White Paper

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For A-Dec/HMH

Title – To come after first draft review.

Executive Summary

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Introduction

In recent years, the dental industry and the media have given a lot of attention to the problem of bacterial contamination of dental unit water lines. Despite advances in awareness and the introduction of many new products, the problem is an ongoing one that requires active attention on the part of the dental practitioner. Doctors and hygienists need to be conscious of the decisions that are made in terms of controlling water line contamination and maintaining equipment. The issue is complex and the risks are severe. Since regulatory enforcement is not stringent, it becomes easy to ignore or under-treat.

At A-dec, we are trying to improve on what is available in dentistry for maintaining an aseptic environment by offering simple and robust solutions to this complex problem. One of the largest dental equipment manufacturers in the world, A-dec is a family-owned, privately held company that has been in continuous operation since 1964. A-dec's primary focus is to create equipment innovations that help doctors perform healthier, more efficient dentistry--a mission the company has adhered to since it began over 35 years ago. We are always looking for ways to incorporate infection control technologies into our products, and we are devoted to protecting the health of you, your staff and your patients.

This white paper is intended to help increase awareness of the issues of water contamination in dentistry. It discusses causes, risks and approaches to treating water contamination in dental unit water lines.

The problem of contamination in dental unit water lines (DUWL)

Water is used in dentistry for many purposes, including irrigating the oral cavity and cooling instruments. One might assume that water in a medical setting such as a dentist's office would be more pure than water in other settings.

There is far more bacteria in dental unit water lines than in drinking water.
Many studies have shown that DUWS often deliver water that is of poor microbiological quality and that would fail to meet U.S. or E.U. guidelines for drinking water standards. In the U.S., the Safe Drinking Water Act of 1999 set a standard for non-coliform bacteria in drinking and recreational water at 500 colony-forming units per millileter (CFU/ml), a level that is matched by current recommendations from the American Dental Association and the U.S. Center for Disease Control. In Europe, the number of bacteria present in potable water in Europe is regulated by the European Union, and should be less than 100 CFU/ml.

In the U.S., microbial counts cultured from the water for air-water syringes and dental hand-pieces untreated systems often exceed 1,000 CFU/ml. Counts ranging between 10,000 and 100,000 CFU/ml may be commonplace. [1] In Europe, a survey in 2000 by the UK Health Protection Agency to assess the microbiology of dental unit water systems in seven European countries found that water supplied by 51% of the dental units exceeded recommended bacterial contamination levels.[2]

It's not hard to understand how the contamination comes about. Bacteria enters the system in one of three ways. Whether a practice uses municipal or bottled water, some microbes are present in the water coming in. Another source of contamination is from within the dental unit itself, since no manufacturer produces or delivers dental units in a sterile environment. Finally, microbes can enter at the outlet end when hand pieces are taken off and replaced, or when syringes, or syringe tips are changed; airborne or other forms of contact can potentially contaminate surfaces that in turn could lead to contaminating the water system.

The biggest source of contamination is from the water source. About __% of practices in the U.S. rely on tap water as their primary source of water. While potable water in the U.S. is delivered to the tap free of pathogens, it is not sterile. Many dentists believe they have a sterile dental line because they avoid the use of tap water, and use only water that has been deionized or distilled. However, evidence shows that even such "sterile" water will eventually become colonized to the same extent as tap water. [3]

Although the bacterial numbers that enter a water system are typically low, they are still significant enough to potentially cause a problem if untreated. Where conditions are favorable, the bacteria will increase in numbers and attach to surfaces to form what is known as biofilm, or "slime" on the surfaces of equipment tubing.

Biofilms are living and growing entities that act as havens for pathogens. They grow as organized communities of microbial cells on surfaces such as teeth, catheters, heart valves and contact lenses. In dentistry, several features of DUWS may encourage the growth of biofilm. The narrow-bore tubing typically used is composed of polyurethane and polyvinylchloride (PVC). This is a good substrate for biofilm formation because of the hardeners and additives that can be used by the bacteria as nutrient sources. Once cells dock at a surface, they quickly grow and form a microcolony.

