CLAIMS

We claim:

1. A salt of (2*E*,4*E*)-3-methyl-5-((1*S*,2*S*)-2-methyl-2-(5,5,8,8-tetramethyl-5,6,7,8-tetrahydronaphthalen-2-yl)cyclopropyl)penta-2,4-dienoic acid, which is a tris salt, a diethylamine salt, a lysine salt, a glycine salt, a choline salt, an ammonium salt, a magnesium salt, a calcium salt, a potassium salt, or a sodium salt of (2*E*,4*E*)-3-methyl-5-((1*S*,2*S*)-2-methyl-2-(5,5,8,8-tetramethyl-5,6,7,8-tetrahydronaphthalen-2-yl)cyclopropyl)penta-2,4-dienoic acid.

2. The salt of claim 1, which is (2*E*,4*E*)-3-methyl-5-((1*S*,2*S*)-2-methyl-2-(5,5,8,8-tetramethyl-5,6,7,8-tetrahydronaphthalen-2-yl)cyclopropyl)penta-2,4-dienoic acid mono-(tris(hydroxymethyl)aminomethane).

3. The salt of claim 1, which is an anhydrate, hemihydrate, monohydrate, or dihydrate of (2*E*,4*E*)-3-methyl-5-((1*S*,2*S*)-2-methyl-2-(5,5,8,8-tetramethyl-5,6,7,8-tetrahydronaphthalen-2-yl)cyclopropyl)penta-2,4-dienoic acid tris(hydroxymethyl)aminomethane.

4. A solid form, which is Form A of the salt of claim 2.

5. The solid form of claim 4, having an X-ray powder diffraction pattern comprising a signal, in terms of 2θ, at 11.3 ±0.2°.

6. The solid form of claim 4, having an X-ray powder diffraction pattern comprising signals, in terms of 2θ, at 3.8 ±0.2°, 7.6 ±0.2°, 11.3 ±0.2°, 18.1 ±0.2°, and 19.6 ±0.2°.

7. The solid form of claim 4, having an X-ray powder diffraction pattern substantially as shown in Figure 1.

8. The solid form of one of claims 4–7, having a differential scanning calorimetry thermogram comprising an endothermic transition at 154 ±3 °C.

9. The solid form of one of claims 4–7, having a differential scanning calorimetry thermogram substantially as shown in Figure 2.

10. The solid form of one of claims 4–9, having a thermogravimetric analysis substantially as shown in Figure 3.

11. A solid form, which is Form B of the salt of claim 2.

12. The solid form of claim 11, having an X-ray powder diffraction pattern comprising a signal, in terms of 2θ, at 11.5 ±0.2°.

13. The solid form of claim 11, having an X-ray powder diffraction pattern comprising signals, in terms of 2θ, at 3.9 ±0.2°, 11.5 ±0.2°, 18.3 ±0.2°, 19.9 ±0.2°, and 23.2 ±0.2°.

14. The solid form of claim 11, having an X-ray powder diffraction pattern substantially as shown in Figure 4.

15. The solid form of one of claims 11–14, having a differential scanning calorimetry thermogram comprising an endothermic transition at 150 ±3 °C.

16. The solid form of one of claims 11–14, having a differential scanning calorimetry thermogram substantially as shown in Figure 5.

17. The solid form of one of claims 11–16, having a thermogravimetric analysis substantially as shown in Figure 6.

18. The solid form of one of claims 4–17, which is substantially purified.

19. The solid form of one of claims 4–18, which is crystalline.

20. The solid form of one of claims 4–19, prepared by a process comprising precipitating the solid form from a solution comprising (2*E*,4*E*)-3-methyl-5-((1*S*,2*S*)-2-methyl-2-(5,5,8,8-tetramethyl-5,6,7,8-tetrahydronaphthalen-2-yl)cyclopropyl)penta-2,4-dienoic acid tris(hydroxymethyl)aminomethane and a solvent.

21. The solid form of claim 20, wherein the solvent comprises ethanol, isopropanol, butanol, or a combination thereof, and the solvent further comprises 0 to about 1 volume % of water.

22. A solid form of the salt of claim 1.

23. A particle, comprising the salt of one of claims 1–3 or the solid form of one of claims 4–22, wherein the particle is optionally coated, micronized, or both.

24. A pharmaceutical composition, comprising the salt of one of claims 1–3, the solid form of one of claims 4–22, or the particle of claim 23, and a pharmaceutically acceptable carrier.

25. A pharmaceutical composition, comprising the salt of one of claims 1–3, the solid form of one of claims 4–22, or the particle of claim 23, wherein the solid form is present in the composition in an amount of at least about 80% by weight.

26. A pharmaceutical composition, consisting essentially of the salt of one of claims 1–3, the solid form of any one of claims 4–22, or the particle of claim 23.

27. The pharmaceutical composition of one of claims 24–26, formulated as an oral, parenteral, topical, or inhalational dosage form, or formulated for oral, parenteral, topical, or inhalational administration.

28. A composition, comprising the salt of one of claims 1–3, the solid form of one of claims 4–22, or the particle of claim 23.

29. A process for preparing the solid form of any one of claims 4–19 or 22, comprising precipitating the solid form from a solution comprising (2*E*,4*E*)-3-methyl-5-((1*S*,2*S*)-2-methyl-2-(5,5,8,8-tetramethyl-5,6,7,8-tetrahydronaphthalen-2-yl)cyclopropyl)penta-2,4-dienoic acid tris(hydroxymethyl)aminomethane and a solvent,

wherein the solvent comprises ethanol, isopropanol, butanol, or a combination thereof, and the solvent further comprises 0 to about 1 volume % of water.

30. A compound comprising:

the salt form of one of claims 1–3;

the solid form of one of claims 4–22;

the particle of claim 23;

the pharmaceutical composition of one of claims 24–27; or

the composition of claim 28,

for use in therapy.

31. Use of the compound of claim 30 in the manufacture of a medicament for treating retinoid X receptor related disease.

32. Use of the compound of claim 30 in the manufacture of a medicament for treating a disease selected from a nervous system disorder, a muscular disorder, a cellular proliferation disorder, or an autoimmune disorder.

33. Use of the compound of claim 30 in the manufacture of a medicament for treating a disease selected from a cancer or tumor.