WHAT IS CLAIMED IS:

1. Fumaryl diketopiperazine (FDKP) microparticles comprising a trans isomer content of about 45% to about 65%.

2. The FDKP microparticles according to claim 1, wherein said trans isomer content is from about 50% to about 65%.

3. The FDKP microparticles according to claim 1, wherein said trans isomer content is from about 53% to about 63%.

4. The FDKP microparticles according to claim 1, further comprising a drug or an active agent.

5. The FDKP microparticles according to claim 4, wherein said drug or active agent is a peptide or protein.

6. The FDKP microparticles according to claim 5, wherein said peptide is an endocrine hormone.

7. The FDKP microparticles according to claim 6, wherein said endocrine hormone is insulin, parathyroid hormone, calcitonin, glucagon, glucagon-like peptide 1, oxyntomodulin, or an analog or active fragment of said endocrine hormone.

8. The FDKP microparticles of claim 4, wherein the drug is present in an amount greater than 0.01 wt% of the microparticles.

9. A dry powder comprising the FDKP microparticles of claim 1.

10. A dry powder comprising the FDKP microparticles of claim 4.

11. Use of a dry powder formulation in the manufacture of a medicament for treating an endocrine-related disease or disorder, wherein the dry powder formulation comprises fumaryl diketopiperazine (FDKP) microparticles comprising an FDKP trans isomer content of about 45% to about 65% and an endocrine hormone suitable to treat said disease or disorder.

12. The use of claim 11, wherein the endocrine hormone is insulin, parathyroid hormone, calcitonin, glucagon, glucagon-like peptide 1, oxyntomodulin, or an analog of said endocrine hormone.

13. The use of claim 11, wherein the endocrine-related disease is diabetes.

14. The FDKP microparticles of any one of claims 1-8 or the dry powder of claims 9 or 10 or the use of any one of claims 11-13, wherein the FDKP microparticles have a respirable fraction on fill (RF/fill) value of greater than 40%, reflecting improved

aerodynamic performance as compared to microparticles having a trans isomer content outside of about 45% to about 65%.

15. The FDKP microparticles of any one of claims 1-8 or the dry powder of claims 9 or 10 or the use of any one of claims 11-13, wherein the FDKP microparticles have a volumetric median geometric diameter (VMGD) less than 12.5µm.

16. The FDKP microparticles of any one of claims 1-8 or the dry powder of claims 9 or 10 or the use of any one of claims 11-13, wherein the FDKP microparticles have a VMGD less than 7.0µm.

17. The FDKP microparticles of any one of claims 1-8 or the dry powder of claims 9 or 10 or the use of any one of claims 11-13, wherein the FDKP microparticles have a VMGD less than 4.8µm.

18. The FDKP microparticles of claim 4 or the dry powder of claim 10 wherein the drug or the active agent is insulin.

19. The use of claim 11, wherein the endocrine hormone is insulin.

20. A dry powder comprising microparticles comprising 3,6-bis(N-fumaryl-4-amino-butyl)-2,5-diketopiperazine and insulin; wherein said microparticles are about 10% to 15% insulin by weight; wherein the trans-FDKP isomer content of the microparticles is from about 53% to 63%.

21. An inhalation system comprising a breath powered inhaler and a dry powder comprising microparticles comprising 3,6-bis(N-fumaryl-4-amino-butyl)-2,5-piperazine and insulin; wherein said microparticles are about 10% to 15% insulin by weight; wherein the trans-FDKP isomer content of the microparticles is from about 53% to 63%; and wherein said dry powder is provided in a unit dose cartridge.