
The synthesis of D-glucose labeled with positron emitting radionuclides has recently received much attention because important applications in medical research have been found. A new chemical synthesis of the title compound has been reported.

A mixture of D-arabinose and potassium cyanide was heated for 10 min in presence of alkali, passed through a column of cat-ion exchange resin, and evaporated to dryness under reduced pressure. The reaction mixture was then suspended in tetrahydrofuran. The suspension was added with diborane, refluxed for 10 min, and added with water to decompose an excess of diborane.

After removal of ionic substances with a retardation resin column, the cold desired compound was then afforded by high performance liquid chromatography technique in a 17% yield based on cyanide. A mixture of [C-11]cyanide and D-arabinose was treated as in the procedure described above to give the desired compound.

The radiochemical yield and purity are ca. 10% and over 95%, respectively.

The procedure of the system is as follows: 1) reaction of 3,4,6-tri-o-acetyl-d-glucal (TAG) with [F-18]AcOF has been suggested to be most suitable. Because the procedure of the reaction is simple and the contamination of 2-deoxy-2-[F-18]fluoro-D-mannose in [F-18]FDG is least in several synthesis methods. Therefore, we have developed a new automated synthesis system of [F-18]FDG based on the reaction of [F-18]AcOF.

The automated synthesis of [F-18]FDG was carried out within 50min after the end of irradiation. A neutral, sterile and pyrogen-free [F-18]FDG solution was reproducibly synthesized with the radiochemical yield of 20-25% and the radiochemical purity of over 97% at the end of synthesis. In addition, the system can be used to produce other sugars including the fluorinations with [F-18]AcOF such as 2-deoxy-2-[F-18]fluoro-D-galactose and 2-deoxy-2-[F-18]fluoro-L-fucose.