Data loggers

What is a data logger?

Temperature data loggers are small electronic devices that measure temperatures at preset time intervals and record the results over a period of time. Data loggers should be set to record temperatures at 5-minute intervals.

Each logger is a self-contained miniature computer. Data loggers come in a range of shapes and sizes. Once programmed using a computer, loggers are disconnected from the computer and placed in the vaccine refrigerator near the temperature probe or vaccines. The logger then operates independently on its own battery until the recording is downloaded to the computer.

Some purpose-built vaccine refrigerators have an inbuilt data logger. Information from the data logger should be downloaded at least weekly (or more frequently if recommended by the manufacturer), reviewed and digitally stored.

Advances in technology are producing more features in data loggers; the information in this section refers to basic models.

What information do data loggers provide?

Data loggers provide an accurate indication of vaccine refrigerator temperatures and can be used to map 'cold spots' or investigate problems. Loggers use a similar measuring principle to chart recorders; however, they record the data electronically. The data can be stored by the monitoring system and can also be downloaded to a computer.

The objective of data logging is to build up a 'temperature map' for the refrigerator (see Section 5.4 'Stabilising the vaccine refrigerator temperature'), to identify which areas are safe for vaccine storage. In particular, it is important to identify areas where vaccines could freeze.

Twice-daily minimum and maximum temperatures must still be manually recorded as a timely alert to any breach in the cold chain. If a data logger is used for routine temperature monitoring (instead of a minimum/maximum thermometer), it must have a visual display of minimum/maximum temperatures to allow twice-daily real-time readings to be viewed and manually recorded.

Many data loggers can be programmed to alarm when a temperature outside the 2 to 8C range is recorded.

Using a data logger

The data logger and the minimum/maximum thermometer should be co-located in the refrigerator; otherwise, different recordings can occur. If the data logger and probe have a fixed position in the refrigerator and cannot be moved, the vaccines should be stored as close as practicable to the probe.

The results from the data logger can be printed in graph and numerical formats, including times that the temperature was recorded outside the 2 to 8°C range, and the minimum and maximum temperatures.

All staff should be trained in how to operate and manage the data logger and interpret its readings. Data logging will help immunisation service providers to get to know their refrigerator (see National Vaccine Storage Guidelines – Strive for 5, Section 5.4 'Stabilising the vaccine refrigerator temperature'). Any actions taken in response to data logging should be documented and retained according to state or territory health department policy or medico-legal requirements.

Continuous logging

All vaccine refrigerators should have a permanent data logger in place to continuously measure the refrigerator temperature at preset 5-minute intervals. The data should be downloaded at least weekly, in addition to twice-daily minimum/maximum recordings. The data logger can be a portable digital data logger or may be built into the refrigerator.

Benefits of continuous temperature monitoring

Continuous temperature monitoring:

- provides information on the duration of a cold chain breach and supplements a cold chain audit
- confirms that the cold chain has been maintained and provides accurate knowledge of the vaccine refrigerator temperature
- identifies times when there is a risk of vaccines freezing (0C or below) — for example, overnight, long weekends and when the refrigerator is not in use
- assists staff to understand the functioning of the refrigerator
- identifies temperature fluctuations between the refrigerator shelves and the location of any cold spots on each shelf
- supports accreditation documentation and audits
- helps to assess the refrigerator thermometer's accuracy.

Points to consider when purchasing a data logger

Find out:

- whether the data logger will allow preset 5-minute temperature recordings
- whether the data logger is easy to set up and use, particularly for recording and downloading data
- whether the data logger has alert capabilities
- the accuracy of the data logger (is it ±1C or, more usually, ±0.1C?)
- whether the accuracy of the data logger can be checked by the user or requires a technician
- the battery life of the data logger (this depends on the frequency of temperature recording, downloading and resetting)
- whether there is a display on the set-up screen of remaining battery life
- whether the data logger will be used as a permanent method of monitoring temperatures
  - does it have a visual minimum/maximum temperature display?
  - is the current temperature visible?

Checklist for data loggers

- Place the data logger where it is easily seen and in the middle of the vaccines.
- Measure the current, minimum and maximum temperatures twice daily, and record them.
- Set the alarm system to alarm outside the 2 to 8C range. Check that the alarm is working.
- Train all staff to recognise the alarm and download information from the data logger.
- Download and record information as soon as possible after an alarm is activated.
- If recordings are outside the 2 to 8C range, follow the cold chain breach protocol (see the National Vaccine Storage Guidelines – Strive for 5, Appendix 3) and notify the relevant state or territory health department. See contact details on the last page of these guidelines.
- Regularly check and record the accuracy of the data logger. Record the date the accuracy check is done. To check the accuracy, place a second data logger in the refrigerator next to the existing data logger to obtain comparison temperature readings. Inbuilt data loggers should be checked for accuracy according to the manufacturer's recommendation.
- Change the battery according to the manufacturer's recommendation, or when the battery life displayed on either the data logger or computer set-up screen is low. Record the date the battery is changed. Life of the replaceable battery may be dependent on usage (e.g. how frequently the temperature is recorded and data are downloaded).