Other factors are also at work in biofilm formation. Fluids moving through narrow-bore tubing assume a hydrodynamic pattern known as laminar flow. Close to the tubing surface, frictional forces actually slow down the movement of fluids until flow at the surface is stabilized. This creates an environment where microorganisms can flourish with minimal risk of being dislodged.[4] On top of that, narrow-bore tubing presents a very large ratio of surface area to volume (6:1) which encourages biofilm formation. Finally, in DUWS water will be stagnant for the most of the time – that is, during the day, overnight and at weekends - providing favorable conditions for the proliferation of bacteria. Even during periods of regular use, stagnation can cause a problem as most units are designed with several dead-ends and nooks and crannies where water can pool or sit.

Water from dental unit water lines contains opportunistic pathogens.
In addition to containing high numbers of microorganisms, a wide variety of bacteria, protozoa and fungi have been recovered from DUWS. Most of the organisms are gram-negative non-coliform water bacteria with limited pathogenic potential in healthy people. However, opportunistic pathogens such as *Legionella pneumophila, Mycobaterium spp., Pseudomonas aeruginosa and Candid spp.* have also been isolated from DUWS.[5] Such pathogens may pose a risk, especially to patients with compromised immune systems. There is also evidence of occupational exposure of dental personnel to *Legionella* species.

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[1] CH Miller, "Microbes in dental unit water", Journal of California Dental Association, 1996:24(1):47.
[2] Walker, Bradshaw er et al. 2000, "Microbial biofilm formation and contamination of dental unit water systems in general dental practice." Applied and Environmental Microbiology 66, 3363.
[3] Ibid.
[4] Shannon E. Mills, "The Dental Unit Water line Controversy," Journal of the American Dental Association, Vol 131, October 2000, 1427.
[5] Walker and Marsh, "A review of biofilms and their role in microbial contamination of dental unit water systems," International Biodeterioration and Biodegradation 54 (2004) 87-89.

Only a few infections have been directly traced to exposure of water from DUWS, including post-operative infection of two dental patients and the death of a dentist after contracting Legionairres' disease. However, underreporting is probably at play as it is very difficult for individuals to correlate infection with a visit to their dentist.

As water line and handpiece anti-retraction equipment can malfunction, there is the potential for retraction of large numbers of microorganisms from a DUWS into the water supply during periods of water pressure fluctuations.

The importance of taking action.
This issue must be viewed as a public health concern. Regardless of the total microbial loading, the type of system used and the quality of the source water, the DUWS could still discharge opportunistic pathogens to the unsuspecting dental practitioner or their patients. To reduce the potential health impact of DUWS contamination, dentists must practice due diligence by taking steps to reduce the microbial load in their dental water and to control the biofilm cells that line the tubing of their equipment.

Strengths and weaknesses of current approaches

In 1995, the American Dental Association Board of Trustees adopted a statement on dental unit water lines directing industry and the research community to take an "ambitious and aggressive course" to ensure the deliver of quality treatment water to patients.[6] In subsequent years, many different approaches have been pursued by industry and research that address the biofilm issue with some measure of success. These approaches vary greatly in their effectiveness for controlling contamination of water lines by microbes, as well as in their cost, ease of use, level of maintenance required and other factors. In order to construct a more effective solution, it is worthwhile to understand how each current approach works, its strengths and its drawbacks.

Chemical treatments.

The most extensive group of products used today to treat dental unit water lines is the chemical family. Approximately XXX% of all practices in North America use either periodic or continuous chemical treatments. The figure is closer to XXX% in Europe.

- **Periodic chemical treatments "shock treatments".**

One method commonly used is to periodically "shock" the water with an aggressive chemical designed to destroy any organisms that may be attempting to colonize the internal surfaces of the water system.

