

**$^{14}\text{C}$** 

# Radioisotope Fact Sheet

## Carbon 14

**Half life** 5730 years

### Radiations emitted

Beta radiation only: 157 keV max, 50 keV average, 100% yield.

Radiation	Energy (keV)	Yield (%)
Beta ray	157 - max, 50 - average	100

### Safety precautions

$^{14}\text{C}$  is a low energy beta emitter that only presents an internal hazard. Perspex shielded workstations are not required because of the limited range of the beta rays in air. Handling tools and standard laboratory PPE (gloves, lab coat, safety glasses) should be used to avoid skin contamination.

Work areas and equipment should be monitored using a suitable survey meter.

A fume cupboard must be used for  $^{14}\text{CO}_2$  labelling or carrying out any processes that could liberate  $^{14}\text{CO}_2$  or  $^{14}\text{CO}$ .

### Radiotoxicity data

$^{14}\text{C}$  is classed as being of moderate hazard (Group 3) according to AS/NZS 2243.4.

The Annual Limit on Intake by ingestion ( $\text{ALI}_{\text{ing}}$ ) and inhalation limit ( $\text{ALI}_{\text{inhal}}$ ) are 34 MBq.

### Dose rates

Beta dose rate to the basal skin cells from contamination of 1 kBq  $\text{cm}^{-2}$ : 324  $\mu\text{Sv h}^{-1}$

Beta dose rate from a 1 kBq (0.05 ml) droplet on skin: 2.7  $\mu\text{Sv h}^{-1}$

### Shielding

Maximum range in air: 27 cm. There is very low potential for bremsstrahlung production and perspex shielding of workstations and waste containers is not necessary.

### Licensing requirements

Under the *Radiation Safety Regulation 2021*, a licence is required for the possession of  $^{14}\text{C}$  sources with concentrations of greater than

or equal to 10 kBq per gram and with activities of 10 MBq or greater. A use licence is also required for any persons who use such sources for research purposes.

### Disposal data

The maximum concentration of  $^{14}\text{C}$  in aqueous wastes released to a sewerage system is given in the Regulation as 2.36 MBq per  $\text{m}^3$  i.e. 2.36 kBq per litre.

The concentration of  $^{14}\text{C}$  in solid wastes disposed of to either the general or pathology waste streams must be less than 5 kBq per gram (5 MBq per kg) – i.e. half the concentration limit for licensing.

Wastes containing  $^{14}\text{C}$  should not be placed in a decay store as there will be no significant diminution in activity and accountability for the waste may be lost.

Where licensed users create wastes containing  $^{14}\text{C}$ , they should consult with the RSO to determine the most appropriate method for the waste to be disposed of promptly.

### Radiation detection and monitoring

A large diameter end window or pancake type GM tube contamination monitor is the most suitable type of meter for contamination control. TLD/OSL personal dosimeters are not required.

### Laboratory requirements

Indicative maximum activities:

Low level	Bench	10 MBq (No $^{14}\text{CO}_2$ use)
	Fume cupboard	100 MBq (1 MBq for $^{14}\text{CO}_2$ )
Medium level	Bench	37 MBq (No $^{14}\text{CO}_2$ use)
	Fume cupboard	370 MBq (37 MBq for $^{14}\text{CO}_2$ )