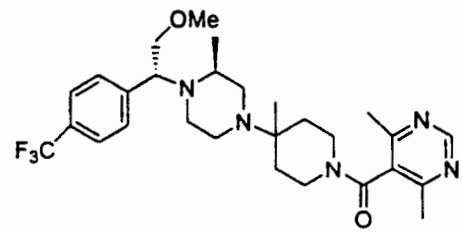
PROCESS FOR THE PREPARATION OF COMPOSITIONS HAVING AN INCREASED AMOUNT OF PHARMACEUTICALLY ACTIVE SALTS OF ROTAMERS

Field of the Invention

This patent application generally discloses a novel process to prepare pharmaceutically useful salts. It specifically discloses a novel process to synthesize pharmaceutically useful salts of piperidine, 4-[4-[(1*R*)-[4-(trifluoromethyl)phenyl]-2-methoxyethyl]-(3*S*)-methyl-1-piperazinyl]-4-methyl-1-[(4,6-dimethyl-5-pyrimidinyl)carbonyl]. It further discloses a process to prepare pharmaceutical salts that are enriched in desired specific rotameric configurations. This application claims priority from U.S. provisional patent application, Docket No. 60/334,331 filed November 29, 2001 and U.S. provisional patent application, Docket No. 60/373,916 filed April 19, 2002.

Background of the Invention

Piperidine, 4-[4-[(1*R*)-[4-(trifluoromethyl)phenyl]-2-methoxyethyl]-(3*S*)-methyl-1-piperazinyl]-4-methyl-1-[(4,6-dimethyl-5-pyrimidinyl)carbonyl] (Formula I) is disclosed in pending U.S. patent application, Serial No. 09/562,814 filed on May 1, 2000, incorporated herein by reference.



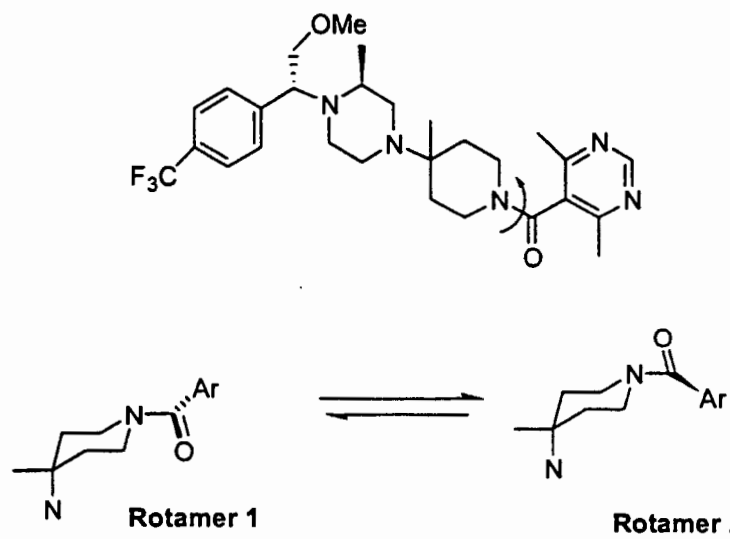
I

That patent application, Serial Number 09/562,814, discloses several novel antagonists of the CCR5 receptor which are useful for the treatment of AIDS and related HIV infections, including the compound of Formula I. CCR-5 receptors have also been reported to mediate cell transfer in inflammatory diseases such as arthritis, rheumatoid arthritis, atopic dermatitis, psoriasis, asthma and allergies, and inhibitors of such receptors are expected to be useful in the treatment of such

diseases, and in the treatment of other inflammatory diseases or conditions such as inflammatory bowel disease, multiple sclerosis, solid organ transplant rejection and graft v. host disease.

Generally, pharmaceutical compounds are used as their pharmaceutically acceptable salts. This is true of CCR5 receptor antagonists such as the compound of Formula I too, which makes the preparation of pharmaceutically acceptable salts of such compounds quite important.

The compound of Formula I has two chiral centers and the absolute configurations of the chiral centers are controlled by the chemical synthesis. However, the compound of Formula I exists as a mixture of rotational isomers or rotamers. There are two rotamers (diastereoisomers) resulting from restricted rotation about the amide bond marked in the figure in Scheme 1. The two rotamers may be denoted as isomers 1and 2, in order of their elution from a HPLC column (Scheme 1):



Scheme 1

While general synthetic approaches for salts typically yield a 1:1 ratio of the rotamers 1 and 2, it would be preferable to find methods of synthesis that would yield rotamer populations that are enriched in certain rotamers preferentially.