Periodic chemical products are indeed effective at killing bacteria in water lines, and can be effective in removing established biofilm. Anti-microbial agents such as bleach, glutaraldehyde, iodophors, chlorhexidine and essential oil mouth rinses can lower the levels of bacterial and viral contamination of the water delivered to patients. But there are several drawbacks to this approach. First of all, not all of these chemicals are safe - some of them are potentially toxic.[7] MORE?

Secondly, periodic chemical treatments provide no residual protection to the water line. While they may be effective at wiping out any organisms in the water line at the time they are administered, they do not protect the water line from re-contamination. The quality of the water coming out of the unit will at best be no better than the quality that is supplied when the bottle is filled with water for daily use. As time passes before the next treatment, the quality can only deteriorate.

This approach is dependent upon strict adherence to a very time-consuming protocol with a lot of cumbersome steps. Dental staff typically have to mix the chemical, operate the water lines to introduce it, and then after a certain period – anywhere from a minute to overnight - come back again remove all of the chemical. Then they must put in fresh water. Not only can't the equipment be used for patient treatment while this is going on, but each step provides an opportunity for errors to occur -- such as staff forgetting to run the chemical through one of the water lines, or forgetting to purge it out completely. If one syringe is overlooked when introducing the chemical, it will not be treated.

[6] American Dental Association Statement on Dental Unit Water lines, 1995.
[7] Journal of Clinical Dentistry 15:17, 2004.

Finally, these chemicals are generally quite aggressive, and often incompatible with dental equipment materials. They can cause corrosion or other equipment damage such as corrosion if the protocol is not rigorously followed.

- **Continuous chemical treatment.**

With this approach, chemicals are continuously present at low dilutions in the dental unit water during normal daily use. In the U.S., the chemicals are typically mixed manually, while in Europe they are more often metered into the water from a supply tank. The effectiveness of this approach varies according to the specific chemicals involved, but because they can be potentially ingested, or inhaled as aerosols, the chemicals must be much less aggressive than the previous category.

While this approach is generally convenient and inexpensive, a major drawback stems from the fact that very low levels of active agents are used. Resistant strains of bacteria may be able to withstand the treatment, especially if the product contains only a single active agent, and form a biofilm.

Finally, there can be a problem of incompatibility between these products and the materials used in dental procedures. Since the chemicals are continuously present in the treatment water, they come into contact with the oral cavity and teeth. Some chemicals have been found to decrease the adhesion of resins to both enamel and dentin, hence restoration fillings may fail prematurely. [8]

Microfilters.

This approach involves using microfilters, or small cartridge filters at the point of use, such as near the end of each water line where the water exits the dental unit. They are designed to trap anything larger than 0.2 microns, which includes bacteria and protozoa.

Microfilters are highly reliable at trapping bacteria. However, they provide no protection to water after it passes downstream. This leaves the downstream lines prone to contamination, which is why the filters are generally placed as close as possible to the outlets.

What's more, the potential exists for micro-organisms to gradually grow through the filter membrane, through the very same tiny holes that allow water to flow through. Because of this, a 1995 position statement from the American Dental Association declared that filtration alone was not a complete solution.

The microfilters need to be changed every one to five days, depending on the model, in order to address the "grow-through" risk as well as the risk that other fine matter in the water could clog them. Since microfilters are placed on each and every one of the tubing outlets, with up to XXX tubing outlets in the average dental water unit, maintenance can be very costly as well as inconvenient and time-consuming for staff. The sterility of the inlets and outlets of the filters must be preserved as they are being swapped out, or re-contamination can occur.

Finally, the presence of a microfilter, especially on handpiece lines, can present an impediment to good dexterity.

Ultra-violet devices.

Certain wavelenths of ultra-violet light are known to inactivate bacteria so that they are unable to replicate. Some dental equipment makes use of ultraviolet light devices that are mounted near the water input to a dental unit. As water passes through the device, ultraviolet light streams through and inactivates the microbes.

