WFHSS CONFERENCE – BARCELONA 2022

The 23rd WFHSS congress was held at the Palau de Congressos de Barcelona between 16 and 19 November 2022. The venue was located in the historic Montjuic area, the birthplace of the city of Barcelona. Montjuic translates from Catalan as “Jewish Mountain” and derived its name from the medieval Jewish cemetery there. Perched on the hill, now sits the splendid Palau Nacional. From here, wonderful views of the city can be enjoyed.


Palau Nacional

The congress opened on16 November with an opening ceremony and welcome to the delegates and trade. Christine Denis WFHSS President announced that 4 committee members were re-elected and paid tribute to Teressa Normington who sadly passed away earlier this year. 800 delgates and 52 trade stands were registered.

One of the conference themes was development of a Green CSSD. Delegates were invited to post their ideas on the conference website. Prizes would be awarded for the best entries.

The entertainment was provided by Spanish flamenco dancers, who put on a show. This was followed by Tapas, Cervezas, Cava and Vino Tinto in the trade hall.

Day 2. Thursday 17 November 2022

1. **The physics of sterilization**
Daniel Beysans and Nicolas Lavielle (France)

This presentation focused on adsorption and condensation during sterilization and compared the physics of steritisation methods. Generally, the focus of cycle monitoring is to examine the variables such as pressure, temperature, time, humidity, concentration of the sterilizing agent and corresponding parameter ranges. These variables are measured at chamber or load level i.e. at a distance from the RMD surfaces and the microorganisms that they may carry. It was also noted that. a salt particle on an RMD will prevent condensation surrounding the salt deposit
A case study was presented that demonstrated that a low concentration of H2O2 at high pressure indicates that microbicidal efficacy increases at low initial relative humidity. This condition limits the thickness of the H2O2/water condensate and allows the H2O2 concentration to be higher on the surface of RMD. Condensation during sterilization can become less efficient as the RMD becomes saturated.

2. **Performance evaluation of chemical, biological and physical indicators in the process of sterilization under the effect of non-condensable gases**
Sandoval Barbosa Rodrigues (Brazil)

The importance of removing non condensable gases (Nitrogen, Oxygen and CO2) was emphasized as gases compete for space with steam inside the sterilizing chamber and can create a thermal barrier around RMD. This then prevents condensation occurring. There are numerous sources of non condensable gases (ncg). Steam supply, breaches in the supply and exhaust pipes, leaking door seals, excessive use of wrapping, and

from residual detergent used during fabric washing There are so many variables that each sterilization cycle should be regarded as a unique event. Studies were conducted examining deliberate leaks into the sterilizer chamber. The study concluded that low levels of ncg cannot be detected by chemical indicators located within the chamber unless using a process challenge device (PCD). Results from Bowie and Dick tests varied between manufacturers. Indicators should be evaluated prior to use to determine their effectiveness. A PCD is most effective for detecting ncg.

3. **In-depth case study of Low Temperature Steam Formaldehyde (LTSF) Sterilization**
Nathan Ronsse (Belgium)

Low temperature steam formaldehyde sterilization was reviewed at two large hospitals in Belgium. The study concluded that owing to LTSF ability to penetrate long narrow lumens (3000mm x 0.5mm) it is a suitable method for sterilizing flexible endoscopes. Cycle costs were approx 5.65 Euro compared to 2.50 for steam and 12.25 for H2O2. The study presented a SWAT analysis of LTSF use, with long cycle times a disadvantage. (Dedicated LTSF sterilizers exhibited at the conference complete cycles within 90 minutes). Many RMD do not include LTSF in their instructions for use. Advantages are that the flexible endoscopes can be wrapped, providing a long shelf life, and LTSF sterilizers are capable of penetrating long narrow lumens.

4. **Endsocopy in the 21st century: minimally invasive state of the art medical technology or a future main vector of hospital-acquired infections?**
Rodolphe Hervé (UK)

This presentation examined the effectiveness of flexible endoscope reprocessing. High level disinfection has known limits despite adherence to recommended cleaning protocols (which may vary from one country to another). Correct selection of brush size is essential for effective cleaning. Too short fibres will not contact the sides of the channel. Too long fibres will bend inside the channel.
Often there is no inspection of flexible endoscopes following initial cleaning, and in the UK LTSF is banned due to its prion fixing properties.

