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(54) **Title:** PHARMACEUTICAL COMPOSITIONS OF FEBUXOSTAT

(57) **Abstract:** The present invention relates to stable, solid oral pharmaceutical composition comprising febuxostat, wherein the composition is manufactured by wet granulation. Further, it relates to a process for preparation of the solid composition, and its uses thereof.



PHARMACEUTICAL COMPOSITIONS OF FEBUXOSTAT

Field of the Invention

The present invention relates to stable, solid oral pharmaceutical composition comprising febuxostat, wherein the composition is manufactured by wet granulation.

5 Further, it relates to a process for preparation of the solid composition.

Background of the Invention

Febuxostat, chemically known as 2-(3-cyano-4-isobutyloxyphenyl)-4-methyl-5-thiazolecarboxylic acid, is a useful therapeutic agent for the treatment of gout and hyperuricemia. Febuxostat was first disclosed in U.S. Patent No. 5,614,520, assigned to
10 Teijin Limited.

Febuxostat is a non-purine selective inhibitor of xanthine oxidase. It works by non-competitively blocking the channel leading to the active site on xanthine oxidase. Xanthine oxidase is needed to successively oxidize both hypoxanthine and xanthine to uric acid. Febuxostat inhibits xanthine oxidase, therefore reducing production of uric acid.
15 For treatment of hyperuricemia in patients with gout, febuxostat is recommended at 40 mg or 80 mg once daily. No dose adjustment is necessary when administering febuxostat in patients with mild to moderate renal and hepatic impairment.

Febuxostat is commercially available as an immediate-release formulation in the form of tablets. According to the Biopharmaceutics Classification System (BCS),
20 febuxostat is classified as a Class 2 compound, exhibiting low solubility and high permeability. It suffers from the disadvantage of being poorly soluble in aqueous media, and, as a result, having an undesirable dissolution profile and, consequently, poor bioavailability within the organism following oral administration. The therapeutic dose required to be administered must thus be increased in order to compensate for this
25 disadvantage.

U.S. Patent No. 6,225,474 assigned to Teijin Limited discloses six crystal polymorphs of febuxostat including an amorphous form and solvates (methanolate (D) and hydrate (G)). The polymorphs of febuxostat are designated as crystals A, B, C, D, E and G. These polymorphs may interconvert from one to the other. Further, U.S. Patent No.

6,225,474 discloses that if the crystal Forms B and D are exposed to air/moisture, then they may take water and convert into a hydrous form, *i.e.*, crystal G.

The inventors of the present invention have prepared a stable, solid oral pharmaceutical composition of febuxostat by wet granulation, which is easy to
5 manufacture and has an acceptable dissolution profile.

Further, it is well known that particle size can affect the solubility properties of a pharmaceutical compound. Particle size reduction can increase a compound's dissolution rate and consequently its bioavailability. Particle size can affect how freely the crystals or powdered form of the drug will flow past each other, which has consequences in the
10 production process of pharmaceutical products containing the drug. The present invention utilizes febuxostat of fine particle size, which has good solubility and is well suited for preparing pharmaceutical products.

Summary of the Invention

In one aspect, the present invention relates to a stable, solid oral pharmaceutical
15 composition comprising febuxostat wherein the composition is manufactured by wet granulation.

Embodiments of the composition may include one or more of the following features. The composition of the present invention may contain about 1 mg to 500 mg of febuxostat. Preferably, the composition contains about 5 mg to about 200 mg of
20 febuxostat. More preferably, the composition contains about 10 mg to 140 mg of febuxostat.

In one embodiment, febuxostat has an average particle size of from 1 μm to 50 μm . Particularly, the average particle size of febuxostat ranges from 2 μm to 25 μm .

In another embodiment, the composition comprises one or more pharmaceutically
25 acceptable excipients selected from diluent, disintegrant, binder, lubricant, glidant, stabilizer, organoleptic ingredients such as coloring agents, flavoring agents, sweeteners and others known to the skilled person in the art.

In still another embodiment, the composition of present invention can optionally be film-coated.