While these devices are more convenient that other approaches, their effectiveness can be poor. Like microfilters, ultraviolet devices do not provide any residual protection once the water passes through the light, leaving ample opportunity for the water to become re-contaminated. Since these devices are typically situated far from the water outlets, the problem is compounded. In addition, depending on the device design and the water flow rate, it is possible that insufficient exposure time may allow some organisms to pass through. There is also a risk that power or the bulb will fail or that turbidity or mineral deposits will reduce the light intensity that actually reaches the bacteria.

Ozone generators.

[8] Walker and Marsh, "A review of biofilms and their role in microbial contamination of dental unit water systems," International Biodeterioration and Biodegradation 54 (2004) 87-98.

Ozone generators produce ozone that is either bubbled or injected into the water. Ozone is a powerful oxidizer; however, the amounts of ozone that are typically dissolved into the water are typically nearly negligible, reducing this method's effectiveness at killing bacteria.

Convenience is also an issue. The pressurized water reservoir used in this device is very cumbersome to remove and install. It's noisy, due to constant bubbling. What's more, obstructed water flow can result as ozone bubbles get trapped behind narrow passages such as flow adjust valves. What's more, these solutions can be very expensive both for start up as well as for replacement components.

Silver-based devices.

Relative newcomers to the industry, some water treatment products introduce silver ions into the dental unit water. Silver is known to be a powerful antimicrobial. But silver is slow to kill by itself, requiring up to several hours to be effective. In components with a high flow rate, such as a syringe, there may be very minimal time - perhaps even seconds - that the water is in contact with the silver, which may be inadequate for reducing bacteria counts to an acceptable level.

Another concern with silver devices is that the release is silver ions is typically not well controlled, so that the amount of silver in the water could be inadequately low or very high, depending on the water chemistry and the flow rate of the water as it passes through the device that administers the silver. Silver-based devices are also generally expensive to install and to operate.

Anti-microbial materials.

Some devices rely on anti-microbial materials on their surface that are intended to prevent bacteria from colonizing and forming the bio-film. While this can be a useful approach, by themselves these materials are slow to control organisms that are already in the source water. In addition, given enough time, deposits or other agents can form and dissolve into the water. These deposits can interfere with the process of bacteria reaching the anti-microbial surface, and give an opportunity for bio-film to grow and contamination to occur.

The problem of imbalanced performance.

Each of these solutions has certain advantages, but each also has significant drawbacks in one or more areas: effectiveness for controlling contamination of water lines by microbes, convenience, cost, and other factors. No solution by itself exhibits an optimal balance in all of these areas. But by examining all the different approaches, one can determine the best opportunities for improvement and start to define an ideal solution.

Defining an ideal solution

While no system on the market today can be regarded as perfect, we can at least learn from them and posit what an ideal one would look like. At A-dec, we spent several years evaluating the current approaches, and defining the elements of an ideal solution.

An ideal solution would be safe, effective and robust.

When considering what would make up an ideal solution for controlling microbial contamination in DUWL, one must consider many factors. Is the solution safe for patients, staff and the environment? How effective is it? Does the solution offer long-lasting residual protection? Can it withstand varying degrees of water quality? Does the solution's design avoid creating standing water?

Is the solution robust when it comes to protocol errors? If, for instance, an operator forgets to flush a line one day or perform other scheduled maintenance, could the error lead to bio-film contamination? Were contamination to occur, could the system recover? These are only some issues to consider.

First and foremost, an ideal solution would maintain the safety of the patient as well as the operators of the equipment and the environment. Clearly, it would meet the requirements of local regulatory bodies such as the federal Food and Drug Administration or the Environmental Protection Agency. And of course it would effectively control microbial contamination throughout the dental unit water line.

An ideal solution would be effective and robust. It would provide long-lasting residual protection, tolerate a reasonable degree of human errors in protocol, and have some means by which it could recover automatically if contamination were to occur. It would tolerate varying degrees of water quality. And it would be designed so that water has no place in the system where it could stagnate.

It would be convenient and compatible with dental procedures.