The study used highly sensitive fluorescence epi-microscopy to examine the various surfaces of endoscopes, especially inside the working channels. Results of the study demonstrated that soil can accumulate in endoscope channels over several years of clinical use. Residual biofilms can also survive reprocessing cycles.
Antimicrobial resistance is developing faster than new drugs are emerging and flexible endoscopes are becoming more complex, and are used for more invasive procedures. Fatal cases of hospital acquired infections linked to reusable endoscopes have been identified and reported in the literature. Further research and development in the field of endoscope reprocessing and surveillance is needed to ensure that reprocessing methods are sufficiently effective to keep pace with these developments.

5. **Alpha-synuclein seeds of Parkinson´s disease: Transmissible biological agents with prion-exceeding resistance to steam sterilization**
Michael Beekes (Germany)

Michael Beekes presented a study demonstrating that Parkinsons disease can be transferred to mice which then develop symptoms of the disease.

Intracerebral injection of brain, stomach wall and muscle tissue homogenates and blood from Parkinsons disease patients were injected into the mice brains. The study demonstrated that transmitted Parkinsons disease seeds, including those from the stomach wall (but not blood), are able to propagate in new mammalian hosts and subsequently cause development of the disease.
The effectiveness of steam sterilization to de-activate Parkinsons disease seeds was also examined. Five minutes of steam sterilization at 134°C reduced the titre in the homogenate by only 2.25 ± 0.15 decadic-logarithmic units. Increasing the sterilizing time to 90 minutes did not result in additional inactivation.
The study concluded that Parkinsons disease seeds may potentially be iatrogenically transmitted between humans and may stimulate pathologies or clinically harmful effects in recipients. The Parkinsons disease seeds are extremely resistant to de-activation by steam sterilizing. Further research is therefore required to examine what additional physical or chemical cleaning and disinfection methods are required to thoroughly deplete or inactivate contaminated reusable medical devices.

6. **Validation of a cleaning verification test for lumened medical devices**
Kaumudi Kulkarni & Mary Ann Drosnock (USA)

This presentation provided an overview of the development of a protein test for flexible endoscope channels to be used following initial cleaning and prior to automatic flexible endoscope reprocessing.
The presenter considers that testing cleaning efficacy prior to automatic endoscope reprocessing is rarely undertaken. The test involves passing a swab through the working channels of a used and then cleaned/brushed flexible endoscope and testing the swab for protein residue.
To demonstrate the efficacy of the test, 'live' endoscopes were sampled after clinical use and manual cleaning, for bacteriological, TOC, and protein analysis. Ninety endoscopes were sampled: Thirty each of gastroscopes, bronchoscopes, and colonoscopes. The study demonstrated a low limit of detection for the cleaning verification test. The test was sensitive at picking up proteins as low as 1.3µg. It therefore, provides a useful cleaning verification tool for sterile processing professionals to check for residual proteins in the channels of lumened devices after manual cleaning.
An interesting comment from the audience following the presentation informed that in Germany the test would not be of use as there is no pre-cleaning. The process is entirely automated. As per regulations.

7. **To borescope or not to borescope**
Frank Daniels (USA)

A borescope was used to examine the internal channels of all flexible endoscopes within the endoscopy department of a leading US hospital. New flexible endoscopes arriving into the facility, and when returning from repair, were also examined.
Of those new and repaired endoscopes, the findings demonstrated a total of thirty-six to be unsatisfactory. This consisted of eight new and twenty-eight repaired flexible endoscopes. Of the repaired endoscopes, eighteen came from the manufacturer, and ten came from a third-party repairer. This represented a 23% fail rate. Faults included blockage of channels with glue, scratching, and deposits within the lumen.

The high rate of faults within new and repaired flexible endoscopes indicates that manufacturers and third-party repair companies should be held more accountable for their work and inspection processes prior to returning scopes to hospitals.

8. Cleaning of robotic instruments: Can we reduce the work load in the CSSD and improve patient safety?
Klaus Roth (Germany)

Manual pre-cleaning of robotic instruments is time intensive and results vary. Laboratory testing by radioactive labeling of test soils and detection of residual proteins and hemoglobin after cleaning was used to determine the effectiveness of cleaning of robotic instruments in a range of washers using a variety of detergents.

