The vaccine cold chain is a temperature-controlled environment used to maintain and distribute vaccines in optimal condition. The cold chain begins with the cold storage unit at the manufacturing plant, extends through transport of vaccines to the distributor and delivery to and storage at the provider facility, and ends with administration of vaccine to the patient. Appropriate storage and handling conditions must be maintained at every link in the cold chain.

When the Cold Chain Fails

Too much exposure to heat, cold, or light at any step in the cold chain can damage vaccines, resulting in loss of vaccine potency. Once lost, potency cannot be restored. Each time vaccines are exposed to improper conditions, potency is reduced further. Eventually, if the cold chain is not properly maintained, potency will be lost completely, and vaccines will be useless.

While exposure to any inappropriate conditions can affect potency of refrigerated vaccines, a single exposure to freezing temperatures (0°C [32°F] or colder) will destroy some. Liquid vaccines that contain an aluminum adjuvant can permanently lose potency when exposed to freezing temperatures.

Vaccine appearance is not a reliable indicator that vaccines have been stored in appropriate conditions. For example, inactivated vaccines, even when exposed to freezing temperatures, may not appear frozen, giving no indication of reduced or lost potency.
Vaccine Handling Tips

REMEMBER: Improperly stored or outdated vaccines won’t protect your patients!

**Manage vaccine inventories.**
Inventory your vaccine supplies at least monthly and before placing an order. Expired vaccine must never be used and it becomes “cash in the trash!”

**Always use the vaccine with the soonest expiration date first.**
Move vaccine with the soonest expiration date to the front of the storage unit and mark it to be used first. These actions help ensure it will be picked up first by someone selecting vaccine from the unit.

**Store vaccine appropriately.**
Place vaccines in refrigerator or freezer immediately upon receiving shipment. Keep vaccine vials in their original packaging. Place vaccine in clearly labeled wire baskets or other open containers with a 2–3” separation between baskets and 4” from wall of unit. Separate or clearly mark vaccines to distinguish those that were supplied from your state’s Vaccines for Children program (or other state-funded source) from those that were privately purchased. Do not store vaccines in the door or on the floor of the unit.

**Stabilize temperatures.**
Store ice packs in the freezer and large jugs of water in the refrigerator along with the vaccines. This will help maintain a stable, cold temperature in case of a power failure or if the refrigerator or freezer doors are opened frequently or are accidentally left open. Because frequent opening of either the refrigerator or freezer door can lead to temperature variations that could affect vaccine efficacy, you should not store food or beverages in the refrigerator or freezer.

**Safeguard the electrical supply to the refrigerator.**
Make sure the refrigerator and freezer are plugged into outlets in a protected area where they cannot be disconnected accidentally. Label the refrigerator, freezer, electrical outlets, fuses, and circuit breakers on the power circuit with information that clearly identifies the perishable nature of vaccines and the immediate steps to be taken in case of interruption of power.

For easy help with labeling units and power supplies, see IAC signs “Do Not Unplug Refrigerator or Freezer” (www.immunize.org/catg.d/p2090.pdf) and “Do Not Stop Power to Circuit Breaker” (www.immunize.org/catg.d/p2091.pdf). For guidance on steps to take during a power interruption, see IAC’s “Emergency Response Worksheet” (www.immunize.org/catg.d/p3051.pdf).

---

Freezer

- MMR*
- MMRV
- Varicella
- Zoster

**Maintain freezer temperature between -50° and -15°C (-58° and 5°F).**

Refrigerator

- DTaP, Tdap, Td, DT
- Hepatitis A
- Hepatitis B
- H. influenzae type b (Hib)
- Human papillomavirus
- Influenza
- Polio (IPV)
- MMR*
- Meningococcal
- Pneumococcal
- Rotavirus

**Maintain refrigerator temperature between 2° and 8°C (36° and 46°F). Aim for 5°C (40°F).**

---

*MMR may be stored in either the freezer or the refrigerator.
† Refer to package insert for specific instructions on the storage of each vaccine.
‡ For easy help with labeling units and power supplies, see IAC signs “Do Not Unplug Refrigerator or Freezer” (www.immunize.org/catg.d/p2090.pdf) and “Do Not Stop Power to Circuit Breaker” (www.immunize.org/catg.d/p2091.pdf). For guidance on steps to take during a power interruption, see IAC’s “Emergency Response Worksheet” (www.immunize.org/catg.d/p3051.pdf).
## Vaccines with Diluents: How to Use Them

Be sure to reconstitute the following vaccines correctly before administering them! Reconstitution means that the lyophilized (freeze-dried) vaccine powder or wafer in one vial must be reconstituted (mixed) with the diluent (liquid) in another.

- Only use the diluent provided by the manufacturer for that vaccine as indicated on the chart.
- ALWAYS check the expiration date on the diluent and vaccine. NEVER use expired diluent or vaccine.

<table>
<thead>
<tr>
<th>Vaccine product name</th>
<th>Manufacturer</th>
<th>Lyophilized vaccine (powder)</th>
<th>Liquid diluent (may contain vaccine)</th>
<th>Time allowed between reconstitution and use, as stated in package insert*</th>
<th>Diluent storage environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>ActHIB (Hib)</td>
<td>Sanofi Pasteur</td>
<td>Hib</td>
<td>0.4% sodium chloride</td>
<td>24 hrs</td>
<td>Refrigerator</td>
</tr>
<tr>
<td>Hibrix (Hib)</td>
<td>GlaxoSmithKline</td>
<td>Hib</td>
<td>0.9% sodium chloride</td>
<td>24 hrs</td>
<td>Refrigerator or room temp</td>
</tr>
<tr>
<td>Imovax (RABHDCV)</td>
<td>Sanofi Pasteur</td>
<td>Rabies virus</td>
<td>Sterile water</td>
<td>Immediately†</td>
<td>Refrigerator</td>
</tr>
<tr>
<td>M-M-R II (MMR)</td>
<td>Merck</td>
<td>MMR</td>
<td>Sterile water</td>
<td>8 hrs</td>
<td>Refrigerator or room temp</td>
</tr>
<tr>
<td>MenHibrix (Hib-MenCY)</td>
<td>GlaxoSmithKline</td>
<td>Hib-MenCY</td>
<td>0.9% sodium chloride</td>
<td>Immediately†</td>
<td>Refrigerator or room temp</td>
</tr>
<tr>
<td>Menomune (MPSV4)</td>
<td>Sanofi Pasteur</td>
<td>MPSV4</td>
<td>Distilled water</td>
<td>Single-dose vial: Immediately† Multidose vial: 35 days</td>
<td>Refrigerator</td>
</tr>
<tr>
<td>Menveo (MenACWY)</td>
<td>GlaxoSmithKline</td>
<td>MenA</td>
<td>MenCWY</td>
<td>8 hrs</td>
<td>Refrigerator</td>
</tr>
<tr>
<td>Pentacel (DTaP-IPV/Hib)</td>
<td>Sanofi Pasteur</td>
<td>Hib</td>
<td>DTaP-IPV</td>
<td>Immediately†</td>
<td>Refrigerator</td>
</tr>
<tr>
<td>ProQuad (MMRV)</td>
<td>Merck</td>
<td>MMRV</td>
<td>Sterile water</td>
<td>30 min</td>
<td>Refrigerator or room temp</td>
</tr>
<tr>
<td>RabAvert (RABPCECV)</td>
<td>GlaxoSmithKline</td>
<td>Rabies virus</td>
<td>Sterile water</td>
<td>Immediately†</td>
<td>Refrigerator</td>
</tr>
<tr>
<td>Rotarix (RV1)</td>
<td>GlaxoSmithKline</td>
<td>RV1</td>
<td>Sterile water, calcium carbonate, and xanthan</td>
<td>24 hrs</td>
<td>Refrigerator or room temp</td>
</tr>
<tr>
<td>Varivax (VAR)</td>
<td>Merck</td>
<td>VAR</td>
<td>Sterile water</td>
<td>30 min</td>
<td>Refrigerator or room temp</td>
</tr>
<tr>
<td>YF-VAX (YF)</td>
<td>Sanofi Pasteur</td>
<td>YF</td>
<td>0.9% sodium chloride</td>
<td>60 min</td>
<td>Refrigerator</td>
</tr>
<tr>
<td>Zostavax (HZV)</td>
<td>Merck</td>
<td>HZV</td>
<td>Sterile water</td>
<td>30 min</td>
<td>Refrigerator or room temp</td>
</tr>
</tbody>
</table>

Always refer to package inserts for detailed instructions on reconstituting specific vaccines. In general, follow the steps below.

1 For single-dose vaccine products (exception is Rotarix!), select a syringe and needle of proper length to be used for both reconstitution and administration of the vaccine. Following reconstitution, Menomune in a multidose vial will require a new needle and syringe for each dose of vaccine to be administered. For Rotarix, see the package insert.†

2 Before reconstituting, check labels on both the lyophilized vaccine vial and the diluent to verify that
   • they are the correct two products to mix together,
   • the diluent is the correct volume (especially for Menomune in the multidose vial), and
   • neither the vaccine nor the diluent has expired.

3 Reconstitute (i.e., mix vaccine just prior to use) by
   • removing the protective caps and wiping each stopper with an alcohol swab,
   • inserting needle of syringe into diluent vial and withdrawing entire contents, and
   • injecting diluent into lyophilized vaccine vial and rotating or agitating to thoroughly dissolve the lyophilized powder.

4 Check the appearance of the reconstituted vaccine.
   • Reconstituted vaccine may be used if the color and appearance match the description on the package insert.
   • If there is discoloration, extraneous particulate matter, obvious lack of resuspension, or the vaccine cannot be thoroughly mixed, mark the vial as “DO NOT USE,” return it to proper storage conditions, and contact your state or local health department immunization program or the vaccine manufacturer.

5 If reconstituted vaccine is not used immediately or comes in a multidose vial (i.e., multi-dose Menomune), be sure to
   • clearly mark the vial with the date and time the vaccine was reconstituted,
   • maintain the product at 2°–8°C (36°–46°F); do not freeze, and
   • use only within the time indicated on chart above.

Technical content reviewed by the Centers for Disease Control and Prevention
Preparing Refrigerators for Vaccine Storage

1. Remove all drawers and bins. Vaccines should not be stored in refrigerator doors, drawers, or bins.

2. Fill the refrigerator floor with water bottles. Put water bottles in the door and bin space, and on the top shelf (underneath the cold air vent). Do not block air vents.

3. You’ll need to set up and get familiar with your data logger before using it to monitor temperatures. Refer to “Data Logger Setup & Use” (IMM-1206) for further instruction. Store your backup device’s buffered probe in the vaccine refrigerator.

4. Attach the digital display to the outside of the refrigerator, either on the door or on the side. CURRENT, MIN, and MAX temperatures must be visible without opening the storage unit door.


6. Set the refrigerator temperature. If the refrigerator has a thermostat, set it at 40°F. If it has a dial with a range of settings, set it to the middle of the range. The next morning, check the temperature and adjust it until it stabilizes at approximately 40°F.

7. Once the temperature has stabilized, record CURRENT, MIN, and MAX temperatures on the log twice a day. Do not store vaccines in the refrigerator until the temperature is stable at around 40°F for 3–5 days.
Refrigerator Setup for Vaccine Storage

A carefully organized refrigerator helps protect vaccines and facilitates vaccine inventory management. Refrigerate all vaccines except MMR, MMRV, Varicella, and Zoster.

Refrigerator-only Unit

- Separate VFC vaccines from privately purchased vaccines and label them clearly.
- Group and label vaccines by pediatric, adolescent, and adult types.
- Place vaccine boxes in breathable plastic mesh baskets or directly on shelves.
- Always keep vaccines in original boxes. Do not open the box until you are ready to use the vaccine.
- Keep baskets 2-3 inches from walls and other baskets.
- Store only vaccines and other medication in vaccine storage units.
- Store vaccines with the earliest expiration dates to the front of the shelf.
  
  If you have vaccines that will expire in 3-6 months that you will not be able to use, notify the VFC Call Center.

- Keep temperatures between 35.0°F and 46.0°F.

- Do not block air vents.
- No vaccines in solid plastic trays or containers.
- No vaccines in doors.
- No food in refrigerator.
- No vaccines in drawers or on floor of refrigerator.

If you have any problems with your refrigerator, keep the refrigerator door shut and contact the VFC Call Center at (877) 243-8832.

VFC Field Rep.

www.eziz.org
Preparing Freezers for Vaccine Storage

1. In an upright freezer, put a few cold packs in areas where vaccines cannot be stored, like the door, top shelf, and floor.

   In a chest freezer, put a few cold packs in the basket at the top or on the floor.

   **Upright freezer**

   **Chest freezer**

2. You’ll need to set up and get familiar with your data logger before using it to monitor temperatures. Refer to “Data Logger Setup & Use” (IMM-1206) for further instruction.

