MICROBIOLOGICAL EVALUATION OF THE LOW-TEMPERATURE STERILIZATION METHOD OPERATING WITH HYDRONIUM

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INTRODUCTION AND PURPOSE

- Low-temperature sterilization methods are frequently used in Central Sterilization Units (CSUs).

  However, they have certain disadvantages, such as:

  - Limitations in lumen diameter and length
  - Toxicity
- This study was conducted to clinically evaluate,
- The HRF 3000 HdrOZON (Teknomar, Türkiye) device, which is claimed to eliminate these disadvantages,
- Which performs sterilization by using Hydronium ion technology obtained by the combined use of Hydrogen Peroxide and Ozone gases.

MATERIALS AND METHODS

Operating stages of the device

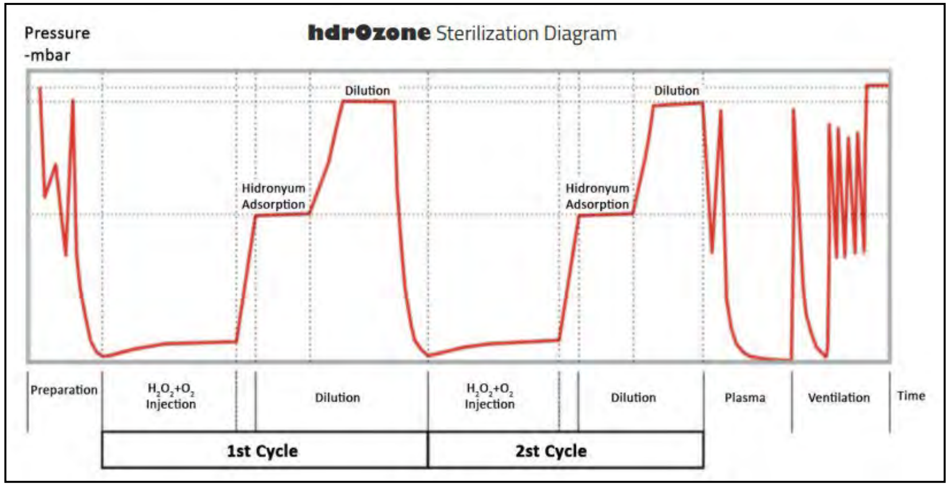
After the chamber temperature reaches 44 °C:

1- Vacuum phase: Bringing the sterilization chamber to -600, -900 mBar vacuum,
2- Injection phase: Vaporization and injection of 60% H2O2 concentration,
3- Diffusion phase: Diffusion of hydrogen peroxide into the materials to be sterilized,
4- Ozonation: Taking oxygen into the system, ozonating it and delivering it to the chamber,
5- Adsorption: Adsorption of hydrogen peroxide and ozone onto the materials to be sterilized by forming a heavy molecule.

6- Dilution: Dilution of Hydronium

7- Plasma phase: Performing HRF COLD PLASMA under -300/-700 mBar atmospheric vacuum

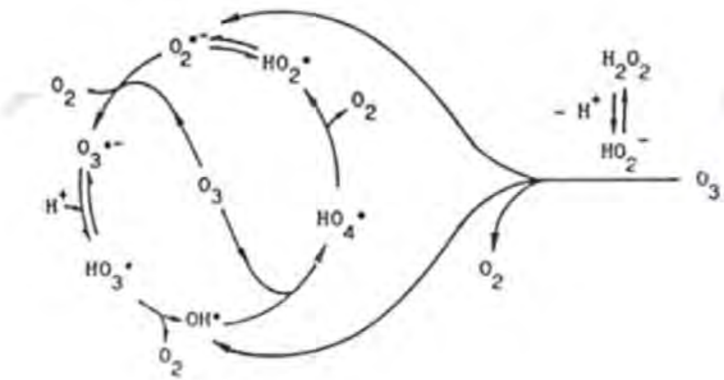
8- Ventilation: Aeration phase: return to normal atmospheric pressure.