Summary of the Invention

In an embodiment, the present invention discloses a unique process for preparing a mixture of rotamers of a salt of a basic compound wherein said mixture comprises one or more rotamers of said salt in a higher (i.e., preferentially enriched) molar percent than their corresponding rotamers of said salt, with the process comprising reacting said basic compound with an acid in admixture with a solvent. It also teaches a method for preparing pharmaceutically useful salts. It specifically teaches a method for the formation of the salts, pharmaceutically useful or otherwise, of the compound of Formula I in high yields. It also teaches the direct, enriched preparation of specific, preferential rotamers of a salt of the compound of Formula I in high yields and in higher molar percent than other corresponding rotamers of the salt.

The term "high yields" refers to at least about 50% yield of the desired enriched product . Thus, unlike previously known processes which result in a 1:1 ratio of the salts of the rotamers 1 and 2, the present process offers a way to obtain the selective formation of unequal ratios of the salts of the desired rotamer directly. The term "higher molar percent" refers to selective preferred formation of a certain rotamer (or diastereoisomer) or rotamers over the other corresponding rotamer (or diastereoisomer) or rotamers by at least about a 55:45 ratio of molar percent. The formation of such differential ratio of rotamer (or diastereoisomer) directly in the present process is influenced by the unique choice of the solvent medium for the reaction between the particular acid and the basic compound. The term 'directly' means 'without the need for an additional step to separate the 50:50 rotamers obtained, for example, in the conventional process'. Thus, for example, if rotamer 2 is the desired one with high pharmaceutical activity, the present process makes it possible to obtain that rotamer directly instead of having to make an equimolar mixture of the rotamers 1 and 2 by previously known processes, followed by cumbersome separation of the mixture; such a separation may or may not yield the desired salt in decent yields and the process is also likely to be expensive.

Since the activity of pharmaceutical compositions may differ depending upon the type of salt they are comprised of, the present process affords a unique way to obtain desired specific salts with good pharmaceutical activity in highly

enriched rotameric content. In the case of the compound of Formula I, the present process achieves such preferential formation of the isomers by creative selection of the acid (for salt formation) and solvent medium for the salt-forming reaction.

The inventive process to make differing ratio of the rotamers of the salts of the compound of Formula I has several advantages: it is economical, can be easily scaled-up, affords the desired, preferentially enriched rotamer ratio in high yields and is generically applicable.

Description of the Invention

In one embodiment, the present invention discloses a novel, easy-to-use process for preparing a pharmaceutical salt of a basic compound in high yields. In another embodiment, the present invention discloses a novel, easy-to-use process for preparing a pharmaceutical salt of a basic compound of Formula I in high yields. It also teaches the preferential preparation of specific rotamers of the salt of the compound of Formula I in high yields. In another embodiment, the present process, while described and illustrated herein as the preparation of specific desired rotamers of the compound of Formula I, is simple enough to be applicable generically to the preparation of pharmaceutically useful salts from a basic pharmaceutical composition. The present process comprises reacting the compound of Formula I (or a similar base) with an acid in admixture with a selected solvent medium in order to obtain differing ratios of rotamers as salts. The term "admixture" refers to physical contact of the ingredients as is known to those skilled in the art such as, for example, solution, suspension, emulsion, contact through a matrix such as, running through a column, and the like.

Thus, in another embodiment, the invention offers a novel, simple process to directly prepare desired salts of a basic compound in an unequal ratio of rotameric populations. In yet another embodiment, the present invention teaches the formation of pharmaceutically useful salts in high yields and selectivity of rotamer population.

In an illustrative embodiment, the present process offers a way to directly obtain at least about 55 mole percent of rotamer 2 and about 45 mole percent of rotamer 1 in the salt of the compound of Formula I. In many instances, it affords a

way to obtain rotamer 2 and rotamer 1 in a molar percent ratio of 75:25 respectively. In fact, in several instances, it affords rotamer 2 in even greater than 90 molar percent. Specifically, the present process achieves such preferential formation of the desired rotamer of the salt of the compound of Formula I by creative selection of the acid (for salt formation) and solvent medium for the salt-forming reaction.

The process, while described and illustrated herein as the preparation of specific desired rotamers of the compound of Formula I, is simple enough to be applicable generically to the preparation of pharmaceutically useful salts from basic pharmaceutical compositions. By appropriate choice of the solvent medium, the reaction of the basic compound with an acid (from which the salt is to be derived) to form the salt selectively yields the desired rotameric compositions in enriched molar percent. Thus, in another embodiment, the invention offers a novel, simple process to directly prepare desired salts of basic compounds in an unequal ratio of rotamers. In yet another embodiment, the present invention teaches the formation of pharmaceutically useful salts in high yields and selectivity of rotamer population.

