

Wet Packs- Causes and Solutions

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Objectives

- To define wet packs and wet loads
- To review the major causes for wet packs/loads
- To discuss investigations and troubleshooting methods for resolution of wet packs

History

Steam sterilization is the most common form of sterilization used today in both hospitals and Ambulatory Surgery Centers. Over the years many things have changed with steam sterilization and consequences have resulted. When steam sterilizers were first approved, the type of packaging material used was muslin - which was relatively easy to dry. Instrument sets were comprised of basic instruments and weighed about 16 pounds.

Healthcare changed to disposable wraps, first crepe paper, then plastic based wrap, then rigid containers. With the change in larger, heavier sets (especially Orthopedic sets) and the newer wrapping materials, sterile processing personnel have seen an increase in wet packs. Most newer packaging materials, especially heavy duty wraps and some plastic containers, make drying the contents more difficult. Most rigid container systems recommend a minimum 30 minute dry time because of this fact.

What is a Wet Pack?

Any pack which is still wet after sterilization and drying is considered wet. There are three possible scenarios; visible moisture on outside of packs; moisture inside pack (e.g. moist towel) or visible water inside the set/tray. When multiple wet packs are found in the same load, the load is referred to as a wet load. A wet load could be symptomatic of a steam problem; however, a full investigation should take place. Wet packs represent one of the greatest problems in sterility maintenance. Both the Association of peri-Operative Registered Nurses (AORN) and the Association for the Advancement of Medical Instrumentation (AAMI) recommend against the use of an item that is wet or a set that contains visible moisture, even if it is inside a rigid container (ANSI/AAMI ST-79; AORN).

Wet Loads

- When multiple wet packs are found in the same load, the load is referred to as a wet load.
- A wet load could be symptomatic of a steam problem; however, a full investigation should take place.
- Wet packs represent one of the greatest problems in sterility maintenance.
- Both AORN and AAMI recommend against the use of an item that is wet or a set that contains visible moisture, even if it is inside a rigid container (ANSI/AAMI ST-79; AORN, 2011).

Causes of Wet Packs

The first reaction is to think there is a problem with the steam? It is important to understand that when room temperature metal instruments come in contact with hot steam, condensate will form. The colder the instruments and the more mass of metal, the greater the amount of condensate. Too much condensate may result in a wet pack at the completion of the drying cycle.

Other Causes of Wet Packs

Improper packaging – how was the set packaged? Was the wrapper too large (traps condensate inside set)? Was the package taped too tightly (traps condensate inside package)?

Improper loading of sterilizer – sterilizers should never be overloaded. There should be sufficient space between items to allow for steam to permeate around the package.

Would You Expect Wet Packs?



PHOTO ABOVE: Would You Expect Wet Packs here? (Sets too close together, some overlapping)



PHOTO ABOVE: Peel packs stacked, trays overlapping

Generally, you should leave sufficient space between packs/sets to permit air removal and steam penetration. There should be about one inch of space between each tray and rigid container. Proper spacing enhances drying.

- **Linen packs should be placed on edge.** If sterilizing multiples of the same type (e.g. towel packs), you should be able to fit your fist between the packages; if not, they are loaded too tightly.
- **Metal items** – in a mixed load (linens and metal goods) metal items should be on bottom and peel packages and linens on top.
- **Rigid containers** – Stacking should not be performed unless the container manufacturer gives specific information on this process. Place containers beneath other items since they produce condensate.



PHOTO ABOVE - How Many Things Wrong Here?

Peel packs under sets, sets loaded on their side instead of flat

- **Solid Mayo trays** (including those with small holes) – must be placed on edge to permit condensate to fall off. They should be tilted in proper direction (tilted forward so condensate does not collect in the lip of the tray).
- **Mesh bottom baskets (wrapped)** – should be placed flat on the sterilizer cart.
- **Paper-plastic pouches** – should be placed on their edge in a paper-plastic pouch separator or basket. If a basket is used, run your hand over the packages; they should move freely.
- **Basins and other items that could retain water** – place on their side (edge) so condensate can run out.

Set configuration

How was the set assembled? Was there a large amount of metal mass (instruments) in one location instead of the instruments being evenly distributed on the set? Were high density items (e.g. weighted vaginal speculums) wrapped in absorbent material to help reduce condensate?