The outcome of the protein tests demonstrated that robotic instruments can be safely reprocessed. Around 95% of the instruments evaluated had a level of less than 100 µg of residual protein. The average was 35 µg of protein, much lower than the acceptance level prescribed by ISO 15883-5.
The tests showed that automated pre-cleaning within an ultrasonic bath which articulates the tip of the robotic instrument during washing can reduce the manual pre-cleaning time of robotic instruments. Such new developments can lead to less work and reduce the time intensive pre-cleaning processes. Automation can also lead to improved process safety.

9. **New insights into chemical passivation of stainless surgical steel: Corrosion prevention and beyond**
Matthias Buhmann (Switzerland)

Chemical passivation can modify the surface of stainless steel. Changes to the surface can facilitate RMD reprocessing by reducing the adhesion of contaminants and microorganisms and by increasing corrosion resistance. Passivation may also make a significant contribution to maintaining the lifespan and value of the instrumentation. Passivation is the formation of a chromium oxide rich layer on the surface of stainless steel. Stainless steel with a higher chromium content (12%) forms a richer layer. Daily use of RMD promotes corrosion: Halide ions [chloride, iodide and bromide) from blood, saline solution or disinfectants attack the passive layer of RMD causing corrosion.

HAXPES *(Hard X-ray Photoelectron Spectroscopy)* was used to analyze the top 20 nm of stainless steel coupons treated with a phosphoric/nitric acid-based solution and coupons treated with a citric acid-based solution. These were compared to untreated coupons. Tests of the coupons included classical electrochemical characterization, water contact angle measurements, wet chemical corrosion tests, and assessment of the adhesion of protein and microorganisms to the surfaces.

Results demonstrated that treatment with the phosphoric/nitric acid-based solution on steel with 12% chromium content resulted in a 5-fold thicker passive layer than the steel treated with the citric acid based solution. Coupons treated with the phosphoric/nitric acid-based solution also showed increased hydrophobic qualities which assist the dispersal of water to reduce the adhesion of contaminants and improve drying.

10. **Methods for the determination of process chemical residues after reprocessing medical devices**
Matthias Tschoerner (Germany)

This presentation was oriented toward an audience with an advanced knowledge of chemistry.

Toxic residue (surfactants) from used detergents may remain on the surfaces of RMD after completion of the cleaning and disinfection process. These residues may present a risk to patients and staff.

A detection method was developed by combining a wide variety of measurement techniques on a Tandem Mass spectrometer, which enabled the identification of the type of surfactant used in the process chemical. This method was applied to test specimens and real life RMD. A washer disinfector was utilized to process test specimens of different materials and subjected to multiple, automated cleaning of up to 500 cycles.

Results of test data demonstrated that the limits for toxicologically acceptable residues are obtained with proper reprocessing procedures. However, instruments sampled from the field show that some exceed the limits due to insufficient rinsing.

The manufacturer of the process chemicals should define the tolerable limits for residues and provide appropriate analysis methods for determining tolerable quantities.

11. **Statistical evaluation of protein levels of test objects and real instruments after cleaning in washer-disinfectors: Results from the years 2015 - 2022**
Karen Seekamp-Schnieder (Germany)

This presentation focused on the very extensive testing of Crile clamps and a dental handpiece as test objects for washer disinfectors. 500,000 tests were performed between 2015 and 2022 in Germany.

The acceptance value (following washing) of 100 µg of residual protein per test object was originally specified in the German guidelines. After the publication (2013) of a comparative study of the residual protein levels on test objects and real instruments after cleaning, the acceptance value for successful cleaning was readjusted to ≤ 80 µg. This was published in the 4th edition of the guidelines in 2014
The validations carried out since 2015 for this study, have shown that both the use of test objects and the sampling of real instruments are important in order to evaluate the cleaning performance of washer-disinfectors and to identify insufficient cleaning processes

Day 3. Friday 18 November 2022

12. **Contributing factors on duodenoscope reprocessing and verification of interdependencies in clinical settings**
Annette Rittich (Germany)

Five iatrogenic infections resulting from duodenscopy procedures were recorded in France. The only common denominator was the long duration of the procedure and its complexity. The duodenoscope manufacture undertook a study of 182 hospitals to determine the effectiveness of flexible endoscope reprocessing. Specially qualified technicians performed on-site visits to all endoscopy departments that were using the specific duodenoscope. Staff training, reprocessing workflow, and duodenoscope condition were individually recorded. A digital tool was used to record findings and provide feedback on observed deviations from the manufacturers' reprocessing instructions. After visits, the facilities were provided with strategies to improve reprocessing.