   Store your backup device’s buffered probe in the vaccine refrigerator.

   Place the buffered probe in the center of the freezer near the vaccines.

3. Attach the digital display to the outside of the freezer, either on the door or on the side.

   CURRENT, MIN, and MAX temperatures must be visible without opening the storage unit door.


5. If the freezer has a thermostat, set it below 0°F.

   If it has a dial with a range of settings, set it to the coldest.

   Check the temperature the next morning. Adjust the thermostat until the temperature stabilizes below 0°F.

6. Once the temperature has stabilized, record CURRENT, MIN, and MAX temperatures on the log twice a day.

   Do not store vaccines in the freezer until the temperature stays below 0°F for 3–5 days.

   **Freezer Temperature Log**

<table>
<thead>
<tr>
<th>CURRENT</th>
<th>MIN</th>
<th>MAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>-6.0</td>
<td>-10.0</td>
<td>-3.3</td>
</tr>
</tbody>
</table>

**WARNING!** Do Not Unplug
Freezer Setup for Vaccine Storage

A carefully organized freezer helps protect vaccines and facilitates vaccine inventory management. Freeze MMR, MMRV, Varicella, and Zoster vaccines.

- Separate the VFC vaccine supply from privately purchased vaccine and label them clearly.
- Group and label vaccines by pediatric, adolescent, and adult types.
- Place vaccine boxes in breathable plastic mesh boxes or directly on shelves.
- Always keep vaccines in their original boxes. Do not open the box until you are ready to use the vaccine.
- Keep baskets 2-3 inches from walls and other baskets.
- Store vaccines with the earliest expiration dates to the front of the shelf. If you have vaccines that will expire in 3–6 months that you will not be able to use, notify the VFC Call Center.
- Keep temperatures 5.0°F or colder.

If you have any problems with your freezer, keep the freezer door shut and contact the VFC Call Center at (877) 243-8832.

VFC Field Rep.
If you experience a power failure, do not open refrigerator/freezer doors. If you determine that power will not be restored in time to maintain internal temperatures within recommended ranges, e.g. more than 2 hours, activate your emergency plan.

VFC Field Rep.
Monthly Care of Vaccine Storage Units

A small amount of regular maintenance is necessary to help ensure that vaccine refrigerators and freezers work properly. Follow the steps below to keep household and commercial refrigerators and freezers clean. If you have a pharmaceutical/laboratory grade unit, follow the manufacturer’s maintenance schedule and other recommendations.

1. Clean the inside of the storage units

Cleaning the inside of the refrigerator and freezer will help prevent the growth of bacteria and fungus.

You do not need to remove the vaccine from the unit to clean it. Just move the trays of vaccine as you clean.

**Do not unplug the unit.**

- Clean any spills.
- Wipe the inside of the compartment and the shelves with disinfectant or antibacterial wipes. Let it dry.
- Put the trays of vaccine back where they were.

2. Check the door seals

Refrigerators and freezers have flexible door seals that prevent cold air from escaping when doors are closed. If the seals do not seal completely, cold air escapes. This can cause temperatures to fluctuate in the unit.

**Do not unplug the unit.**

1. Locate the seals.
2. Examine the seals.
   - They should not be torn or brittle.
   - When the unit is closed, there should be no gaps between the seals and the body of the unit.
3. If you suspect a problem with the seals, tell your supervisor.

3. Clean the coils

If the coils are easy to reach, use a duster to remove any visible dust.
Data Logger Setup & Use

All key practice staff monitoring storage unit temperatures must be trained on how to operate and manage data loggers and interpret their temperature readings.

Preparing New Data Loggers for Use

Refer to your device’s product guide or video to learn how to use your data logger. Call the vendor’s support number for all questions regarding setup, functionality, or configuration.

Set Up and Get Familiar with Functions

1. Open the box and retrieve its contents.
   - Store the certificate of calibration in the practice’s VFC Program binder.
   - Locate vendor’s support number for assistance with setup.
   - Review any training video or resources.
   - Review the manufacturer’s product guide.

2. Place the buffered probe in the center of the vaccine storage unit.
   - Slide the cable through the hinge side of the door and close the storage unit door.
   - Ensure the probe remains in the vaccine storage unit at all times.

3. Set up and prepare your device to monitor temperatures.
   - Install software, if necessary based on device make and model. Data download might require a flash drive or cloud account.
   - Assign a name to each device (for example, Injection_Room_Unit_01).
   - Set the device to current time, date, and year.
   - Set the device to either Fahrenheit or Celsius.
   - Set the logging interval to record every 30 minutes.
   - Set the LO/HI temperature alarm limits for vaccine refrigerators and freezers:

<table>
<thead>
<tr>
<th>Settings</th>
<th>Refrigerator</th>
<th>Freezer</th>
</tr>
</thead>
<tbody>
<tr>
<td>LO</td>
<td>34.9°F (1.9°C)</td>
<td>-58.1°F (-50.1°C)</td>
</tr>
<tr>
<td>HI</td>
<td>46.1°F (8.1°C)</td>
<td>5.1°F (-14.9°C)</td>
</tr>
</tbody>
</table>

4. Place or mount the digital display outside the storage unit. Temperatures must be visible without opening the storage unit door.

5. Ensure the device is set to begin monitoring vaccine temperatures.

6. Get familiar with the device using the manufacturer’s training materials.
   - Locate CURRENT, MIN, and MAX readings. These readings might appear on the digital display or be accessed by menu buttons (REVIEW, START, or DISPLAY).
   - Determine how your device will communicate temperature alarms. For example, audible alarms, visual light/icon, or text/e-mail alerts.

7. Practice downloading temperature data files.

8. Create folders on your computer to store downloaded temperature data files.
   - Create separate folders for each storage unit by location (for example, Injection_Room_Unit_01).

9. Resume temperature recording after data downloads, if necessary based on device make and model.

10. Get familiar with your downloaded temperature data files including summary data.
    - Locate excursion time/date, MIN/MAX temperatures, and total time above/below alarm limits.
    - Locate the one-page summary report (if available).

11. Update the vaccine management plan and provider profile with the device’s relevant information.

12. Begin using the new device to record storage unit temperatures after 3-5 days of use.
If storage units are in the OK range:
Reset if your data logger requires a manual reset. Make sure storage unit door is shut. Record temperatures twice daily.

If an alarm has been triggered:
Follow these steps to complete the process.
1. Post the “Do Not Use Vaccines” sign and alert your supervisor.
2. Download the data logger temperature data file.
3. Save the file to your data folder. Specify a filename that includes your VFC PIN, storage unit ID, and current date. For example: VFC012345_Unit01_01162017.
4. Look for any excursions. You’ll need to report time/date, MIN/MAX temperatures, and total time above/below alarm limits.
5. Record temperatures on VFC temperature logs:
   • Record CURRENT, MIN, and MAX temperatures.
   • If an alarm was triggered but MIN and MAX are in the OK range, record the MIN and MAX from the temperature data file.
6. Return the data logger to its original location. Be sure the data logger is now recording storage unit temperatures.
7. Reset if your data logger requires manual reset.
8. Immediately report the temperature excursion to MyVFCvaccines.org.
9. Print the summary report and attach to your VFC temperature log. If no summary report is available, only print the page(s) that indicates any temperature excursions.

Contact the vendor for questions about device use.

For Supervisors
For every two-week reporting period:
Supervisors must certify that temperatures were recorded twice daily and all excursions identified and reported.

Required aids: Downloaded temperature data file, completed VFC temperature log, and printed excursion reports (if any)
1. Download and analyze temperature data files for unreported excursions or trends that may indicate storage unit performance issues.
2. Review completed logs to make sure all temperatures were legibly recorded and excursions circled.
4. Print and attach any excursion reports for all circled temperatures.
5. Certify your review by writing your full name, signature, and the date.
6. Record names and initials for all staff that recorded temperatures on the log.
7. Keep temperature logs and electronic data files for 3 years.
OFFICE VACCINE MANAGEMENT PLAN TEMPLATE  PIN# __________

This plan has been developed to assure the proper handling and storage of vaccines administered by this clinic. Vaccines are temperature and light sensitive and must be stored correctly to maintain their effectiveness. The following personnel are responsible for vaccine management:

Vaccine Coordinator __________________________________________________________

Home phone number _________________________________________________________

Cell phone number __________________________________________________________

Back Up Vaccine Coordinator _________________________________________________

Home phone number _________________________________________________________

Cell phone number __________________________________________________________

VACCINE ORDERING

To request state supplied vaccine, follow instructions in the Vaccines for Children Program Protocol (pages 8-10).

To order privately supplied vaccine, refer to ________________________________________________.

VACCINE RECEIVING

When vaccine is received by the front desk personnel, the vaccine coordinator or back-up will be notified immediately. All staff will be trained in vaccine receipt. The box will be taken to the vaccine storage area and unpacked in the following manner within 2 hours of receipt:

REFRIGERATED VACCINE

1. Upon opening the box, verify that the cold chain has been maintained. First, check the temperature indicator to determine if the vaccines were exposed to temperatures above 46°F. Follow the instructions on the card. Second, inspect the temperature indicator for evidence that the vaccines were frozen. Follow the instructions on the card. Examine the shipping container and contents for signs of damage. If damage to the contents or cold chain failure is noted, call the Nevada State Immunization Program (775-684-5900). Finally, check the interval between shipment from the supplier and arrival of the product at the office. If more than 48 hours has elapsed, call the Nevada State Immunization Program. The vaccine shipment must be inspected within 2 hours of arrival. If problems are discovered two hours after arrival of the vaccine, then McKesson is not responsible for replacement of the compromised vaccine.

2. Check the contents of the shipment against the shipping invoice. Compare quantities, lot numbers, and expiration dates carefully. Log in the date, name of the vaccine, lot number, manufacturer, expiration date, arrival condition and quantity received in your log book. Any discrepancies must be reported immediately to the Nevada State Immunization Program (775-684-5900).

3. File the shipping invoice in your Immunization Program binder.

4. Place the new vaccines in the refrigerator with the shortest expiration dates in the front of the pack. Make sure to separate the VFC vaccines from the private supply by _________________________________.

FROZEN VACCINE

1. Upon opening the box, verify that the cold chain has been maintained. A slip inside the box states when the shipment was packed. If more than 48 hours have elapsed since the box was packed, then call the Merck Order Management Center immediately at 1-800-MERCK RX (1-800-637-2579) for replacement instructions and the Nevada State Immunization Program (775-684-5900).

2. Check the contents of the shipment against the shipping invoice. Compare quantities, lot numbers, and expiration dates carefully. Log in the date, name of the vaccine, lot number, manufacturer, expiration date, arrival condition and quantity received in your log book. Any discrepancies must be reported immediately to the Nevada State Immunization Program (775-684-5900).

3. Place the new vaccines in the freezer with the shortest expiration dates in the front of the pack. Make sure to separate the VFC vaccines from the private supply by_____________________________.

VACCINE STORAGE

Publicly supplied (VFC/317) vaccines will be stored in ________________________________________________________.

Privately purchased vaccines will be stored in ________________________________________________________.

REFRIGERATOR TEMPERATURE must be between 36 -46°F or 2 -8°C. Ideally, the temperature should be maintained around 40°F or 5°C. Temperatures will be checked twice a day by pushing the review button on the data logger. This will place a mark on the graph that is generated. By pushing the review button, the maximum and minimum temperatures will be reviewed. In addition to checking the max/min temperatures twice a day, initial the paper temperature log and record the room temperature. Make sure that an alarm has not occurred since the last temperature check. If an alarm has occurred, download the data immediately and e-mail the files to NVIZ@health.nv.gov. Any alarm that occurs will prompt immediate intervention. First, check that the battery of the data logger is OK. Change the battery in the data logger if an “X” appears over the battery icon. Check to make sure the refrigerator seals are intact, that the unit is plugged in and the circuit breaker intact. If the unit appears to be functioning normally, then adjust the thermostat and check again in a 1/2 hour. If the unit appears to be failing, transfer the vaccines to a backup unit. Document all actions taken on the vaccine incident report.

FREEZER TEMPERATURE must be equal to or less than 5°F or -15°C. Ideally, the temperature should be maintained around 0°F or -20°C. Temperatures will be checked twice a day by pushing the review button on the data logger. This will place a mark on the graph that is generated. By pushing the review button, the maximum and minimum temperatures will be reviewed. In addition to checking the max/min temperatures twice a day, initial the paper temperature log and record the room temperature. Make sure that an alarm has not occurred since the last temperature check. If an alarm has occurred, download the data immediately and e-mail the files to NVIZ@health.nv.gov. Any temperature that is out of range will prompt immediate intervention. First, check that the battery of the data logger is OK. Change the battery in the data logger if an “X” appears over the battery icon. Check to make sure the freezer seals are intact, that the unit is plugged in and the circuit breaker intact. If the unit appears to be functioning normally, then adjust the thermostat and check again in a 1/2 hour. If the unit appears to be failing, then transfer the vaccines to a backup unit. Document all actions taken on the vaccine incident report.

