

# “Vaccine Storage and Handling Toolkit”

By the Public Health Agency of Canada

## ***Section 4 Vaccine Storage Practices***

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<http://www.phac-aspc.gc.ca/publicat/2007/nvshglp-ldemv/section4-eng.php>

Proper vaccine storage and handling procedures include but are not limited to the following:

- A minimum of twice daily minimum and maximum temperature monitoring of the refrigerator(s) and freezer(s), as well as the room temperature.
- A minimum of twice daily recording on the temperature logs.
- Responding to storage temperatures outside the recommended range.
- Maintaining storage and handling equipment and records.
- Rotating vaccine stock so that vaccine closer to its expiration date will be used first.
- Monitoring expiration dates on vaccines and ensuring that expired vaccine is not administered to clients.
- Ordering vaccines to maintain no more than a one month supply (or quantity sufficient to meet seasonal or outbreak demands).
- Overseeing proper receipt, storage, and transport of vaccine.

All vaccines should be stored with the caps on in their original boxes until they are needed. Light exposure may cause loss of potency in vaccines and other biologics. Therefore, these products should be protected from light exposure at all times.

### **Live Vaccines**

Certain live vaccines must be stored in a continuously frozen state at -15°C or colder until administration. In Canada, most live vaccines are licenced as refrigerator stable products. However, if the vaccine is received frozen from the vaccine supply source, it may be stored in the freezer. Do not refreeze vaccines. Always refer to the product monograph for the most up-to-date information on storage information.

### **Inactivated Vaccines**

Inactivated vaccines are sensitive to both excessive heat and freezing. They should be stored in a refrigerator at +2°C to +8°C, with a desired average temperature of +5°C (mid-point that allows for ±3°C buffer). Exposure to

temperatures outside this range may result in decreased vaccine potency and increased risk of vaccine-preventable diseases.

### **Lyophilized (Freeze-Dried) Vaccines and Diluents**

Diluent that is packaged separately from its corresponding lyophilized (freeze-dried) vaccine can be stored at room temperature or in the refrigerator. To conserve space, these diluents may also be stored in the door of the refrigerator. Use only the diluent accompanying the vaccine for reconstitution as specified by the manufacturer.

Diluent which has been frozen should not be used because of the risk of fractures in the vial that may cause contamination. Appropriate actions should be taken to isolate and dispose of the vials according to your local public health office or immunization program\* recommendations.



### **4.2 Organizing Your Refrigerator and Freezer**

Organization of your refrigerator and freezer must take into account convenience for staff, technical features of the refrigerators, and vaccine requirements. Figure 1 summarizes how your refrigerator should be organized.

Ideally, frozen vaccines should be stored in a separate designated freezer unit. However, for domestic refrigerators having a separate freezer compartment, frozen vaccine may be stored in the middle of the compartment away from the walls, coils, and floor. Vaccines should not be stored in the freezer door. The temperature in the door is not stable because door openings subject products in this location to frequent temperature fluctuations.

Frozen vaccines may be stored in either a manual defrost or a frost-free freezer at  $-15^{\circ}\text{C}$  or colder. Vaccine products must not be stacked or placed so closely together that air circulation inside the freezer compartment is impeded.

In the refrigerator, vaccine should be stored in the middle of the compartment away from the coils, walls, floor, and cold-air vent. The temperature near the floor of the refrigerator is not stable and differs from that in the middle of the compartment. For this reason, vaccine should never be stored in the vegetable bins. Vaccines should not be stored in the refrigerator door. The temperature in the door is not stable because door openings subject products in this location to frequent temperature fluctuations. Refrigerated vaccines should always be stored far enough away from the air venting from the freezer compartment to avoid freezing.

Organization of your refrigerator and freezer must take into account convenience for staff, technical features of the refrigerators, and vaccine requirements. In the refrigerator, vaccine should be stored in the middle of the compartment away from the coils, walls, floor, and cold-air vent. In the freezer, vaccine should be stored in the middle of the compartment away from the walls, coils, and peripheral areas.

Figure 1: Organizing the Refrigerator



## Know Your Refrigerator

Refrigerator technology can vary, so it is not possible to make generalized statements on how to manage vaccines for all refrigerators. It is important that you "know your refrigerator." The following suggestions are summarized from the Australian Government, Department of Health and Ageing,<sup>(1)</sup> and Grassby<sup>(2)</sup>.

Most refrigerators have a temperature gradient, meaning that there is a gradual difference in temperature from one part of the refrigerator to another, for example, from top to bottom, side to side, and front to back. It is important to know each refrigerator's temperature gradients. Do not assume that the top part of the refrigerator is coldest and the bottom part is warmest. The gradients will depend on how the refrigerator is cooled and/or where the plate evaporator is located.

To determine the gradients within your refrigerator, a recording device, such as a data logger, should be placed in each position for a minimum of 24 hours, preferably with at least two other recorders simultaneously placed in other parts of the unit. Depending on the type and number of recorders available, this could take some time and is best done when there is no vaccine in the fridge but with some sort of "cold mass" to simulate a batch of vaccine (e.g. cooled water

bottles). Knowing the temperature gradients will help you to place your vaccines properly within the refrigerator.