Of the 182 hospitals visited, a total of 31% revealed medium to important non-conformities in adherence to manufacturer's reprocessing instructions. During the observation of the daily reprocessing workflow, deviations were noted in 34 of 135 essential steps. Over 50% of these deviations referred to the reprocessing of the distal end and elevator lever of the duodenoscope.
A review of the actual training of the reprocessing staff, found that only 35% were trained by the manufacturer of the duodenoscope. 59% of the reprocessing technicians had undergone internal training from peers and 6% had not received any training at all. Technicians trained by the manufacturer were most likely to follow the manufacturer's reprocessing instructions. It was also noted that damage to endoscopes was more likely to be caused by un-trained staff.
Nationwide re-training was conducted by the manufacturer. There have been no further infections.

13. **Endoscope reprocessing: retrospective analysis of 90 311 samples**
Lionel Pineau (France)

The contamination level of patient ready endoscopes published in the literature varies from 0.4% to 49.0%. It is not possible to determine an accurate level of contamination due to the small sample size and variations in culturing methodology between sites. The objective of this retrospective study was to analyse the results of 90, 311 endoscope samples collected between 2004 and 2021 in 490 hospitals in France.

The sampling and culturing methods were performed in accordance with French guidelines. During the test period, the mean ratio of endoscopes contaminated at the action level in 2021 was 12.6% and 21% at the alert level.
An annual analysis indicates that the overall microbial quality of gastroscopes, duodenoscopes and colonoscopes is improving year by year whereas a downward trend is observed for ultrasound endoscopes and bronchoscopes. The presenter advised that there was no proven link with infection levels.

14. **Assesment of novel antimicrobial materials to prevent biofilm formation in critical and semi-criticat medical devices**
William Leiva (USA)

Samples of copper impregnated PLA polymer were tested to examine their antimicrobial resistance. PLA polymer coupons were contaminated with a range of pathogenic bacteria. Test results showed a log reduction attributable to the material. The aim is to develop a material suitable for manufacture of RMD which are resistant to bacterial growth. Further research is required. The presenter advised that the polymer tested may be useful for manufacture of single use devices.

15. **Implementing an evidence based parametric load release for steam sterilisation in practice**
Anke van Rosmalen (Netherlands)

Anke presented results of a literature review demonstrating that steam composition within the chamber, cannot be determined by using pressure and temperature measurements alone. To overcome this, non condensable gas (NCG) sensors located within the steam sterilizer chamber were used to detect the presence of air during the sterilizing cycle. The use of the NCG detector provided real time evidence during each cycle.

Use of the sensor enabled parametric load release. Steam penetration and leak rate test programs at the start of the day could be eliminated, and annual validation of sterilizers could also be re-considered.

The presentation concluded that use of an NCG detector can reduce costs and is more sustainable than conventional methods because less energy, water and consumables are used.
A comment from the audience during question time suggested that the sensor detected air within the chamber as opposed to non condensable gases.

16. Effectiveness of disinfection and sterilization in laparoscopes and arthroscopes and their risk of infection: a systematic review
Sandra Patricia Rodríguez Bonilla (Colombia)

This presentation compared the use of steam sterilisation of rigid laparoscopes and arthroscopes to disinfection with gluteraldehyde. The earliest references presented from the literature review were from 1978 and the most recent 2013.

The conclusion is copied below verbatim;

It is evident that there is a lack of studies and clinical trials comparing the effectiveness of reprocessing methods of laparoscopes and arthroscopes; additionally, it is necessary to develop more research in the area, involving a rigorous methodology and participation of different areas of knowledge.

17. **Monitoring steam penetration in channeled instruments: an evidence-based worst-case for practical situations**
Francesco Tessarolo (Italy)

Effective steam sterilization of RMD requires steam penetration into narrow lumens. This study tested the hypothesis that a 70 cm tube with one closed end could be representative of the worst case for steam penetration in wrapped lumened instruments.

Infrared sensors for the measurement of water vapor at the closed end of an unwrapped 70 cm reference tube and a wrapped 50 cm test tube were compared. The open ends of the test tubes were placed inside packs to test the effects of different combinations of wrapping, load amounts, and pack positions. The worst case for steam penetration was defined as the condition showing the lowest water vapour concentration during the exposure phase.