In another aspect, the present invention relates to a process for preparing a stable, solid oral pharmaceutical composition of febuxostat comprising the steps of:

- (a) blending a mixture of febuxostat and at least one pharmaceutically acceptable excipient;
- 5 (b) wetting the blend of step (a) with a granulating liquid;
- (c) drying the wet granules to obtain dried granules;
- (d) optionally milling the dried granules, followed by adding at least one lubricant and optionally other pharmaceutically acceptable excipients to the dried milled granules; and
- 10 (e) compressing the lubricated granules to form tablets or filling the lubricated granules in capsules.

The active ingredient and pharmaceutically acceptable excipient(s) are blended in a planetary mixer or a rapid mixer granulator.

The granulating liquid includes, but is not limited to, water, ethanol, isopropyl
15 alcohol, acetone, dichloromethane and other hydroalcoholic solvents such as an isopropyl alcohol-water mixture.

In yet another aspect, there is provided a method of treating gout and hyperuricemia by administering to a person in need thereof a stable, solid oral pharmaceutical composition comprising febuxostat and pharmaceutically acceptable
20 excipients manufactured by wet granulation.

The pharmaceutical composition of febuxostat may be administered in combination with other therapeutic agents.

The details of one or more embodiments of the inventions are set forth in the description below. Other features and objects of the invention will be apparent from the
25 description and examples.

Detailed Description of the Invention

The present invention relates to a stable, solid oral pharmaceutical composition comprising febuxostat wherein the composition is manufactured by wet granulation.

The wet granulation process offers several advantages. This method assures content uniformity in the tablets, and color distribution is also more uniform as compared to direct compression. The cohesiveness and compressibility of powders are improved because of the formulation of agglomerates called granules. It prevents segregation or separation of components of a homogeneous powder mix during processing. High dose drugs having poor flow, or compressibility properties can be prepared by wet granulation. Further, the dissolution rate of hydrophobic drugs may be improved by the wet granulation method.

The term “pharmaceutical composition”, as used herein, refers to the tablet or capsule composition of a predetermined quantity of active substance in association with at least one pharmaceutically acceptable excipient.

The term “stable”, as used herein, refers to a dosage form which is physically or polymorphically stable. The dosage form according to present invention may remain physically stable, that is that there are no substantial changes with respect to physical attributes like color, etc. The dosage form according to the present invention may remain polymorphically stable, that is the polymorph (crystalline or amorphous) in the dosage form does not convert into another form upon storage.

The term “drug” or “active ingredient” or “febuxostat”, as used herein, encompasses anhydrous form, hydrous form, different crystalline forms, amorphous form, solvates or mixtures thereof or any other form of febuxostat. Febuxostat may be present in the present composition in an amount ranging from 5 mg to 500 mg. Preferably, the composition contains about 5 mg to about 200 mg of febuxostat. More preferably, the composition contains about 10 mg to 140 mg of febuxostat.

The drug is present in a micronized form having an average particle size of from 1 μm to 50 μm . The drug particles of the desired particle size may be obtained by any of the conventional size reduction process known in the art such as mechanical milling; supercritical fluid processes; cryogenic spraying; or by solvent evaporation process. Mechanical reduction of particle size may be done by using a hammer mill, air jet mill, ball mill or any other milling equipment known in the art. The particle size distribution of febuxostat particles of the present invention may be determined using an optical microscopic method, sedimentation techniques, for example, pipette analysis using an

Andreassen pipette, sedimentation scale, photosedimentometer or sedimentation in a centrifugal force field, pulse methods, for example using a Coulter counter, or sorting by means of gravitational or centrifugal force, sieve analysis, laser diffraction or ultrasound attenuation spectroscopy. The particle size distribution of febuxostat particles of the present invention is particularly determined by laser diffraction using a Malvern® Mastersizer laser diffraction instrument.

The present invention teaches methods of making tablets by wet granulation. The compression step may be carried out using a tablet compression apparatus commonly used in tableting.

