

What is claimed is:

1. An imaging agent comprising 2-deoxy-2-[¹⁸F]fluoroglucuric acid, or a pharmaceutically-acceptable salt thereof.
2. A composition comprising the imaging agent of claim 1 disposed in a pharmaceutically-acceptable carrier, diluent, vehicle, or excipient.
3. A method of positron emission tomography (PET) imaging of a subject, comprising:
administering to the subject an imaging agent comprising 2-deoxy-2-[¹⁸F]fluoroglucuric acid (¹⁸F-FGA), or a pharmaceutically-acceptable salt thereof;
allowing the imaging agent to penetrate into a tissue of the subject, the tissue suspected to contain a necrosis; and
collecting a PET image of the tissue suspected to contain the necrosis.
4. The method of claim 3, comprising preparing the ¹⁸F-FGA, or a pharmaceutically-acceptable salt thereof, from a quantity of 2-deoxy-2-[¹⁸F]fluoro-D-glucose (¹⁸F-FDG), wherein the administering step occurs within about 3 hours after preparing the ¹⁸F-FGA.
5. The method of claim 3, wherein the subject is suspected of having tissue damage due to a cancer, brain stroke, traumatic brain injury, or myocardial infarction.
6. The method of claim 3, wherein the tissue is selected from a group consisting of tissues of the myocardium, brain, breast, prostate, colon, kidney, spleen, limb, and lung.
7. The method of claim 3, wherein the imaging agent preferentially accumulates in the necrosis.
8. A method of preparing a radiopharmaceutical for use in PET imaging, comprising:
combining a quantity of 2-deoxy-2-[¹⁸F]fluoro-D-glucose (¹⁸F-FDG) with an oxidizing agent, and an alkaline buffering agent to form a reaction mixture;
and
reacting the reaction mixture for a duration of less than about 10 min causing conversion of substantially all of the ¹⁸F-FDG into 2-deoxy-2-[¹⁸F]fluoroglucuric acid (¹⁸F-FGA).

9. The method of claim 8, wherein the oxidizing agent is selected from the group consisting of 2,2,6,6-tetramethylpiperidine 1-oxyl (TEMPO), 4-hydroxy-TEMPO, TEMPO methacrylate, 4-Oxo-TEMPO, 4-amino-TEMPO, 4-acetamido-TEMPO, 4-carboxy-TEMPO, 4-hydroxy-TEMPO benzoate, 4-(2-Iodoacetamido)-TEMPO, 4-Maleimido-TEMPO, 4-Isothiocyanato-TEMPO, 4-(2-Bromoacetamido)-TEMPO, 4-methoxy-TEMPO, 4-Cyano-TEMPO, 4-amino-4-carboxy-TEMPO, 4-Phosphonooxy-TEMPO hydrate, 2,2,6,6-tetramethyl-4-(methylsulfonyloxy)-1-piperidinoxy, hydrogen peroxide, sodium hypochlorite, calcium hypochlorite, ozone, nitric acid, permanganate compounds, halogens, metal-catalyzed oxidation agents, gold nanoparticles, nanoparticles which mimic peroxidase activity-mimicking nanoparticles, glucose oxidase, and glucose-oxidizing enzymes or compounds.
10. The method of claim 8, wherein the alkaline buffering agent has a buffering capacity in a pH range of about 9 to about 12.
11. The method of claim 8, wherein the reacting step occurs at a reaction temperature in a range of about 0 °C to about 25 °C.
12. The method of claim 8, comprising adding an acid to the reaction mixture after conversion of the ^{18}F -FDG into ^{18}F -FGA to change the pH of the reaction mixture to a pH in a range of about 6.5 to about 7.5.
13. The method of claim 8, wherein the oxidizing agent is a free compound, or is linked to a bead, resin, or polymer.
14. The method of claim 8, wherein the reaction mixture further comprises a reaction initiator.
15. The method of claim 14, wherein the reaction initiator is selected from the group consisting of sodium hypochlorite (NaOCl) and calcium hypochlorite ($\text{Ca}(\text{ClO})_2$).
16. The method of claim 8, wherein the reaction mixture further comprises a reaction accelerator.
17. The method of claim 16, wherein the reaction accelerator is selected from the group consisting of sodium bromide (NaBr) and potassium bromide (KBr).

18. A kit for producing 2-deoxy-2-[^{18}F]fluoroglucuric acid (^{18}F -FGA), comprising: (1) an oxidizing agent, (2) a reaction initiator, (3) a reaction accelerator, and (4) an alkaline buffering agent; and instructions for combining a quantity of 2-deoxy-2-[^{18}F]fluoro-D-glucose (^{18}F -FDG) with the oxidizing agent, the reaction initiator, the reaction accelerator, and the buffering agent to produce the ^{18}F -FGA.
19. The kit of claim 18, further comprising a container containing the ^{18}F -FDG.
20. The kit of claim 18, wherein the oxidizing agent, reaction accelerator, and buffering agent are disposed in a first container, and the reaction initiator is disposed in a second container.
21. The kit of claim 18, wherein the oxidizing agent, reaction accelerator, buffering agent, and reaction initiator are disposed in separate containers.
22. The kit of claim 18, wherein the alkaline buffering agent has a buffering capacity in a range of about pH 9 to about pH 12.
23. The kit of claim 18, further comprising an acid able to neutralize the reaction mixture to a pH in a range of about 6.5 to 7.5.
24. The kit of claim 18, wherein the oxidizing agent is selected from the group consisting of 4-hydroxy-TEMPO, TEMPO methacrylate, 4-Oxo-TEMPO, 4-amino-TEMPO, 4-acetamido-TEMPO, 4-carboxy-TEMPO, 4-hydroxy-TEMPO benzoate, 4-(2-Iodoacetamido)-TEMPO, 4-Maleimido-TEMPO, 4-Isothiocyanto-TEMPO, 4-(2-Bromoacetamido)-TEMPO, 4-methoxy-TEMPO, 4-Cyano-TEMPO, 4-amino-4-carboxy-TEMPO, 4-Phosphonooxy-TEMPO hydrate, 2,2,6,6-tetramethyl-4-(methylsulfonyloxy)-1-piperidinoxy, hydrogen peroxide, sodium hypochlorite, calcium hypochlorite, ozone, nitric acid, permanganate compounds, halogens, metal-catalyzed oxidation agents, gold nanoparticles, nanoparticles which mimic peroxidase activity-mimicking nanoparticles, glucose oxidase, and glucose-oxidizing enzymes or compounds.
25. The kit of claim 18, wherein the reaction initiator is selected from the group consisting of sodium hypochlorite (NaOCl) and calcium hypochlorite ($\text{Ca}(\text{ClO})_2$).
26. The kit of claim 18, wherein the reaction accelerator is selected from the group consisting of sodium bromide (NaBr) and potassium bromide (KBr).

27. The kit of claim 18, wherein the oxidizing agent is a free compound, or is linked to a bead, resin, or polymer.
28. The kit of claim 18, wherein the instructions are provided as a package insert.
29. The kit of claim 18, wherein the instructions are accessible virtually by a user of the kit via a uniform resource locator (URL) or web address.
30. The kit of claim 18, wherein the instructions comprise directions for administering the ^{18}F -FGA to a subject.
31. The kit of claim 18, comprising at least one of a thin layer chromatography (TLC) strip, and a TLC solvent.