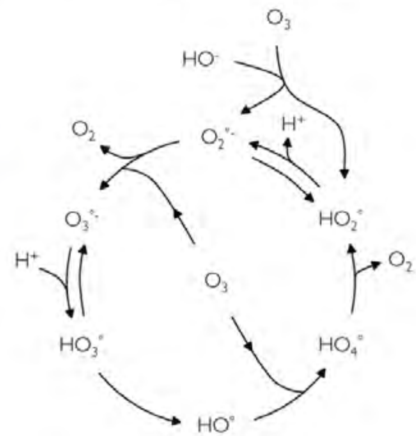


Sterilization Mechanism

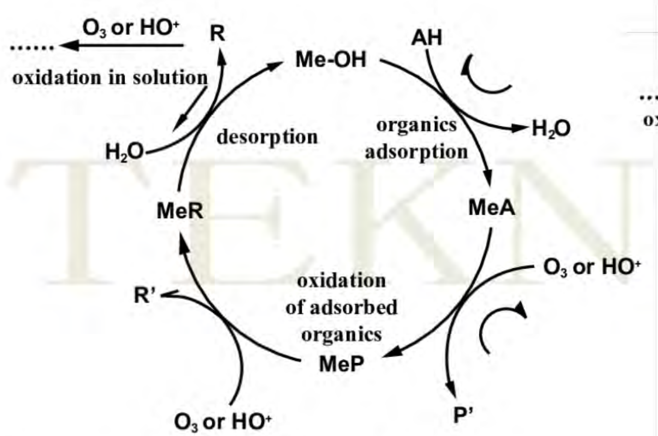
Activation mechanism between H_2O_2 and ozone

Reaction of Ozone with Hydrogen Peroxide (Peroxone Process): A Revision of Current Mechanistic Concepts Based on Thermokinetic and Quantum-Chemical Considerations .**Activation mechanism of H_2O_2 by ozone, (DORÉ, 1989).**

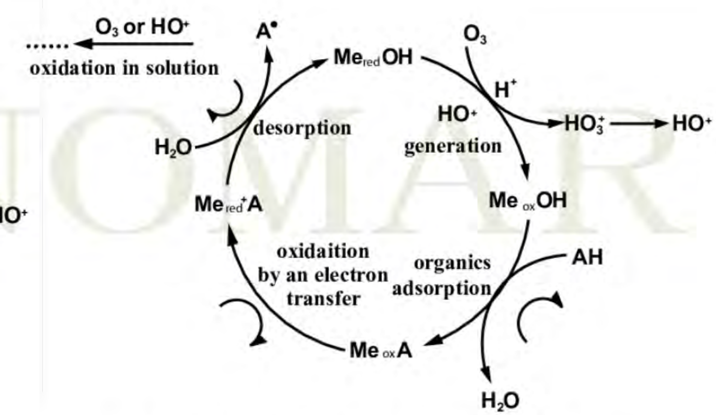




With the application of H_2O_2 and O_3 together, a sterilization effect is achieved on microorganisms through adsorption by the action of hydronium heavy molecules, radicals, hydroxyls, and ions such as HO_3, HO_4, H_2O_3, H_2O_4, HO_5, OOH, H_3O, etc.



The mechanism for adsorption on catalyst and oxidation
by ozone or HO radical of adsorbed organic



The possible mechanism for HO or other radical species generation by reaction of ozone with reduced metal of catalyst.

Polytetrafluoroethylene (PTFE) and steel lumen tubes were used as the challenging test system (PCD) in the study.

