



National Institutes of Health  
*Office of Management*

# What is the effective life span of ULPA filters in cell sorter Aerosol Management Options?

Althea Capul, Ph.D.  
National Biosafety & Biocontainment Training Program  
Division of Occupational Health and Safety  
National Institutes of Health, Bethesda, MD

# Cell Sorter Biosafety at the NIH

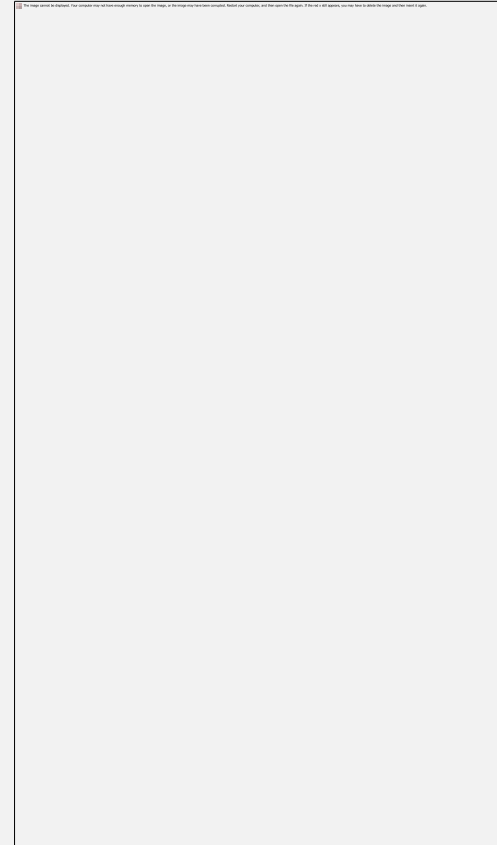
	BSL-2	BSL-2 with enhanced precautions	BSL-3	BSL-4
<b>Operational Aerosol Containment</b>	Required, validated	Required, validated	Required, validated	Required, validated
<b>Separate Room, Environmental Controls</b>	Optional	Required or limit room access	Required, cell sorter enclosure	Required, cell sorter enclosure
Administrative	SOP	SOP, Limit room access	SOP, limit room access	SOP, limit room access
PPE	eye protection, closed lab coat	+ respiratory protection (N95, PAPR) required	Coveralls + PAPR	Positive pressure suit

# Preventing exposure to aerosols

## BSC for large sorters

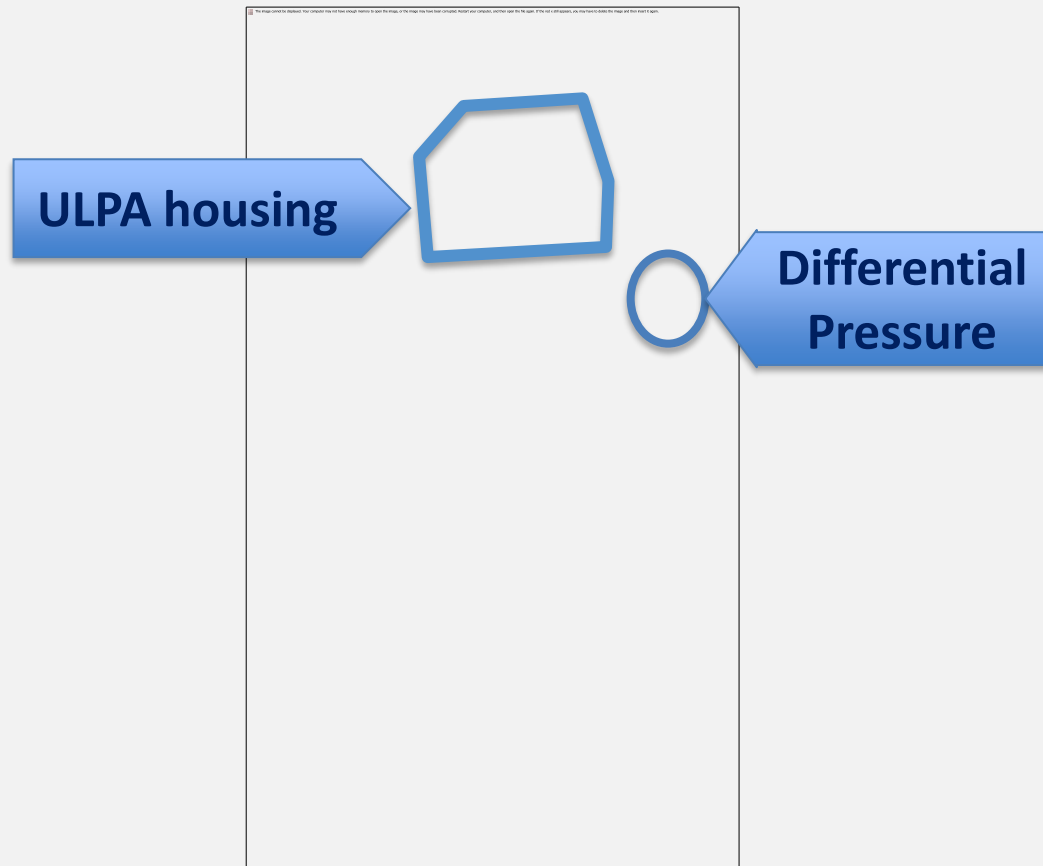


## Aerosol Management Option (AMO)



# Ultra-Low Penetration Air Filters

- **99.999% minimum efficiency**
- **Tested with 0.12  $\mu\text{m}$  particles (IEST)**



