

Preparation and quality control of [^{18}F]NaF for clinical application

S. Goto¹, K. Terasaki², R. Iwata³ and K.Sera²

¹Nishina Memorial Cyclotron Center, Japan Radioisotope Association
348-58 Tomegamori, Takizawa, Iwate 020-0173, Japan

²Cyclotron Research Center, Iwate Medical University
348-58 Tomegamori, Takizawa, Iwate 020-0173, Japan

³CYRIC, Tohoku University
Aramaki, Aoba-ku, Sendai, Miyagi 980-8578, Japan

Abstract

[^{18}F]NaF is used for skeletal imaging. While some $^{99\text{m}}\text{Tc}$ -labeled pharmaceuticals such as [$^{99\text{m}}\text{Tc}$]methylene diphosphonate also have high affinity for bones and widely used, [^{18}F]NaF is considered to be more preferable agent in some viewpoints. One benefit of using [^{18}F]NaF is rapid blood clearance which serves shorter study time for patient convenience. [^{18}F]NaF is a simple compound and easily prepared only by eluting $^{18}\text{F}^-$ trapped on an anion exchange column (QMA) with normal saline or NaHCO_3 solution through a 0.20 μm membrane filter. However, [^{18}F]NaF injection produced by this way is subject to the quality of ^{18}O enriched water that is irradiated to produce ^{18}F , and the product is likely accompanied by some impurities such as vanadium-48 (^{48}V), a radionuclide with half-life of 15.97 days derived from irradiation of titanium target chamber. To use [^{18}F]NaF for clinical purpose, it is important to assure the quality. In this paper, content of impurities in samples taken at some points of [^{18}F]NaF preparation is analyzed by using PIXE method and pure-Ge semiconductor detector to find optimum conditions (ion form of QMA, kind of eluent and its volume) for preparing [^{18}F]NaF. Contamination is shown least in [^{18}F]NaF eluted with 2 mL of 0.4% NaHCO_3 solution. This suggests that inorganic nuclides such as ^{48}V are oxidized in aqueous solution and held trapped on QMA when $^{18}\text{F}^-$ is eluted with diluted NaHCO_3 .