- 10 A general process for preparing a stable, solid oral pharmaceutical composition of febuxostat comprises the steps of:
- (a) blending a mixture of febuxostat and at least one pharmaceutically acceptable excipient;
 - (b) wetting the blend of step (a) with a granulating liquid;
 - 15 (c) drying the wet granules to obtain dried granules;
 - (d) optionally milling the dried granules, followed by adding at least one lubricant and optionally other pharmaceutically acceptable excipients to the dried milled granules; and
 - (e) compressing the lubricated granules to form tablets or filling the lubricated granules in capsules.
- 20

The granulating liquids used for wet granulation include, but are not limited to, water, ethanol, isopropyl alcohol, acetone, dichloromethane and other hydroalcoholic solvents such as isopropyl alcohol-water mixture.

The pharmaceutical compositions as described herein may comprise one or more pharmaceutically acceptable excipients selected from diluent, disintegrant, binder, lubricant, glidant, stabilizer, organoleptic ingredients such as coloring agent, flavoring agent, sweetener and others known to the skilled person in the art.

Examples of fillers or diluents include, but are not limited to, corn starch, anhydrous lactose, lactose monohydrate, white sugar, sugar compressible, sugar confectioners, sucrose, glucose, maltose, calcium carbonate, calcium dihydrogen

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phosphate dihydrates, calcium phosphate-dibasic, calcium phosphate-tribasic, calcium sulfate, microcrystalline cellulose, cellulose powdered, dextrans, dextrose, fructose, kaolin, lactitol, mannitol, sorbitol, starch, or a mixture thereof. Particularly, the diluents comprise lactose, microcrystalline cellulose, calcium hydrogen phosphate
5 dehydrate, or a mixture thereof. The diluent is present in an amount of about 25% to about 85% by weight of the tablet.

Examples of binders include, but are not limited to, carbomer, sodium carboxymethylcellulose, microcrystalline celluloses (MCC), microfine celluloses, dextrin, lactose, glucose, guar gum, hypromellose, hydroxypropyl cellulose, pregelatinized starch,
10 starch, povidone or mixture thereof or other materials known to one of ordinary skill in the art. Particularly, the binder is hydroxypropyl cellulose. The binder is present in an amount of about 0.0% to about 10% by weight of the tablet.

The binder can be a part of the granulating liquid. Alternatively, a part of the binder can be blended with the active ingredient and the other part is dispersed or
15 dissolved in the granulating liquid.

Examples of disintegrants include, but are not limited to, starch, sodium starch glycolate, croscarmellose sodium, crospovidone, alginic acid, low-substituted hydroxypropyl cellulose, carboxymethyl cellulose sodium, microcrystalline cellulose, calcium carbonate, sodium carbonate, alginic acids, agar, guar gum, or mixture thereof. The
20 disintegrant is present in an amount of about 0.0% to about 20% by weight of the tablet. According to instant invention, the disintegrant may be added in drug granules stage and/or extragranular stage.

Examples of lubricants that can be used in the present invention include, but are not limited to, stearic acid, polyethylene glycol, magnesium stearate, calcium stearate, talc,
25 zinc stearate, hydrogenated castor oil, silica, colloidal silica, cornstarch, calcium silicate, magnesium silicate, silicon hydrogel, or mixture thereof. The lubricant is present in an amount of about 0.1% to about 5% by weight of the tablet.

Examples of glidants that can be used in the present invention include, but are not limited to, colloidal silicon dioxide, colloidal silica, cornstarch, talc, calcium silicate,
30 magnesium silicate, colloidal silicon, silicon hydrogel, or mixture thereof. The glidant is present in an amount of about 0% to about 5% by weight of the tablet.

The coloring agents and flavoring agents of the present invention may be selected from any FDA approved colors and flavors for oral use.

The sweetener may be selected from aspartame, saccharin sodium, acesulfame potassium, dried invert sugar, dextrose, glucose, fructose, galactose, levulose, maltose, 5 neotame, sucralose, or mixture thereof. The preferred sweetener is aspartame.

The tablets obtained may further be film-coated. Additional excipients such as film-forming polymers, solvents, plasticizers, antiadherents, opacifiers and optionally colorants, pigments, antifoam agents, and polishing agents can be used in coatings.

