

INFECTION CONTROL GUIDE TO CARE OF INHALATION SEDATION FLOWMETERS AND SCAVENGER BREATHING SYSTEM COMPONENTS

Infection Control procedures for use and care of this type of equipment are frequently misunderstood and the intention of this article is to guide and assist with provision of a suitable Infection Control Protocol.

Section 1. Inhalation Sedation Flowmeters

As defined in 'A Conscious Decision' published by the Department of Health in 2003 the section for Equipment for Conscious Sedation states:

"Of the various reports since 1967, the Poswillo Report made the most specific recommendation for the equipment and drugs which dental practices should have to support the practice of sedation. This included the availability and use of dedicated inhalational sedation machines capable of delivering a fixed maximum level of nitrous oxide and a fixed minimum level of oxygen when providing relative analgesia (a particular sedation technique using inhalation); the use of indwelling cannulae for intravenous sedation; and additional equipment for the resuscitation of patients who had received sedation. It is essential that all machines used for conscious sedation meet the above guidelines bearing in mind the potential for general anaesthetic machines to be used for conscious sedation. The Group recommends that all Inhalation Sedation machines should be regularly maintained and equipped to the British or European Standard applicable at the time of their purchase." (ref 1)

The most commonly found types of Inhalation Sedation Flowmeters are currently:

Matrx Analogue MDM (also referred to as Quantiflex)
Quantiflex Mark II (currently in process of being withdrawn)
Matrx Digital MDM
Porter C3000 MXR
McKesson Mc1
Accutron Ultra & Digital Ultra

These are all dedicated Inhalation Sedation machines. Units still in production are:

MDM / DMDM / C3000 MXR – all manufactured by Porter Instruments Inc, USA
McKesson Mc1 – manufactured by McKesson/Cestradent, UK
Ultra / Newport/ Digital Ultra – manufactured by Accutron Inc, USA

All these units have dedicated one-way valving on the fresh gas outlets. These valves also incorporate bag tees which direct some of the titrated gas flow into a reservoir bag. In units which are correctly maintained, this valving is preserved and effectively means that the inside of the IS unit and bag will never become contaminated by human breath. This protection is usually assisted by the breathing system used to deliver titrated gas mix to the patient. By the same token, use of bacterial filters, as used with G A circuits – is not necessary or desirable.

External Cleaning

External cleaning of the flowmeter body varies according to Manufacturer/type; the Matrix MDM and DMDM/ Ultra & Digital Ultra can be wiped over externally by using a germicide containing glutaraldehyde, following the manufacturer's directions for use. Care must be taken with the touch screen face of the DMDM and Digital Ultra - alternatively a disposable barrier shield can be used. In the case of the C3000 MXR, the recommendation is to use an approved disinfectant for the dental environment – again, following the disinfectant manufacturer's directions (and cautions) for use. Similar procedures would be recommended for other types of flowmeter. The Digital Ultra, DMDM and C3000 MXR are part of the 'new generation' of sedation flowmeters designed with infection control in mind.

The use of clinical E-cloths may be employed to remove surface dirt and contamination. These should be colour coded, damp with no excess moisture in the cloth and used by gently wiping over the flowmeter and associated mounting i.e. mobile 4 cylinder stand.

Never spray onto the flowmeter itself and then wipe. Dip the cloth in warm water and wring out thoroughly before applying to the equipment. Further guidelines on use of these cloths can be found in The Revised Healthcare Cleaning Manual (Ref 2) and also: An Integrated Approach to Hospital Cleaning: microfibre cloth & steam cleaning technology. Department of Health
Please note: Flowmeters must never be immersed in liquid. If this happens, please quarantine and contact the service provider.