The following non-limiting list includes anions representing suitable acids which may be used to form salts in accordance with the present invention. The list of anions for useful salts includes, for example, acetate, benzenesulfonate, benzoate, bicarbonate, bromide, calcium edetate, camphorsulfonate, carbonate, chloride/dihydrochloride, citrate, N,N-di(dehydroabietyl)ethylenediamine, edetate, 1,2-ethanedisulfonate, ethanesulfonate, fumarate, glucoheptonate, gluconate, glutamate, p-glycollamidophenylarsonate, hexylresorcinate, hyclate, hydrobromide, hydrochloride, 2-hydroxyethanesulfonate, hydroxynaphthoate, iodide, lactate, lactobionate, lauryl sulfonate, malate, maleate, mandelate, methanesulfonate, methylbromide, methylnitrate, methylsulfate, mucate, nafate, napsylate, nitrate, pamoate, pantothenate, phosphate/diphosphate, polygalacturonate, salicyclate, sodium succinate, stearate, subacetate, succinate, sulfate, tosylate, tannate, tartarate/bitartarate, 8-chlorotheophyllinate, triethiodide, adipate, alginate, aminosalicyclate, anhydromethylenecitrate, arecoline, asparate, bisulfate, butylbromide, camphorate, digluconate, dihydrobromide, disuccinate, glycerophosphate, hemisulfate, hydrofluoride, hydroiodide,

methylenebis(salicyclate), naphthalenedisulfonate, oxalate, pectinate, persulfate, phenylethylbarbiturate, picrate, propionate, thiocyanate, undecanoate, acetylaminoacetate, N-acetyl-L-asparaginate, N-acetylcystinate, adamantoate, adipoate, N-alkylsulfamates, anthraquinone-1,5-disulfonate, arabolactansulfate, argininate, aspartate, betaine, carnitine, 4-chloro-m-toluenesulfonate, decanoate, diacetyl sulfate, dibenzylethylenediamine, dimethylamine, diguaiacylphosphate, dioctylsulfosuccinate, pamoate, fructose-1,6-diphosphate, glucose phosphate, L-glutaminate, hydroxynaphthoate, lauryl sulfate, lysine, 2-naphthenesulfonate, octanonate, tannate and theobromine acetate. Additionally, acids which are generally considered suitable for the formation of pharmaceutically useful salts from basic pharmaceutical compounds are discussed, for example, by S. Berge *et al, Journal of Pharmaceutical Sciences* (1977) 66(1),1-19; P. Gould, *International J. of Pharmaceutics* (1986) 33 201-217; Anderson *et al,* "The Practice of Medicinal Chemistry" (1996), Academic Press, New York; and in *The Orange Book* (Food & Drug Administration, Washington, D.C. on their website). These disclosures are incorporated herein by reference. Mono- and di- salts are included.

Generally, known processes to form salts by reaction of basic compounds with acids yield equal ratios of rotamers which need to be later separated in yet another step. The present process, which avoids such separation by preferentially enriching in certain rotamer populations during the salt formation reaction itself is superior.

The present process may be illustrated by the formation of the maleate salt of the compound of Formula I. The compound of Formula I, which is basic, may be dissolved in a suitable solvent. Suitable solvents include alcohol, ester, ketone, hydrocarbon or mixtures thereof. Non-limiting examples of such suitable solvents are ethyl acetate, isopropyl acetate, isopropyl alcohol, ethyl alcohol, acetone, hexane, toluene, heptane and the like, and mixtures thereof. Preferred solvents are ethyl acetate or isopropyl acetate. Maleic acid may be added to this either as a solid or as a solution in the same solvent. The acid is used generally in a 5:1 mole ratio, preferably in a 2:1 molar ratio and typically in a 1:1 molar ratio, with respect to the compound of Formula I. The total quantity of the solvent may generally be in about a 20:1 ratio, preferably about a 10:1 ratio and typically about a 6:1 ratio, with

respect to the compound of Formula I. The mixture is stirred or intimately mixed otherwise, generally at about 25-90°C, preferably at about 50-90°C and typically at about 60-80°C for a duration of about 1-48 hours generally, about 1-36 hours preferably, and about 1-24 hours typically, and then kept at about the ambient conditions to allow the completion of salt formation, usually as crystals. Seeding may be done if necessary or desired. The salt may be isolated by filtration or such similar methods. The rotameric ratio may be determined by methods known to those skilled in the art such as, for example, HPLC, HMR and the like, as is well known to those skilled in the art. In an illustrative experiment involving the compound of Formula I, when ethyl acetate or isopropyl acetate was used as the solvent and maleic acid as the acid, a diastereomeric ratio of >2:98 (for the isomer 1 to the isomer 2) was found in the maleate salt formed from the reaction. Similar results were obtained for salts prepared with acids other than maleic acid too.

The salts prepared by the present invention exhibit desirable physical and chemical characteristics suitable for pharmaceutical uses. Non-limiting examples of such characteristics include physical stability, chemical stability, thermal stability, desirable hygroscopicity, solubility, fluidity and the like.

The following nonlimiting EXAMPLES and TABLE 1 are provided in order to further illustrate the present invention.

