LivaNova

Health innovation that matters

URGENT FIELD SAFETY NOTICE

Potential Cardiac Surgery Infection Risk Reduction Measure:
Hydrogen Peroxide Concentration Monitoring

FSCA Identifier: CP-MUN-2018-005

Affected Devices: Heater-Cooler 1T and 3T Devices

Date: October 29., 2018

Attention: Cardiac surgeons, perfusionists, biomedical engineers/technicians

Reason: Provide updated instructions to monitor and adjust the concentration of hydrogen peroxide in the water circuit to limit microbial growth

Dear Valued Customer:

Reason for this Letter and affected products

The purpose of this letter is to advise you that LivaNova[1] is providing updated instructions to monitor the concentration of hydrogen peroxide in the water circuit of 1T and 3T heater cooler devices[2], to verify that sufficient concentration of hydrogen peroxide is present to limit microbial growth, and to adjust the concentration of hydrogen peroxide if it drops below 100 ppm. This regimen enhances the water maintenance regimen outlined in Section 6.4 of the Operating Instructions.

This updated instruction affects all 1T and 3T heater cooler distributed by LivaNova. Part numbers and descriptions are listed in the following table:

Part Number	Description
16-02-80	Heater-Cooler 3T, 230V
16-02-81	Heater-Cooler 3T, 240V/60Hz
16-02-82	Heater-Cooler 3T, 208V/60Hz
16-02-83	Heater-Cooler 3T, 127V/60Hz
16-02-85	Heater-Cooler 3T, 120V/60Hz
16-02-95	Heater-Cooler 3T, 200V/50Hz/60Hz
16-02-50	Heater-Cooler 1T, 230V

Description of the issue

The 1T/3T Operating Instructions prescribe the addition of 50 ml for 1T, and 150 ml for 3T, of Hydrogen Peroxide 3% medical grade solution to the filtered tap water used to fill the tanks in the device every 7 days. This results in a maximum hydrogen peroxide concentration of approximately 330 ppm. The

[1] LivaNova PLC is a U.K. holding company with a number of wholly-owned subsidiaries, including LivaNova Deutschland GmbH. In this document, we refer to all entities using the brand name LivaNova.

[2] The 1T and 3T are non sterile heating-cooling machines manufactured by LivaNova Deutschland GmbH. They are used to control patient's body temperature over a cardiopulmonary bypass procedure. The 1T model may not have been distributed in your country.

purpose of adding the hydrogen peroxide is to limit microbial growth between the regular cleaning/disinfection cycles performed every 14 days.

The concentration of hydrogen peroxide in the water circuit is expected to decrease naturally over the 7 days period but remain above 100 ppm, a level that controls microbial growth to the target concentration of ≤100 CFU/ml. Section 6.4 of Operating Instructions provides a suggested regimen to monitor hydrogen peroxide levels to mitigate this effect. Additional microbial monitoring procedures were provided in the June 2015 Field Safety Notice.

LivaNova has observed that in a limited number of devices tested after a period of clinical use, the concentration of hydrogen peroxide decreased rapidly to zero within a day. In the devices where rapid hydrogen peroxide loss occurred, LivaNova observed the degradation of a nickel coating on cooling coils in the tanks, resulting in exposed copper. LivaNova's investigation concluded the rapid decrease is caused by a reaction between the exposed copper and the hydrogen peroxide.

The drop of hydrogen peroxide below 100 ppm was not observed in all tested devices. The rate of decrease is expected to vary by device, and can be dependent on a number of factors such as age or overall condition of the device, past maintenance practices, and local water conditions.

How does this affect patients?

The 1T/3T Operating Instructions establish disinfection procedures that are designed in part to maintain water quality at a total heterotrophic plate count (HPC) ≤100 CFU/ml within the 1T/3T heater-cooler water circuit. If the hydrogen peroxide concentration within the water circuit drops below 100 ppm, microorganisms may start to grow in the period between bi-weekly disinfection cycles, possibly to a concentration that exceeds this specification. Although an increased HPC count suggests the growth of microorganisms, it does not necessarily follow that devices are contaminated with Mycobacterium Chimaera, whose growth rate is very low.

Although the water in the 1T/3T heater-cooler unit does not come into direct contact with the patient, users should be mindful that aerosols can be emitted when the heater-cooler unit is used. Aerosols emission can occur with 1T and non-upgraded 3T heater-cooler units, primarily during the patient warming phase and at the end of a procedure, when water is returned to the tanks. Depending on the characteristics of the bacteria and the concentration of bacteria in the water in the tanks, these aerosols may carry bacteria into the operating room environment. Another risk of contamination for the patient is a direct contact transfer of water/solution droplets containing waterborne, pathogenic microorganisms into the surgical field. Some of these microorganisms, if they come in contact with the patient, could lead to cardiovascular infection, including endocarditis or other deep-surgical-site infections.

