Glucose and glucose analogs for glucose uptake assays

Chemical	Radioisotope	Labeling	Solvent	Specific activity	Radiochemical concentration	Storage	Catalog number
2-deoxy-D-glucose	^{3}H	N (1,2 position)	90% ethanol	5-10 Ci/mmol	1 mCi/mL	-20°C	NET328
		N (1,2 position)	steri-packaged aqueous solution	5-10 Ci/mmol	1 mCi/mL	4°C	NET328A
		N (1,2 position)	90% ethanol	25-50 Ci/mmol	1 mCi/mL	-20°C	NET549
		N (1,2 position)	steri-packaged aqueous solution	25-50 Ci/mmol	1 mCi/mL	4°C	NET549A
	^{14}C	(position 1)	90% ethanol	45-60 mCi/mmol	0.1 mCi/mL	-20°C	NEC495
		(position 1)	steri-packaged aqueous solution	45-60 mCi/mmol	0.1 mCi/mL	4°C	NEC495A
		U	steri-packaged aqueous solution	250-350 mCi/mmol	0.1 mCi/mL	4°C	NEC720A
3-O-methyl-D-glucose	^{14}C	(methyl group)	90% ethanol	30-60 mCi/mmol	0.1 mCi/mL	-20°C	NEC377
D-Glucose	^{3}H	N (2 position)	90% ethanol	20-30 Ci/mmol	1 mCi/mL	-20°C	NET238C
		(3 position)	90% ethanol	10 -20 Ci/mmol	1 mCi/mL	-20°C	NET331C
		(3 position)	steri-packaged aqueous solution	10-20 Ci/mmol	1 mCi/mL	4°C	NET331A
		N (5 position)	90% ethanol	10-20 Ci/mmol	1 mCi/mL	-20°C	NET531
		N (6 position)	90% ethanol	25-50 Ci/mmol	1 mCi/mL	-20°C	NET100C
	^{14}C	(position 1)	90% ethanol	45-60 mCi/mmol	0.1 mCi/mL	4°C	NEC043X
		(position 6)	3% ethanol	50-62 mCi/mmol	0.2 mCi/mL	-20°C	NEC045X
		U	90% ethanol	1-5 mCi/mmol	0.1 mCi/mL	4°C	NEC042A
		U	90% ethanol	250-360 mCi/mmol	1 mCi/mL	4°C	NEC042B
		U	90% ethanol	250-360 mCi/mmol	0.1 mCi/mL	4°C	NEC042X
		U	3% ethanol	250-360 mCi/mmol	0.2 mCi/mL	-20°C	NEC042V

See next page for information on how to select a glucose or glucose analog from this table

Guidelines for choosing a glucose or glucose analog from the above table, for glucose uptake assays:

- Chemical
  - Deoxy-D-glucose (DOG) is a glucose analog that is readily transported into most cells, is phosphorylated and trapped by the cells (unidirectional transport), and cannot be further metabolized. It is the most-common chemical used in glucose uptake assays.
  - 3-O-methyl-D-glucose (OMG) is another glucose analog that is readily transported into most cells, but does not become phosphorylated and therefore will equilibrate across the cell membrane. Equilibrium is usually reached rapidly, so the assay may only be linear for a short period of time; you may need to take your measurements fairly quickly. This analog also cannot be further metabolized by cells.
  - D-Glucose (non-analog) can be incorporated into lipids, which provides a measurement of glucose transport. It is a metabolized tracer.

- Radioisotope: Either ^{14}C-labeled glucose and glucose analogs, or ^{3}H-labeled glucose and glucose analogs, can be used in glucose uptake assays. ^{14}C has higher energy compared to ^{3}H. ^{14}C also has higher efficiency compared to ^{3}H in liquid scintillation counting. Your radioactive license may restrict you to one radioisotope or the other. You will want to consult your radiation safety officer when selecting a radioisotope for your assay.

- Packaging
  - Glucose that is packaged in ethanol will be more-resistant to contamination by bacteria or other microbes. Preventing contamination is one way to ensure the longest shelf-life for a chemical (particularly in the case of glucose, because it is an excellent food-source for microbes).
  - For cell labeling or *in vivo* experiments, you may need to evaporate off any ethanol in the stock material prior to use, as ethanol can be toxic to cells.
  - Products that are “steri-packaged” are prepared with additional precautions to substantially reduce product bioburden and enhance product stability. PerkinElmer makes no warranties, whether expressed or implied, with respect to the sterility or non-pyrogenicity of these or any products.

- Labeling positions: for uptake assays, the actual positioning of label is of less importance than it would be if you were performing an enzymatic assay, as uptake of the intact glucose or glucose analog is being traced
  - U (uniformly-labeled): designation for compounds labeled in all positions in a uniform or nearly uniform pattern
  - N (nominally-labeled): designation when the method of preparation requires some (usually a significant amount) of the label to be at a specific site or sites, but no further information is available on the extent (if any at other positions)
  - G (generally-labeled): designation for compounds in which there is a random distribution of radioactivity at various positions
  - Specifically labeled: designation used when all labeled positions are identified and the radioactivity at these positions is greater than 95% of the total incorporated into the compound

- Specific activity: the higher the specific activity, the greater the amount of radioactivity there is per glucose molecule. Specific activity is given in units of Curies per millimole of glucose or glucose analog, or milliCuries per millimole of glucose or glucose analog. The theoretical maximum specific activity of tritium is ~29 Ci/mmol (Curies per millimole of tritium). ^{3}H products with a specific activity over this value indicate that on average, each glucose or glucose analog molecule contains more than one tritium. The theoretical maximum specific activity of ^{14}C is ~62 mCi/mmol (milliCuries per millimole of carbon). ^{14}C products with a specific activity over this value indicate that on average, each glucose or glucose analog molecule contains more than one labeled carbon. Specific activity can be decreased by adding cold glucose or glucose analog.