Findings of the study on 180 test loads were that water vapor values at the closed end of 50 cm long tubes were affected by load amount, wrapping, and pack position. Steam penetration was higher for heavier loads in rigid containers, but lower for heavier loads in pouches, non-woven, and crepe wraps. In all of the tested combinations of load/wrapping, the 70 cm reference tube displayed lower water vapor values than the wrapped 50 cm test tubes. These findings demonstrate that a 70 cm is the worst case test in all combinations of load and wraps.
The study concluded that a measuring system integrating the water vapor sensor in a 70 cm tube may provide a quantitative steam penetration test for real-time monitoring of the steam sterilization process of channeled instruments.

18. **Individual surgical instrument traceability: in line with the European regulation MDR 2017/745/EU**
François Barbier (France)

François' presentation discussed the processes undertaken to uniquely identify all RMD in a French hospital. EU regulation 2017/745 requires that RMD be individually identified by 2027. The hospital had 45,000 RMD that were not uniquely marked. A laser etching machine was purchased to etch RMD that were not uniquely identified. Tags were placed on RMD that were unsuitable for etching.
The process was found to be a time-consuming activity. It has demonstrated, however, that mixing of instruments between different surgical sets occurs and there is a loss of many RMD. Unique identification allows total computerised traceability, establishment of a system for repair of broken instruments, and replacement of broken instruments.

19. **Improvement of management efficiency by verifying the expiration date of sterilized products**
Youngsook IM (Republic of Korea)

The expiry period for re-processed RMD in a Korean hospital was set at one month. Experiments were conducted utilizing cotton swabs placed in test packs to identify if the shelf life could be extended. The test packs were opened every 2 weeks and microbiologically tested. There was no growth found until week 48. In conjunction with infection control, a twelve week expiry for rigid containers and non woven wraps was instituted. Laminate and Tyvek pouches were extended from 24 to 38 weeks.

The resulting increase in shelf life reduced the re-processing of expired RMD by 82.8%.

20. **Modeling a tool for planning a new CSSD**
Olivier Willième (Belgium)

Olivier presented details of how a bespoke software program (digital twin) is used to determine the design and capacity of a new sterilizing facility in Belgium. The new facility will re-process RMD from three hospitals. Currently there are 40,000 RMD in use and over 4000 sets. 30 fte are employed to complete the work.
In order to equip the new facility correctly and to provide an efficient service, there was a need to predict the number of people, the work schedules, and the quantity of washers, and steam sterilizers to be installed. By developing a software tool (digital twin) to analyse current data, a decision support tool was created. The tool can be manipulated by changing different variables to allow the analysis of different scenarios. The most efficient can be identified and selected. For example, this tool should be able to define the best time to collect soiled medical devices for transport to the new facility. Unfortunately, the new facility will not be completed in time for the next world forum in Belgium.

Following the day's presentations, the poster award winners were announced and given their prizes. Friday concluded with the Gala dinner at Camp Nou football stadium. Home of Barcelona FC.

Day 3 Saturday 19 November

21. **Contamination and surface damage on reprocessed robotic system surgical instruments in clinical use**
Dayane de Melo Costa (Australia)

Forty DaVinci wrist instruments were inspected following their 10 use lifespan. All instruments were re-processed in accordance with the manufacturer's ifu. Samples showing a large amount of debris during optical microscopy were subjected to either Scanning Electron Microscopy (SEM), determination of protein contamination (Pierce BCA Protein Assay, Themofisher), or determination of the level of corrosion using Potassium ferricyanide III (Sigma).
Results showed debris on all instruments subjected to SEM. All of the joints tested were contaminated with residual protein, averaging 33 µg/cm2. Corrosion was detected on the outer surface of 26% of instruments.

The study concluded that as the average protein load (33 µg/cm2), was more than ten times higher than the current recommended "alert level" of ≥ 3 µg/cm2, and five times higher than the "action level" of ≥ 6.4 µg/cm2, that the re-processing of these difficult to clean RMD should be reconsidered. Single use alternatives may be necessary to maintain patient safety. It was noted that as only end of life RMD were tested it could not be assumed that contamination had occurred prior to the 10^{th} use.

22. **The impact of time and environmental conditions on contaminated instrumentation**
Terra Kremer (USA)

Terra presented research conducted on the solubility of dried soil on reusable medical devices and the chemical changes of the proteins most prevalent in blood: mucin, lysozyme and albumin.