Weight of trays - Most steam sterilizers were validated to sterilize and dry 16 pound sets. When we exceed that weight, problems can develop in drying the excess condensate that forms. AAMI now recommends that Orthopedic loaner sets weigh no more than 25 pounds including the container. All other sets should not exceed 25 pounds without the container.

Rigid containers **add** metal mass and weight to sets. Most container manufacturers recommend a 30 minute dry time to compensate for this. Some containers are made of plastic. Plastic is not as good at retaining heat as metal so the drying may not be as good in a plastic container as a metal one. What weight limit did your container manufacturer recommend; e.g. 16-25 pounds of instruments for the inside basket?

Use of other materials on set - Some facilities place rolled towels on sets (to permit easy retrieval of the stringer of instruments). However, this is not recommended because it is difficult to dry a rolled up towel; it forms too many layers. The use of non-absorbent wicking materials can also contribute to wet packs. This includes using disposable wrap inside trays (this is also prohibited because you have placed twice the amount of packaging recommended), silicone mats (difficult to dry), etc.

Other Causes

- Steam quality – This needs to be evaluated by the Engineering Department
- Improper insulation of steam lines
- Malfunction of traps in the steam line or no traps in the steam line
- Malfunction of the drain check valve or no drain check valve
- Steam contact with a cold load
- Too much water in the steam produced at the boiler
- Insufficient drying time
- Incorrect sterilizer installation
- Incorrect type of container (material, weight, design)
- Noncompliance with environmental controls for the preparation and packaging area
- Incorrect environmental conditions in the cool-down area (e.g., incorrect location of air conditioning vents)

Removal of Items From the Sterilizer

Items/packs removed from the sterilizer **should be visibly dry**. If moisture is noted on top of the packages, it is probably due to condensate from the autoclave rack. It is recommended to line the autoclave cart with absorbent cloths which usually resolves this. The cloths should be changed each shift.



PHOTO ABOVE - Moisture On Outside of Set

After Sterilization

Avoid directly touching items while hot (a minimum of 30 min to 2 hours or more). It is also important to remember that steam vapor remaining in packs can cause condensate to form so items should not be handled before cooled. In Ambulatory Surgery Centers where autoclave racks are not usually used, this presents problems because the items need to be removed so another cycle can be run. It is recommended that when the items are being removed; prepare a cart that is lined with bath blankets. Apply sterile gloves and carefully transfer the packages to the cart for cooling.

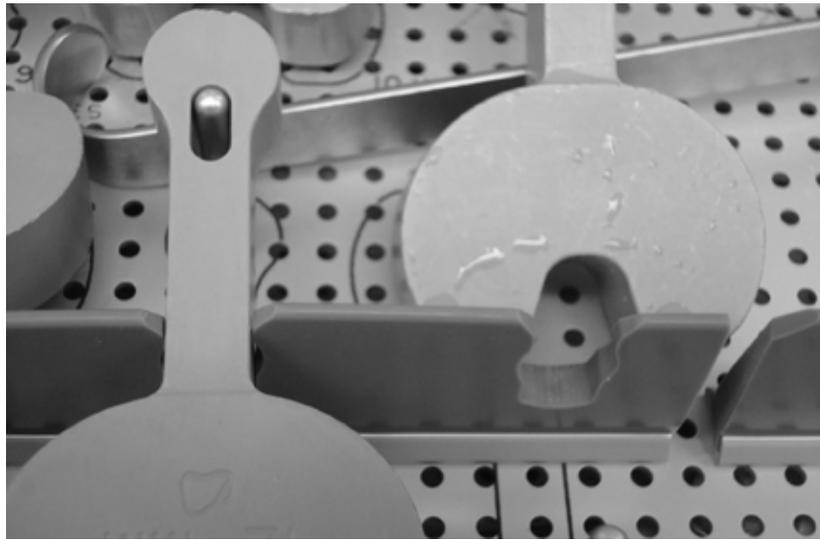


PHOTO ABOVE – Moisture Inside Set After Sterilization

Ability To Dry Sets

Most SPDs are faced with heavy and/or multi-level sets - can make drying difficult. The use of containment systems (e.g., rigid sterilization containers and multi-level organizing trays) and heavy-duty wrapping materials can also impede drying. It is the responsibility of the facility to ensure that sets and other packaged items can be dried after sterilization in the sterilizers being used; this is part of product testing (ANSI/AAMI ST-79). After sterilization, the packages should be cooled, opened, and inspected for visible water or evidence of moisture on the instruments or on the materials (e.g., towels) used inside the package.