EXAMPLES

Unless otherwise stated, the following abbreviations have the stated meanings in the Examples and Table 1 below:

HPLC= High Performance Liquid Chromatography

M.pt: melting point

NMR= nuclear magnetic resonance spectroscopy

mL= milliliters

mmol=millimoles

g= grams

rt= room temperature (ambient)

THF= Tetrahydrofuran

TBME= Methyl t-butyl ether

ACN= Acetonitrile

EtOH= Ethanol

EtOAc= Ethyl acetate

iPrOAc= Isopropyl acetate

EXAMPLES

Example 1. Mono-benzenesulfonic acid salt of the compound of Formula I: To 0.2 g (0.37 mmol) of the amine compound of Formula I dissolved in 1mL ethyl acetate at 40 ° C was added a solution of 0.06g (0.38 mmol) benzene sulfonic acid in 1.5 mL EtOAc at 40 ° C. The solution was stirred 2 days and filtered. Solids were washed with 0.5 mL ethyl acetate and dried to give 40mg of the mono-benzene sulfonate salt with 8.7: 91.3 ratio of rotamers 1 to 2.

Example 2. Di- benzenesulfonic acid salt of the compound of Formula I: To 0.3g ((0.55 mmol) of the amine compound of Formula I dissolved in 1mL ethyl acetate at 40 ° C was added a solution of 0.18g (1.12 mmol) benzene sulfonic acid in 3 mL ethyl acetate at 40 ° C. The solution was stirred 2 days and filtered. Solids were washed with 0.5 mL ethyl acetate and dried to give 0.26g of di-benzene sulfonate salt in 51.3% yield.

Example 3. Citric acid salt of the compound of Formula I: To 6.14 g (9.18 mmol) of the amine compound of Formula I dissolved in 15 mL of acetone at 23 °C was added 1.77 g (9.17 mmol) of solid citric acid. The mixture was heated to 50 °C and allowed to cool to room temperature. The mixture was stirred for 23 hr and15 mL of acetone was added. The solids were filtered, washed with 15 mL of acetone and dried to give 5.05 g of the citrate salt in 76% yield with 1:99 ratio of rotamers 1 to 2.

Example 4. Mono-hydrochloric acid salt of the compound of Formula I: To 0.28 g (0.525 mmol) of the amine compound of Formula I dissolved in 1 mL MTBE at 23 °C was added 0.043 mL (0.52 mmol) 12 M HCl solution. The mixture was stirred for 10 days as the product slowly solidified. Two mL of TBME

was added, the solids were filtered, washed with 2 mL THF and dried to give 0.25 g of the mono HCl salt in 85% yield.

Example 5. Di-hydrochloric acid salt of the compound of Formula I:

To 5.02 g (9.22 mmol) of the amine compound of Formula I dissolved in 22.5 mL of 2 : 1 THF : toluene at 23 °C was added 1.55 ml (18.7 mmol) 12 M HCl solution. The mixture was stirred for 23 hr and filtered. The solids were washed with 15 mL THF and dried to give 5.2 g of the di-HCl salt in 92% yield with 1:99 ratio of rotamers 1 to 2.

Example 6. Fumaric acid salt of the compound of Formula I: To 0.5g (0.92 mmol) of the amine compound of Formula I dissolved in 0.5mL toluene and 2.5 mL acetone at room temperature was added 0.1145g (0.987 mmol) fumaric acid and 2.5 mL acetone. The solution was stirred for 2 days, cooled to 0 ° C and filtered to give 0.29g of the mono-fumarate salt.

Example 7. Di-phosphoric acid salt of the compound of Formula I:

To 0.30g (0.55mmol) of the amine compound of Formula I dissolved in 1.5mL isopropyl alcohol was added 75 µL (1.10 mmol) 85% phosphoric acid at 40 ° C. The solution was stirred for 2 days, filtered and dried to give 0.35 g of the diphosphate salt in 85.2 % yield.

Example 8. Mono-p-toluene sulfonic acid salt of the compound of Formula I: To 0.23g (0.44 mmol) of the amine compound of Formula I dissolved in 1mL isopropyl acetate at 40 ° C was added a solution of 0.0845g (0.24 mmol) p-toluene sulfonic acid monohydrate in 1.5 mL isopropyl acetate at 40 ° C. The solution was stirred 2 days and filtered. Solids were washed with 0.5mL isopropyl acetate and dried to give 0.17g of mono-PTSA salt in 54.6% yield with 7.7:92.3 ratio of rotamers 1 to 2.

Example 9. Di-p-toluene sulfonic acid salt of the compound of Formula I: To 0.30g (0.44mmol) of the amine compound of Formula I dissolved in 1mL acetone at 40 ° C was added a solution of 0.1686g (0.89 mmol) p-toluene sulfonic acid monohydrate in 3mL acetone at 40 ° C. The solution was stirred 2days and filtered. Solids were washed with 1.5mL acetone and dried to give 0.2g of the di-PTSA salt.