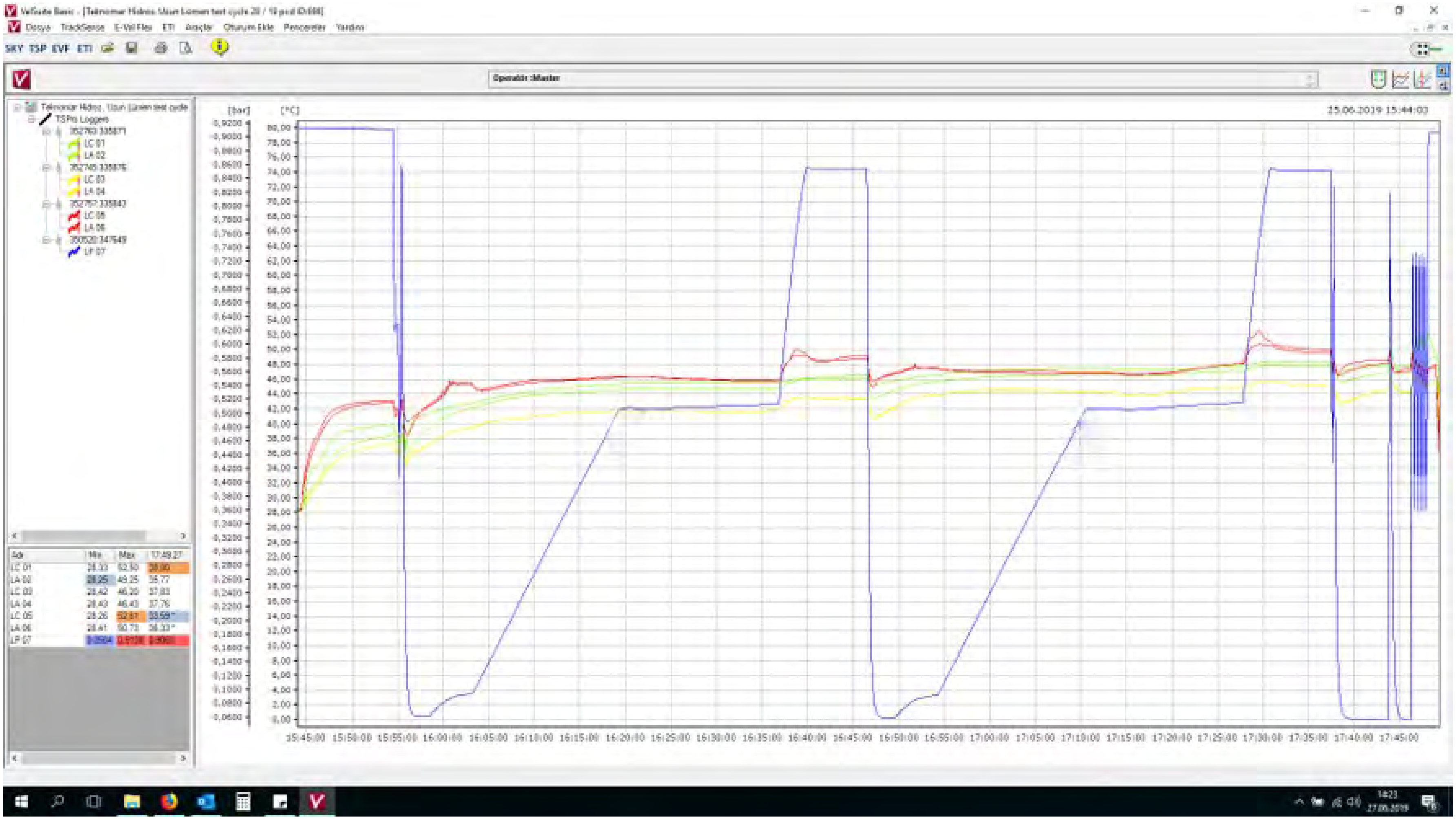
Challenging test systems used

PCD	Length (mm)	Lumen Dıameter(mm)
Teflon PTFE	850	1
Teflon PTFE	1200	2
Teflon PTFE	900	0,4
Teflon PTFE	7500	2
Teflon PTFE	10000	2
Teflon PTFE	15000	2
Steel	500	0,7

