2'-Deoxy-2'-[^{18}F]fluoro-1-β-D-arabinofuranosyl-adenine

[^{18}F]FAA

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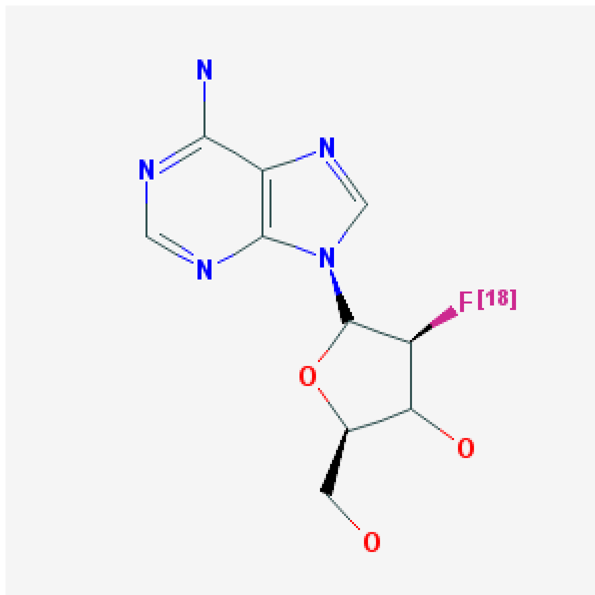
Chemical name:	2'-Deoxy-2'-[^{18}F]fluoro-1-β-D-arabinofuranosyl-adenine
Abbreviated name:	[^{18}F]FAA
Synonym:	
Agent Category:	Compound
Target:	Unknown
Target Category:	Non-catabolized trapping inside cells
Method of detection:	PET
Source of signal:	^{18}F
Activation:	No
Studies:	• Rodents



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Background

[PubMed]

Adenylates are important in cellular metabolism and functions (1). Adenosine is converted intracellularly to adenosine triphosphate (ATP), which is an important source

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of energy as well as a regulator of cellular functions. Adenosine stimulates the acetylcholine-sensitive K^+ current in the heart. Many fluorinated analogs of adenosine nucleoside have been investigated as potential antitumor and antiviral agents (2-5). 2'-Deoxy-2'-fluoro-9-β-D-arabinofuranosyl-adenine (FAA) has been reported to exhibit antitumor activity (6). [^{18}F]FAA has been synthesized and studied in tumor-bearing mice with positron emission tomography (PET) imaging (7).

Synthesis

[PubMed]

Alauddin et al. (7) synthesized [^{18}F]FAA by reaction of the respective triflate (*N*3,3',5'-tri-methoxytrityl-2'-trifluoromethanesulfonyl-9-β-D-arabinofuranosyl-adenine) with tetrabutylammonium [^{18}F]fluoride, followed by acid hydrolysis to remove the methoxytrityl protecting groups. The desired product, [^{18}F]FAA, was purified with high-performance liquid chromatography with a radiochemical yield of 10%–12% (decay-corrected) and a radiochemical purity >99%. The average specific activity for [^{18}F]FAA was >74 GBq/μmol (2,000 mCi/μmol) at the end of the synthesis. Total synthesis time was 90–95 min from the end of bombardment.

In Vitro Studies: Testing in Cells and Tissues

[PubMed]

No publication is currently available.

Animal Studies

Rodents

[PubMed]

Alauddin et al. (7) performed biodistribution studies of [^{18}F]FAA in nude mice (n = 5) bearing an HT-29 tumor in the left flank and a herpes simplex virus thymidine kinase (HSV-tk)–transduced HT-29 tumor in the right flank. [^{18}F]FAA cleared rapidly from the blood within 20 min after injection with a plasma half-life of ~10 min. The spleen had the highest accumulation at 120 min (the only time point studied) with 11.65% injected dose (ID)/g, followed by the kidney (3.5% ID/g), liver (2.4% ID/g), intestine (1.9% ID/g), heart (1.55% ID/g), and lung (1.4% ID/g). The accumulation in the two tumors was 1.75% ID/g in the wild-type tumor and 1.55% ID/g in the HSV-tk-transduced tumor with tumor/blood ratios of 3.27 and 2.92, respectively. The similar tumor uptakes suggested that [^{18}F]FAA is not a substrate for HSV-tk gene. Radioactivity in the blood and muscle was 0.53% ID/g and 0.75% ID/g, respectively. PET images were obtained at 30, 60, and 120 min after injection. The spleen exhibited the highest radioactivity. Both tumors were clearly visualized. No significant differences in images were observed at the three time points. No blocking experiment was performed. The authors suggested that further studies are necessary to understand the mechanism of tumor accumulation.

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.

NIH Support

CA72896

References

1. Dzeja P.P., Terzic A. Phosphotransfer networks and cellular energetics. J Exp Biol. 2003;**206**(Pt 12):2039–47. PubMed PMID: 12756286.
2. Kim C.G., Yang D.J., Kim E.E., Cherif A., Kuang L.R., Li C., Tansey W., Liu C.W., Li S.C., Wallace S., Podoloff D.A. Assessment of tumor cell proliferation using [18F]fluorodeoxyadenosine and[18F]fluoroethyluracil. J Pharm Sci. 1996;**85**(3):339–44. PubMed PMID: 8699341.
3. Mikhailopulo I.A., Poopeiko N.E., Pricota T.I., Sivets G.G., Kvasyuk E.I., Balzarini J., De Clercq E. Synthesis and antiviral and cytostatic properties of 3'-deoxy-3'-fluoro- and 2'-azido-3'-fluoro-2',3'-dideoxy-D-ribofuranosides of natural heterocyclic bases. J Med Chem. 1991;**34**(7):2195–202. PubMed PMID: 2066992.
4. Pittillo R.F., Moncrief C., Brockman R.W., Chambers P. Antimicrobial Activity of 2-Fluoroadenosine and 2-Fluoroadenine. Antimicrobial Agents Chemother (Bethesda). 1964;**10**:474–84. PubMed PMID: 14287979.
5. Secrist J.A., Shortnacy A.T., Montgomery J.A. Synthesis and biological evaluations of certain 2-halo-2'-substituted derivatives of 9-beta-D-arabinofuranosyladenine. J Med Chem. 1988;**31**(2):405–10. PubMed PMID: 3339610.
6. Takahashi T., Kanazawa J., Akinaga S., Tamaoki T., Okabe M. Antitumor activity of 2-chloro-9-(2-deoxy-2-fluoro-beta-D-arabinofuranosyl) adenine, a novel deoxyadenosine analog, against human colon tumor xenografts by oral administration. Cancer Chemother Pharmacol. 1999;**43**(3):233–40. PubMed PMID: 9923554.

7. Alauddin M.M., Shahinian A., Park R., Tohme M., Fissekis J.D., Conti P.S. Biodistribution and PET imaging of [(18)F]-fluoroadenosine derivatives. Nucl Med Biol. 2007;**34**(3):267–72. PubMed PMID: 17383576.