When reviewing the refrigerator and freezer temperatures, also record the room temperature, the time and initials of the reviewer on the paper temperature log.

Back up certified calibrated thermometer is located_______________________________________________________.
If the refrigeration or freezer unit malfunctions, call _______________________________ for servicing.

See pages 4 and 5 for instructions on how to proceed when a vaccine incident occurs.

MAINTENANCE OF THE REFRIGERATION UNIT AND FREEZER

1. Clean the unit once a month to discourage bacterial and fungal growth.

2. Defrost the freezer on a routine basis if the unit is not self-defrosting.

3. Place the unit in a well ventilated room with sufficient space (4 inches) around the sides and top for air circulation.

4. **NO FOOD OR BEVERAGES** may be stored in units dedicated to vaccine storage.

5. Periodically vacuum the dust from the exterior coils.

6. Keep ice packs in the freezer and full water jugs in the door shelves and bottom bins of the refrigerator to help stabilize the temperature.

7. Check the seals around the doors monthly for signs of wear.

8. Place a **"DO NOT UNPLUG"** sticker on or near the outlet that the unit is plugged into and a **"DO NOT DISCONNECT"** sticker on the circuit breaker that supplies power to the vaccine storage unit. These warning signs will prevent housekeeping and maintenance staff from turning off the power supply to the vaccine storage units.

9. Check to make sure the certificate of calibration on the thermometers/data loggers in use has not expired.

VACCINE

1. Store the vaccine in their original boxes. *(Vaccines are light sensitive!)*

2. Privately purchased vaccine is stored__________________________________________.

3. State supplied (VFC/317) vaccine is stored______________________________________.

4. Diluent is stored ________________________________ *(never in the freezer!)*.

5. Vaccines and diluents with the shortest expiration date are located in the front, to be used first.

6. Open **only one box** of each type of vaccine. Mark it as **“opened”** with a sticker or permanent marker to prevent multiple boxes from being opened!

7. Check expiration dates of vaccine stock weekly. If state supplied vaccine cannot be administered prior to the expiration date, call the Immunization Program to have the vaccine transferred to another provider at least **3 months** before it expires. **Once vaccine expires, remove it from the vaccine storage unit, mark “DO NOT USE,” and store in a cabinet until it is shipped.** Complete the VTrckS UPS Pickup Request for Expired/Spoiled/Vaccine (See page 11.)

8. Arrange the vaccine stacks in the **center** of the refrigerator or freezer. Do not permit the vaccine boxes to touch the side walls or back of the unit. **DO NOT** store vaccines in the crisper bins, door or under the vent.
9. Indicate on the label of each multi-dose vial the date and time that it was reconstituted or first opened. Refer to the manufacturer’s package insert for the expiration date. Influenza and polio vaccine in multi-dose vials can be used until the expiration date if the vial is not contaminated or exposed to out-of-range temperatures.

10. Physically separate similar packages of vaccine to avoid administration errors. Placing the boxes of vaccine in labeled bins may also help prevent administration errors.

11. Store vaccine with space between the boxes to allow air circulation.

12. **NO FOOD OR BEVERAGES** may be stored in units dedicated to vaccine storage.

13. Post a sign on the refrigerator door showing which vaccines should be stored in the refrigerator and a sign on the freezer door showing which vaccines should be stored in the freezer.

---

**PROCEDURES IN THE EVENT OF A POWER FAILURE OR MECHANICAL DIFFICULTY**

**SHORT TERM POWER OUTAGE**

1. Record the time and room temperature. Note the temperatures of the refrigerator and freezer using certified calibrated data loggers.

2. If you are sure that the power will only be off for several hours, then tape the freezer and refrigerator doors shut so no one inadvertently opens the doors and allows all the cold air to escape.

3. When the power resumes, record the time and the temperatures in the refrigerator and freezer. If the vaccine was not moved to an alternate storage site and temperatures are out of range, contact the manufacturer for instructions and do not use the vaccine until the manufacturer has been consulted. Notify the Nevada State Immunization Program (775-684-5900) if publicly supplied vaccines were involved in a temperature excursion.

**LONG TERM POWER OUTAGE DUE TO A NATURAL OR MANMADE DISASTER: FACILITY WITH A GENERATOR**

1. Record the time and temperatures of the room, refrigerator, and freezer.

2. Make sure that the vaccine storage unit is plugged into an outlet that is supplied power by the generator. Once the generator is supplying power to the storage unit, record the temperatures in the freezer and refrigerator. If the generator is not functioning, then prepare to transfer the vaccine to a functioning unit.

**LONG TERM POWER OUTAGE DUE TO A NATURAL OR MANMADE DISASTER: FACILITY WITHOUT A GENERATOR**

1. Record the time and temperatures of the room, refrigerator, and freezer.

2. Have the following items available in case of a disaster: flashlight with extra batteries, ice packs, bubble wrap and cardboard, coolers (Styrofoam or hard sided), and cold-weather gloves.

3. Complete the Vaccine Incident Report. (Page 9)

4. Place conditioned ice packs on the bottom of the cooler/box. Place a layer of bubble wrap and a layer of cardboard over top of the ice packs. Fill the cooler/box with refrigerated vaccine. Place a bottle containing a thermometer probe in the middle of the box, surrounded by the vaccine, with the display attached to the
outside the box. Place a layer of bubble wrap and a layer of cardboard over top of the vaccine boxes. Place conditioned ice packs on top of bubble wrap and cardboard. Secure the lid of the cooler/box and the digital thermometer display.

5. Place freezer packs on the bottom and sides of a cooler. Remove varicella vaccine from the freezer and place in the cooler on top of the freezer packs. Surround vaccine with freezer packs. Place a thermometer in the middle of the cooler, surrounded by the vaccine, with the display placed outside the cooler. Secure the lid of the cooler and the digital thermometer display. Alternatively, a VaxiPac or AcuTemp unit can be used to transport frozen vaccine.

6. Transport vaccine immediately. Note the amount of time the vaccine is out of the vaccine storage unit and the temperature and call the manufacturer for instructions if appropriate temperatures are not maintained.

7. Transport the containers of vaccine in the cab of the vehicle – NOT IN THE TRUNK – to a vaccine storage unit that has been appropriately monitored. Transport the vaccine to:

   Name ____________________________
   Address ____________________________
   Phone ____________________________

8. Continue to record temperatures twice a day utilizing a data logger while the vaccine is in the back up storage unit to assure viability of vaccine.

9. If the vaccines were removed from units with temperatures above the permissible range, call the vaccine manufacturer with the information from the Vaccine Incident Report. Manufacturers’ numbers are listed on page 1 of this document.

   • If the manufacturer determines that the vaccine is still viable and can be used, then mark the vaccine boxes and vials with the new expiration date if one is provided.

   • If the manufacturer determines that the vaccine is spoiled and cannot be used, remove it from the vaccine storage unit and return all state supplied vaccine to McKesson. See instructions on page 1.

10. If the vaccines were removed from units with temperatures below the permissible range, call the vaccine manufacturer with the information from the Vaccine Incident Report.

    • If the manufacturer determines that the vaccine is still viable and can be used, then mark the vaccine boxes and vials with the new expiration date if one is provided.

    • If the manufacturer determines that the vaccine is spoiled and cannot be used, remove it from the vaccine storage unit and return all state supplied vaccine to McKesson. See instructions on page 1.

**MECHANICAL FAILURE OF THE VACCINE STORAGE UNIT**

1. Record the time and temperatures of the room, refrigerator, and freezer.

   Pack the vaccine as outlined above in #4 and #5 and transfer the vaccine to another storage unit that has been previously monitored. If the temperatures were out of acceptable range in the primary storage unit, then mark the vaccine “DO NOT USE” until the manufacturers are contacted for advice.

   • Alternate storage unit for refrigerated vaccines is located at __________________________.
• Alternate storage unit for frozen vaccines is located at __________________________.

2. Call ________________ to schedule a service call on the vaccine storage unit.

3. Complete the Vaccine Incident Report. (Page 9)

4. Continue to review the temperatures twice a day while the vaccine is in the back up storage unit to assure viability of vaccine. Write the room temperature and initials on a paper temperature log.

5. If the vaccines were removed from units with temperatures above the permissible range, then call the vaccine manufacturer with the information from the Vaccine Incident Report. Manufacturers’ numbers are listed on Page 10.

   • If the manufacturer determines that the vaccine is still viable and can be used, mark the vaccine boxes and vials with the new expiration date if one is provided.

   • If the manufacturer determines that the vaccine is spoiled and cannot be used, remove vaccine from the storage unit and return all state supplied vaccine to McKesson. Follow the instructions on page 11.

6. If the vaccines were removed from units with temperatures below the permissible range, call the vaccine manufacturer with the information from the Vaccine Incident Report.

   • If the manufacturer determines that the vaccine is still viable and can be used, mark the vaccine boxes and vials with the new expiration date if one is provided.

   • If the manufacturer determines that the vaccine is compromised and cannot be used, remove it from the vaccine storage unit and return all state supplied vaccine to McKesson. See instructions on page 11.

7. When the storage unit has been repaired, resume checking temperatures twice a day with a LogTag data logger. Vaccines may be returned to the repaired unit after 5 consecutive days of acceptable temperatures and state immunization program approval.

8. If the malfunctioning storage unit cannot be repaired and a new unit is purchased, acceptable temperatures must be recorded in the new unit for 5 consecutive days and state approval must be obtained before the vaccine can be moved into the new unit.

VACCINE WASTAGE

1. State supplied vaccine that is drawn up into a syringe but not administered should be discarded into the sharps container. Wasted doses should be recorded on the “Vaccine Inventory and Accountability Report” that is submitted to the state at the end of the month.

2. State supplied vaccine that is spoiled due to inappropriate storage or shipment should be returned to McKesson. Complete a Vaccine Incident Report (page 9) and fax to the Nevada State Immunization Program (775-684-8338). Follow the procedure and forms included on page 11 to have the spoiled vaccine picked up by UPS.

3. State supplied vaccine that is expired should be returned to McKesson. Follow the procedure and forms included on page 11 to have the expired vaccine picked up by UPS.
4. **Wastage of vaccine due to expiration can be prevented** by notifying the state when vaccine is 3 months from its expiration date, and will not be administered prior to expiration. The state will make arrangements to have the vaccine picked up and moved to another provider enrolled in the Nevada State Immunization Program.

### VACCINE STORAGE AND HANDLING TRAINING FOR STAFF MEMBERS

The office vaccine coordinator and back up vaccine coordinator must be knowledgeable about vaccine storage and handling. Vaccine is very expensive and can be compromised by out of range temperatures and light exposure. Therefore, the vaccine coordinator and back up vaccine coordinator must read the following. Initial and date when each item is completed. Save any certificates generated.

1. **Nevada State Immunization Program Protocol** (updated yearly)

2. **The PINK book – Chapter 5 – Vaccine Storage & Handling:**
   www.cdc.gov/vaccines/pubs/pinkbook/vac-storage.html

3. **CDC Vaccine Storage & Handling Toolkit:**
   www.cdc.gov/vaccines/recs/storage/toolkit/storage-handling-toolkit.pdf

4. **CDC “You Call the Shots” modules 10 (Storage and Handling) and 16 (VFC Program).**
   http://www2a.cdc.gov/nip/isd/ycts/mod1/courses/sh/ce.asp
   http://www2a.cdc.gov/nip/isd/ycts/mod1/courses/vfc/ce.asp

5. **CDC Vaccine Storage and Handling Video:** http://www2.cdc.gov/vaccines/ed/shvideo/shvideo.asp

This document was created by (print) _____________________________________________________.

Signature___________________________________________________________.

Date___________________________________________________________.
Vaccine Incident Report

(Print clearly)

Facility Name: ____________________________  PIN # ____________

Reported by: _________________________  Telephone # ____________________  Date Reported: ________________

Current temperature of refrigerator: _______ F or ________ C  Max/Min temperature reached: _______ F or ________ C

Current temperature of freezer: _______ F or ________ C  Max/Min temperature reached: _______ F or ________ C

**Date of incident and refrigerator temperature at time incident discovered:** Date: _______  _______ F or ________ C

Date and time of last recorded temp before incident: ________________ at ___________ am/pm  _______ F or ________ C

Amount of time the temperature was outside normal range: Refrigerator ________________  Freezer ________________

Vaccines were moved to a working refrigerator/freezer post event:  Yes ☐  No ☐

**Description of incident:** DO NOT THROW OUT AFFECTED VACCINES- (do not assume vaccines are not viable)

________________________________________________________________________________________

________________________________________________________________________________

_____________________________________________________________________________

_____________________________________________________________________________

What steps will be taken to prevent this from happening in the future?