AAMI puts the responsibility on the facility to demonstrate they can effectively dry their sets (wrapped or containers). Therefore, it is the responsibility of the facility to verify its ability to dry sets under facility conditions. AAMI recommends you perform a series of dry tests. Document the results and retain on file to verify that drying effectiveness is being monitored. Study the largest, heaviest, most dense trays.

- Sterilize the trays using the usual drying time.
- Allow the trays to cool, then open the sets (within one hour) and inspect for the following:
 - o Moisture on the instruments which may appear as “dew”.
 - o Moist towels or silicone liners
 - o Visible water inside container

If any of the above observations is noted, the set is to be considered not sterile.

Investigation

Whenever wet packs occur, a complete investigation of the causes must be conducted and corrective actions implemented. Some of the information to be collected includes the following:

- Date of wet packs
- Time of day
- Load configuration (number of sets)
- Number and description of sets that were reported as wet
- Selected cycle (gravity-displacement or dynamic-air-removal)
- Cycle temperature and exposure time
- Packaging material used for sets that were wet
- Type of containment device used (e.g., Mayo tray, metal mesh basket)

- Person(s) who prepared/wrapped the sets
- Inventory list for the sets (so that the set configuration and weight can be evaluated)

If a problem is noted, the first step is to check or adjust the following:

- Assembly of instruments in the set. Are the instruments well distributed in the set? Is there too much metal mass in the set?
- Size of peel pouches used to package the load contents. Is there too much metal mass in the pouches?
- Basin packaging and loading: Are basins nested with non-linting absorbent material between the basins?
- Loading techniques: Is there too much metal mass in the load? Are textile items on the top rack and metal items on the bottom rack?
- Selection of cycle parameters: Was the sterilization cycle correct for the load contents? (Check the medical device manufacturers' IFU).
- Drying time: Was the drying time correct for the load contents? (Check the medical device manufacturers' IFU). Should the drying time be increased because of the amount of metal mass in the load?
- Unloading and cooling: Is the room temperature appropriate? Are there nearby air conditioning or other cold-air vents?
- Were the sets cooled completely?

Troubleshooting

The troubleshooting procedure should be continued until the problem is solved. Wet packs should not be used; instead, they should be sent back to SPD for reprocessing. Consideration should be given to opening other packs in the questionable load to check for moisture and/or to recalling all items from the load.

Actions to Take

Assure that the load remains untouched for a minimum of thirty minutes to two hours depending on the metal mass contained in the sets/load, an AAMI recommendation. Releasing sets while still warm after steam sterilization contributes to wet sets and tray contamination.

Reconfigure the set. The placement of the instruments on the set (e.g. all the retractors in the same location) can affect drying effectiveness. Instruments distributed evenly on the sets enhance the drying process. **NOTE:** Use of silicone mats increases drying time. If necessary, re-design the set by dividing a large set into two sets to facilitate drying. Promptly revise tray

count sheets to reflect tray content or layout changes to ensure all CSP staff configure the trays in the same manner.

More Information

Conduct dry tests whenever instruments are added to trays to ensure the additional instrumentation does not adversely affect the drying process. Reconfigure or redesign sets if necessary.

If one wet pack is found, should the entire load be recalled? The problem is no one knows if the entire load was wet or only specific packs. It is in the best interest of patients to recall and reprocess the entire load.

Conclusion

Wet packs represent a major quality and patient safety issue for the end user. It is essential that when wet packs are found, a complete investigation be performed so that the cause of the problem is identified. Then steps should be taken (including changes in procedures, in servicing, etc.) to correct the problem and prevent preventable recurrences.

References

AAMI, *Comprehensive Guide to Steam Sterilization and Sterility Assurance in Healthcare Facilities*. ST-79, 2006; Annex I, 2008, Annex II, 2009, Annex III, 2010, Annex IV, 2012, Annex V, 2013.

Basics of Sterile Processing. Sterile Processing University, LLC, Fifth Edition, 2014.

QUIZ – Wet Packs- Causes and Solutions

Please click on the link below to take the quiz.

https://www.spdceus.com/ceus/wet_packs_quiz.htm

Good Luck!