



Failure of the vaccine cold chain following modification of a domestic refrigerator

Vaccinators maintain the cold chain to ensure vaccine potency. The Immunization Handbook advises vaccinators to use refrigerators with certain technical specifications and advises on ways to ensure that refrigerator temperatures remain within the recommended range.¹ Recently, a cold chain failure occurred in a practice that was routinely monitoring maximum and minimum temperatures and believed that the cold chain was being maintained.

The practice used a popular modern domestic refrigerator. The practice recorded daily maximum and minimum temperature readings from an electronic probe thermometer placed at the centre of the refrigerator. The practice also checked daily readings from a second analogue maximum/minimum mercury thermometer in a lower part of the fridge. A third thermometer was kept on the upper shelf of the fridge. All recordings suggested that the cold chain was being maintained.

As part of a routine cold chain surveillance, the local Public Health Unit (PHU) used an electronic probe thermometer over a five-day period and concluded that the refrigerator temperatures were very stable and within the recommended range for the stored vaccines. These results reconfirmed the practice's belief that the cold chain was being well maintained.

Some time prior to the PHU's cold chain surveillance, a staff member wishing to create more storage space in the refrigerator had removed the refrigerator door inserts. Door inserts on domestic refrigerators have several uses, such as food isolation – but it was not appreciated at the time that the upper door insert had the additional function of switching off the interior light when the refrigerator door was closed.

Some time after the PHU's cold chain surveillance, another staff member noted that a vaccine pack in the vicinity of the interior light did not feel cold. It was quickly realised that the interior light was not turning off and that this light was acting as a local heat source. The practice used temperature probing to outline areas in the refrigerator in which vaccines might have been stored at temperatures above those recommended. The immediate problem was remedied by removing the interior light bulb.

Records showed when the door insert had been removed, and because strict vaccination records of vaccine storage and vaccine recipients had been maintained, the practice was able to determine which individual vaccinations may have been thermally damaged and who had received those vaccines.

All recipients of possibly thermally damaged vaccines were written to and offered serological testing and revaccination where appropriate.

This incident had potential for serious health outcomes, but fortunately none has arisen.

This incident shows that problems present in a system can sometimes escape detection both from recommended routine monitoring and from further surveillance from outside authoritative agencies. It also shows that at times a seemingly minor alteration in a system can lead to potentially serious adverse health outcomes: in this case removing a single door insert led to local warming of vaccines.

Finally this incident shows again how useful meticulously-kept vaccination records can be when vaccination problems do arise.

DJ Baker

Clinical Tutor, Department of General Practice
Dunedin School of Medicine

Dr J Jerram

Medical Director, Student Health Services
University of Otago

L A Reid

Practice Nurse, Student Health Services
University of Otago

Reference:

1. Ministry of Health. Immunization Handbook. Wellington: Ministry of Health, 2002.