_________________________________________________________________________________

________________________________________________________________________________________

_________________________________________________________________________________

___________________________________________

Report of viability from manufacturer (required):

___________________________________________

_____________________________________________

Complete section below for all vaccines affected by the event: (use additional page if necessary)

<table>
<thead>
<tr>
<th>Vaccine Brand Name</th>
<th>Manufacturer</th>
<th>Lot No.</th>
<th>Exp. Date</th>
<th>No. of Doses</th>
<th>Vial Open or Closed</th>
<th>Disposition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

*For wasted vaccine, please complete the “UPS Pickup Request Form for Expired or Spoiled Vaccine”
### Contact Information: Selected Vaccine Manufacturers & Distributors

<table>
<thead>
<tr>
<th>Manufacturer/Website</th>
<th>Phone Number</th>
<th>Products</th>
</tr>
</thead>
</table>
| Centers for Disease Control & Prevention  
www.cdc.gov/ncidod/srp/drugs/drug-service.htm  
www.cdc.gov/laboratory/drugservice/index.html | 404-639-3670 | Distributor for diphtheria antitoxin, VIG, smallpox vaccine |
| GlaxoSmithKline  
| Massachusetts Biological Labs  
www.umassmed.edu/massbiolabs/index.aspx | 617-474-3000 | IGIM, Td, TT |
| MedImmune, Inc.  
www.medimmune.com | 877-633-4411 | FluMist |
| Merck & Co., Inc.  
| Biotest Pharmaceuticals  
www.biotestpharma.com/products/nabiHB.html | 800-458-4244 | HBIG |
| Novartis Vaccines  
| Pfizer (Wyeth Vaccines)  
| sanofi Pasteur  
www.vaccineshoppe.com | 800-822-2463 | Daptacel, Tripedia, Pentacel, ActHIB, Fluzone, Menomune, Menactra, IPOL, Imovax, Decavac, Tenivac, Adacel, Typhim Vi, YF-Vax |
| Talecris Biotherapeutics  
www.talecris.com/talecris-biotherapeutics-us-home.htm | 800-520-2807 | HBIG, IGIM, RIG, TIG |
VTrckS UPS Pickup Request for Expired/Spoiled Vaccine

Date: ________________  PIN: ________________  Facility Name: ________________________________

Address: ________________________________  Contact: ________________________________

Phone: ________________________________  Fax: ________________________________

**INSTRUCTIONS:** (Applies to state supplied vaccines ONLY.) (DO NOT discard or return any vaccine to the Immunization Program or local health districts.) (DO NOT contact McKesson directly.)

**EXPIRED VACCINES**

1) Complete this form.
2) Fax the completed form to (775) 684-8338 (keep a copy for your records.)
3) Securely pack the vaccine to be returned with a copy of this form in any available box.
4) Expired/Spoiled vaccines do NOT need to be stored in your refrigerator.

**RETURN REASON CODES:**

1. Expired
2. Natural Disaster/power outage*
3. Refrigerator temperature too warm*
4. Refrigerator temperature too cold*
5. Failure to store properly upon receipt*

*indicates Vaccine Incident Report required

**VACCINES INCIDENTS**

1) Complete a Vaccine Incident Report
   a) Call the Immunization Program to report any incident of compromised cold chain within 2 hours of discovery at (775) 684-5900
2) Fax the completed form to (775) 684-8338 (keep a copy for your records.)
3) If the manufacturer deems any or all of the vaccines are non-viable, follow instructions in the Expired Vaccines section on the left.

**REQUIRED Vaccine Information** (Please print clearly - This form must be legible or it will be returned)

<table>
<thead>
<tr>
<th>Reason Code</th>
<th>NDC NO</th>
<th># of Doses</th>
<th>VACCINE</th>
<th>Exp. Date</th>
</tr>
</thead>
<tbody>
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</tbody>
</table>

**How many boxes for UPS to pick up?**
**Temperature Log for Refrigerator – Fahrenheit**

**Monitor temperatures closely!**
1. Write your initials below in “Staff Initials,” and note the time in “Exact Time.”
2. Record temps twice each workday.
3. Record the min/max temps once each workday – preferably in the morning.
4. Put an “X” in the row that corresponds to the refrigerator’s temperature.
5. If any out-of-range temp, see instructions to the right.
6. After each month has ended, save each month’s log for 3 years, unless state/local jurisdictions require a longer period.

<table>
<thead>
<tr>
<th>Day of Month</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff Initials</td>
<td>AM</td>
<td>PM</td>
<td>AM</td>
<td>PM</td>
<td>AM</td>
<td>PM</td>
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<tr>
<td>Exact Time</td>
<td>AM</td>
<td>PM</td>
<td>AM</td>
<td>PM</td>
<td>AM</td>
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<td>AM</td>
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<td>AM</td>
<td>PM</td>
<td>AM</td>
<td>PM</td>
<td>AM</td>
</tr>
<tr>
<td>Min/Max Temp (since previous reading)</td>
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</tr>
</tbody>
</table>

**Danger! Temperatures above 46°F are too warm!** Write any out-of-range temps and room temp on the lines below and call your state or local health department immediately!

- 46°F
- 45°F
- 44°F
- 43°F
- 42°F
- 41°F

**Aim for 40°C**

- 40°F

**Acceptable**

- 39°F
- 38°F
- 37°F
- 36°F

**Danger! Temperatures below 36°F are too cold!** Write any out-of-range temps and room temp on the lines below and call your state or local health department immediately!

- Write any out-of-range temps (above 46°F or below 36°F) here:
- Room Temperature

**Take action if temp is out of range – too warm (above 46°F) or too cold (below 36°F).**
1. Label exposed vaccine “do not use,” and store it under proper conditions as quickly as possible.
2. Do not discard vaccines unless directed to by your state/local health department and/or the manufacturer(s).
3. Record the out-of-range temps and the room temp in the “Action” area on the bottom of the log.
4. Notify your vaccine coordinator, or call the immunization program at your state or local health department for guidance.
5. Document the action taken on the “Vaccine Storage Troubleshooting Record” on page 3.

**Immunization Action Coalition**

Saint Paul, Minnesota • 651-647-9009 • www.immunize.org • www.vaccineinformation.org

Adapted with appreciation from California Department of Public Health
**Vaccine Storage Troubleshooting Record**

Use this form to document any unacceptable vaccine storage event, such as exposure of refrigerated vaccines to temperatures that are outside the manufacturers’ recommended storage ranges. A fillable troubleshooting record (i.e., editable PDF) can also be found at www.immunize.org/clinic/storage-handling.asp.

<table>
<thead>
<tr>
<th>Date &amp; Time of Event</th>
<th>Storage Unit Temperature</th>
<th>Room Temperature</th>
<th>Person Completing Report</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date:</td>
<td>Temp when discovered:</td>
<td>Temp when discovered:</td>
<td>Name:</td>
</tr>
<tr>
<td>Time:</td>
<td>Minimum temp:</td>
<td>Maximum temp:</td>
<td>Comment (optional):</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Title:</td>
</tr>
</tbody>
</table>

**Description of Event** *(If multiple, related events occurred, list each date, time, and length of time out of storage.)*

- General description (i.e., what happened?)
- Estimated length of time between event and last documented reading of storage temperature in acceptable range (36° to 46°F [2° to 8°C] for refrigerator; -58° to 5°F [-50° to -15°C] for freezer)
- Inventory of affected vaccines, including (1) lot #s and (2) whether purchased with public (for example, VFC) or private funds (Use separate sheet if needed, but maintain the inventory with this troubleshooting record.)
- At the time of the event, what else was in the storage unit? For example, were there water bottles in the refrigerator and/or frozen coolant packs in the freezer?
- Prior to this event, have there been any storage problems with this unit and/or with the affected vaccine?
- Include any other information you feel might be relevant to understanding the event.

**Action Taken** *(Document thoroughly. This information is critical to determining whether the vaccine might still be viable!)*

- When were the affected vaccines placed in proper storage conditions? (Note: Do not discard the vaccine. Store exposed vaccine in proper conditions and label it “do not use” until after you can discuss with your state/local health department and/or the manufacturer[s].)
- Who was contacted regarding the incident? (For example, supervisor, state/local health department, manufacturer—list all.)
- IMPORTANT: What did you do to prevent a similar problem from occurring in the future?

**Results**

- What happened to the vaccine? Was it able to be used? If not, was it returned to the distributor? (Note: For public-purchase vaccine, follow your state/local health department instructions for vaccine disposition.)
Vaccine Storage Troubleshooting Record

(check one) ☑ Refrigerator □ Freezer

Use this form to document any unacceptable vaccine storage event, such as exposure of refrigerated vaccines to temperatures that are outside the manufacturers’ recommended storage ranges.

A fillable troubleshooting record (i.e., editable pdf) can also be found at www.immunize.org/clinic/storage-handling.asp

<table>
<thead>
<tr>
<th>Date &amp; Time of Event</th>
<th>Storage Unit Temperature</th>
<th>Room Temperature</th>
<th>Person Completing Report</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>at the time the problem was discovered</td>
<td>at the time the problem was discovered</td>
<td>Name: Nancy Nurse</td>
</tr>
<tr>
<td>Date: (see below)</td>
<td>Temp when discovered: 45°F</td>
<td>Temp when discovered: 77°F</td>
<td>Title: VFC Coordinator</td>
</tr>
<tr>
<td>Time: (see below)</td>
<td>Minimum temp: 38°F</td>
<td>Maximum temp: 53°F</td>
<td>Date: 6/24/13</td>
</tr>
</tbody>
</table>

Description of Event (If multiple, related events occurred, list each date, time, and length of time out of storage.)

- General description (i.e., what happened?)
- Estimated length of time between event & last documented reading of storage temperature in acceptable range (36° to 46°F [2° to 8°C] for refrigerator; 58° to 69°F [15° to 20°C] for freezer)
- Inventory of affected vaccines, including (1) lot #s and (2) whether purchased with public (for example, VFC) or private funds (Use separate sheet if needed, but maintain the inventory with this troubleshooting record)
- At the time of the event, what else was in the storage unit? For example, were there water bottles in the refrigerator and/or frozen coolant packs in the freezer?
- Prior to this event, have there been any storage problems with this unit and/or with the affected vaccine?
- Include any other information you feel might be relevant to understanding the event.

At 8 am on Monday (6/24/13) morning when clinic opened, identified 4 temperature excursions over the weekend in refrigerator with readings as high as 54°, 50°, 49° & 53°F in primary vaccine storage unit #1. Recordings taken every 15 min on calibrated digital data logger overnight. Data logger probe in glycol located in middle of refrigerator with vaccines. Total time out of range: approximately 3 hrs — maximum temp 53°F (see attached document of continuous temp readings) Inventory of vaccines: see attached Water bottles in refrigerator door. No vaccine stored in freezer. No problems with storage unit prior to Saturday night. Thunderstorms in area over weekend may have affected power.

Action Taken (Document thoroughly. This information is critical to determining whether the vaccine might still be viable!)

- When were the affected vaccines placed in proper storage conditions? (Note: Do not discard the vaccine. Store exposed vaccine in proper conditions and label it “do not use” until after you can discuss with your state/local health department and/or the manufacturer[s].)
- Who was contacted regarding the incident? (For example, supervisor, state/local health department, manufacturer—list all.)
- IMPORTANT: What did you do to prevent a similar problem from occurring in the future?

Vaccines currently stored appropriately at 40°F. Refrigerator and vaccines labeled “Do Not Use.”

My State Immunization Program contacted at 8:30 am. Spoke with Victor Vaccine. Provided Victor with details of event and list of vaccines. Vaccine to remain quarantined until we hear back from Victor.

Called electric company and confirmed 2 short power outages during weekend.

Checked refrigerator seals — called refrigerator maintenance company to replace seals.

Checked plug on unit — placed tape over plug to prevent inadvertent dislodging. Plan to purchase plug guard.

Plan to follow up with Immunization Program on data loggers with alarms that could be sent to coordinator and back-up phones.

Results

- What happened to the vaccine? Was it able to be used? If not, was it returned to the distributor? (Note: For public-purchase vaccine, follow your state/local health department instructions for vaccine disposition.)