The following Examples illustrate the preparation of the maleic acid salt of the compound of Formula I from different solvents:

Example 10a. From isopropanol: The amine compound of Formula I (3.0 g, 93.6% pure) and maleic acid (0.65 g) were mixed and dissolved in isopropanol (12 mL). The mixture was stirred at room temperature for about 1 h resulting in a cloudy solution. Crystalline seeds were added and the resulting slurry was stirred at room temperature for about 21 h. The product was filtered and dried overnight at 55 °C under vacuum to give a white solid (3.0 g, 88% yield). Ratio of rotamers 1 to 2: 1.1:98.9.

Example 10b. From ethanol/toluene mixture: The amine compound of Formula I (10 g) in ethyl acetate (about 35 mL) was mixed with a solution of maleic acid (2.17 g) in methanol (10 mL) at room temperature. The mixture was concentrated under vacuum and the residue was redissolved in ethanol (10 mL). Toluene (125 mL) was added slowly at 60 °C to give a milky solution. The mixture was cooled to room temperature over 2 h and seeded. The mixture was stirred at room temperature for about 2.5 days. The product was filtered and dried for 18 h at 45 °C under vacuum to give a white solid (8.66 g, 71% yield). Ratio of rotamers 1 to 2: 1.8:98.2.

Example 10c. From ethanol/ethyl acetate mixture: The amine compound of Formula I (10 g) in ethyl acetate (35 mL) was mixed with a solution of maleic acid (2.18 g) in ethanol (10 mL) at room temperature. Crystalline seeds were added and the mixture was stirred at room temperature for 22 h. The slurry was cooled gradually to –10 °C and stirred at that temperature for 4 h. The product was filtered, washed with ethyl acetate (10 mL), and dried overnight at 64 °C under vacuum to give the desired salt as a white solid. Ratio of rotamer 1 to 2: 2.3:97.7.

Example 10d. From isopropanol/ethyl acetate: The amine compound of Formula I (10 g) in ethyl acetate (40 mL) was mixed with a solution of maleic acid (2.2 g) in isopropanol (20 mL) at 55 °C. The cloudy mixture was seeded, cooled slowly to 40 °C, and stirred at 40 °C overnight. The resulting slurry was cooled gradually to room temperature and stirred overnight. The product was filtered, washed with 2:1 ethyl acetate/isopropanol (30 mL), and dried overnight at

55 °C under vacuum to give the desired salt as a white solid. Ratio of rotamers 1 to 2: 0.9: 99.1.

Example 10e. From ethyl acetate: The amine compound of Formula I (26 g) in ethyl acetate (26 mL) was mixed with a solution of maleic acid (5.7 g) in Ethyl Acetate (74 mL) at 60 °C. The solution was seeded at 60 °C and stirred at 60 °C overnight. The resulting slurry was cooled gradually to room temperature and to 0 °C for 2 hours. The product was filtered, and dried overnight at 25 °C under vacuum to give a white solid (27.6 g, 87% yield). Ratio of rotamers 1 to 2: 1.8:98.2.

Example 10f. From ethyl acetate/heptane: The amine compound of Formula I (20 g) in ethyl acetate (20 mL) was mixed with a solution of maleic acid (4.4 g) in Ethyl Acetate (60 mL) at 65 °C. The solution was seeded at 65 °C and stirred at 65 °C for 1 hours. Then 20 mL of Heptane was added to the slurry at 65 °C. After stirring at 65 °C overnight, the slurry was cooled gradually to room temperature and to 0 °C for 2 hours. The product was filtered, and dried overnight at 25 °C under vacuum to give a white solid (22.3 g, 92% yield). Ratio of rotamers 1 to 2: 1.9:98.1.

Example 10g. From isopropyl acetate: Maleic acid (4.4 g) was dissolved in 100 mL of Isopropyl acetate at 75 °C. The solution of the amine compound of Formula I (20 g) in Isopropyl acetate (20 mL) was added to the maleic acid solution at 75 °C. After stirring at 75 °C overnight, the resulting slurry was cooled gradually to room temperature and to 0 °C for 2 hours. The product was filtered, and dried overnight at 25 °C under vacuum to give a white solid (22.1 g, 91% yield). M.pt. 183.5°C . Ratio of rotamers 1 to 2: 1.8:98.2.

