

SureGard® Filters and SARS

I have recently been asked by a number of people whether filters provide protection from the SARS virus when performing spirometry.

SureGard® filters are equally effective for inspiratory or expiratory flow protection. The filter media has been tested down to a micron size of 20nm which is smaller than less than the Hepatitis C virus. No filter is 100% effective as no air would pass through if it were, but the SureGard® filter has been demonstrated to be 99.99992% effective against Bacteria and Viruses by independent laboratories.

There is a wide range of bacteria and viruses that we need to consider when choosing protection.

Particle Sizes of Bacteria – Viruses

Viruses

Bacteriophage MS-2 20nm size
Hepatitis 24nm – 30nm
Adenovirus 70nm
HIV 80nm
Cytomegalovirus 100nm
Orthomyxovirus 120nm
Coronavirus (SARS) 80 – 160nm
(Classed as a large size Virus)

Bacteria

Myobacterium tuberculosis 30nm – 100nm
Serratia marcescans 450nm
Pseudomonas aeruginosa 500nm
Pseudomonas diminuta 500nm
Staphylococcus aureus 1000nm
Bacillus subtilis 1000 x 700nm

Significance of % removal of Bacteria/Viruses

There are three factors that have to be considered in comparing efficacy of Filter Media.

- (A) The size of the organism used in the challenge.
- (B) The concentration of organisms in challenge.
- (C) The flow rates during testing.

There are 2 recognised testing laboratories.

- **Nelson Labs, Salt Lake City, Utah, USA**
- **Centre for Applied Microbiology and Research (CAMR) Porton Downs, UK.**

Nelson Labs test at flows of 30L/min using Bacteriophage MS-2 - 27nm size challenge and at increased concentrations.

CAMR test at flows greater than 750L/min using Bacteriophage MS-2 - 20nm size challenge and at increased concentrations.

What Nelson Labs testing fails to show is how well the filter media maintains its integrity at high flows e.g. does the filter matrix open as the flow increases? During Spirometry testing some patients can attain peak flows of 750L/min.

Published data for the 3 most commonly used Filters in Australia follows.

TESTING LABORATORY

	Nelson Labs. USA	CAMR
Flow Rates / particle size	30L/m – 27nm	750L/m – 20nm

<u>Reported by</u>	
Nelson Labs	SensorMedics Viasys

SureGard® (RJ & VK Bird)	99.99992%	>99.99%	99.72%
Microguard® (SensorMedics/Viasys)		99.95%	94.06%
Spirobac® Tyco/DAR		89.00%	72.60%

These efficiency measures mean that if challenged with 1,000,000 organisms of 20-27 nm size, the number of organisms passing through the filter would be as follows:

	Nelson Labs 30L/min – 27nm size		CAMR 750L/min – 20nm size	
	% Efficiency	No Passing through	% Efficiency	No Passing through
SureGard® (RJ & VK Bird)	99.99992%	8	99.72%	2800
Microguard® (SensorMedic/Viasys)	99.95%	500	94.06%	59400
Spirobac® Tyco/DAR	89.00%	110000	72.60%	274000

Based on this evidence, **SureGard®** filters offer the best protection for patients, operators and equipment against cross contamination from all common respiratory bacterial and viral pathogens. In particular the large size of the SARS virus (80-160 nm) means it will most likely be completely excluded. The greatest concern with SARS is that it is very stable unlike most viruses and has been reported to survive up to 24hrs, hence the problem with transmission via door handles and the like. This means that while the filter may protect against contamination of the instrument, careful handling and disposal of the filter is needed to ensure protection of the environment.

Based on the published data, **SureGard®** filters would appear to offer the best infection control protection for spirometry.

Bob Bird



R J & V K Bird Pty Ltd