CLAIMS

1. A human monoclonal anti-α-synuclein antibody, or an α-synuclein binding fragment thereof, wherein the antibody or α-synuclein binding fragment thereof comprises:

a VH CDR1 comprising residues 31-35 of SEQ ID NO:9,

a VH CDR2 comprising residues 50-68 of SEQ ID NO:9,

a VH CDR3 comprising residues 101-102 of SEQ ID NO:9,

a VL CDR1 comprising residues 23-33 of SEQ ID NO:12,

a VL CDR2 comprising residues 49-55 of SEQ ID NO:12, and

a VL CDR3 comprising residues 88-98 of SEQ ID NO:12.

2. A human monoclonal anti-α-synuclein antibody, or an α-synuclein binding fragment thereof comprising:

a) a VH region comprising the amino acid sequence of SEQ ID NO:10 and

b) a VL region comprising the amino acid sequence of SEQ ID NO:13.

3. A human monoclonal anti-α-synuclein antibody, or an α-synuclein binding fragment thereof comprising:

a) a VH region comprising the amino acid sequence of SEQ ID NO:9 and

b) a VL region comprising the amino acid sequence of SEQ ID NO:12.

4. The antibody or α-synuclein binding fragment thereof of any one of claims 1-3, which is

(i) detectably labeled, wherein the detectable label is selected from the group consisting of an enzyme, a radioisotope, a fluorophore and a heavy metal; or

(ii) attached to a drug.

5. The antibody or α-synuclein binding fragment thereof of any one of claims 1-3 comprising a human IgG 1 heavy chain constant region.

6. The antibody or α-synuclein binding fragment thereof of any one of claims 1-5 comprising a human lambda light chain constant region.

7. An isolated human monoclonal antibody or antigen-binding fragment thereof that binds to human α-synuclein in aggregated form and does not specifically bind to β-synuclein or γ-synuclein.

8. A composition comprising the antibody or α-synuclein binding fragment thereof of any one of claims 1-7 wherein the composition is

(i) a pharmaceutical composition further comprising a pharmaceutically acceptable carrier; or

(ii) a diagnostic composition further comprising one or more immuno or nucleic acid based diagnostic reagents.

9. A kit for the diagnosis of a synucleinopathic disease, said kit comprising the antibody or α-synuclein binding fragment thereof of any one of claims 1-7 with reagents and/or instructions for use.

10. The kit of claim 9, wherein the synucleinopathic disease is Parkinson's disease.

11. An isolated polynucleotide or polynucleotides encoding the antibody or α-synuclein binding fragment thereof of any one of claims 1-7.

12. An expression vector or vectors comprising the polynucleotide or polynucleotides of claim 11.

13. A host cell comprising the expression vector or vectors of claim 12.

14. A method for preparing an anti-α-synuclein antibody or fragment thereof, said method comprising:

(a) culturing the cell of claim 13; and

(b) isolating said antibody or fragment thereof from the culture.

15. The use of the antibody or α-synuclein binding fragment thereof of any one of claims 1-7 in the manufacture of a medicament for treatment of a synucleinopathic disease in a human subject.

16. The use of claim 15, wherein the synucleinopathic disease is selected from the group consisting of Parkinson's disease (PD), Parkinson's disease dementia (PDD), dementia with Lewy bodies (DLB), the Lewy body variant of Alzheimer's disease (LBV AD), multiple systems atrophy (MSA), pure autonomic failure (PAF), neurodegeneration with brain iron accumulation type-I (NBIA-1), Alzheimer's disease, Pick's disease, juvenile-onset generalized neuroaxonal dystrophy (Hallervorden-Spatz disease), amyotrophic lateral sclerosis, traumatic brain injury, and Down’s syndrome.

17. The use of claim 15, wherein the synucleinopathic disease is Parkinson’s disease.

18. A method of diagnosing a synucleinopathic disease in a human subject, the method comprising:

(a) assessing a level of α-synuclein in a sample from the human subject to be diagnosed with the antibody or α-synuclein binding fragment thereof of any one of claims 1-7; and

(b) comparing the level of the α-synuclein to a control, wherein a difference or similarity between the level of the α-synuclein and the control indicates that the human subject has a synucleinopathic disease.

19. The method of claim 18, wherein the synucleinopathic disease is selected from the group consisting of Parkinson's disease (PD), Parkinson's disease dementia (PDD), dementia with Lewy bodies (DLB), the Lewy body variant of Alzheimer's disease (LBV AD), multiple systems atrophy (MSA), pure autonomic failure (PAF), neurodegeneration

with brain iron accumulation type-I (NBIA-1), Alzheimer's disease, Pick's disease, juvenile-onset generalized neuroaxonal dystrophy (Hallervorden-Spatz disease), amyotrophic lateral sclerosis, traumatic brain injury, and Down’s syndrome.

20. The method of claim 18, wherein the synucleinopathic disease is Parkinson's disease.

21. The use of the antibody or α-synuclein binding fragment thereof of any one of claims 1-7 attached to a therapeutic or diagnostic agent in the manufacture of a medicament for *in vivo* detection of or targeting a therapeutic and/or diagnostic agent to α-synuclein in a human subject, wherein α-synuclein is detected by positron emission tomography (PET), single photon emission tomography 20 (SPECT), near infrared (NIR) optical imaging, magnetic resonance imaging (MRI), or a combination thereof.

22. The antibody or α-synuclein binding fragment thereof of any one of claims 1-7 for use as a medicament.