Table 1

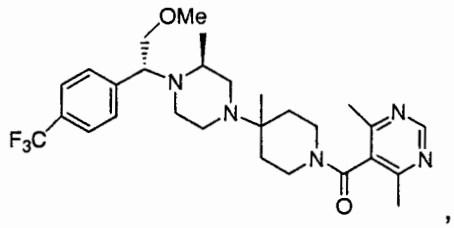
Salt		Solvent (diastereomeric ratio 1 to 2 in solids) Yield%				
1.	Mono-Benzene sulfonate	Ethyl Acetate (8.7:91.3)				
2.	Di-Benzene sulfonate	Ethyl Acetate 51% yield	TBME 94% yield			
3.	(1S)-(+)-Camphorsulf-onate	THF/TBME (50:50)				
4.	Citrate	Acetone (1:99)				
5.	Mono-hydrochloride	TBME 85% yield				
6.	Di-hydrochlori-de	THF/Toluene (1:99)				
7.	Fumarate	Acetone 66% yield	Acetonitrile 76% yield	iPrOAc 51% yield	Acetone/ Toluene	
8.	Di-Phosphate	Acetone 69% yield	Ethyl Acetate 57% yield	Isopropyl alcohol 85% yield		
9.	Mono-Tosylate	Ethyl Acetate	iPrOAc (7.7:92.3)			
10	Di-Tosylate	Acetone 50% yield	Ethyl Acetate	IPrOAc or Toluene	Isopropyl alcohol	TBME 99.5% yield
11	Maleate	Ethyl Acetate (1.8:98.2) Ethyl Acetate/ Heptane (1.9:98.1)	iPrOAc (1.8:98.2)	EtOH/Ethyl Acetate (2.3:97.7) EtOH/ toluene (1.8:98.2)	Isopropyl alcohol (1.1:98.9) Isopropyl alcohol/ EtOAc (0.9:99.1)	

While the EXAMPLES and TABLE 1 are described herein as the preparation of the diastereomeric isomer of the salts of the compound of Formula I, it will be apparent to those skilled in the art that many modifications, variations and alterations to the present disclosure, both to materials, methods and reaction conditions, may be practiced. All such modifications, variations and alterations are intended to be within the spirit and scope of the present invention.

CLAIMS

What is claimed:

1. A process for preparing a mixture of rotamers of a salt of a basic compound wherein said mixture comprises one or more rotamers of said salt in a higher molar percent than their corresponding rotamers of said salt, said process comprising reacting said basic compound with an acid in admixture with a solvent, wherein said compound has the structure of Formula I:



Formula I

wherein said acid is used in a molar ratio of 5:1 with respect to said basic compound and said solvent is used in a molar ratio of 20:1 with respect to said basic compound.

2. The process of claim 1, wherein said molar percent is 55:45 of said one or more rotamers of the salt to said other corresponding rotamers of the salt.

3. The process of claim 2, wherein said molar percent is 75:25 of said one or more rotamers of the salt to said other corresponding rotamers of the salt.

4. The process of claim 3, wherein said molar percent is at least 90:10 of said one or more rotamers of the salt to said other corresponding rotamers of the salt.

5. The process of claim 1, wherein said higher molar percent refers to the ratio of the salt of rotamer 1 to the salt of rotamer 2 of said compound of Formula I.

6. The process of claim 1, wherein said higher molar percent refers to the ratio of the salt of rotamer 2 to the salt of rotamer 1 of said compound of Formula I.

7. The process of claim 1, wherein said salt is selected from the group consisting of benzenesulfonate, citrate, camphorsulfonate, maleate, fumarate, phosphorate, p-toluenesulfonate, (D)-camphorate, and hydrochloride.

8. The process of claim 7, wherein said salt is maleate.

9. The process of claim 1, wherein said solvent is an alcohol, ester, ketone, hydrocarbon or mixtures thereof.

10. The process of claim 1, wherein said alcohol is selected from the group consisting of ethyl alcohol, isopropyl alcohol and mixtures thereof.

11. The process of claim 10, wherein said alcohol is isopropyl alcohol.

12. The process of claim 8, wherein said hydrocarbon is selected from the group consisting of toluene, hexane, heptane and mixtures thereof.

13. The process of claim 9, wherein said ester is selected from the group consisting of ethyl acetate, isopropyl acetate and mixtures thereof.

14. The process of claim 8, wherein said maleate is formed at a temperature range of ambient temperature to 90°C.

15. The process of claim 14, wherein said solvent is ethyl acetate.

16. The process of claim 14, wherein said solvent is isopropyl acetate.

17. The process of claim 14, wherein said solvent is isopropyl alcohol.

18. The process of claim 14, wherein said solvent is a mixture of ethyl alcohol and toluene.

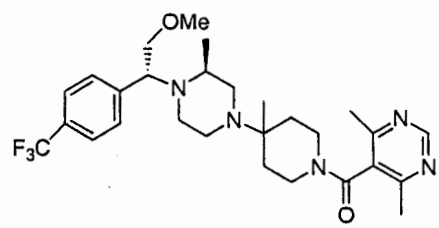
19. The process of claim 14, wherein said solvent is a mixture of ethyl acetate and heptane.

