

# BQA: Storing Vaccines Properly

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The Arkansas Beef Quality Assurance Program (BQA) is an educational program that illustrates the importance of proper handling and administration of animal health products. One BQA recommendation is to store animal health products at the proper temperature (Arkansas BQA Handbook, 2012).

Refrigeration is required for most animal health products (antibiotics, pharmaceuticals, biologicals, vaccinations, etc.). Biological products should be kept under refrigeration between 35° to 45°F (2° to 7°C) unless the inherent nature of the product makes storage at a different temperature advisable (APHIS, 2007). Storing animal health products at < 35°F can be more damaging than storing animal health products at > 45°F because the antigen can separate from the adjuvant. Producers are very good about storing animal health products in a refrigerator. These refrigerators are often older models and are located outside, in a tack room, near the working chute, in barns and/or out in the elements (Figure 1). Given these situations, maintaining proper temperature for animal health products becomes a genuine concern.

In order to determine if animal health products were being stored at the proper temperature, a Watchdog data logger was used to monitor and record the refrigerator temperature every 10 minutes for 48 hours. Results from this demonstration clearly showed temperature of refrigerators storing animal health products should be monitored very carefully. In

addition, following a simple refrigerator general maintenance plan can help ensure the refrigerator is working properly.

## Refrigerator Demonstration Results

Watchdog data loggers were used to record the temperature at 10-minute intervals for 48 hours in 239 refrigerators of producers (75%), retail stores (18%) and veterinarian clinics (7%). The most common refrigerator tested was a refrigerator with the freezer-on-top (45%), followed by side-by-side refrigerators (22%), mini-refrigerators (17%), other types of refrigerators (14%) and freezer-on-bottom refrigerators (2%). The refrigerator ages were listed as ≤ 5 years = 22%, 6 to 10 years = 37%, 11 to 15 years = 22% and > 15 years = 19%. The other category (52%) was the most common category for refrigerator location, followed by kitchen (23%), barn (13%), mud room (5%), tack room (4%) and porch (2%). The other category locations included within a store (29%), office (21%), workshop (17%) and garage (14%).

Of the 5,016 animal health products stored in the test refrigerators, 4% were expired and 10% were opened. For most animal health products, an expiration date is printed on the label. Any expired animal health product should not be used and should be disposed of properly. Review the manufacturers' insert for proper disposal methods or unique disposal concerns regarding human health. Mixed

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modified live vaccines should be disposed of 1 hour after mixing. Killed vaccines should be disposed of approximately 10 days after opening.

Table 1 illustrates the importance of monitoring refrigerator temperature to ensure animal health products are stored at the correct temperature. Of the 239 refrigerators tested, only 63 (26%) recorded temperatures within 35° to 45°F greater than 95% of the time over a 48-hour period. To illustrate the seriousness of the situation, 58 refrigerators (24%) recorded temperatures within 35° to 45°F less than 5% of the time over 48 hours. It is recommended that animal health products should be stored in refrigerators that maintain the temperature within 35° to 45°F 95% of the time. Given this recommendation, 74% of the refrigerators tested are unacceptable for storing animal health products.

**Table 1. The number and percentage of refrigerators categorized by the percentage of data points within 35° to 45°F.**

Category <sup>a</sup>	Number of Refrigerators	Percentage of Refrigerators
Greater than 95% <sup>b</sup>	63	26%
66% to 95%	49	21%
36% to 65%	39	16%
5% to 35%	30	13%
Less than 5%	58	24%

<sup>a</sup>288 data points were recorded over a 48-hour period.

<sup>b</sup>Of the 288 data points, greater than 95% of the data points were within 35° to 45°F.

Figure 2 depicts an example of a refrigerator where temperature varied very little, maintaining the temperature between 35° and 45° over a 24-hour period. The refrigerator example in Figure 3 also kept the temperature between 35° and 45°, but the variation was substantially greater when compared to the refrigerator in Figure 2.

After the Watchdog data logger was inserted into the refrigerator in Figure 4, it took approximately 7.5 hours before the temperature dropped below 45°F. Figure 5 is an example of a refrigerator that kept the temperature too cold with all but 2 datum points above 35° across the 24-hour observation period. Moreover, there was almost a 10° variation every 50 minutes throughout the 24-hour period (Figure 5). Storing animal health products at temperatures < 35°F can be more damaging than storing animal health products at temperatures > 45°F, because the antigen can separate from the adjuvant.