Late on Monday, I talked with Victor regarding continued use of vaccine. Victor had checked with manufacturers which confirmed that vaccine is acceptable for use. He told me that vaccine could therefore be removed from quarantine. I discussed the entire situation with Susie Supervisor and Dr. Director (clinic medical director) who agreed that we could put vaccine back in use.
## Vaccine Storage Troubleshooting Record

Use this form to document any unacceptable vaccine storage event, such as exposure of refrigerated vaccines to temperatures that are outside the manufacturers’ recommended storage ranges. A fillable troubleshooting record (i.e., editable pdf) can also be found at www.immunize.org/clinic/storage-handling.asp

### Date & Time of Event
<table>
<thead>
<tr>
<th>Date: 7/16/2013</th>
<th>Storage Unit Temperature</th>
<th>Room Temperature</th>
<th>Person Completing Report</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time: 8:00 am</td>
<td>Temp when discovered: 28ºF</td>
<td>Temp when discovered: 77ºF</td>
<td>Name: Nancy Nurse</td>
</tr>
<tr>
<td>Minimum temp: 2.8ºF</td>
<td>Maximum temp: 42ºF</td>
<td>Comment (optional): temp is approx</td>
<td>Title: VFC Coordinator</td>
</tr>
</tbody>
</table>

### Description of Event (If multiple, related events occurred, list each date, time, and length of time out of storage.)
- **General description (i.e., what happened?)**
- **Estimated length of time between event & last documented reading of storage temperature in acceptable range (36º to 46º F [-2º to 8º C] for refrigerator; -58º to 5ºF [-50º to -15º C] for freezer)
- **Inventory of affected vaccines, including (1) lot #s and (2) whether purchased with public (for example, VFC) or private funds (Use separate sheet if needed, but maintain the inventory with this troubleshooting record)**
- **At the time of the event, what else was in the storage unit? For example, were there water bottles in the refrigerator and/or frozen coolant packs in the freezer?**
- **Prior to this event, have there been any storage problems with this unit and/or with the affected vaccine?**
- **Include any other information you feel might be relevant to understanding the event.**

When checked main clinic fridge (in lab) at 8:00 am on Tuesday, 7/16/2013, digital readout on data logger read 28ºF. Data logger located in center of fridge with probe in glycol. Review of computer readings (taken every 15 minutes) showed steady drop in temps from 42ºF at 8:15 pm (7/15/2013) to 28ºF reading discovered when arrived at clinic on Tuesday morning (7/16/2013). Readings hit 34ºF at 11 pm (7/15) and 32ºF at 2 am (7/16). Total time out of recommended storage temps = 9 hours, with 6 hours at freezing or below (see attached document of continuous temp readings). Inventory of vaccines attached.

Water bottles in refrigerator door and crisper area. No vaccines stored in freezer. No recent adjustments to temp controls and no previous temp excursions noted with this refrigerator before 7/15.

### Action Taken (Document thoroughly. This information is critical to determining whether the vaccine might still be viable!)
- **When were the affected vaccines placed in proper storage conditions? (Note: Do not discard the vaccine. Store exposed vaccine in proper conditions and label it “do not use” until after you can discuss with your state/local health department and/or the manufacturer[s].)**
- **Who was contacted regarding the incident? (For example, supervisor, state/local health department, manufacturer—list all.)**
- **IMPORTANT: What did you do to prevent a similar problem from occurring in the future?**

Upon discovery, vaccines marked “Do Not Use” and stored in 2nd clinic fridge (in exam room #3 at 41ºF). Also placed “Do Not Use” note on main fridge in lab. Notified Susie Supervisor about the issue. Contacted Victor Vaccine at My State Immunization Program at 8:30 am. Provided Victor with details of event and list of vaccines in fridge. Victor said to maintain vaccines in 2nd fridge and that he would check with manufacturers to determine next steps.

Called Jim’s Appliance Repair to examine fridge. Repairman found and replaced faulty thermostat in unit.

Reset data logger on center shelf in fridge with probe in glycol.

### Results
- **What happened to the vaccine? Was it able to be used? If not, was it returned to the distributor? (Note: For public-purchase vaccine, follow your state/local health department instructions for vaccine disposition.)**

After fridge thermostat repaired, monitored temps in empty fridge for 1 week, per state requirements. Fridge maintained 38º-40º°F temps for entire week. Submitted repair documentation and data logger readings to Victor Vaccine for approval and ordered replacement vaccines. Victor had checked with manufacturers who confirmed that all vaccines in fridge EXCEPT MMR were no longer viable and should be returned per state policy guidelines. MMR may be used because pkg insert allows storage down to -58ºF. Discussed entire situation with Susie Supervisor and clinic director, Dr. Director, who agreed on continued use of MMR. Will continue to monitor fridge closely to watch for pattern of temp fluctuations indicating potential problem with thermostat. If problems, contact Victor Vaccine for advice on purchasing new fridge meeting criteria for appropriate vaccine storage.
Vaccine Storage and Handling Guidelines:
Vaccine storage units must be selected carefully and used properly. Stand-alone refrigerators and freezers are the only units proven to consistently maintain required temperature ranges for safe vaccine storage. However, a combination refrigerator/freezer unit with two doors and two thermostat controls is acceptable for vaccine storage if only the refrigerator compartment is being used to store vaccine. Combination units do not maintain consistent in-range temperatures for the freezer compartment. The Centers for Disease Control and Prevention (CDC) recommends that any refrigerator or freezer being used for vaccine storage must:

1. Be able to maintain required vaccine storage temperatures year-round;
2. Be large enough to hold the year’s largest inventory (think back to school and flu season);
3. Be monitored using an unexpired, calibrated digital data logger thermometer; and
4. Be dedicated to the storage of vaccines or other biologics. No food or beverages should be stored in a vaccine storage unit.

General Requirements:
Vaccines that require storage temperatures between 35° and 46°F (2° and 8°C) must be stored in the refrigerator compartment of a household- or commercial-style refrigeration unit. Vaccines that require storage temperatures of 5°F (-15°C) or colder must be stored in a stand-alone freezer. Frozen vaccines include MMR-V (Proquad), Varivax and Zostavax. It is recommended that provider offices use separate units for vaccine storage, because stand-alone refrigerators and freezers maintain the required temperatures better than home-style combination units. Whatever type of storage unit is used, the refrigerator and freezer compartments must have separate external doors and separate thermostat controls. The storage unit must have enough room to store the year’s largest vaccine order without crowding and without the vaccines touching the back or sides of the unit’s interior. It is recommended to store full water bottles in the refrigerator and frozen ice packs in the freezer to help stabilize the temperature and assist in keeping the compartments cold in cases of a power outage.

Reminder: Vaccines are not to be stored in the door of a unit nor in the crisper drawers.

For more information on vaccine storage go to: www.cdc.gov/vaccines/recs/storage/default.htm
Unacceptable Vaccine Storage Units:
The following units are unacceptable for vaccine storage, even temporarily, no exceptions:

- “Dorm-style” units provide poor temperature control and often freeze vaccines that require refrigeration, resulting in immediate and irreversible damage. “Dorm-style” units are defined as small refrigerator/freezer combination units with a single external door and an evaporator plate or cooling coil that forms a small freezer compartment within the unit or is pulled across the internal back wall of the unit.
- Manual defrost (or cyclic defrost) refrigerators have significant temperature variations, often freezing and damaging vaccines. These units often have exposed cooling plates, coils or vertical plates in the interior back wall of the refrigerator. These may be covered with visible frost or ice.
- Convertible refrigerator-only units that have an internal switch to convert the “refrigerator-only” unit to a “freezer-only” unit.
- Any refrigeration/freezer unit that is over 10 years old.
- Small apartment size (4ft or below) units.

| Dorm-Style Units: Small, single-door combined refrigerator/freezer units should not be used for any vaccine storage, even temporary. The freezer compartment in this type of unit is incapable of maintaining temperatures cold enough to store frozen vaccines. If attempts are made to cool the freezer to the appropriate temperature, then the temperature in the refrigerator will fall below the recommended range, potentially freezing the refrigerated vaccines. |

Acceptable Vaccine Storage Units:
The following types of units are accepted by the Nevada State Immunization Program:

- Stand-alone refrigerator unit(s) – recommended type
- Stand-alone freezer unit(s) – recommended type
- Combination refrigerator/freezer unit with two doors and two thermostat controls, where only the refrigerator compartment is being used for vaccine storage.
- Combination refrigerator/freezer unit with two doors and one thermostat control, where only the refrigerator compartment is being used for vaccine storage.
- Commercial combination self-defrosting unit with two separate compressors, a thermostat control for each compartment, and no circulating air between the freezer and refrigerator compartments.
Option 1: Stand-Alone, Under-the-Counter Refrigerator and Freezer Units

Stand-alone, under-the-counter refrigerators and freezers are excellent choices for vaccine storage. Under-the-counter refrigerators and freezers are stand-alone units that allow for the separate storage of frozen and refrigerated vaccines. Stand-alone refrigeration units must also be self-defrosting and it is recommended that stand-alone freezer units be self-defrosting.

The benefits of using stand-alone units for vaccine storage include:

- **Lower risk of catastrophic inventory loss.** Separate compressors and condensers decrease the risk of total vaccine loss that might occur in a combination style unit.

- **Temperature stability.** Because these units are only required to hold a single set temperature, they are not constantly re-adjusting and circulating cold air between the refrigerator and freezer compartments.

- **No risk of accidentally freezing refrigerated vaccine.** Combined units often use a cold air vent from the freezer to regulate temperatures in the refrigerator compartment. This freezing air blows down on the top shelf of the refrigerator and can quickly freeze any vaccines stored underneath.

Providers have many options for finding affordable, office-appropriate stand-alone units. **Stand-alone units can be under-the-counter size as discussed here or full-size.** Office Managers can shop local home improvement stores (Home Depot, Lowes) or go for lab/pharmaceutical grade units (Panasonic, Amer Biotech Supply, GemRef):

- [http://www.panasonic.com/business/healthcare/biomedical/vaccine/?_kk=5ce24da0-8f0d-46d9-a4fc-9e7e44de6fe5&_kt=16601245831](http://www.panasonic.com/business/healthcare/biomedical/vaccine/?_kk=5ce24da0-8f0d-46d9-a4fc-9e7e44de6fe5&_kt=16601245831)
- [http://www.americanbiotechsupply.com/Products/Refrigerators/Pharmacy-Vaccine-Basic.aspx](http://www.americanbiotechsupply.com/Products/Refrigerators/Pharmacy-Vaccine-Basic.aspx)
Option 2: Home-Style, Combination Refrigerator/Freezer Units

These types of units are most often found in home and appliance stores. Higher-end models are sometimes referred to as “commercial-grade” and are most often used in the food service industry. While not ideal for vaccine storage, many immunization clinics use this type of unit due to its affordability. However, beginning in 2013 all Vaccines for Children providers in Nevada will be required to purchase a stand-alone freezer for storage of frozen vaccines. It is important for providers to choose an appropriate household model for storage of refrigerated vaccines. The unit must incorporate the characteristics detailed in the next paragraph.

**Essential features for a combination unit:**

- Refrigerator and freezer compartments must have separate external doors;
- Refrigerator and freezer compartments must each have a dedicated thermostat control;
- The shelves should be adjustable; and
- There should be enough room to store vaccine on the middle shelves (away from cool air vents).

**Recommended features for a combination unit:**

- Outside door locks (manufacturer installed only);
- Separate compressor units for each compartment;
- Automatic condensate removal, no drain lines;
- Forced air circulation;
- Door alarm if left open or ajar; and
- Battery back-up (in cases of power failure).

**Risk of freezing vaccine** – Never store freeze-sensitive vaccines near the cold air vent in the refrigerator compartment; cold air from the freezer will often blow down on the vaccine and freeze it, resulting in irreparable damage and wasted vaccine.

**Single thermostat units** – Home-style, combination refrigerators with a single thermostat are strongly discouraged. This type of unit is only acceptable if storing vaccine in refrigerator compartment only. A single thermostat makes it difficult to maintain recommended temperatures in both compartments. **If you are thinking of purchasing a new unit – do not purchase a single thermostat unit!!**
Option 3: Stand-Alone, Laboratory Grade Refrigerator and Freezer Units

Stand-alone, laboratory grade refrigerators and freezers are considered the gold standard for dedicated vaccine storage; they are considered the most secure. As with most “gold-standard” products, they carry a hefty price tag and are usually reserved for health departments, laboratories and hospitals. However, many manufacturers also produce an array of refrigerators and freezers that may meet your clinic’s vaccine storage needs. Be aware that units with glass-front doors do not maintain cold temperatures during power outages as well as units with solid doors.