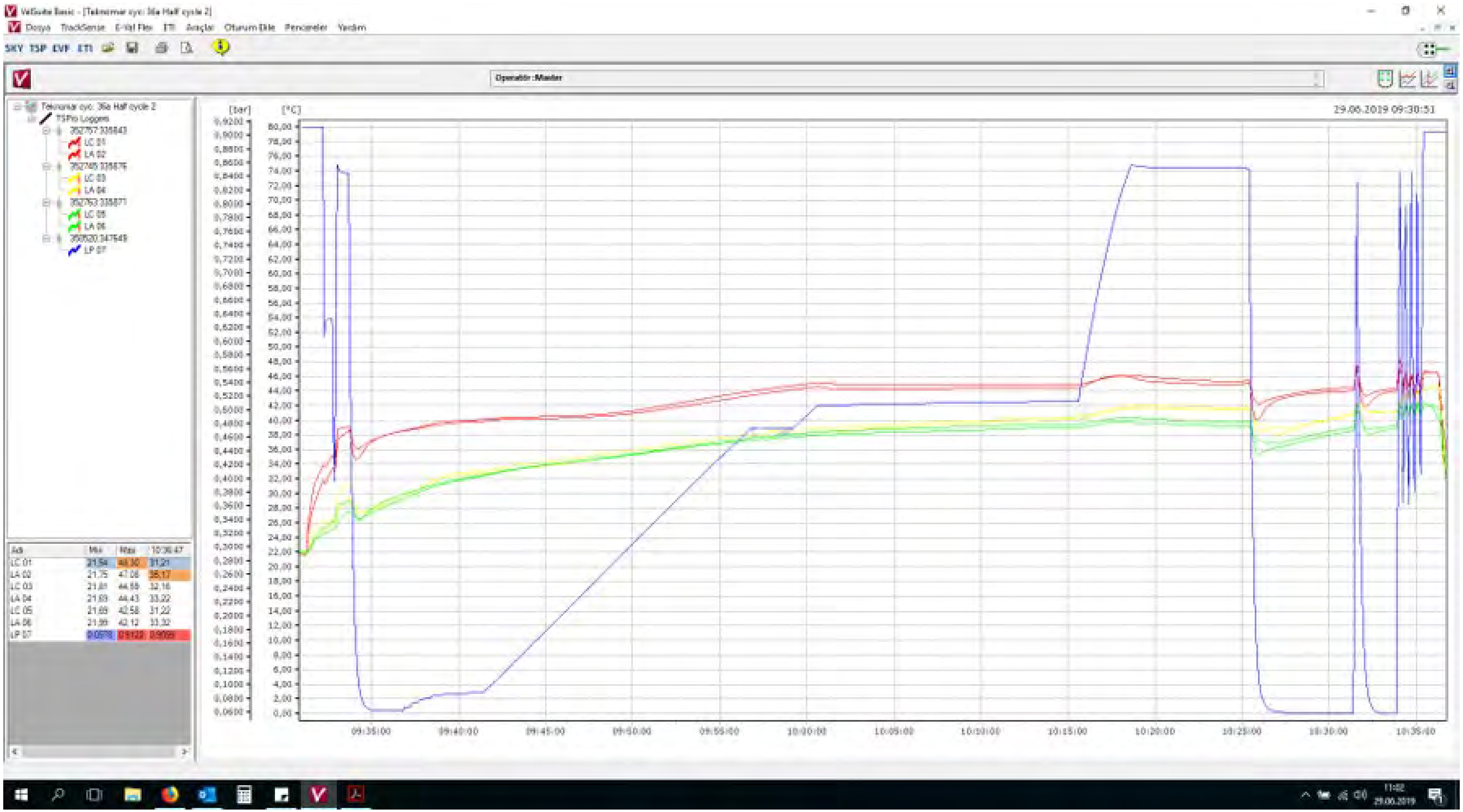
BIONOVA brand bacterial spore strips containing 10^6 G. sterothermophilus were placed at the closed end of the challenging test systems and packaged with 4A brand TYVEK.All test systems were placed in different localizations in each cycle and tested as full and half cycles.

Incubation in Tryptic Soy liquid medium at 55 °C for 7 days.

Full Cycle



Half Cycle



Calculation of the logarithmic reduction factor

LRF = log10 [control] – log10 [test]

FINDINGS

- In all test systems and in all cycles, the reduction factor was calculated as 8 log compared to the positive control.
- No microorganism growth was observed in any of the Bionova H2O2 biological indicators placed inside 23 PCD lumens in each cycle.

CONCLUSION

In all test systems and in all cycles, the reduction factor was calculated as 8 log compared to the positive control.No microorganism growth was observed in any of the Bionova H2O2 biological indicators placed inside 23 PCD lumens in each cycle.

THANK YOU