Figure 6 is a refrigerator set too warm with all of the data points 10° to 15° above 45°. It is not advisable to store animal health products at this temperature, and it was recommended to the

producer to dispose of all animal health products stored in this refrigerator.

The refrigerator in Figure 7 illustrates two points. First, temperature varied from approximately 45° to 30°F during the first 12 to 14 hours after data logger insertion. It appeared the condenser was on an approximately 1-hour defrost cycle causing the temperature variation. Secondly, refrigerator temperature got as low as 29°F five times in 24 hours.

## General Refrigerator Maintenance

All refrigerators require general maintenance, and it is important to keep the refrigerator coils clean. Refrigerator coils are located in the rear of the refrigerator and can be cleaned by vacuuming the vents and coils. Dusty coils have to work harder to cool down the interior and contents of the refrigerator.

The drip pan, located beneath the refrigerator, should also be cleaned. In automatic defrost models, the water from the defrost process flows out a drain in the floor of the refrigerator and into a pan where it sits until evaporating. Food particles can be carried along and clog the drain or be left behind to rot. You can clear out the tube that carries particles to the pan by removing the stopper at the opening. Stick a pipe cleaner or similar device into the opening to push any particles through to the pan. Flush with soapy water and then empty and clean the pan.

The gaskets are the seals that keep cold air in and the outside air out of the refrigerator, and the gaskets should last the life of the refrigerator if properly cared for. Gaskets should be washed with soapy water, and the “paper test” can be used to test the condition of the gasket. You should not be able to slide a piece of paper between the rubber seal and the wall of the refrigerator. If the piece of paper slips between the seal and the wall, the seal is not tight enough and the gasket requires replacement.

Consider the location of your refrigerator and/or freezer. Do not position them in direct contact with hot appliances, as this will make the compressor work harder. Regularly defrost manual-defrost freezers, never allowing frost to build up more than 0.25 inch.

## Implications

This demonstration assisted producers in determining if they are storing animal health products according to labeled instructions. When animal health products are stored incorrectly, the effectiveness of animal health products may become compromised. All animal health products that are past their expiration date or opened should be disposed of properly.

Figure 1. Examples of refrigerators where animal health products were stored.



Figure 2. An example of a refrigerator that kept a constant temperature between 35° and 45°F within a 24-hour period.

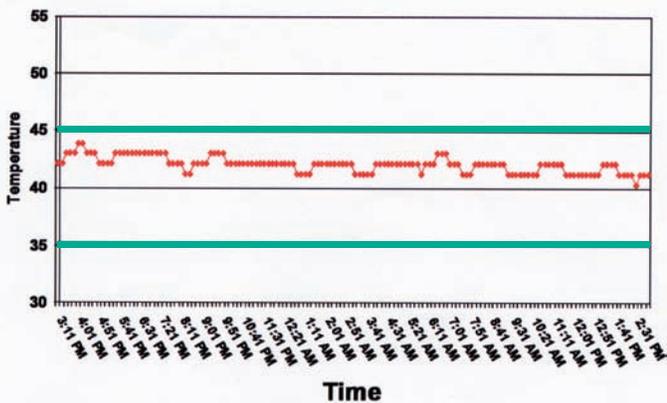


Figure 3. An example of a refrigerator that kept the temperature between 35° and 45°F but showed some variation within a 24-hour period.

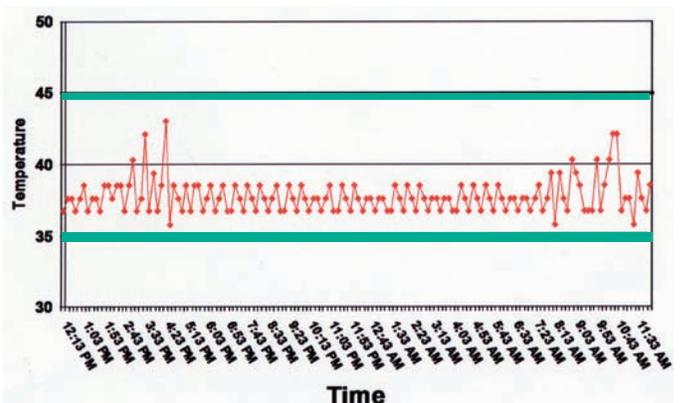


Figure 4. An example of a refrigerator that took approximately 7.5 hours before the temperature was below 45°F.