An ideal solution would have no adverse effects on adhesive dental procedures should the prepared enamel and dentin surfaces be exposed to the solution. It would also be easy to use, would not impede the doctor or hygienist, and would not damage the equipment. It would be quick, require little downtime, and have no affect on the taste or odor of water. It would work with either municipal or bottled water sources, and be compatible with flushing recommendations.

An ideal solution would also be compatible with the use of warm water. Many infection control experts have advised against using warm water because the higher temperature can accelerate the rate at which bacteria proliferate. But patients generally prefer warm water when a sensitive tooth is being treated. Doctors and hygienists prefer it as well.

It would be cost-effective and balanced.

Millions are spent each year by dental practices on water sterilization products, including start-up costs, ongoing maintenance costs, and operating costs. Solutions vary widely in price, raging from $147 to $1,200 a year, according to a recent study by Clinical Research Associates (CORRECT?). There tends to be a trade-off between price and performance – the lower the cost, the less effective.

An ideal solution would satisfy all the conditions above at a reasonably low price point for startup, maintenance and operating costs. Unlike current solutions, which perform well in some areas and not well in others, an ideal solution would balance all performance factors together cost-effectively.

The A-dec approach

With no optimal solution in sight, A-dec decided to develop its own multi-pronged approach that draws upon the strengths and lessons learned from other methods. From the water system to the control block to the water line itself, A-dec has considered all aspects of product design, materials and impact on patients as well as staff with an eye towards developing products that responsibly address the problem of contamination of dental unit water lines with convenient and affordable solutions.

The A-dec approach is founded on a self-contained water system that provides effective continuous treatment through daily use of a chemical tablet. It also uses antimicrobial materials in all tubing surfaces that have water contact, and a redesigned control block that resolves several issues related to water stagnation.

The A-Dec Self-Contained Water System (SCWS)

Self contained water systems were developed in XXX by XXX to help control water quality. A-dec introduced its first self contained water system in 1994.

The concept of a self-contained water system – a bottle, in other words - is simple, but profoundly important from an infection control perspective. For one thing, these give dentists the ability to control the water source and to isolate dental equipment from the municipal water supply. The American Dental Association underscored the importance of this in a 2004 statement: "The ADA urges industry to continue to ensure that all dental units manufactured and marketed in the U.S.A. in the future have the capability to be equipped with a separate water reservoir independent of the public water supply. In this way, dentists not only will have better control over the quality of the source water used in patient care, but also will be able to avoid interruptions in dental care when "boil water" notices are issued by local health authorities."[9]

These systems also provide a simple means by which a chemical agent can be introduced to eradicate any contamination or bio-film that might be present. While swamp water cannot be turned into spring water, with a self-contained water system, the water source can at least be easily monitored and treated.

Finally, self-contained water systems eliminate the need for a backflow prevention device. Backflow prevention devices are required for city plumbed systems. They're intended to protect the municipal

[9] American Dental Association Statement on Dental Unit Water lines, 2004.

water supply from the possibility of contaminants being sucked back into the system, for instance in the advent of a water main break and sudden change in pressure. With a self contained water system, that expense and maintenance is avoided.

The latest version of A-dec's self-contained water system is a 2 litre bottle for use with the A-Dec 500 control block. This newly designed bottle reinforces infection control by using AlphaSan on its inner surface, an anti-microbial material that helps protect against the colonization of micro-organisms. (See below for more information on AlphaSan.)

Commented [jb1]: Correct?

The A-dec SCWS is practical, simple to use and easy to maintain. The bottle has a quick-disconnect mechanism that makes it is easy to remove and insert on the dental unit. And it has a pickup tube, which acts is like a straw that sucks water from the bottle and pushes it up into the tubing. The pickup tube is contained within the bottle, so that it is not left exposed when the bottle is removed, minimizing the possibility of inadvertent contamination while the bottle is off.

The bottles have specifically been designed for flexibility. They can be filled in a sink in the cabinet or elsewhere. They can be adapted to a variety of operatory configurations that allow for retrofitting, including mounted in remote locations away from the dental chair.

