CLAIMS:

1. An isolated variant of a native LovD polypeptide, wherein the variant LovD polypeptide comprises amino acid substitutions at an amino acid residue selected from the group consisting of: ~~A10;~~ D12; K26; A86; A190; H161; ~~K227;~~ G275; V334; and L361 of SEQ ID NO: 1, wherein the variant LovD polypeptide has an improved whole cell activity at 25°C. as compared to the LovD polypeptide of SEQ ID NO:1.

2. The variant LovD polypeptide of claim 1, wherein the variant comprises amino substitutions at amino acid residue positions C40 and C60 of SEQ ID NO:1.

3. The variant LovD polypeptide of claim 1 or 2, wherein the variant LovD polypeptide comprises amino acid substitutions selected from the group consisting of: ~~A10V;~~ D12G; K26E; C40A; C60N; A86V; H161Y; A190T; ~~K227R;~~ G275S; V334D; V334F; and L361M.

4. The variant LovD polypeptide of claim 1, wherein the variant exhibits:
a decreased aggregation;
an improved thermal stability;
an improved catalytic activity;
an improved k_{cat}/K_m value; or
an improved soluble expression level.

5. A composition of matter comprising:
monacolin J;
an acyl thioester that donates an acyl moiety to the C8 hydroxyl group of monacolin J in the presence LovD acyltransferase;
a variant of LovD polypeptide comprising an amino acid substitution at:
amino acid residue positions C40 and C60; and
at least one amino acid residue position: A10; D12; K26; A86; A190; H161; K227; G275; V334; or L361 of SEQ ID NO:1, wherein the variant LovD polypeptide has an improved whole cell activity at 25°C. as compared to the LovD polypeptide of SEQ ID NO:1; and
simvastatin.