If using pre-moistened wipes such as Clinell or Septakam for example, great care must be taken. These wipes are normally quite moist with excess liquid. The wipe, once extracted from the container, must be squeezed to remove any excess moisture. Only then should it be applied to the flowmeter – with care, avoiding any obvious open areas. This is to prevent moisture seeping into the interior of the flowmeter and causing damage. The flowmeter will only become contaminated by aerosol spray and operator gloves and therefore does not require stringent cleaning.

Reservoir bags:

Reservoir bags are usually composed of a grey non-latex material. These are protected from internal contamination by the non-return valving of the flowmeter outlet. If required, they can be externally cleaned with a mild detergent such as Tri-Sodium Phosphate or a neutral liquid soap. The product can also be autoclaved providing the maximum temperature does not exceed 137 degrees Celsius. Lower sterilisation temperature will extend product life. It is not necessary to change the reservoir bag between patients or use disposable bags (green).

Section 2. Scavenger Breathing Systems

Cleaning and sterilisation of these will vary considerably with regard to manufacturer instructions. The most frequently seen types on the UK marketplace are:

Porter brown double mask Scavenger System

Accutron Scavenger System

Matrix ANS (Autoclavable Nitrous Scavenger) System

Note on Matrix Passive Systems: *This system has been on the marketplace for approximately 40+ years and was originally designed to scavenge 'passively' i.e. air flow rate at the nasal mask of no more than 0.5 L/min even when connected to an AGS System (w/air brake in-line). There were also infection control issues as only the blue nasal hood could be autoclaved. The Manufacturer, Porter Instruments, discontinued production in September 2009 and this system type is now considered obsolete for dental application.*

Porter brown System: Porter Instruments recommend the following Protocol:

The following items are placed in an ultrasonic with water and an enzymatic instrument cleaner, manually cleaned (if necessary) with soap and water and sterilised in a steam autoclave on a low temperature cycle (121° Centigrade is recommended*):

Porter Adult Hood (grey) - 5054A

Porter Adult Liner (grey) - 5054-1

Porter Paediatric Hood (grey) - 5054B

Porter Paediatric Liner (grey) - 5054-2

Fresh Gas Y Connector (grey) - 5058

Vacuum Line Y Connector (grey) - 5062

Tension Slide Adjuster (grey) - 5057

Mask to Tubing Connectors -pair (grey) - 5061

Vacuum Hose (grey) - 5059

Fresh Gas Hose (cream autoclavable only) - RA2011 is rinsed with soap and water and autoclaved.

The Vacuum Control Block 5501-RK and Vacuum Tube Holder 5056 can be wiped down with a disinfectant-type wipe. Do not autoclave or immerse in liquid.

* Please note this lower sterilisation temperature 121° C vs. 134° C requires a longer cycle time but gives same assurance of sterilization and is kinder, helping to extend the life of the product.

Warning: Chemical Disinfectants: It is recommended that these are not used. Disinfectants do not provide the same reduction in microbial contamination levels as sterilization. These techniques can leave a residue on the mask and liner that can irritate or even chemically burn the patient's skin or mucous membranes if the mask/liners is not rinsed thoroughly with clean water.

Matrx ANS) Autoclavable Nitrous Scavenger System: The manual states that '*Most A.N.S. components are autoclavable. CAUTION: When autoclaving A.N.S. components, Matrx recommends following the specific protocol of the using service or the steriliser manufacturer. Temperatures consistent with silicone, Ultem (polyetherimide) and polysulfone, in the range of 120 degrees Celsius to 134 degrees Celsius can be used.*' The system should be disassembled, each tube and the scavenging cone system washed with a mild alkali detergent and all parts not precluded, autoclaved. Precluded parts include: white single-use nasal hoods and the scavenger control valve.

Note: This system can be used with blue (autoclavable) nasal hoods and white (Dynomite single patient use) nasal Hoods. Components latex free.

Porter Silhouette System:

A radically different system offering a disposable mask and tubing for improved infection control. The white fresh gas hose and vacuum hose are autoclavable. Mask/tubing sets are available in four sizes: paediatric, small adult, medium adult and large adult to provide a perfect fit. The design incorporates an adhesive strip for mask security.