Temperatures for each location of the refrigerator can also fluctuate at any given time. For frost-free refrigerators, the defrost cycle can affect the temperature. Environmental factors may also affect the temperature, for example, the surrounding room temperature and the location of the refrigerator in reference to windows, heat sources, or air conditioning. It is also important to know what happens when there are changes in the weather, or a decrease or increase in use compared to usual daily activities.

**It is important to know your refrigerator. Knowing the temperature gradients will help you to place your vaccines properly within the refrigerator. It is also important to know the factors that affect fluctuations in temperatures in the refrigerator.**

### **Vaccine Spacing**

Vaccine should be grouped by product, taking note to place short-dated products near the front of the group for more immediate use and with space between the vaccine and the compartment wall, and with space between each large box, block, or tray of vaccine to allow for cold air circulation around the vaccine. Adequate cold-air circulation helps each vaccine to reach a consistent temperature throughout its mass and is necessary for the storage unit to maintain a consistent temperature inside the compartment. Packing any vaccine storage unit too tightly will affect the temperature. Likewise, packing too much vaccine in one unit will affect the temperature (e.g. during peak flu season). No more than 50% of the internal volume of the refrigeration unit should be filled with vaccine<sup>(2)</sup>.

**Packing any vaccine storage unit too tightly and/or packing too much vaccine in one unit will affect the temperature.**

### **Vaccine Packaging**

Vaccine products that have similar packaging should be stored in different locations to avoid confusion and medication errors. For example, if you have pediatric and adult versions of the same vaccine, storing them in different locations lessens the chance that someone will inadvertently choose the wrong vaccine.

Likewise, vaccines that have similar sounding names should be stored in different locations. For example, DT and Td vaccines might be easily confused, as could Hib and hepatitis B vaccines.

Like antigens of different brands are also best kept separate to avoid administration of an incorrect dose if the dosing schedule or series differs among brands of the same antigen.



### 4.3 Organizing Vaccine Inventory

The location of each specific vaccine inside the storage unit should be clearly labeled. Storing each vaccine in its own specifically labeled section of the refrigerator or freezer helps decrease the chance that someone will mistakenly select the wrong vaccine.

In addition to labeling the location of vaccines, mark each opened multidose vial with the **date** it was **first punctured**. Mark reconstituted vaccine with the **date and time** it was reconstituted. Dating these vials is important for two reasons.

1. Some vaccines expire within a certain time after puncturing or after reconstitution. This may not correspond to the expiration date printed on the vial by the manufacturer. Follow manufacturer recommendations or jurisdictional guidelines for use of multidose vials and reconstituted vaccine.
2. Dating punctured or reconstituted vials helps manage vaccine inventory by identifying vials that should be used first. Whenever possible, use all the vaccine in one multidose vial before opening another vial. Use all the reconstituted vaccine in one vial before reconstituting another vial to reduce vaccine waste.

Store punctured multidose vials in a designated, labeled container so that they are easily recognized. Remember to store these vials in their original boxes to prevent light exposure.

Diluents should be clearly labeled, whether they are stored at room temperature or in the refrigerator. Label the boxes of corresponding vaccines and diluents from the same manufacturer so that they will be used together. This avoids confusion and helps to ensure that you use only the specific diluent provided by the manufacturer for each type of lyophilized (freeze-dried) vaccine. This is particularly important if you store two or more lyophilized vaccines using different diluents.

**Diluents should be clearly labeled, whether they are stored at room temperature or in the refrigerator.**



### 4.4 Storage Containers

## Vaccine Boxes

Vaccine and diluent should be stored in their original packaging. Storing loose vaccine vials makes inventory management more difficult, administration errors more likely, and exposes the vaccines to light.

## Trays and Containers

Trays and containers may be used to organize vaccine boxes. Each tray or container should only store vaccine of the same type. Other medications and biological products, if they **must** be stored in the vaccine storage unit, must not be stored on the same trays or containers as the vaccines to avoid medication errors. Clearly label trays or containers.

Trays and containers must not be stacked or placed so closely together that air circulation inside the vaccine storage unit compartment is impeded. Trays and containers should be vented to allow air circulation. Never use air-tight containers.



## 4.5 Storage of Non-Vaccine Products

Never store food or beverages inside vaccine storage units. As well, whenever possible, medications and/or other biological products should not be stored with vaccines. Storing non-vaccine items results in frequent opening of the storage unit door. This results in a greater chance for temperature instability and excessive exposure to light. It may also result in spills and contamination inside the compartment. Introduction of other items also impedes airflow and introduces varying temperatures to the unit.

**Never store food or beverages inside vaccine storage units.**

Reference 3 – publication

Grassby PF. *Safe storage of vaccines: problems and solutions*. Pharm J 1993;251:323–327.

Reference:

<http://209.85.141.104/search?q=cache:SZPIPGHoDKcJ:www.bccdc.org/downloads/pdf/epid/reports/Vaccine%2520Temperature%2520Log.pdf+vaccine+temperature&hl=en&ct=clnk&cd=1&gl=ca>

**Vaccine Temperature Log**

**Safe Vaccine Storage and Handling – S & Phys of Ontario**

<http://www.cpsso.on.ca/Publications/Dialogue/MarApr06/ppvaccine.htm>