CLAIMS

1. A pharmaceutical composition for use in the treatment or prevention of levodopa-induced dyskinesia, comprising glucagon-like peptide-1 receptor agonist ("GLP-1 receptor agonist") or a controlled-release formulation thereof.

2. The pharmaceutical composition for use according to claim 1, wherein the GLP-1 receptor agonist is a GLP-1 analogue.

3. The pharmaceutical composition for use according to claim 2, wherein the GLP-1 analogue is exendin-4, exenatide, liraglutide, semaglutide, lixisenatide, dulaglutide, albiglutide, efpeglenatide, or a combination thereof.

4. The pharmaceutical composition for use according to claim 1, wherein the controlled-release formulation includes: a core containing the GLP-1 receptor agonist and a biodegradable polymer; and a coating layer for the core.

5. The pharmaceutical composition for use according to claim 4, wherein the biodegradable polymer is at least one selected from the group consisting of: a polymer selected from the group consisting of polylactide, polyglycolide, poly(lactide-co-glycolide) as a copolymer of lactide and glycolide, polyorthoester, polyanhydride, polyhydroxybutyric acid, polycaprolactone and polyalkyl carbonate; a copolymer or mixture of two or more of said polymers; a copolymer of said polymer and polyethylene glycol; and a polymer-sugar complex in which said polymer or copolymer is combined with sugar.

6. The pharmaceutical composition for use according to claim 1, wherein the treatment includes improvement in symptoms of levodopa-induced dyskinesia or no further worsening of the

~~symptoms.~~

~~7. The pharmaceutical composition for use according to claim 1, wherein the prevention includes prevention or delayed onset of levodopa-induced dyskinesia despite administration of levodopa.~~

~~8. The pharmaceutical composition for use according to claim 1, wherein the composition has effects of improving abnormal involuntary movements (AIMs).~~

~~9. The pharmaceutical composition for use according to claim 1, wherein the composition is adapted to be administered in combination with levodopa.~~

~~10~~1. Use of ~~a GLP-1 receptor agonist or~~ a controlled-release formulation of a GLP-1 receptor agonist~~thereof~~ in the manufacture of a therapeutic agent for the treatment of levodopa-induced dyskinesia, wherein the therapeutic agent comprising a therapeutically effective amount of the controlled-release formulation of the GLP-1 receptor agonist ~~or the controlled-release formulation thereof~~ is to be administered to a patient with levodopa-induced dyskinesia,

wherein the GLP-1 receptor agonist is exendin-4 or exenatide,

wherein the controlled-release formulation includes: a core containing the GLP-1 receptor agonist and a biodegradable polymer; and

wherein the biodegradable polymer is at least one selected from the group consisting of: polylactide, polyglycolide, poly(lactide-co-glycolide) as a copolymer of lactide and glycolide, polyorthoester, polyanhydride, polyhydroxybutyric acid, polycaprolactone and polyalkyl carbonate; a copolymer or mixture of two or more of said polymers; a copolymer of said

polymer and polyethylene glycol; and a polymer-sugar complex in which said polymer or copolymer is combined with sugar.

~~11~~2. Use of ~~a GLP-1 receptor agonist or~~ a controlled-release formulation of a GLP-1 receptor agonist ~~thereof~~ in the manufacture of a therapeutic agent for the prevention of levodopa-induced dyskinesia, wherein the therapeutic agent comprising a prophylactically effective amount of the controlled-release formulation of the GLP-1 receptor agonist ~~or the controlled-release formulation thereof~~ is to be administered to a Parkinson's disease patient who does not involve occurrence of levodopa-induced dyskinesia,

wherein the GLP-1 receptor agonist is exendin-4 or exenatide,

wherein the controlled-release formulation includes: a core containing the GLP-1 receptor agonist and a biodegradable polymer; and

wherein the biodegradable polymer is at least one selected from the group consisting of: polylactide, polyglycolide, poly(lactide-co-glycolide) as a copolymer of lactide and glycolide, polyorthoester, polyanhydride, polyhydroxybutyric acid, polycaprolactone and polyalkyl carbonate; a copolymer or mixture of two or more of said polymers; a copolymer of said polymer and polyethylene glycol; and a polymer-sugar complex in which said polymer or copolymer is combined with sugar.

~~12~~3. The use according to claim ~~10~~ 1 or ~~11~~2, wherein the patient has received administration of levodopa.

~~13~~4. The use according to claim ~~10~~ 1 or ~~11~~2, wherein the therapeutic agent comprising ~~the GLP-1 receptor agonist or~~ the controlled-release formulation of the GLP-1 receptor agonist~~thereof~~ is to be administered simultaneously with levodopa or after administration of levodopa.

~~14~~5. The use according to claim ~~10~~1, wherein the therapeutically effective amount ranges from 0.01 μg/kg/day to 100 μg/kg/day.

~~15~~6. The use according to claim ~~11~~2, wherein the prophylactically effective amount ranges from 0.01 μg/kg/day to 100 μg/kg/day.

~~16. The use according to claim 10 or 11, wherein the GLP-1 receptor agonist is a GLP-1 analogue.~~

~~17. The use according to claim 16, wherein the GLP-1 analogue is exendin-4, exenatide, liraglutide, semaglutide, lixisenatide, dulaglutide, albiglutide, efpeglenatide, or a combination thereof.~~

~~18~~7. The use according to claim ~~10~~ 1 or ~~11~~2, wherein the controlled-release formulation includes~~: a core containing the GLP-1 receptor agonist and a degradable polymer; and~~ a coating layer for the core.

~~19. The use according to claim 18, wherein the degradable polymer is at least one selected from the group consisting of: a polymer selected from the group consisting of polylactide, polyglycolide, poly(lactide-co-glycolide) as a copolymer of lactide and glycolide, polyorthoester, polyanhydride, polyhydroxybutyric acid, polycaprolactone and polyalkyl carbonate; a copolymer or mixture of two or more of said polymers; a copolymer of said polymer and polyethylene glycol; and a polymer-sugar complex in which said polymer or copolymer is combined with sugar.~~

~~20~~8. Use of ~~a GLP-1 receptor agonist or~~ a controlled-

release formulation of a GLP-1 receptor agonist~~thereof~~ in the manufacture of a therapeutic agent for the treatment of levodopa-induced dyskinesia,

wherein the GLP-1 receptor agonist is exendin-4 or exenatide,

wherein the controlled-release formulation includes: a core containing the GLP-1 receptor agonist and a biodegradable polymer; and

wherein the biodegradable polymer is at least one selected from the group consisting of: polylactide, polyglycolide, poly(lactide-co-glycolide) as a copolymer of lactide and glycolide, polyorthoester, polyanhydride, polyhydroxybutyric acid, polycaprolactone and polyalkyl carbonate; a copolymer or mixture of two or more of said polymers; a copolymer of said polymer and polyethylene glycol; and a polymer-sugar complex in which said polymer or copolymer is combined with sugar.