Accutron Scavenger System: Similar in appearance to the Porter brown except the tubing is white, not grey. However, the main differences are:

The vacuum control block is placed in-line with the vacuum hose and the system uses autoclavable or scented single patient use nasal hood with a clear collector cap or double mask arrangement. For reusable components, the manufacturer states:

- Must be thoroughly cleaned before reuse
- The spiral vacuum tubing containing the vacuum flow gauge is not autoclavable and do not submerge in liquid solutions
- Single use PIP+ or Clearview nasal hoods may not be reprocessed

Reprocessing of reusable scavenging circuit components according to ISO 17664:2004	
Preparation for Decontamination	Detach spiral vacuum tubing containing vacuum flow gauge. Disinfection of this component is normally unnecessary, however if internal contamination or fluid is observed it must be replaced. Do not attempt to disassemble or clean the vacuum gauge. Detach nasal hood - autoclave if grey. If coloured, dispose. Detach White or grey corrugated fresh gas hose - do not autoclave. All remaining components may now be reprocessed.
Cleaning/ Disinfection: Automated	Load Washer Disinfector according to manufacturer's instruction Processing should include a) cold water rinse, b) circulation wash with detergent, c) warm water rinse and d) disinfection cycle. Accutron recommends a 93°C - 10 minute disinfection cycle.
Cleaning: Manual	Submerge/soak the reusable components in an enzymatic detergent solution (as per manufacturer instructions). Scrub using a soft bristled nylon brush until all visible soil removed Rinse components in clean warm tap water for minimum of 3 mins. Flush all internal lumens and difficult to reach areas to ensure removal of all residuals. Remove excess moisture with clean absorbent lint-free wipes.
Sterilisation	Standard packing material may be used but ensure that it is large enough to prevent stressing or kinking of tubing or other components. Accutron recommends gravity autoclave steam sterilisation for a minimum of 24 minutes at a temperature of 134°C. Dry time 30 mins. No particular requirements for storage

Section 3. General Observations

The **HTM 01-05 Decontamination in primary care dental practices** does not mention R A (or I.S.) Sedation equipment at all. However, the Audit Tool; '*Assessing Implementation of HTM 01-05: Decontamination in Primary Care Dental Practices and related infection prevention and control issues*' does:

Section 5 Management of Dental Medical Devices – equipment and dental instruments Heading **Inhalation Sedation Machines (ISM)** (ref 3) contains the following questions:

27. **Are IS Flowmeters used and maintained in accordance with OEM (Original Equipment Manufacturer) or Suppliers instructions?**
28. **Are IS breathing systems (mask and tubing's) used in accordance with Manufacturer's or Suppliers instructions (Also please refer to Q14).**

Q14 comes under the sub-heading of **Other Medical Devices** and asks: '*Are single-use items only used for single treatment episode and disposed of following use?*'

Comment on Disposable Breathing Components: Most breathing systems are designed to be autoclaved, but with the option of using disposable, single patient use components. These range from nasal hoods and inner liners (for use with autoclavable double masks) to coaxial hoses.

In 2012 a fully disposable 'End Change' Set comprising: Pair green coaxial hose, clear slide adjuster, clear hood/hose connectors and a Clearview double mask became available. These components are designed to be combined with the Porter brown vacuum hose and vacuum control block, Vacuum Y connector, Fresh Gas Y connector and fresh gas hose, the addition of which completes the breathing system circuit. This effectively means that all components of the breathing system which come into contact with the patient, can be changed and disposed of following use.

References:

Ref 1: 'A Conscious Decision' Department of Health 2003

Ref 2: The Revised Healthcare Cleaning Manual www.npsa.nhs.uk/cleaning

Ref 3: Local Self-Assessment Audit for Assessing Implementation of HTM 01-05. I.P.S. 2009

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