Examples of film-forming agents include, but are not limited to, cellulose 10 derivatives such as soluble alkyl- or hydroalkyl-cellulose derivatives such as methylcelluloses, hydroxymethyl celluloses, hydroxyethyl celluloses, hydroxypropyl celluloses, hydroxymethylethyl celluloses, hydroxypropyl methylcelluloses, sodium carboxymethyl celluloses, etc.; insoluble cellulose derivatives such as ethylcelluloses and the like, dextrans, starches and starch derivatives; polymers based on carbohydrates and 15 derivatives thereof, natural gums such as gum Arabic; xanthans; alginates; polyacrylic acids; polyvinyl alcohols; polyvinyl acetates; polyvinylpyrrolidones; polymethacrylates and derivatives thereof (Eudragit® products); chitosan and derivatives thereof; shellac and derivatives thereof; waxes and fat substances.

The coating can also be performed using any commercially available ready-to-coat 20 preparations such as Opadry® AMB, Opadry® White, Opadry® Clear, Opadry® II, etc. Opadry® formulations generally comprise polymer, plasticizer, and, if desired, pigment in a dry concentrate. Opadry® products produce attractive, elegant coatings on a variety of tablet cores and can be used in both aqueous and organic coating procedures.

Some of the excipients are used as adjuvants to the coating process, including 25 excipients such as plasticizers, opacifiers, antiadhesives and polishing agents.

Examples of plasticizers include, but are not limited to, castor oil, diacetylated monoglycerides, dibutyl sebacate, diethyl phthalate, glycerin, polyethylene glycols, propylene glycols, triacetin, triethyl citrate, and mixtures thereof. An opacifier like titanium dioxide may also be present in an amount ranging from about 10% (w/w) to about 30 20% (w/w) based on the total weight of the coating.

Antiadhesives are frequently used in the film-coating process to avoid sticking effects during film formation and drying. An example of an antiadhesive for this purpose is talc.

Examples of polishing agents include, but are not limited to, polyethylene glycols of various molecular weights or mixtures thereof, talc, surfactants (*e.g.*, glycerol monostearate and poloxamers), fatty alcohols (*e.g.*, stearyl alcohol, cetyl alcohol, lauryl alcohol and myristyl alcohol) and waxes (*e.g.*, carnauba wax, candelilla wax and white wax).

The composition of the invention may be used in treating conditions such as gout and hyperuricemia. The pharmaceutical composition of febuxostat may be administered in combination with other therapeutic agents.

The present invention is illustrated below by reference to the following example. However, one skilled in the art will appreciate that the specific methods and results discussed are merely illustrative of the invention, and not to be construed as limiting the invention.

Examples

Example 1:

Ingredients	Percent w/w
Febuxostat #	15.38
Lactose	35.66
Microcrystalline Cellulose	35.57
Hydroxy Propyl Cellulose	3.08
Purified Water	qs
Sodium Croscarmellose	5.00
Colloidal Silicon Dioxide	0.96
Magnesium Stearate	1.44
Core Tablet Weight	97.09
Opadry® II	2.91
Purified Water	q.s.

Average particle size <50.00 micron

Procedure:

1. Febuxostat, lactose and microcrystalline cellulose were sifted through a suitable mesh.
2. Hydroxy propyl cellulose was sifted through suitable mesh and dissolved in purified water.
3. Blend from step 1 was granulated with binder solution prepared in step 2.
4. Granules obtained in step 3 were dried in a suitable dryer.
5. Sodium croscarmellose and colloidal silicon dioxide were sifted through a suitable mesh.
6. Granules obtained in step 4 were blended with the mixture of step 5.
7. The blend from step 6 was lubricated with magnesium stearate.
8. The blend of step 7 was compressed into tablets with suitable tooling, and the tablets were coated with a suspension of Opadry® II.

While several specific embodiments of the invention have been illustrated and described, it will be apparent to a person skilled in the art that various modifications and combinations of the invention detailed in the text can be made without departing from the spirit and scope of the invention.