PREPARING A NEW UNIT FOR VACCINE STORAGE

Before placing vaccines in a new unit, follow these simple steps to ensure success:

- Plug the vaccine storage unit directly into a wall or floor outlet. **Never use surge protectors or extension cords!**
- If using a combination unit: remove the crisper drawers or fill them with full bottles of water.
- Carefully label the areas where you will be storing vaccine. Identify where publicly supplied vaccine will be stored versus where privately purchased vaccine will be stored.
- Place digital unexpired, calibrated thermometers (in glycol-enclosed bottles) in the center of the unit. Any thermometer being used, including built-in thermometers in pharmacy or lab-grade units, must have a certificate of calibration proving it has been calibrated to NIST or ASTM standards.
- Set the refrigerator temperature to stay steady around 40°F. Freezer units should be 5°F (-15°C) or colder at all times.
- Monitor the temperature of the new unit twice daily for five business days before placing vaccines within. **Vaccines should be temporarily stored in an appropriate, alternate unit until the temperature in the new unit is stable within the recommended range for at least five business days.**
- Installation of pharmacy or laboratory grade units should be completed by a refrigeration specialist. They will level the unit, identify the coldest and warmest zones, determine when the unit is ready for use, and provide staff training.
Manufacturers to Consider*

- Kelvinator (used throughout the food service industry) - [www.kelvinator.com/](http://www.kelvinator.com/)
- Summit Appliance - [www.summitappliance.com/](http://www.summitappliance.com/)
- Sanyo BioMedical – [http://us.sanyo.com/Biomedical](http://us.sanyo.com/Biomedical)
- Marvel Scientific - [www.marvelscientific.com/](http://www.marvelscientific.com/)
- Lab Research Products - [www.labresprod.com/](http://www.labresprod.com/)
- Panasonic - [www.panasonic.com/business/healthcare/biomedical/vaccine/](http://www.panasonic.com/business/healthcare/biomedical/vaccine/)
- American Biotech Supply - [www.americanbiotechsupply.com/Products/Refrigerators](http://www.americanbiotechsupply.com/Products/Refrigerators)

Additional Resources

- CDC’s Vaccine Storage and Handling Website - [www.cdc.gov/vaccines/recs/storage/default.htm](http://www.cdc.gov/vaccines/recs/storage/default.htm)
- Shepler Refrigeration - [www.sheplerrefrigeration.com/](http://www.sheplerrefrigeration.com/)
- PMC Scientific - [www.pmcscientific.com/](http://www.pmcscientific.com/)
- Dickson (temperature monitoring) - [www.dicksondata.com/](http://www.dicksondata.com/)
- LogTag Recorders (temperature monitoring) - [www.logtagrecorders.com/](http://www.logtagrecorders.com/)

*The Nevada State Immunization Program does not endorse any specific product or manufacturer. This list is provided for informational purposes only. Providers and their staff should do their own research and choose a product that best fits the needs of the office.*
Optional Equipment

**Alarmed phone dialers:** This type of equipment is designed to call a pre-determined list of phone numbers when the attached probe records a temperature outside of the range set by the user. They are sold by several manufacturers with varied models, styles and prices. Alarmed phone dialers are especially useful in geographical areas that experience frequent power outages. Below are some suppliers of alarmed phone dialers.

- Sensaphone - [www.sensaphone.com/](http://www.sensaphone.com/)
- Dickson - [www.dicksondata.com/](http://www.dicksondata.com/)

**Storage unit power back-up:** Disruption in power supply is one of the most frequent causes of costly vaccine loss. It doesn’t take long for a refrigerator and freezer to begin to warm once the power has been cut. With this in mind, a clinic may want to consider adding a secondary source of power in cases of emergency. If the clinic already has a back-up system (e.g., a generator), then it is highly recommended that the vaccine storage unit be placed on that emergency power circuit as well.

For those clinics without one, a small back-up generator might be a great option for an extra layer of protection. Backup generators should have sufficient capacity to run continuously for 72 hours, if necessary. Plans should be made to ensure that an adequate supply of fuel is on hand.

Some examples include:

## Immunization and Vaccines (General)

**General Recommendations on Immunization – Recommendations of the Advisory Committee on Immunization Practices (ACIP)**
Guidance about vaccination and vaccines for health care providers.
[www.cdc.gov/mmwr/preview/mmwrhtml/rr6002a1.htm](http://www.cdc.gov/mmwr/preview/mmwrhtml/rr6002a1.htm)

**Epidemiology and Prevention of Vaccine-Preventable Diseases (the Pink Book), 13th Edition: Course Textbook (2015)**
Comprehensive information on routinely used vaccines and the diseases they prevent.

**The Pink Book Webinar Series**
One-hour webinars with CDC experts exploring chapters of the Pink Book.

**“You Call the Shots” Online Training Modules**
A series of training modules for health care providers on vaccine recommendations with self-tests to assess learning. CE credit available.
[www.cdc.gov/vaccines/ed/youchalltheshots.html](http://www.cdc.gov/vaccines/ed/youchalltheshots.html)

**Vaccine Safety**
Safety information about specific vaccines and answers to commonly asked questions.
[www.cdc.gov/vaccinesafety/index.html](http://www.cdc.gov/vaccinesafety/index.html)

**Vaccine Information Statements (VIS)**
Statements required by law to inform patients about the benefits and risks of a vaccine they are receiving.
[www.cdc.gov/vaccines/hcp/vis/](http://www.cdc.gov/vaccines/hcp/vis/)

## Vaccine Storage and Handling

- **Epidemiology and Prevention of Vaccine-Preventable Diseases (the Pink Book): Storage and Handling Chapter**
  [www.cdc.gov/vaccines/pubs/pinkbook/vac-storage.html](http://www.cdc.gov/vaccines/pubs/pinkbook/vac-storage.html)

- **Vaccine Storage and Handling Guidelines and Recommendations**
  Resources on vaccine storage and handling recommendations and guidelines.
  [www.cdc.gov/vaccines/recs/storage/default.htm](http://www.cdc.gov/vaccines/recs/storage/default.htm)

- **Vaccine Storage and Handling Toolkit**
  Comprehensive guidance for health care providers on vaccine storage and handling recommendations and best practices.
  [www.cdc.gov/vaccines/hcp/admin/storage/toolkit/storage-handling-toolkit.pdf](http://www.cdc.gov/vaccines/hcp/admin/storage/toolkit/storage-handling-toolkit.pdf)

- **“Keys to Storing and Handling Your Vaccine Supply” Training Video**
  This training outlines vaccine storage and handling best practices, and provides helpful tips for preventing errors and preserving vaccine supply and integrity.
  [www2.cdc.gov/vaccines/ed/shvideo/](http://www2.cdc.gov/vaccines/ed/shvideo/)

## Vaccine Administration

- **Skills Checklist for Immunization**
  A self-assessment tool from the Immunization Action Coalition for health care staff who administer vaccines.

- **Epidemiology and Prevention of Vaccine-Preventable Diseases (the Pink Book): Vaccine Administration Chapter**

- **Vaccine Administration Guidelines and Recommendations**
  CDC resources include information on vaccine dosage, route, and site; vaccines with diluents; sample vaccine records; recommendations for emergency situations; managing vaccine reactions; and vaccine indications.
  [www.cdc.gov/vaccines/recs/vac-admin/default.htm](http://www.cdc.gov/vaccines/recs/vac-admin/default.htm)

- **Injection Safety**
  Information for health care providers about safe injection practices.
  [www.cdc.gov/injectionsafety/providers.html](http://www.cdc.gov/injectionsafety/providers.html)

- **Using Standing Orders for Administering Vaccines: What You Should Know**
  The Immunization Action Coalition provides standing orders for ACIP-recommended vaccines and an overview about the use of standing orders for vaccination.
  [www.immunize.org/standing-orders/](http://www.immunize.org/standing-orders/)
Packing Vaccines for **Transport during Emergencies**

Be ready BEFORE the emergency
Equipment failures, power outages, natural disasters—these and other emergency situations can compromise vaccine storage conditions and damage your vaccine supply. **It’s critical to have an up-to-date emergency plan with steps you should take to protect your vaccine.** In any emergency event, activate your emergency plan immediately, and if you can do so safely, follow the emergency packing procedures for refrigerated vaccines.

1. **Gather the Supplies**

   **Hard-sided coolers or Styrofoam™ vaccine shipping containers**
   - Coolers should be large enough for your location’s typical supply of refrigerated vaccines.
   - Can use original shipping boxes from manufacturers if available.
   - Do NOT use soft-sided collapsible coolers.

   **Conditioned frozen water bottles**
   - Use 16.9 oz. bottles for medium/large coolers or 8 oz. bottles for small coolers (enough for 2 layers inside cooler).
   - Do NOT reuse coolant packs from original vaccine shipping container, as they increase risk of freezing vaccines.
   - Freeze water bottles (can help regulate the temperature in your freezer).
   - Before use, you must condition the frozen water bottles. Put them in a sink filled with several inches of cool or lukewarm water until you see a layer of water forming near the surface of bottle. The bottle is properly conditioned if ice block inside spins freely when rotated in your hand.

   **Insulating material — You will need two of each layer**
   - **Insulating cushioning material** – Bubble wrap, packing foam, or Styrofoam™ for a layer above and below the vaccines, at least 1 in thick. Make sure it covers the cardboard completely. Do NOT use packing peanuts or other loose material that might shift during transport.
   - **Corrugated cardboard** – Two pieces cut to fit interior dimensions of cooler(s) to be placed between insulating cushioning material and conditioned frozen water bottles.

   **Temperature monitoring device** – Digital data logger (DDL) with buffered probe. Accuracy of +/-1°F (+/-0.5°C) with a current and valid certificate of calibration testing. Pre-chill buffered probe for at least 5 hours in refrigerator. Temperature monitoring device currently stored in refrigerator can be used, as long as there is a device to measure temperatures for any remaining vaccines.

Why do you need cardboard, bubble wrap, and conditioned frozen water bottles?
Conditioned frozen water bottles and corrugated cardboard used along with one inch of insulating material such as bubble wrap keeps refrigerated vaccines at the right temperature and prevents them from freezing. **Reusing vaccine coolant packs from original vaccine shipping containers can freeze and damage refrigerated vaccines.**
Packing Vaccines for **Transport during Emergencies**

### Pack for Transport

#### Conditioning frozen water bottles
- Put frozen water bottles in sink filled with several inches of cool or lukewarm water or under running tap water until you see a layer of water forming near surface of bottle.
- The bottle is properly conditioned if ice block inside spins freely when rotated in your hand.
- If ice “sticks,” put bottle back in water for another minute.
- Dry each bottle.
- Line the bottom and top of cooler with a single layer of conditioned water bottles.
- Do NOT reuse coolant packs from original vaccine shipping container.

**Close lid** – Close the lid and attach DDL display and temperature log to the top of the lid.

**Conditioned frozen water bottles** – Fill the remaining space in the cooler with an additional layer of conditioned frozen water bottles.

**Insulating material** – Another sheet of cardboard may be needed to support top layer of water bottles.

**Insulating material** – Cover vaccines with another 1 in. layer of bubble wrap, packing foam, or Styrofoam™

**Vaccines** – Add remaining vaccines and diluents to cooler, covering DDL probe.

**Temperature monitoring device** – When cooler is halfway full, place DDL buffered probe in center of vaccines, but keep DDL display outside cooler until finished loading.

**Vaccines** – Stack boxes of vaccines and diluents on top of insulating material.

**Insulating material** – Place a layer of bubble wrap, packing foam, or Styrofoam™ on top (layer must be at least 1 in. thick and must cover cardboard completely).

**Insulating material** – Place 1 sheet of corrugated cardboard over water bottles to cover them completely.

**Conditioned frozen water bottles** – Line bottom of the cooler with a single layer of conditioned water bottles.

### Arrive at Destination

**Before opening cooler** – Record date, time, temperature, and your initials on vaccine temperature log.

**Storage** – Transfer boxes of vaccines quickly to storage refrigerator.

**Troubleshooting** – If there has been a temperature excursion, contact vaccine manufacturer(s) and/or your immunization program before using vaccines. Label vaccines “Do Not Use” and store at appropriate temperatures until a determination can be made.

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**NOTE:**
This packout can maintain appropriate temperatures for up to 8 hours, but the container should not be opened or closed repeatedly.
Establish Storage and Handling Policies

1. We have designated a primary vaccine coordinator and at least one alternate coordinator to be in charge of vaccine storage and handling at our facility.

2. Both the primary and alternate vaccine coordinator(s) have completely reviewed either CDC’s Vaccine Storage & Handling Toolkit (www.cdc.gov/vaccines/hcp/admin/storage/toolkit/storage-handling-toolkit.pdf) or equivalent training materials offered by our state or local health department’s immunization program.

3. We have detailed, up-to-date, written standard operating procedures for general vaccine management, including procedures for routine activities and an emergency vaccine retrieval and storage plan for power outages and other problems. Our procedures are based on CDC’s Vaccine Storage & Handling Toolkit and/or on instruction from our state or local health department’s immunization program.

