CLAIMS

1. A method for making succinic acid or a salt thereof ~~a product~~ comprising:

irradiating a lignocellulosic or cellulosic feedstock material with ionizing radiation to produce a~~treating a~~ reduced recalcitrance lignocellulosic or cellulosic material;

saccharifying the reduced recalcitrance lignocellulosic or cellulosic material with one or more enzymes to produce a sugar solution comprising xylose and glucose;

converting the xylose with *Actinobacillus succinogenes* (ATCC 55618) to produce succinic acid or a salt thereof~~and/or organisms to produce a poly carboxylic acid; and~~

~~converting the poly carboxylic acid to the product~~.

2. The method of claim 1, wherein a feedstock is further pretreated with at least one of ~~irradiation,~~ sonication, oxidation, pyrolysis and steam explosion to produce the reduced recalcitrance lignocellulosic or cellulosic material.

3. The method of claim ~~2~~1, wherein irradiation is performed with an electron beam.

4. The method of any one of the above claims, ~~wherein converting the poly carboxylic acid to the product comprises~~further comprising ~~chemically~~ converting the succinic acid or a salt thereof to a product.

5. The method of claim 4, wherein converting comprises chemically converting.

~~5~~6. The method of claim 4~~5~~, wherein chemically converting is selected from the group consisting of polymerization, condensations, isomerization, esterification, alkylation, oxidation, amination, acid halide formation, reduction, hydrogenation, cyclization, ion exchange, anhydration, acylation and combinations thereof.

~~6~~7. The method of claims ~~4~~ 5 or ~~5~~6, wherein chemically converting includes steps selected from catalytic conversion, non-catalytic conversion and combinations thereof.

~~7. The method of any one of the above claims, wherein treating is performed initially with one of more enzymes to release one or more sugar from the lignocellulosic or cellulosic material followed by one or more organisms to produce the poly carboxylic acid.~~

~~8. The method of claim 7, wherein the sugar is selected from the group consisting of glucose, xylose, sucrose, maltose, lactose, mannose, galactose, arabinose, fructose, disaccharides of any one or two of these, cellobiose, sucrose, poly saccharides of any of two or more of these, and mixtures of these.~~

~~9~~8. The method of claim ~~8~~1, wherein ~~treating converts~~the method further comprises converting one or more of the sugars to an intermediate product prior to conversion to the ~~poly carboxylic~~succinic acid or salt thereof.

~~10~~9. The method of claim ~~9~~8, wherein the intermediate product is ethanol or glycol.

~~11~~10. The method of claim ~~9 or 10~~7, wherein the sugar is converted to the intermediate product by fermentation.

~~12. The method of any one of the above claims, wherein the poly carboxylic acid is selected from the group consisting of oxalic acid, malonic acid, succinic acid, tartaric acid, glutaric acid, adipic acid, pimelic acid, suberic acid, azelaic acid, sebacic acid, undecanedioic acid, dodecanedioic acid, maleic acid, fumaric acid, glutaconic acid, traumatic acid, muconic acid, phthalic acid, isophthalic acid, terephthalic acid, citric acid, isocitric acid, aconitic acid, mellitic acid and mixtures of these.~~

~~13. The method of any one of the above claims, wherein the poly carboxylic acid is succinic acid.~~

~~14~~11. The method of claim ~~13~~4, wherein the product is selected from the group consisting of tetrahydrofuran, gamma-butyro lactone, 2-pyrrolidinone, N-methyl-2-pyrrolidinone (NMP), N-viny-2-pyrrolidinone, succinimide, N-hydroxysuccinimide, succindiamide, succinyl chloride, succinic acid anhydride, maleic anhydride, 1,4-diaminobutane, succinonitrile, 1,4-butandiol and dimethyl succinate.

~~15~~12. ~~A~~ The method of claim 1, for making a product comprising:

~~contacting~~wherein the sugar solution is a mixed sugar solution comprising a nitrogen source and inorganic salts ~~with a succinic acid producing organism to produce succinic acid,~~

~~purifying the succinic acid, and~~

~~converting the purified succinic acid to the product, wherein~~

~~the sugar solution is made by saccharifying an electron beam treated cellulosic or lignocellulosic biomass~~.

~~16~~13. The method as in claim 12, wherein the inorganic salts include one or more of NaH_2PO_4, Na_2HPO_4, NaCl, $MgCl_2$ and $CaCl_2$.

~~17~~14. The method of claim ~~15~~ 12 or ~~16~~13, wherein the nitrogen source includes yeast extract.

~~18. The method of any one of claims 15 through 17, wherein the organism is selected from the group consisting of *Actinobacillus succinogenes*, *Anaerobiospirillum succiniciproducens*, *Mannheimia succiniciproducens* and , PEP carboxylase over-expressing *E. coli*.~~

~~19. The method of any one of claims 15 through 18, wherein converting comprises chemically converting.~~

~~20~~15. The method of any one of claims ~~15~~ 1 through ~~19~~14, wherein, in the irradiating step, the cellulosic or lignocellulosic material receives between about 10 and about 50 Mrad of radiation.

~~21. A method for making a product comprising:~~

~~contacting a mixed sugar solution comprising a nitrogen source and inorganic salts with an organism selected from the group consisting of *Actinobacillus succinogenes*, *Anaerobiospirillum succiniciproducens*, *Mannheimia succiniciproducens* and , PEP carboxylase over-expressing *E. coli*. and fermenting at least one sugar to succinic acid, and~~

~~converting the succinic acid to the product, wherein~~

~~the sugar solution is made by saccharifying an electron beam treated cellulosic or lignocellulosic biomass.~~

~~22. The method of claim 21, wherein converting comprises chemically converting.~~

~~23. The method of claim 22, wherein chemically converting is selected from the group consisting of polymerization, condensations, isomerization, esterification, alkylation, oxidation, amination, acid halide formation, reduction, hydrogenation, cyclization, ion exchange, anhydration, acylation and combinations thereof.~~

~~24. The method of any one of claims 21 through 23, wherein lignocellulosic material receives between about 10 and about 50 Mrad of radiation.~~

~~25. A method for making a product comprising:~~

~~treating a reduced recalcitrance lignocellulosic or cellulosic material with one or more enzymes and/or organisms to produce a poly carboxylic acid.~~

~~26. The method of claim 25, wherein a feedstock is pretreated with ionizing radiation to produce the reduced recalcitrance lignocellulosic or cellulosic material.~~

~~27. The method of claim 26, wherein the ionizing radiation is performed with an electron beam.~~

28. The method of any one of claims 25 through 27, wherein treating is performed initially with one of more enzymes to release one or more sugar from the lignocellulosic or cellulosic material followed by one or more organisms to produce the poly carboxylic acid.

29. The method of any one of claims 25 through 28, wherein the poly carboxylic acid is selected from the group consisting of oxalic acid, malonic acid, succinic acid, tartaric acid, glutaric acid, adipic acid, pimelic acid, suberic acid, azelaic acid, sebacic acid, undecanedioic acid, dodecanedioic acid, maleic acid, fumaric acid, glutaconic acid, traumatic acid, muconic acid, phthalic acid, isophthalic acid, terephthalic acid, citric acid, isocitric acid, aconitic acid, mellitic acid and mixtures of these

30. The method of claim 29, wherein the poly carboxylic acid is not succinic acid.