Continuous Water Treatment: the A-dec ICX tablet

Working hand-in-hand with the A-dec SCWS, the A-dec ICX tablet is an effervescent water tablet designed to continuously treat dental water. It's added each time the bottle is refilled, rather than as a "shock treatment". It is a simple, safe and effective solution that transcends the limitations of this category, including the development of resistant strains and incompatibility with bonding to dentin.

The A-dec ICX is formulated with three carefully selected active ingredients. The first is sodium percarbonate, which is simply a dry means for delivering hydrogen peroxide. When sodium percarbonate dissolves, it releases hydrogen peroxide into the water, which is an oxidizer that quickly destroys bacteria in the source water. It remains in the water as it flows through the system, continuing to destroy microorganisms as they are encountered. However, because of its rapid activity, it can't be relied upon to remain for extended periods of time.

That's where the next active ingredient comes in: silver nitrate. The history of silver as a pharmaceutical agent has been described in historical literature from as long ago as 1000BC. Today, silver is used in a variety of forms of medicinal treatment. For example, silver nitrate and silver sulphadiazine are used as topical treatments for wounds, especially in burn therapy. In addition, many medical applications, including catheters, wound care devices and implanted material are treated with silver to reduce the risk of infection. These many examples serve to highlight both the safety and proven efficacy of its antimicrobial nature.

Silver is a reliable, broad spectrum antimicrobial. The silver ions essentially interfere with the organisms' metabolism, preventing them from reproducing on the surface of the tubing. But silver works very slowly. The percarbonate provides a more rapid kill; silver is there for the long haul to provide long-lasting residual protection when water sits in the lines overnight, over the weekend or longer. To assure lasting residual protection, the ICX tablets also contain quaternary ammonium compounds. These antibacterial surfectants tend to attach to the tubing walls, imparting antibacterial protection where it's most needed.

Since the product contains not one or two but three active ingredients, it effectively reduces the risk that resistant strains of bacteria will develop. The combined amount of the three active ingredients is less than 5 parts per million in solution. To put that in perspective, municipalities add about 2 to 4 parts per million of chlorine to drinking water when it leaves the treatment facility.

The A-dec SCWS has been found to be effective in multiple independent reviews. For instance, a study done by the University of Maryland at Baltimore Dental School found that the A-dec ICX is effective in maintaining the level of organisms in the water within the level recommended for potable water by the American Dental Association and the Center for Disease Control of < 500 CFU/ml ."[10] The ICX tablet has lasting residual effects that remain active during periods of equipment non-use lasting for up to two weeks.

[10] Journal of Clinical Dentistry, 15:17, 2004.

Research on the ICX tablet has found it to be compatible with restorative dental materials and dental hard tissues. A University of Maryland Dental School study demonstrated that exposure of an etched dentin surface to an ICX treatment mixture has no adverse effects on subsequent adhesion strength.[11]

Finally, the ICX tablet is simple to use and cost-effective. As an effervescent tablet, it's a pre-measured dose with no mixing required. Purging water lines at night is no longer necessary. The product is compatible with either municipal water or bottled water and has a long, stable shelf life. It is cost-effective, because it doesn't require plumbing changes or any mechanical intervention, or require any modification of the dental system itself.

Use of an anti-microbial agent in the dental unit water line construction

Another important aspect of A-dec's strategy for preventing contamination in dental water units is that all of the inner tubing in A-dec products that come into contact with water has been constructed with an antimicrobial additive called AlphaSan. (true?)

AlphaSan antimicrobial additive is a ceramic resin that contains silver, whose antimicrobial properties were discussed above. The silver is essentially captured by an ion exchange media, which means that it is not lost into the water system – it stays on the tubing surface for the life of the product.

A flow-through control block: the A-dec 500 Series delivery system

With A-dec's newest control block, the A-dec 500 system, the water delivery system has been re-designed to eliminate dead end passages and branched tubing connections, minimizing the potential for water to stagnate. In addition, the water lines have been shortened, reducing the water line surface area.

