[^{18}F]Fluorobenzaldehyde-leptin

[^{18}F]FBA-Leptin

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Chemical name:	[^{18}F]Fluorobenzaldehyde-leptin	
Abbreviated name:	[^{18}F]FBA-Leptin	
Synonym:		
Agent category:	Polypeptide	
Target:	Leptin receptor	
Target category:	Receptor	
Method of detection:	PET	
Source of signal\contrast:	^{18}F	
Activation:	No	
Studies:	• *In vitro* • Rodents	Click on gene for more information about leptin.

Background

[PubMed]

Leptin is secreted by white adipose tissue as a negative feedback response to maintain body weight by regulating appetite and fat metabolism (1). Leptin receptors (ObRs) are present in the brain (the choroid plexus and hypothalamus) and many peripheral tissues, such as the lungs, kidneys, adrenals, and lymph nodes (2, 3). There are at least six types of ObRs (a, b, c, d, e, and f). Administration of leptin is able to correct obesity in humans and in *ob*/*ob* obese mice that lack a functional leptin gene (*ob*) (4). However, a lack of responsiveness to leptin could lead to obesity. An ability to predict altered ObR biodistribution may provide imaging opportunities by the design of specific molecular imaging agents to target ObRs. Flavell et al. (5) introduced an aminooxy group at the C-

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terminus of leptin using expressed protein ligation technique for labeling with 4-[^{18}F]fluorobenzaldehyde ([^{18}F]FBA) to synthesize [^{18}F]FBA-leptin to image ObRs.

Synthesis

[PubMed]

[^{18}F]FBA was added to a solution of 30 nmol aminooxy-leptin in 100 mM anilinium acetate (5). The mixture was incubated for 15 min at 0°C. The resulting product, [^{18}F]FBA-leptin, was purified with two spin columns. A decay-corrected yield of 25% based on [^{18}F]FBA and a radiochemical purity of >95% were obtained. The specific activity of was 9.25–16.65 MBq/nmol (0.25–0.45 mCi/nmol) with a total synthesis time of 120 min. [^{18}F]FBA-Leptin was stable in buffers and mouse serum after 1 h incubation.

In Vitro Studies: Testing in Cells and Tissues

[PubMed]

In vitro binding tests showed that binding of [^{18}F]FBA-leptin to cells expressing ObRs was inhibited by 90% with 5 μM leptin (5).

Animal Studies

Rodents

[PubMed]

Flavell et al. (5) performed a preliminary study of positron emission tomography analysis in *ob*/*ob* mice after intravenous injection of 3.7 MBq (100 μCi) [^{18}F]FBA-leptin. [^{18}F]FBA-Leptin rapidly accumulated in the cortex of the kidneys. No blocking experiment was performed. The authors noted that further investigation of the biodistribution of [^{18}F]FBA-leptin is being performed in various leptin-sensitive and leptin-resistant animal models.

Other Non-Primate Mammals

[PubMed]

No publication is currently available.

Non-Human Primates

[PubMed]

No publication is currently available.

Human Studies

[PubMed]

No publication is currently available.

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References

1. Prieur, X., Y.C. Tung, J.L. Griffin, I.S. Farooqi, S. O'Rahilly, and A.P. Coll, *Leptin regulates peripheral lipid metabolism primarily through central effects on food intake.* Endocrinology, 2008
2. Bjorbaek C., Kahn B.B. Leptin signaling in the central nervous system and the periphery. Recent Prog Horm Res. 2004;**59**:305–31. PubMed PMID: 14749508.
3. Margetic S., Gazzola C., Pegg G.G., Hill R.A. Leptin: a review of its peripheral actions and interactions. Int J Obes Relat Metab Disord. 2002;**26**(11):1407–33. PubMed PMID: 12439643.
4. Maffei M., Halaas J., Ravussin E., Pratley R.E., Lee G.H., Zhang Y., Fei H., Kim S., Lallone R., Ranganathan S.et al. Leptin levels in human and rodent: measurement of plasma leptin and ob RNA in obese and weight-reduced subjects. Nat Med. 1995;**1**(11):1155–61. PubMed PMID: 7584987.
5. Flavell R.R., Kothari P., Bar-Dagan M., Synan M., Vallabhajosula S., Friedman J.M., Muir T.W., Ceccarini G. Site-specific (18)F-labeling of the protein hormone leptin using a general two-step ligation procedure. J Am Chem Soc. 2008;**130**(28):9106–12. PubMed PMID: 18570424.