What actions should be taken by the Customer/User?

Users should monitor the hydrogen peroxide concentration in the water solution on a daily basis to verify that sufficient concentration of hydrogen peroxide is present in the water circuit of the device. A decrease in hydrogen peroxide over the 7-day-period until the next water change is expected, however the hydrogen peroxide concentration should remain above 100 ppm. Detailed instructions are found in **Attachment 2**, titled *Daily Hydrogen Peroxide Monitoring Instructions.* Please read those instructions carefully and follow them.

This monitoring instruction for hydrogen peroxide concentration comes in addition to the microbial monitoring procedures provided in the June 2015 Field Safety Notice. Especially the bi-weekly monitoring of water quality should be maintained. In case water quality is not found at a total heterotrophic plate count (HPC) ≤100 CFU/ml within the 1T/3T heater-cooler water circuit, contact your infection control manager to determine appropriate actions and immediately contact your LivaNova representative for support.

Transmission of this Field Safety Notice

Please ensure that this notice is passed on to all personnel within your organization who need to be aware of this Field Safety Notice. In case you have transferred products to a third party, please pass this information on to them and also inform the below mentioned contact person.

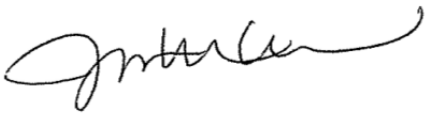
Contact reference person

For questions regarding this Field Safety Notice, please contact your LivaNova representative Tomislav Zupan tomislav.zupan@bostonmedical.hr, or LivaNova Customer Quality at LivaNova.FSCA@livanova.com.

A copy of this Field Safety Notice has been provided to the appropriate Regulatory Agency in your country who is aware of these actions.

Thank you for your cooperation in this matter. LivaNova is committed to providing quality products and we apologize for any inconvenience this may have caused.

Sincerely,



Joan Ceasar
Vice President, Clinical, Quality & Regulatory Services

Enclosed:
Attachment 1: Customer Response Form
Attachment 2: Daily Hydrogen Peroxide Monitoring Instructions

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ATTACHMENT 1
Customer Response Form

FIELD SAFETY NOTICE
CP-MUN-2018-005
Potential Cardiac Surgery Infection Risk Reduction Measure
Hydrogen Peroxide Concentration Monitoring

29., October 2018

According to our records, you have one or more 1T/3T Heater-Cooler devices in your possession. Thank you for your cooperation in completing this Customer Response Form and returning it to LivaNova - Tomislav Zupan, tomislav.zupan@bostonmedical.hr at your earliest convenience.

Adverse reactions or quality problems experienced with the use of this product may be reported to LivaNova via your LivaNova representative tomislav.zupan@bostonmedical.hr or directly to customerquality@livanova.com.

1. We have reviewed and understand the attached Field Safety Notice. The information and required actions have been brought to the attention of all relevant users:
   □ Yes □ No

2. We DO NOT understand the Field Safety Notice and request more information:
   □ Yes □ No

   If "no" was indicated in the statement above Question #1, or "yes" indicated in Question #2, please explain:_____
   _____

3. We have additional questions, please contact us:_____
   _____
   _____

Customer Name: _____

Address: _____
_____
_____
_____

_____ _____
Name (Print) Title

_____ _____
Signature Date

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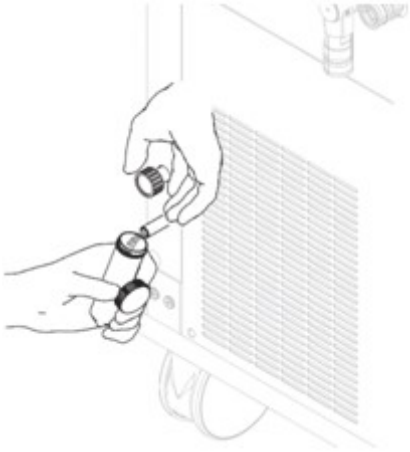
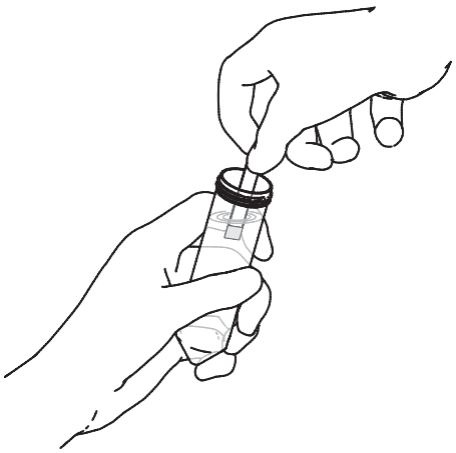
ATTACHMENT 2

