Claims

1. A diagnostic drug comprising at least one compound selected from a deuterated derivative of natural branched-chain amino acid ~~derivative~~ and / or a pharmaceutically acceptable salt of a deuterated derivative of natural branched-chain amino acid ~~derivative~~ for use in the diagnosis of diseases by deuterium magnetic resonance imaging and / or deuterium magnetic resonance spectroscopy, wherein the deuterated derivative is defined as a compound containing deuterium bound to carbon in an amount exceeding its natural amount in at least one position.

2. The diagnostic drug according to ~~the~~ claim 1, which additionally comprises at least one pharmaceutically acceptable auxiliary substance.

3. The diagnostic drug according to ~~the~~ claim 1, in which the deuterated derivative of natural branched-chain amino acid ~~derivative~~ is deuterated valine or deuterated leucine or deuterated isoleucine.

4. The diagnostic drug according to ~~the~~ claim 3, in which

the deuterated valine is valine-4,4,4-d_3, valine-4,4,4,4',4',4'-d_6, valine-3,4,4,4,4',4',4'-d_7, valine-2,4,4,4,4',4',4'-d_7, valine-2,3,4,4,4,4',4',4'-d_8;

the deuterated leucine is leucine-3,3-d_2, leucine-5,5,5-d_3, leucine-5,5,5,5',5',5'-d_6, leucine-4,5,5,5,5',5',5'-d_7, leucine-3,3,5,5,5,5',5',5'-d_8, leucine-3,3,4,5,5,5,5',5',5'-d_9, leucine-2,5,5,5,5',5',5'-d_7, leucine-2,3,3,5,5,5,5',5',5'-d_9, leucine-2,4,5,5,5,5',5',5'-d_8, leucine-2,3,3,4,5,5,5,5',5',5'-d_{10};

the deuterated isoleucine is 2-amino-3-(CD_3)pentanoic acid, 2-amino-3-(CD_3)pentanoic-5,5,5-d_3 acid, 2-amino-3-(CD_3)pentanoic-4,4,5,5,5-d_5 acid, 2-amino-3-(CD_3)pentanoic-2,5,5,5-d_4 acid, 2-amino-3-(CD_3)pentanoic-2,3,5,5,5-d_5 acid, 2-amino-3-(CD_3)pentanoic-3,4,4,5,5,5-d_6 acid, 2-amino-3-(CD_3)pentanoic-2,3,4,4,5,5,5-d_7 acid, 2-amino-3-methylpentanoic-5,5,5-d_3 acid.

5. The diagnostic drug according to ~~the~~ claim 1, in which the deuterated derivative is wholly or predominantly represented by an enantiomer with 2S configuration.

6. The diagnostic drug according to ~~the~~ claim 1, in which the deuterated derivative of natural branched-chain amino acid ~~derivative~~ is

- a mixture of at least two different deuterated derivatives of valine or its pharmaceutically acceptable salts; or

- a mixture of at least two different deuterated derivatives of leucine or its pharmaceutically acceptable salts; or

- a mixture of at least two different deuterated derivatives of isoleucine or its pharmaceutically acceptable salts; or

- a mixture of at least two different deuterated derivatives of valine, leucine and / or isoleucine and / or their pharmaceutically acceptable salts.

7. The diagnostic drug according to ~~the~~ claim 1, which includes

- a deuterated derivative of a natural branched-chain amino acid containing deuterium atoms bonded to carbon atoms in more than one position, or a pharmaceutically acceptable salt thereof;

or

- a mixture of deuterated derivatives of natural branched-chain amino acids and / or their pharmaceutically acceptable salts, with deuterated derivatives containing deuterium atoms in structurally nonequivalent positions.

8. Use of the diagnostic drug according to any one of claims 1-7 in the manufacture of a diagnostic agent for diagnosing a disease in a subject, wherein the disease is ~~an inflammatory process, an infectious process, a process accompanied by active regeneration, a disease associated with ischemia of organs and tissues, a graft rejection reaction, an autoimmune disease, or~~ an oncological disease, wherein:

the diagnostic drug is to be administered to the subject;

a magnetic resonance imaging and / or deuterium magnetic resonance spectroscopy is to be carried out after a time sufficient for the diagnostic drug accumulation in a target tissue, to obtain, respectively, a tomogram and / or NMR spectrum (spectra).

9. The use according to claim 8, wherein the presence or absence of the disease is to be diagnosed based on the observed signal intensity of deuterium nuclei, reflecting the level of accumulation of the diagnostic drug.

10. The use according to ~~the~~ claim 8 or 9, in which the oncological disease is ~~an oncological disease~~ a cancer tumor.

11. The use according to claim 10, wherein the cancer tumor is a solid tumor or tumor metastases, including lymph node metastases.

12. The use according to claim 10 or claim 11, wherein the cancer tumor is a breast cancer.

13. The use according to claim 12, wherein the cancer tumor is 4T1 breast carcinoma tumor.

~~11~~14. The use according to ~~the claim 8 or 9, in which~~ any one of claims 8 to 13, wherein at least one additional medical examination is to be performed, selected from magnetic resonance imaging on nuclei other than deuterium nuclei, ultrasound examination, computed tomography, radiography, palpation, biopsy, analysis of biological material of the subject for tumor markers, radionuclide diagnostics and / or visual observation.

~~12~~15. The use according to ~~the claim 8 or 9~~any one of claims 8 to 13, wherein the presence or absence of the disease is to be diagnosed based on comparing the signal intensity of deuterium nuclei in the subject under examination with the typical signal intensity observed in healthy subjects in a corresponding tissue or corresponding organ.

~~13~~16. The use according to ~~the claim 8 or 9~~ any one of claims 8 to 13, wherein the presence or absence of the disease is to be diagnosed based on a comparison of the deuterium signal intensity in regions corresponding to normal and abnormal tissue according to additional medical examination data.

~~14~~17. The use according ~~to the claim 8 or 9~~any one of claims 8 to 13, in which the diagnostic drug comprising a deuterated derivative of a natural branched- chain amino acid containing deuterium atoms in more than one position or a mixture of deuterated derivatives of a natural branched- chain amino acids containing deuterium atoms in structurally nonequivalent positions, and in which the level of metabolic activity and / or proliferation of cells of a target tissue is additionally assessed based on a comparison of the intensity of signals of deuterium nuclei in structurally nonequivalent positions.

~~15~~18. The use according to ~~the~~ claim ~~11~~14, wherein the presence or absence of the disease is to be diagnosed based on the comparison of the deuterium tomogram of the subject under examination with the image obtained as a result of protium magnetic resonance imaging of the subject.

~~16~~19. The use according to ~~the claim 10~~ any one of claims 8 to 13, wherein the spatial distribution of the region with increased accumulation of the diagnostic drug is to be used to make a conclusion about the structure of a tumor.

~~17~~20. The use according to ~~the claim 10, in which~~ any one of claims 8 to 13, wherein the intensity of the deuterium signal in the region of increased accumulation of the diagnostic drug is to be used to make a conclusion about the malignancy or benignity of a tumor.

~~18~~21. The use according ~~to the claim 8 or 9~~ any one of claims 8 to 13, wherein the rate of deuterium signal intensity change after injection is to be used to make a conclusion about the level of perfusion in different parts of the scanned region.

~~19~~22. The use according to ~~the claim 8 or 9~~ any one of claims 8 to 13, wherein the diagnostic drug is to be administered to the subject per os.

~~20~~23. The use according to ~~the claim 8 or 9~~ any one of claims 8 to 13, wherein the diagnostic drug is to be administered to the subject parenterally.