4. We review these policies with all staff annually and with new staff, including temporary staff, when they are hired.

Log In New Vaccine Shipments

5. We maintain a vaccine inventory log that we use to document the following:
   a. Vaccine name and number of doses received
   b. Date we received the vaccine
   c. Condition of vaccine when we received it
   d. Vaccine manufacturer and lot number
   e. Vaccine expiration date

Use Proper Storage Equipment

6. We store vaccines in separate, self-contained units that refrigerate or freeze only. If we must use a household-style combination unit, we use it only for storage of our refrigerated vaccines, maintaining frozen vaccines in a separate stand-alone freezer.

7. We store vaccines in units with enough room to maintain the year’s largest inventory without crowding.

8. We never store any vaccines in a dormitory-style unit (a small combination freezer-refrigerator unit with the freezer compartment inside the refrigerator).

9. We use only calibrated thermometers that have a Certificate of Calibration Testing* (“Report of Calibration”) and are calibrated every 1 to 2 years from the last calibration testing date or according to the manufacturer’s suggested timeline.

10. We have planned back-up storage unit(s) in the event of a power failure or other unforeseen event.

* Certificate of Calibration Testing (“Report of Calibration”) with calibration measurements traceable to a laboratory with accreditation from the International Laboratory Accreditation Cooperations (ILAC) Mutual Recognition Arrangement (MRA) signatory body.
Ensure Optimal Operation of Storage Units

11. We have a “Do Not Unplug” sign (e.g., www.immunize.org/catg.d/p2090.pdf) next to the electrical outlets for the refrigerator and freezer and a “Do Not Stop Power” warning label (e.g., www.immunize.org/catg.d/p2091.pdf) by the circuit breaker for the electrical outlets. Both signs include emergency contact information.

12. We perform regular maintenance on our vaccine storage units to assure optimal functioning. For example, we keep the units clean, dusting the coils and cleaning beneath the units as recommended by the manufacturer.

Maintain Correct Temperatures

13. We always keep at least one accurate calibrated thermometer (+/-0.5°C [+/-1ºF]) with the vaccines in the refrigerator and a separate calibrated thermometer with the vaccines in the freezer.

14. We use a thermometer that:
   a. uses an active display to provide continuous monitoring information.
   b. is digital and has a detachable probe that has been buffered against sudden temperature changes by being immersed in a vial filled with liquid (e.g., glycol, ethanol, glycerin), loose media (e.g., sand, glass beads), or a solid block of material (e.g., aluminum, Teflon®).
   c. includes an alarm for out-of-range temperatures.
   d. has a digital data logger that indicates current, minimum, and maximum temperatures.
   e. can measure temperatures within +/-0.5°C (+/-1ºF).
   f. has a low-battery indicator.

15. We maintain the refrigerator temperature at 2–8°C (36–46ºF), and we aim for 5ºC (40ºF).

16. We maintain the freezer temperature between -50°C and -15°C (-58°F and +5°F).

17. We set the thermostat for the refrigerator and the freezer at the factory-set or midpoint temperatures.

18. We keep extra containers of water in the refrigerator (e.g., in the door and/or on the floor of the unit where the vegetable bins were located) to help maintain cool temperatures. We keep ice packs, ice-filled containers, or frozen water bottles in the freezer to help maintain cold temperatures and to have frozen water bottles available for conditioning in the event of an emergency.

Maintain Daily Temperature Logs

19. On days when our practice is open, we visually inspect the vaccine storage unit twice a day (first thing in the morning and right before our facility closes) and document refrigerator and freezer temperatures on the appropriate log. (See selections at www.immunize.org/clinic/storage-handling.asp.)

20. We document the minimum and maximum temperature readings in the refrigerator and freezer once each day, preferably in the morning.

21. We consistently record temperatures on the log either in Fahrenheit or Celsius. We never mix temperature scales when we record our temperatures.

22. If the temperature log prompts us to insert an “x” by the temperature that’s preprinted on the form, we do not attempt to write in the actual temperature.

23. We follow the directions on the temperature log to call appropriate personnel if the temperature in a storage unit goes out of range.

24. If out-of-range temperatures occur in the unit, we complete the Vaccine Storage Troubleshooting Record (www.immunize.org/catg.d/p3041.pdf) to document actions taken when the problem was discovered and what was done to prevent a recurrence of the problem.
25. Trained staff (other than staff designated to record the temperatures) review the temperature logs weekly.

26. We keep the temperature logs on file for at least 3 years.

Store Vaccines Correctly

27. We post signs (e.g., www.immunize.org/catg.d/p3048.pdf) on the doors of the refrigerator and freezer that indicate which vaccines should be stored in the refrigerator and which in the freezer.

28. We do not store any food or drink in any vaccine storage unit.

29. We store vaccines in the middle of the refrigerator or freezer (away from walls and vents), leaving room for air to circulate around the vaccine. We never store vaccine in the doors.

30. We have removed all vegetable and deli bins from the storage unit, and we do not store vaccines in these empty areas.

31. If we must use a combination refrigerator-freezer unit, we store vaccines only in the refrigerator section of the unit. We do not place vaccines in front of the cold-air outlet that leads from the freezer to the refrigerator (often near the top shelf). In general, we try to avoid storing vaccines on the top shelf, and we place water bottles in this location.

32. We check vaccine expiration dates and rotate our supply of each type of vaccine so that vaccines with the earliest expiration dates are located close to the front of the storage unit, facilitating easy access.

33. We store vaccines in their original packaging in clearly labeled uncovered containers.

Take Emergency Action As Needed

34. In the event that vaccines are exposed to improper storage conditions, we take the following steps:

a. We restore proper storage conditions as quickly as possible. If necessary, we label the vaccine “Do Not Use” and move it to a unit where it can be stored under proper conditions. We do not discard the vaccine before discussing the circumstances with our state/local health department and/or the appropriate vaccine manufacturers.

b. We follow the Vaccine Storage Troubleshooting Record’s (www.immunize.org/catg.d/p3041.pdf) instructions for taking appropriate action and documenting the event. This includes recording details such as the length of time the vaccine was out of appropriate storage temperatures and the current room temperature, as well as taking an inventory of affected vaccines.

c. We contact our clinic supervisor or other appropriate clinic staff to report the incident. We contact our state/local health department and/or the appropriate vaccine manufacturers for consultation about whether the exposed vaccine can still be used.

d. We address the storage unit’s mechanical or electrical problems according to guidance from the unit’s manufacturer or a qualified repair service.

e. In responding to improper storage conditions, we do not make frequent or large changes in thermostat settings. After changing the setting, we give the unit at least a day to stabilize its temperature.

f. We do not use exposed vaccines until our state/local health department’s immunization program or the vaccine manufacturer has confirmed that the vaccine is acceptable for use. We review this information with our clinic medical director before returning the vaccine to our supply. If the vaccine is not acceptable for use, we follow our state/local health department instructions for vaccine disposition.

If we answer [YES] to all of the above, we give ourselves a pat on the back! If not, we assign someone to implement needed changes!
Staff can easily become confused about vaccines within the storage unit. Labeling the area where vaccines are stored can help staff quickly locate and choose the correct vaccine—perhaps preventing a vaccine administration error. Depending on how the vaccines are organized within the storage unit, labels can be placed on the containers or bins or directly attached to the shelves where the vaccines are placed. Other helpful strategies to prevent vaccine administration errors include color coding the labels (e.g., one color for pediatric and another for adult vaccines) and providing additional information such as age indications or other information unique to the vaccine.

In addition, some vaccines must be reconstituted before administration. These vaccines have two components—a lyophilized vaccine and diluent that must be mixed together. The lyophilized vaccine should only be reconstituted or mixed using the diluent supplied by the manufacturer. Consider posting reminders or labeling the vaccines to remind staff to reconstitute certain vaccines prior to administration.

The following labels are examples that may be used to help organize vaccines. Labels are based on recommendations from the Advisory Committee on Immunization Practices (ACIP) and may include indications different from those of the Food and Drug Administration. The Centers for Disease Control and Prevention (CDC) also recommends that vaccines be stored in the original packaging to protect contents from light, to help maintain the recommended temperature range, and to help prevent administration errors.

Note: Some vaccine preparations are being transitioned from vials and prefilled syringes that contain latex (natural rubber) to vials and prefilled syringes that are not made with natural rubber latex. Read the package insert that accompanies the product to check for the presence of natural rubber or latex.
Diphtheria and Tetanus Toxoid- and acellular Pertussis-containing Vaccines

**DTaP (Daptacel)**
- **Ages:** 6 weeks through 6 years
- **Use for:** Any dose in the series
- **Route:** Intramuscular (IM) injection

**DTaP-IPV (Kinrix)**
- **Ages:** 4 years through 6 years
- **Use for:** DTaP dose #5
- **Route:** Intramuscular (IM) injection
- **IPV dose #4**
- **Do NOT use for DTaP doses 1 through 4 OR IPV doses 1 through 3**

**DTaP (Infanrix)**
- **Ages:** 6 weeks through 6 years
- **Use for:** Any dose in the series
- **Route:** Intramuscular (IM) injection

**DTaP-IPV-HepB (Pediarix)**
- **Ages:** 6 weeks through 6 years
- **Use for:** DTaP and IPV: Doses #1, #2, and/or #3
- **HepB:** Any dose in the series
- **Do NOT use for HepB birth dose**
- **Route:** Intramuscular (IM) injection

Read the package insert that accompanies the product to check for the presence of natural rubber or latex.
Diphtheria and Tetanus Toxoid- and acellular Pertussis-containing Vaccines

**DTaP-IPV/Hib (Pentacel)**

**Ages:** 6 weeks through 4 years  
**Use for:** DTaP and IPV: Doses #1, #2, #3, and/or #4  
Hib: Any dose in the series  
**Route:** Intramuscular (IM) injection  

Reconstitute Hib powder ONLY with manufacturer-supplied DTaP-IPV liquid diluent  
Should be used immediately after reconstitution  
Do NOT administer DTaP-IPV w/o Hib

**DTaP-IPV (Quadracel)**

**Ages:** 4 years through 6 years  
**Use for:** DTaP dose #5  
IPV dose #4 or #5  
Do NOT use for DTaP doses 1 through 4 OR IPV doses 1 through 3  
**Route:** Intramuscular (IM) injection
### Haemophilus influenzae type b-containing Vaccines

#### Hib (ActHIB)
- **Ages:** 6 weeks through 4 years
- **Use for:** Any dose in the series
- **Route:** Intramuscular (IM) injection

Reconstitute Hib powder ONLY with manufacturer-supplied 0.4% sodium chloride diluent

Beyond Use Time: If not used immediately after reconstitution, store at 2°C to 8°C (36°F to 46°F) and discard if not used within 24 hours. Should be shaken vigorously before injection.

#### Hib (PedvaxHIB)
- **Ages:** 6 weeks through 4 years
- **Use for:** Any dose in the series
- **Route:** Intramuscular (IM) injection

Vial stopper contains latex

#### Hib (Hiberix)
- **Ages:** 6 weeks through 4 years
- **Use for:** Any dose in the series
- **Route:** Intramuscular (IM) injection

Reconstitute Hib powder ONLY with manufacturer-supplied 0.9% sodium chloride diluent

Beyond Use Time: If not used immediately after reconstitution, store at 2°C to 8°C (36°F to 46°F) and discard if not used within 24 hours. Should be shaken vigorously before injection.
**Hepatitis Vaccines**

**HepA (Havrix)-Pediatric Formulation**
- **Ages:** 12 months through 18 years
- **Use for:** Any dose in the series
- **Route:** Intramuscular (IM) injection

Read the package insert that accompanies the product to check for the presence of natural rubber or latex.

**HepB (Engerix-B)-Pediatric Formulation**
- **Ages:** Birth through 19 years
- **Use for:** Any dose in the series
- **Route:** Intramuscular (IM) injection

Read the package insert that accompanies the product to check for the presence of natural rubber or latex.

**HepA (Vaqta)-Pediatric Formulation**
- **Ages:** 12 months through 18 years
- **Use for:** Any dose in the series
- **Route:** Intramuscular (IM) injection

Vial stopper and syringe plunger stopper and tip cap contain latex

**HepB (Recombivax HB)-Pediatric Formulation**
- **Ages:** Birth through 19 years
- **Use for:** Any dose in the series
- **Route:** Intramuscular (IM) injection

Vial stopper and syringe plunger stopper and tip cap contain latex
### Hepatitis Vaccines

#### HepA (Havrix)-Adult Formulation
- **Ages:** 19 years and older
- **Use for:** Any dose in the series
- **Route:** Intramuscular (IM) injection

Read the package insert that accompanies the product to check for the presence of natural rubber or latex.

#### HepB (Engerix-B)-Adult Formulation
- **Ages:** 20 years and older
- **Use for:** Any dose in the series
- **Route:** Intramuscular (IM) injection

Read the package insert that accompanies the product to check for the presence of natural rubber or latex.