Monitoring and adjusting the hydrogen peroxide concentration

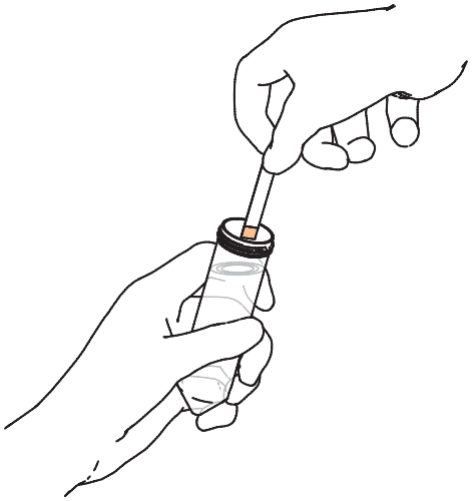
1. Hydrogen peroxide concentration should be tested every day in each of your devices. If the heater-cooler is not monitored daily for hydrogen peroxide concentrations, drain the water tanks. Testing should be performed prior to using the device in a procedure.
2. The hydrogen peroxide concentration in the water circuit can be measured semi-quantitatively by visual comparison of the reaction zone of a test strip (e.g. MQuant, Peroxide Test, Method: colorimetric with test strips, 100 - 1,000 mg/l H2O2, Reference 1.10337.0001) with the fields of a color scale.
3. In addition to the following instructions make sure you observe all of the information in the Instructions for use delivered with the hydrogen peroxide test strips.
4. Before measuring, open the drain valve of the patient circuit(s) (see 1T and 3T Operating Instructions, *Section 3.2 Structure of the heater-cooler*), drain 100 ml of water and discard it.
5. Leave the drain valve open and drain a minimum volume of 5 ml from the water jet into a sterile sample container for measurement and then close the drain valve.

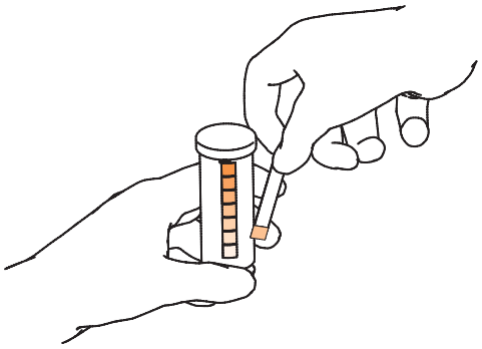


6. Immerse the reaction zones of the test strip in the collected water sample for the reaction time specified in the instructions for use delivered with the peroxide test strips.



7. Shake off excess liquid from the test strip and after the specified reaction time compare the color fields on the packaging and the color of the reaction zone on the test strip. Determine which of the color fields on the label matches the reaction zone color best. Read off the corresponding result in mg/l H_2O_2.





8. If the color of the reaction zone shows hydrogen peroxide concentrations less than 100 mg/l H_2O_2:

   - Prior to adding hydrogen peroxide empty all water circuits back to the tank by closing the circuit valves with circuit pumps powered on. Power off circuit pumps.
   - Without changing the water, add an additional **100 ml** dose of medical grade 3% hydrogen peroxide to the water tanks of the **3T device** and an additional **30 ml** dose to the water tank of the **1T device**.
   - To ensure a homogeneous hydrogen peroxide solution in all water tanks, perform the mixing procedure as described in section 5.2 of the Instructions for Use, Filling the Water Tanks.

9. If the hydrogen peroxide concentration is greater than or equal to 100 mg/l H_2O_2:

   - There is no additional action to be taken other than to continue daily monitoring of hydrogen peroxide concentration.

   Note: If during the measuring step you need to refill, add pre-mix medical grade 3% hydrogen peroxide solution with filtered tap water at a 1:91 ratio (e.g. 10 ml hydrogen peroxide mixed with 910 ml filtered tap water). Add the mixture to the tank until the second green LED of the water level display for the patient circuit lights up.

10. If the 1T / 3T heater cooler is not intended to be used for more than a day, you may monitor the hydrogen peroxide level on days when the machine is not in use and take the above recommended actions depending on the level measured. Alternatively, if the device will not be used or monitored for more than a day (e.g. over a weekend), the device must be completely drained. For long term storage of the heater-cooler refer to section 6.5 of the Operating Instructions, Preparing the heater-cooler for storage.