These design changes improve water quality and make it simpler to maintain the delivery system. With less stagnant water and less water line surface area, there is consequently less opportunity for organisms to attach and grow biofilm. "Shock treatments" of the water line system need to be done less often, and the entire system is more efficient. This flow-through technology is available on any A-dec 500 series delivery system, whether it is wall-mounted, chair-mounted, or cabinet-mounted.

Beyond the dental unit water line

A-dec's devotion to promoting infection control in dentistry is not limited to the dental unit water line. A-dec's goal is to be a leader in improving the entire cleaning cycle for dentistry, including cleaning of instruments and supplies, sterilization of instruments and supplies, and the sterilization and maintenance of handpieces. We've introduced a number of products recently that have made significant progress towards that goal.

One-stop cleaning and sterilization: the A-dec ICC Sterilization Center

The Preference ICC Sterilization Center is a complete cabinet system designed to help simplify the sterilization protocols. It is designed to closely follow the phases of sterilization: related steps are grouped together to promote a consistent, accurate, and intuitive sterilization process. Its cabinetry is specifically designed for use in dental practices, with proper routing for drains, water supplies and power supplies. The outcome is a safer, more efficient environment. The ICC includes several different optional module:

- **Cleaning of instruments and supplies.**

A-dec has partnered with Miele, Inc. to supply the dental office with medical grade washer/disinfectant systems. The Miele G 7881 Dental Washer Disinfector is designed for efficient cleaning and thermal disinfection of dental instruments and supplies such as trays and bottles. The unit cleans and disinfects instruments with a high-temperature cycle rather than a chemical bath. The system allows a dental office to bypass many manual steps that were once required to clean instruments. The fully automated system eliminates the need for pre-soaking, hand scrubbing, rinsing and drying, making instruments ready for sterilization more quickly and safely.

[11] Journal of Clinical Dentistry, 15:28.

- **Sterilization of supplies and instruments.**

Any instrument or supply that will be going into a patient's oral cavity requires sterilization after being put into a sealable pouch or wrapped and taped. One of the most prevalent ways for sterilizing instruments in dentists' offices is by way of steam autoclaves, also called steam sterilizers.

A drawback of traditional steam sterilizers is that the steam has a difficult time penetrating inside all the hollow passages in instruments and other nooks and crannies, because air is present inside. The smaller and longer the internal channels are, the more difficult it is for steam sterilisation to effectively sterilize the instruments.

A-dec has partnered with W & H to offer the Lisa Water Steam Sterilizer. The Lisa is a class B sterilizer that has a free vacuum cycle in which the air inside of the sterilization chamber is sucked out. This makes it possible for steam to rush in and more effectively penetrate all of the narrow internal passages and hollow spaces of instruments.

In addition, the Lisa has a post-vacuum cycle that helps to more quickly dry the instruments, which leads to reduced corrosion as well as a faster ability to handle the instruments safely. If the instruments and supplies are handled when wet, then contaminants could be carried by way of that moisture through the walls of the packaging and reach them. By drying them effectively and quickly, that risk is removed. What's more, the Lisa cycle time is far much shorter than conventional steam autoclaves, returning sterilized equipment for use more quickly.

- **Sterilization and maintenance of dental handpieces.**

Two steps are involved in sterilizing and maintaining air turbine handpieces: first is cleaning the internal passages, and second is lubricating the handpiece. Consistent lubrication is important - if a handpiece is overlubricated, the lubricant could get onto the exterior of the hand piece, preventing sterilization. It could also potentially make its way onto a tooth and compromise a dentin bond.

A-dec's Assistina 301 Plus maintenance system combines and automates the cleaning and lubrication processes. Once a handpiece is placed into it, you simply press a button and start a very short cycle. The Assistina first flushes a prescribed amount of alcohol through the handpiece, and then follows it with a prescribed amount of the lubricant. This provides consistency both in cleaning and lubrication, which helps maintain sterilization and extend equipment life.

Conclusion

To come after first draft review.