#### HepA (Vaqta)-Adult Formulation
- **Ages:** 19 years and older
- **Use for:** Any dose in the series
- **Route:** Intramuscular (IM) injection

Vial stopper and syringe plunger stopper and tip cap contain latex

#### HepB (Recombivax HB)-Adult Formulation
- **Ages:** 20 years and older
- **Use for:** Any dose in the series
- **Alternate Adolescent Schedule for 11 through 15 year olds:**
  - Two 1 mL doses 4 to 6 months apart
- **Route:** Intramuscular (IM) injection

Vial stopper and syringe plunger stopper and tip cap contain latex
Hepatitis Vaccines

HepA-HepB (Twinrix)

**Ages:** 18 years and older

**Contains:** HepA = Pediatric dosage  
HepB = Adult dosage

**Schedule:** 0, 1, and 6 months

**Alternate Schedule:** 0, 7, and 21 to 30 days, followed by booster at month 12

**Route:** Intramuscular (IM) injection

Read the package insert that accompanies the product to check for the presence of natural rubber or latex.
<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Use for</th>
<th>Recommended ages</th>
<th>Catch-up ages</th>
<th>Route</th>
<th>Administer to</th>
</tr>
</thead>
<tbody>
<tr>
<td>2vHPV (Cervarix)</td>
<td>9 years through 26 years</td>
<td>11 years or 12 years</td>
<td>13 years through 26 years</td>
<td>Intramuscular (IM) injection</td>
<td>females only</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4vHPV (Gardasil)</td>
<td>9 years through 26 years</td>
<td>11 years or 12 years</td>
<td>13 years through 26 years</td>
<td>Intramuscular (IM) injection</td>
<td>females and males</td>
</tr>
<tr>
<td>9vHPV (Gardasil 9)</td>
<td>9 years through 26 years</td>
<td>11 years or 12 years</td>
<td>13 years through 26 years</td>
<td>Intramuscular (IM) injection</td>
<td>females and males</td>
</tr>
</tbody>
</table>

Read the package insert that accompanies the product to check for the presence of natural rubber or latex.
Measles Mumps Rubella Vaccine

MMR (M-M-R II)

Ages: 12 months and older
Use for: Any dose in the series
Route: Subcutaneous (subcut) injection

Reconstitute MMR powder ONLY with manufacturer-supplied sterile water diluent

Beyond Use Time: If not used immediately after reconstitution, store in vaccine vial in dark place at 2°C to 8°C (36°F to 46°F) and discard if not used within 8 hours.
### MenACWY-D (Menactra)

**Ages:** 9 months through 55 years  
(certain persons 56 years and older at increased risk)  
**Use for:** Any dose in the series  
**Route:** Intramuscular (IM) injection

### MenACWY-CRM (Menveo)

**Ages:** 2 months through 55 years  
(certain persons 56 years and older at increased risk)  
**Use for:** Any dose in the series  
**Route:** Intramuscular (IM) injection  
*Reconstitute the MenA lyophilized conjugate component ONLY with manufacturer-supplied MenCWY liquid conjugate component*  
*Do NOT administer MenCWY w/o MenA*  
**Beyond Use Time:** Should be used immediately after reconstitution, but may be stored at or below 25°C (77°F) and discarded if not used within 8 hours.

### MPSV4 (Menomune)

**Ages:** 56 years and older  
**Use for:** Any dose  
**Route:** Subcutaneous (subcut) injection  
*Reconstitute Meningococcal powder ONLY with manufacturer-supplied distilled water diluent*  
**Beyond Use Time/Date:** Single-dose vials should be used immediately after reconstitution. Multidose vials may be used for up to 35 days after reconstitution if stored at 2°C to 8°C (36°F to 46°F). Read the package insert that accompanies the product to check for the presence of natural rubber or latex.

### Hib-MenCY (MenHibrix)

**Increased risk children:** 6 weeks through 18 months of age  
**Route:** Intramuscular (IM) injection  
*Reconstitute Hib-MenCY powder ONLY with manufacturer-supplied 0.9% sodium chloride diluent*  
**Beyond Use Time:** Should be used immediately after reconstitution.
Meningococcal Vaccines

**MenB-4C (Bexsero)**

- **Ages:** 10 years and older
- **Use for:** Any dose in the series
- **Route:** Intramuscular (IM) injection

_Bexsero and Trumenba are NOT interchangeable_
_Complete series with same vaccine product_
_Syringe tip cap of prefilled syringe contains latex_

**MenB-FHbp (Trumenba)**

- **Ages:** 10 years and older
- **Use for:** Any dose in the series
- **Route:** Intramuscular (IM) injection

_Bexsero and Trumenba are NOT interchangeable_
_Complete series with same vaccine product_
<table>
<thead>
<tr>
<th>Pneumococcal Vaccines</th>
<th>Poliovirus Vaccine</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PCV13 (Prevnar 13)</strong></td>
<td><strong>IPV</strong></td>
</tr>
<tr>
<td><strong>Ages:</strong> All children 6 weeks through 5 years</td>
<td><strong>Ages:</strong> 6 weeks and older</td>
</tr>
<tr>
<td><strong>Increased risk children</strong> 6 years through 18 years</td>
<td><strong>Use for:</strong> Any dose in the series</td>
</tr>
<tr>
<td><strong>Increased risk adults</strong> 19 years and older</td>
<td><strong>Route:</strong> Intramuscular (IM) injection OR Subcutaneous (subcut) injection</td>
</tr>
<tr>
<td>Adults 65 years and older who have never received PCV13</td>
<td></td>
</tr>
<tr>
<td><strong>Route:</strong> Intramuscular (IM) injection</td>
<td></td>
</tr>
</tbody>
</table>

| **PPSV23 (Pneumovax 23)** | |
| **Ages:** Healthy adults 65 years and older | |
| **Increased risk persons** 2 years through 64 years | |
| **Route:** Intramuscular (IM) injection OR Subcutaneous (subcut) injection | **No more than two doses of PPSV23 recommended before 65th birthday and one dose at 65 years or older.** |
Rotavirus Vaccines

**RV1 (Rotarix)**

**Ages:** 6 weeks through 8 months, 0 days  
Maximum age for 1st dose is 14 weeks, 6 days  
Maximum age for last dose is 8 months, 0 days  
**Route:** Oral (PO)

Reconstitute RV1 powder ONLY with manufacturer-supplied sterile water/calcium chloride/xanthan diluent

Beyond Use Time: If not used immediately after reconstitution, store at 2°C to 8°C (36°F to 46°F) or at controlled room temperature up to 25°C (77°F) and discard if not used within 24 hours.

*Do NOT inject*

Read the package insert that accompanies the product to check for the presence of natural rubber or latex.

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**RV5 (RotaTeq)**

**Ages:** 6 weeks through 8 months, 0 days  
Maximum age for 1st dose is 14 weeks, 6 days  
Maximum age for last dose is 8 months, 0 days  
**Route:** Oral (PO)

*Do NOT inject*
# Tetanus and Diphtheria Toxoid-containing Vaccines

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Age Range</th>
<th>Use for</th>
<th>Route</th>
</tr>
</thead>
<tbody>
<tr>
<td>DT (generic)</td>
<td>6 weeks through 6 years</td>
<td>Primary series and booster doses ONLY for children with a contraindication or precaution to pertussis vaccine</td>
<td>Intramuscular (IM) injection</td>
</tr>
<tr>
<td>Td (Tenivac)</td>
<td>7 years and older</td>
<td>Primary series and booster doses for persons previously vaccinated with Tdap</td>
<td>Intramuscular (IM) injection</td>
</tr>
<tr>
<td>Td (generic)</td>
<td>7 years and older</td>
<td>Primary series and booster doses for persons previously vaccinated with Tdap</td>
<td>Intramuscular (IM) injection</td>
</tr>
</tbody>
</table>

**Syringe tip cap of prefilled syringe may contain latex**
Tetanus and Diphtheria toxoid- and acellular Pertussis-containing Vaccines

**Tdap (Adacel)**

**Ages:** 7 years through 10 years  
**Use for:** A single dose if not fully vaccinated for pertussis  
**Ages:** 11 years and older  
**Use for:** A single dose*  
*Administer Tdap to women during each pregnancy regardless of previous Tdap vaccination history  
**Route:** Intramuscular (IM) injection  
*Syringe tip cap of prefilled syringe may contain latex*

**Tdap (Boostrix)**

**Ages:** 7 years through 10 years  
**Use for:** A single dose if not fully vaccinated for pertussis  
**Ages:** 11 years and older  
**Use for:** A single dose*  
*Administer Tdap to women during each pregnancy regardless of previous Tdap vaccination history  
**Route:** Intramuscular (IM) injection  
*Read the package insert that accompanies the product to check for the presence of natural rubber or latex.
VAR (Varivax)
Ages: 12 months and older
Use for: Any dose in the series
Route: Subcutaneous (subcut) injection

Reconstitute VAR powder ONLY with manufacturer-supplied sterile water diluent
Beyond Use Time: Discard reconstituted vaccine if not used within 30 minutes.

MMRV (ProQuad)
Ages: 12 months through 12 years
Use for: Any dose in the series
Route: Subcutaneous (subcut) injection

Reconstitute MMRV powder ONLY with manufacturer-supplied sterile water diluent
Beyond Use Time: Discard reconstituted vaccine if not used within 30 minutes.

HZV (Zostavax)
Recommended ages: 60 years and older
Use for: Single dose
Route: Subcutaneous (subcut) injection

Reconstitute HZV powder ONLY with manufacturer-supplied sterile water diluent
Beyond Use Time: Discard reconstituted vaccine if not used within 30 minutes.
Reconstituted Vaccines

**DTaP-IPV/HIB (Pentacel)**
- Lyophilized Hib component
- Manufacturer’s DTaP-IPV liquid component
  - Pentacel vaccine
  - Should be used immediately after reconstitution

**Hib (ActHIB)**
- Lyophilized Hib component
- Manufacturer’s 0.4% sodium chloride diluent
  - ActHIB vaccine
  - Beyond Use Time: If not used immediately after reconstitution, store at 2°C to 8°C (36°F to 46°F) and discard if not used within 24 hours.
  - Should be shaken vigorously before injection.
  - Read the package insert that accompanies the product to check for the presence of natural rubber or latex.

**MMR (M-M-R II)**
- Lyophilized MMR component
- Manufacturer’s sterile water diluent
  - M-M-R II vaccine
  - Beyond Use Time: If not used immediately after reconstitution, store in vaccine vial in dark place at 2°C to 8°C (36°F to 46°F) and discard if not used within 8 hours.

**Hib (Hiberix)**
- Lyophilized Hib component
- Manufacturer’s 0.9% sodium chloride diluent
  - Hiberix vaccine
  - Beyond Use Time: If not used immediately after reconstitution, store at 2°C to 8°C (36°F to 46°F) and discard if not used within 24 hours.
  - Should be shaken vigorously before injection.
Reconstituted Vaccines

**MenACWY-CRM (Menveo)**
- Lyophilized MenA component
- MenCYW liquid component
- Menveo vaccine

*Beyond Use Time: Should be used immediately after reconstitution, but may be stored at or below 25°C (77°F) and discarded if not used within 8 hours.*

**MPSV4 (Menomune)**
- Lyophilized MenACWY component
- Manufacturer’s distilled water diluent
- Menomune vaccine

*Beyond Use Time/Date: Multidose vial may be used for up to 35 days after reconstitution if stored at 2°C to 8°C (36°F to 46°F). Read the package insert that accompanies the product to check for the presence of natural rubber or latex.*

**Hib-MenCY (MenHibrix)**
- Lyophilized Hib-MenCY component
- Manufacturer’s 0.9% sodium chloride diluent
- MenHibrix vaccine

*Beyond Use Time: Should be used immediately after reconstitution.*

**RV1 (Rotarix)**
- Lyophilized RV1 component
- Manufacturer’s sterile water-calcium carbonate-xanthan diluent
- Rotarix vaccine

*Do NOT inject.*

*Beyond Use Time: If not used immediately after reconstitution, store at 2°C to 8°C (36°F to 46°F) or at controlled room temperature up to 25°C (77°F) and discard if not used within 24 hours. Read the package insert that accompanies the product to check for the presence of natural rubber or latex.*
Reconstituted Vaccines

**VAR (Varivax)**
- Lyophilized VAR component
- Manufacturer’s sterile water diluent
- Varivax vaccine

**HZV (Zostavax)**
- Lyophilized HZV component
- Manufacturer’s sterile water diluent
- Zostavax vaccine

**MMRV (ProQuad)**
- Lyophilized MMRV component
- Manufacturer’s sterile water diluent
- ProQuad vaccine

Beyond Use Time: Discard reconstituted vaccine if not used within 30 minutes.