converts CO, CO₂, and/or H₂ to acetyl-CoA.
18. The microorganism of claim 1, wherein the microorganism is a bacterium.
19. The microorganism of claim 1, wherein the microorganism is a member of a genus
5 selected from *Acetobacterium*, *Alkalibaculum*, *Blautia*, *Butyribacterium*, *Clostridium*,
Eubacterium, *Moorella*, *Oxobacter*, *Sporomusa*, and *Thermoanaerobacter*.
20. A method of producing β -ketoadipate comprising culturing the microorganism of claim 1 in the presence of a gaseous substrate.
21. The method of claim 20, wherein the gaseous substrate comprises one or more of CO,
10 CO₂, and H₂.
22. The method of claim 20, wherein the gaseous substrate comprises syngas or industrial waste gas.
23. A method of producing a polymer comprising culturing the microorganism of claim 1 in the presence of a gaseous substrate to produce β -ketoadipate and subsequently
15 incorporating the β -ketoadipate into a polymer.
24. The method of claim 23, wherein the polymer is β -ketoadipate-nylon.