Surrogate RMD and coupons were weighed prior to application of 0.22g of worst case test soil (modified coagulated blood) The samples were dried for various periods of time, temperature, and humidity. The samples were weighed again prior to immersion in 45°C water for one hour. The samples were dried and weighed again to measure how much soil had been removed.
The results demonstrated that drying for a period of 8 hours changes the solubility of the soil. After an 8-hour dry, the solubility decreases in water, and a significant reduction in solubility occurs after 72 hours. Temperature also contributes to the chemical changes in protein. Although there was no significant difference between 4°C and 22°C, temperatures greater than 22°C demonstrated a decrease in soil solubility in water. An increase in humidity prevented the soil from completely drying and prevented the chemical changes affecting solubility to occur.
When water evaporates from the soil, the proteins become less soluble and therefore more difficult to remove. Further investigation was conducted on the effect of cleaning agents on dried soil to reverse the reduced solubility. The dried soil was exposed to a variety of cleaning chemistries. Only alkaline cleaning agents were effective at reversing the reduced solubility after a 60-minute soak.

The results support the justification for point-of-use treatment, and provide guidance for environmental conditions and time constraints when transporting soiled surgical instrumentation.

23. **Investigation of the Release of Particles During Phacoemulsification Procedures**
Sulisti Holmes (Scotland)

Sulisti energetically outlined how deposits emanating from phacoemulsification handpieces during surgery, were investigated, identified, and eliminated in a Scottish hospital. Inspired by Jackie Chan, Sulisti detailed how the investigation met with and overcame constant obstacles and pitfalls.
Five patients were adversely impacted by the deposits, one of whom lost their sight. As is often the case, CSSD re-processing was considered the likely source of the contamination. The supplier was contacted to investigate the CSSD re-processing. Changes were recommended but did not result in improvements. Deposits continued, resulting in disruptions and delays in service. Surgeons collected the deposits for examination to help identify the source. Analysis of these samples indicated the presence of acrylates, cellulose, polypeptide, polycarbonate, inorganic compounds and polyethylene polymers. The spectra were matched with those of protein, packaging, gowning materials, gallipots and components in the sterile consumable pack. It was thought that contamination was occurring from consumables used during the procedure. A web search, however, identified similar issues occurring in other hospitals from use of the plastic wrench used to tighten the phaco tip and from the tip cover. This information was referred to the

supplier who later revealed that manufacturing processes had been revised to ensure effective cleaning of these consumables prior to packing.
The investigation took five years to identify the cause.

24. **Sustainable development in sterilization departments**
Mayra Samara Ordoñez Diaz

Mayra focused on sustainable healthcare. The health sector is responsible for a significant percentage of global Carbon emissions. The USA contributes 27% of overall emissions. 8-10% of these are from healthcare.
Sources of emissions were identified. A study (Mhlaba et al:2015) noted that the quantity of RMD used during a surgical procedure ranged between 13% and 22% of the RMD sterilized for the case.
Mayra suggested a few ways of reducing waste.

25. **Safety within the RUMED. Debunking myths**
Mercedes García-Haro

Work Health and safety (WHS) presentation identifying that CSSDs are dangerous places to work, but generally have a low incidence of work place injury. This results from surveillance, identifying the risks and taking steps to eliminate them

Following the conclusion of presentations, the awards for the Green CSSD were presented. The closing ceremony followed with a hand over to Belgium for 2023.

A few comments:
There were no conference bags full of trade leaflets, pens, programs and note pads supplied. This was OK if you don't want the extra baggage to carry around. Although the program was available on line, a pad and pen would have been useful for note taking.
Delegates were provided with a water bottle.

Lunches were provided in polypropylene bags each day. Most of these, along with the plastic packaging for sandwiches and salads ended up in the bins. Not a message consistent with the Green CSSD theme for the conference.
Overall, the conference presentations were informative, relevant, and thought provoking. The standard of the presentations was very high.
Of note among the trade displays was a bench top H2O2 steriliser and a dedicated LTSF sterilizer.

The author would like to thank SRACA WA and FSRACA for support to attend this conference

Sight seeing. Saturday afternoon.


Casa Battlo


Park Guel

Placa De Espana

Casa Perdona

David Nash. December 2022