IT’S NOT JUST STEAM!

Although sterilzers have been here for what has seemed forever, there are still some common misconceptions to the different types of steam sterilization cycles within healthcare practices.

The most commonly used are gravity displacement (N Cycle) and then pre & post-vacuum sterilizers (B & S Cycle). Until recently, gravity displacement sterilizers have constituted the majority of sterilizers owned and used in the practice.

However to appreciate the advantages that the vacuum sterilizer with pre & post-vacuum cycles may bring to the practice in comparison to the gravity displacement models, it is necessary to have an understanding of the basic principles of steam sterilization together with how gravity displacement and pre/post vacuum sterilizers operate. Although relatively new to some practices, vacuum sterilizers with large chamber sizes have been used routinely in hospitals for many years and the important advantages are explained later in this article.

Benchtop sterilizer, N, S and B Cycle terminology is taken from the European Standard EN13060 for small steam sterilizers, which list the requirements of the machine and then the manufacturer will classify it accordingly.

Sterilization is similar for all cycle types where to kill microorganisms, steam must directly contact each instrument or load to being sterilized, at a required temperature and pressure for a specified time. Steam is generated traditionally by heating water in the chamber or more recently via a separate generator that can have the advantage of removing precious minutes from cycle times. Moist heat forms from the steam that fills the sterilizer chamber. Cooler air from the chamber and load is evacuated via an escape valve, the operation is either through electrical switching or more commonly by using a microprocessor that controls precisely the pressure and temperature. With steam sterilization, the agent responsible for killing microorganisms is heat, not pressure.

(N Cycle) gravity displacement sterilizers still form the majority of benchtop sterilizers currently in use by a healthcare practice and usually generates steam within the chamber.

Steam enters the sterilizer, and because the steam is lighter than air, unsaturated air is evacuated from the chamber through the drain or escape valve. During this process, cool air pockets can form within the chamber, resulting in incomplete steam penetration for porous or hollow items. But also, because these air pockets do not reach the required temperatures for sterilization, a sterilization failure may occur that might not be detected via routine monitoring by the sterilizer instruments.

In contrast, pre/post vacuum sterilizers (B/S Cycle) are fitted with a powerful pump that creates a vacuum in the chamber to ensure air is removed from the sterilizing chamber before and during the steam raising stage. Compared to gravity displacement, this procedure allows more thorough and complete steam penetration throughout the entire load, which may have complex and narrow lumens such as in dental handpieces.

In addition to ensuring complete steam penetration of the load, instruments within packs that are processed, when the sterilizing period is complete, the vacuum pump combined with heat within the chamber removes moisture and produces dry instrument packs.

This feature is desirable for two reasons:

Firstly, at the end of the sterilization cycle wet instrument, plastics and paper sealed pouches are a common occurrence with gravity displacement (N Cycle) steam sterilizers. If wet packages are handled before drying, bacteria from hands, airborne droplets, dust, or contaminated surfaces that contact the wet pack, can lead to recontamination of the packages. Additionally, wet packs can be torn or punctured easily, meaning you have to start the process all over again! The second and often overlooked benefit of a post vacuum drying cycle, relates to corrosion. A sterilizer with no post vacuum stage, instruments removed will be wet at the end of a cycle, carbon steel and other metals used in the manufacture of instruments and handpieces may be affected by corrosion.

Secondly, If a vacuum drying cycle is not available, another method for drying instruments is suggested, using a lint free dry cloth and then packing immediately afterwards, however this could raise other issues of handling and importantly it will not be possible to ensure dryness within the internal workings of handpieces or between joints, hinges and other inaccessible areas. This could lead to poor performance, costly repairs and reduced lifespan or instruments.

The move in parts of the UK to accept bagging after sterilization with an N cycle machine throws many potential problems into the already confused situation. N cycle or displacement machines by their very nature do not dry sufficient for bagging therefore the need to physically dry may be acceptable perhaps externally, but moisture is certain to be found within complex passages of hollow instruments, such as dental handpieces.

So whilst steam is an essential element in sterilization, removing any condense and residual moisture is not only desirable in aiding infection control but could also lower your instrument repair bills and greatly extend the life of the practice instruments.