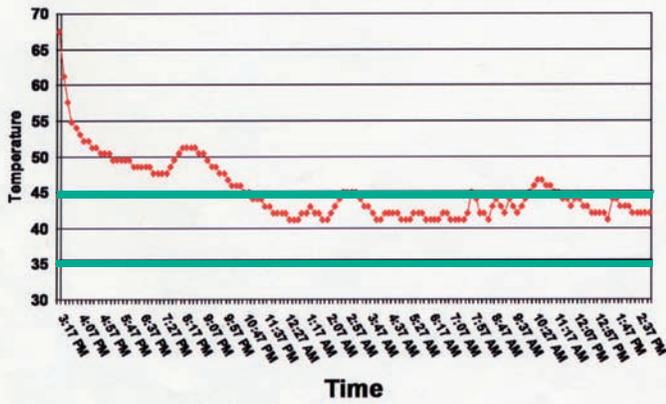


Figure 5. An example of a refrigerator that kept the temperature below 35°F (except for two data points) and showed an approximately 10-degree variation every 50 minutes over a 24-hour period.

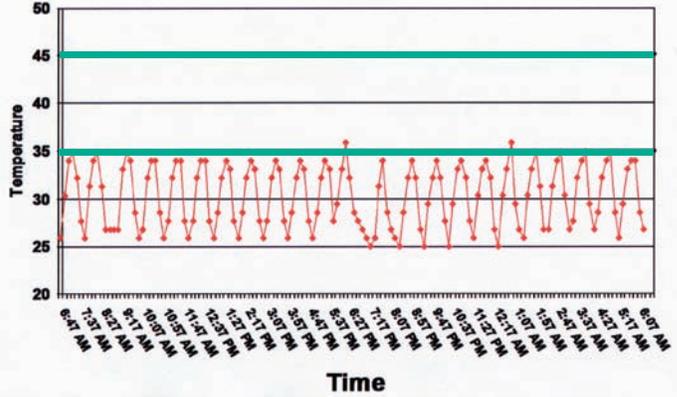


Figure 6. An example of a refrigerator that kept the temperature above 45°F over a 24-hour period.

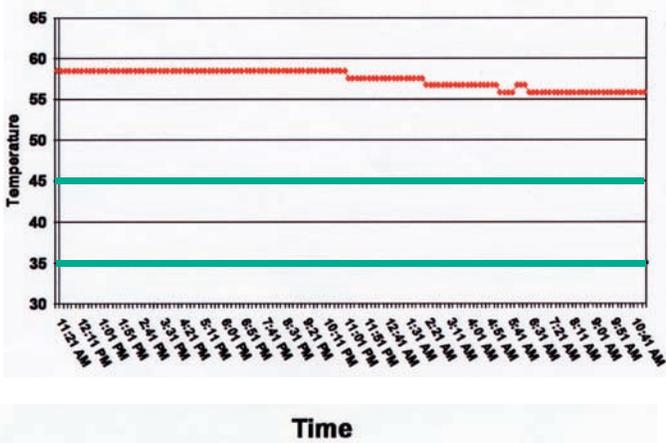
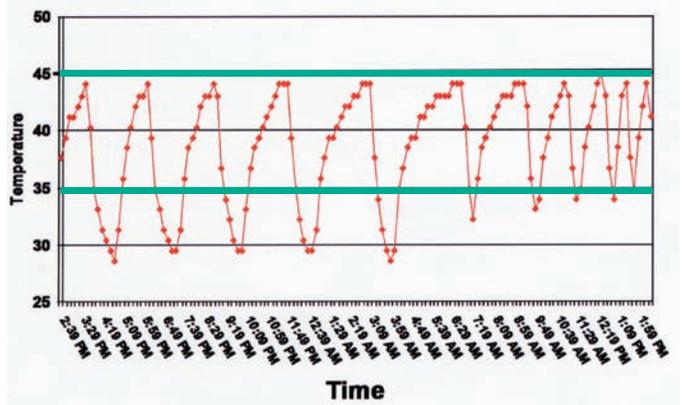


Figure 7. An example of a refrigerator that demonstrated an approximately 15-degree variation every 2 hours and dropped the temperature below 30°F 5 times over a 24-hour period.



## Literature Cited

APHIS. Title 9 – Animals and Animal Products. Chapter I, Part 114 – Production requirements for biological products. 2007. Code of Federal Regulations. Title 9, Volume 1.

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