20. The process of claim 8, wherein said maleate is formed at the ambient temperature over 21 hours.

21. The process of claim 7, wherein said salt is a citrate.

22. The process of claim 21, wherein said solvent is acetone and the reaction is performed at 50°C for 23 hours.

23. A process for preparing a mixture of rotamer 1 and rotamer 2 of the maleate salt of the compound of Formula I



Formula I

wherein the molar percent of said rotamer 2 to the molar percent of said rotamer 1 in said mixture is in at least a 55:45 ratio, said process comprising:

(a) preparing a first intimate mixture of said compound of Formula I in a solvent;

(b) maintaining said first intimate mixture at ambient temperature to 90°C;

(c) preparing a second intimate mixture of maleic acid in the same solvent stated in step (a);

(d) combining said first intimate mixture and said second intimate mixture to prepare a combined intimate mixture and maintaining the combined intimate mixture at ambient temperature to 90°C for 1-24 hours to induce formation of the maleate salt; and

(e) isolating the salt.

24. The process of claim 23, wherein said solvent is an alcohol, ketone, ester, hydrocarbon or mixtures thereof.

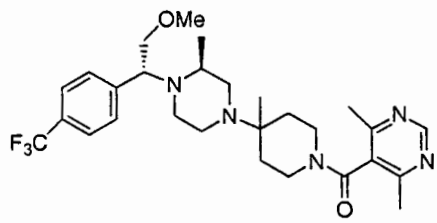
25. The process of claim 24, wherein said solvent is an alcohol.

26. The process of claim 24, wherein said ester is isopropyl acetate or ethyl acetate.

27. The process of claim 23, wherein said ratio is 75:25 for the molar percent of rotamer 2 to the molar percent of rotamer 1.

28. The process of claim 23, wherein said ratio is at least 90:10 for the molar percent of rotamer 2 to the molar percent of rotamer 1.

29. A mixture of rotamers of a salt of a basic compound having the structure of formula I



Formula I

wherein said mixture comprises one or more rotamers of the salt in a higher molar percent than their corresponding rotamers of the salt.

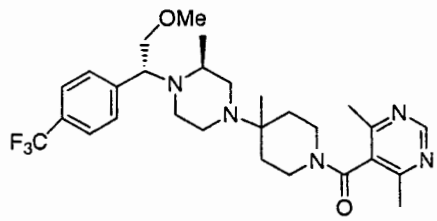
30. A mixture of claim 29, wherein said salt is prepared by a process comprising reacting said basic compound with an acid in admixture with a solvent.

31. The mixture of claim 30, wherein said solvent is a ketone, ether, hydrocarbon or mixtures thereof.

32. The mixture of claim 29, wherein said acid is maleic acid, said salt is maleate, and said molar percent is 55:45 of rotamer 2 of the maleate salt to rotamer 1 of the maleate salt.

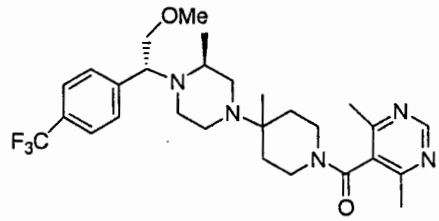
33. The mixture of claim 30, wherein said acid is maleic acid, said salt is maleate, and said molar percent is 55:45 of rotamer 2 of the maleate salt to rotamer 1 of the maleate salt.

34. Rotamer 2 of a salt of a basic compound having the structure of Formula I



Formula I

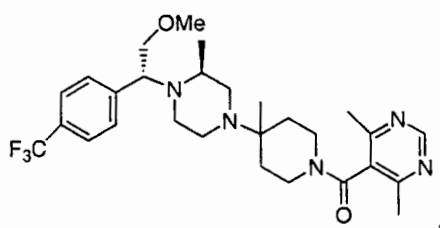
35. An acid salt of a basic compound, wherein said basic compound has the formula:



and wherein said acid salt is selected from the group consisting of acetate, benzenesulfonate, benzoate, bicarbonate, bromide, calcium edetate,