Claims:

- 1 1. A stable, solid oral pharmaceutical composition comprising febuxostat, wherein
2 the composition is manufactured by wet granulation.
- 1 2. A stable, solid oral pharmaceutical composition according to claim 1, wherein the
2 composition contains about 1 mg to 500 mg of febuxostat.
- 1 3. A stable, solid oral pharmaceutical composition according to claim 1, wherein the
2 composition contains about 5 mg to about 200 mg of febuxostat.
- 1 4. A stable, solid oral pharmaceutical composition according to claim 1, wherein the
2 composition contains about 10 mg to 140 mg of febuxostat.
- 1 5. A stable, solid oral pharmaceutical composition according to claim 1, wherein, the
2 average particle size of febuxostat is from 1 μm to 50 μm .
- 1 6. A stable, solid oral pharmaceutical composition according to claim 1, wherein, the
2 average particle size of febuxostat is from 2 μm to 25 μm .
- 1 7. A stable, solid oral pharmaceutical composition according to claim 1, wherein the
2 composition comprises one or more pharmaceutically acceptable excipients selected from
3 diluent, disintegrant, binder, lubricant, glidant, stabilizer, organoleptic ingredients such as
4 coloring agents, flavoring agents, sweetener, and mixtures thereof.
- 1 8. A stable, solid oral pharmaceutical composition according to claim 1, wherein the
2 composition is optionally film-coated.
- 1 9. A stable, solid oral pharmaceutical composition according to claim 1, wherein the
2 wet granulation process comprises the steps of:
 - 3 (a) blending a mixture of febuxostat and at least one pharmaceutically acceptable
4 excipient;
 - 5 (b) wetting the blend of step (a) with a granulating liquid;
 - 6 (c) drying the wet granules to obtain dried granules;
 - 7 (d) optionally milling the dried granules, followed by adding at least one
8 lubricant and optionally other pharmaceutically acceptable excipients to the
9 dried milled granules; and

10 (e) compressing the lubricated granules to form tablets or filling the lubricated
11 granules in capsules.

1 10. A stable, solid oral pharmaceutical composition according to claim 9, wherein the
2 granulating liquid is selected from water, ethanol, isopropyl alcohol, acetone,
3 dichloromethane or a mixture thereof.

1 11. A method of treating gout and hyperuricemia by administering to a person in need
2 thereof a stable, solid oral pharmaceutical composition comprising febuxostat according to
3 claim 1.

1 12. A method of treating gout and hyperuricemia according to claim 11, wherein the
2 pharmaceutical composition of febuxostat is administered in combination with other
3 therapeutic agents.

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2012/052890

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61K9/20 A61K31/426
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A61K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,P	US 2011/311620 A1 (TANEJA RAJNEESH [US] ET AL) 22 December 2011 (2011-12-22) page 1, paragraph 7 page 29; example 4 ----- -/--	1,7,11



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

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INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2012/052890

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Anonymous: "CHMP ASSESSMENT REPORT FOR Adenuric", European Medicines Agency , 2008, pages 1-51, XP002682223, Retrieved from the Internet: URL:http://www.ema.europa.eu/docs/en_GB/document_library/EPAR_-_Public_assessment_report/human/000777/WC500021815.pdf [retrieved on 2012-10-29]	1-11
Y	item 2.1; page 4, paragraph 1 item 2.2; page 5, paragraphs 1,3 page 6, paragraph 9-12 page 7, paragraphs 4,8-10 -----	12
Y	Anonymous: "METABOLEX INITIATES PHASE 2 TRIAL OF ARHALOFENATE Potential Best-in-Class Uricosuric Agent for the Treatment of Gout", Metabolex, Inc. , 19 May 2011 (2011-05-19), XP002682224, Retrieved from the Internet: URL:http://www.metabolex.com/news/may192011.html [retrieved on 2012-10-29] the whole document -----	12

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2012/052890

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2011311620 A1	22-12-2011	TW 201202249 A	16-01-2012
		US 2011311620 A1	22-12-2011
		WO 2011159745 A1	22-12-2011