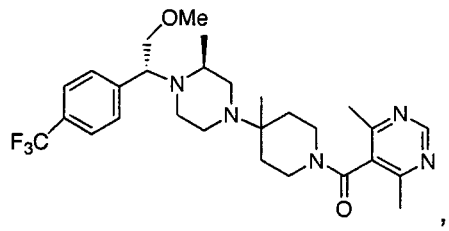
camphorsulfonate, carbonate, chloride/dihydrochloride, citrate, N,N-di(dehydroabietyl)ethylenediamine, edetate, 1,2-ethanedisulfonate, ethanesulfonate, fumarate, glucoheptonate, gluconate, glutamate, p-glycollamidophenylarsonate, hexylresorcinate, hyclate, hydrobromide, hydrochloride, 2-hydroxyethanesulfonate, hydroxynaphthoate, iodide, lactate, lactobionate, lauryl sulfonate, malate, maleate, mandelate, methanesulfonate, methylbromide, methylnitrate, methylsulfate, mucate, nafate, napsylate, nitrate, pamoate, pantothenate, phosphate/diphosphate, polygalacturonate, salicyclate, sodium succinate, stearate, subacetate, succinate, sulfate, tosylate, tannate, tartarate/bitartarate, 8-chlorotheophyllinate, triethiodide, adipate, alginate, aminosalicyclate, anhydromethylenecitrate, arecoline, asparate, bisulfate, butylbromide, camphorate, digluconate, dihydrobromide, disuccinate, glycerophosphate, hemisulfate, hydrofluoride, hydroiodide, methylenebis(salicyclate), naphthalenedisulfonate, oxalate, pectinate, persulfate, phenylethylbarbiturate, picrate, propionate, thiocyanate, undecanoate, acetylaminoacetate, N-acetyl-L-asparaginate, N-acetylcystinate, adamantoate, adipoate, N-alkylsulfamates, anthraquinone-1,5-disulfonate, arabolactansulfate, argininate, aspartate, betaine, carnitine, 4-chloro-m-toluenesulfonate, decanoate, diacetyl sulfate, dibenzylethylenediamine, dimethylamine, diguaiacylphosphate, dioctylsulfosuccinate, pamoate, fructose-1,6-diphosphate, glucose phosphate, L-glutaminate, hydroxynaphthoate, lauryl sulfate, lysine, 2-naphthenesulfonate, octanonate, tannate and theobromine acetate, wherein said salt is prepared by a process comprising reacting said basic compound with an acid in admixture with a solvent, wherein said acid is used in a molar ratio of 5:1 with respect to said basic compound and said solvent is used in a molar ratio of 20:1 with respect to said basic compound.

36. A fumarate salt of a basic compound, wherein said basic compound has the formula:



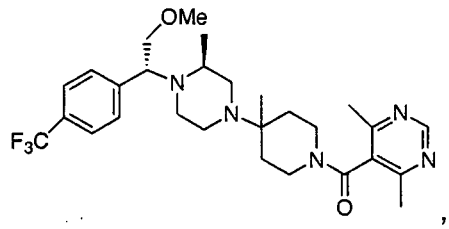
wherein said salt is prepared by a process comprising reacting said basic compound with an acid in admixture with a solvent, wherein said acid is used in a molar ratio of 5:1 with respect to said basic compound and said solvent is used in a molar ratio of 20:1 with respect to said basic compound.

37. A citrate salt of a basic compound, wherein said basic compound has the formula:



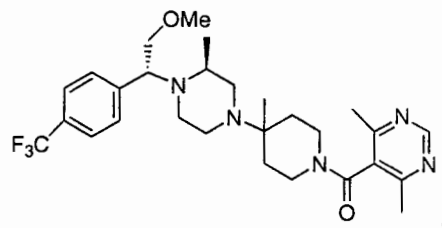
wherein said salt is prepared by a process comprising reacting said basic compound with an acid in admixture with a solvent, wherein said acid is used in a molar ratio of 5:1 with respect to said basic compound and said solvent is used in a molar ratio of 20:1 with respect to said basic compound.

38. A mono-benzene sulfonate salt of a basic compound, wherein said basic compound has the formula:



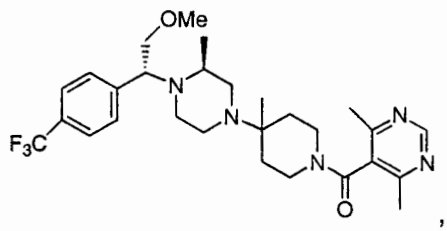
wherein said salt is prepared by a process comprising reacting said basic compound with an acid in admixture with a solvent, wherein said acid is used in a molar ratio of 5:1 with respect to said basic compound and said solvent is used in a molar ratio of 20:1 with respect to said basic compound.

39. A maleate salt of a basic compound, wherein said basic compound has the formula:



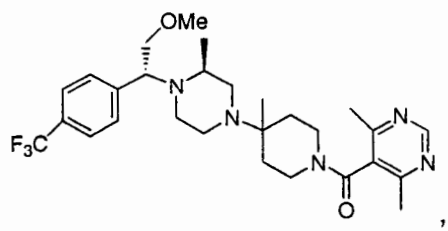
wherein said salt is prepared by a process comprising reacting said basic compound with an acid in admixture with a solvent, wherein said acid is used in a molar ratio of 5:1 with respect to said basic compound and said solvent is used in a molar ratio of 20:1 with respect to said basic compound.

40. A mono-tosylate salt of a basic compound, wherein said basic compound has the formula:



wherein said salt is prepared by a process comprising reacting said basic compound with an acid in admixture with a solvent, wherein said acid is used in a molar ratio of 5:1 with respect to said basic compound and said solvent is used in a molar ratio of 20:1 with respect to said basic compound.

41. A dihydrochloride salt of a basic compound, wherein said basic compound has the formula:



wherein said salt is prepared by a process comprising reacting said basic compound with an acid in admixture with a solvent, wherein said acid is used in a molar ratio of 5:1 with respect to said basic compound and said solvent is used in a molar ratio of 20:1 with respect to said basic compound.