# How long should the filter be in place?

- **BSL-2 and BSL-2 with enhancements**
- **Filter change**
  - Filter differential pressure >2.4 inches of water column (in. w.c.)
  - Every 6 months
  - Whichever is sooner

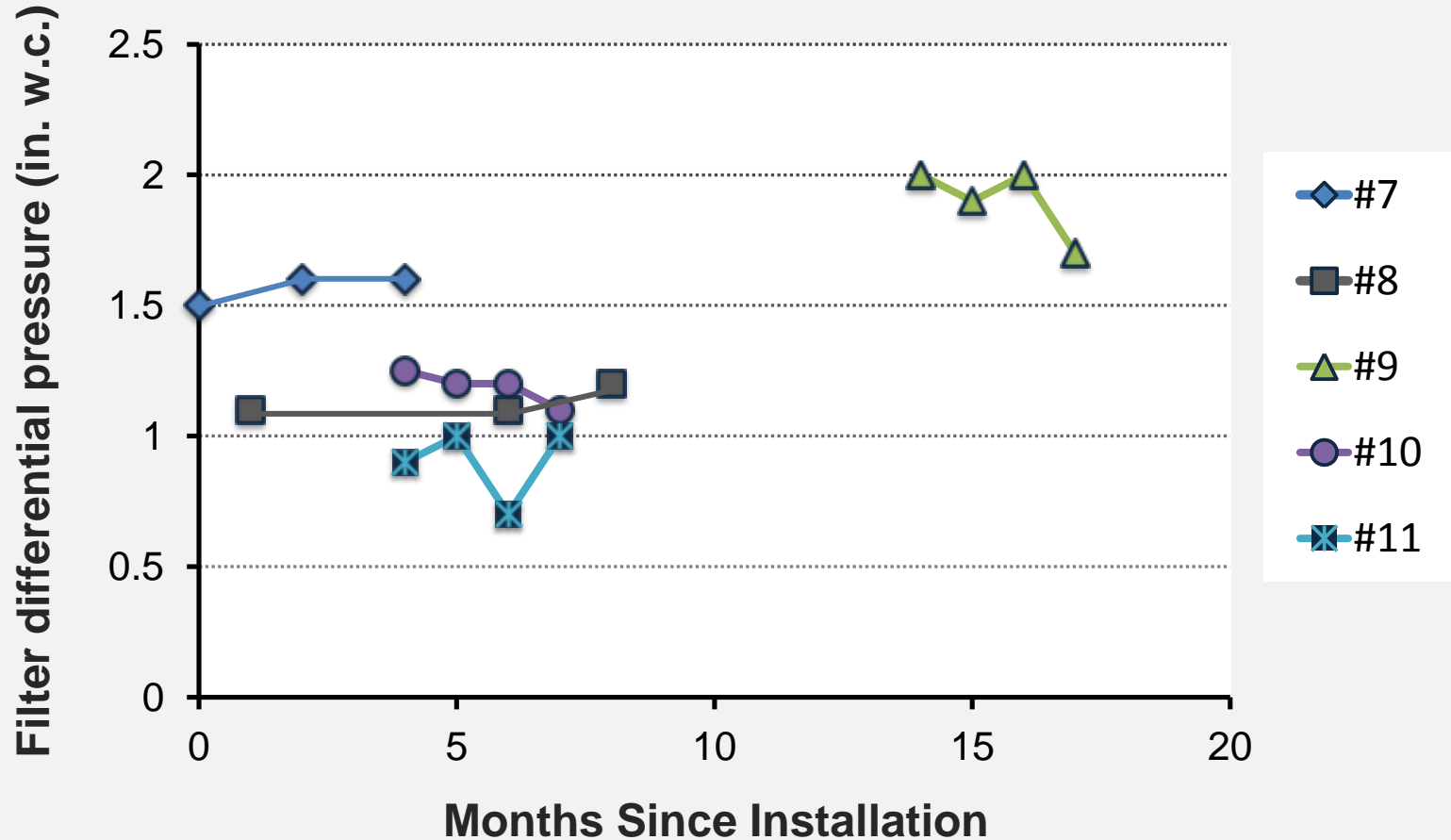


- **Do in-use filters operate below 2.4 inches w.c.?**
  - Field monitoring of in-use AMOs
- **Does filter lifespan change when experimentally challenged?**
  - AMO exposure to Glo Germ aerosol

## Independently installed filters

In-use filter	#1	#2	#3	#4	#5	#6	
Differential Pressure (inches w.c.)	1.4	1.5	1.1	1.3	1.2	1.6	1.5
Months since installation	1	1	2	5	6	5	11
Mean pt/cm <sup>3</sup> in room	560	1090	1213	1073	1463	1780	1380

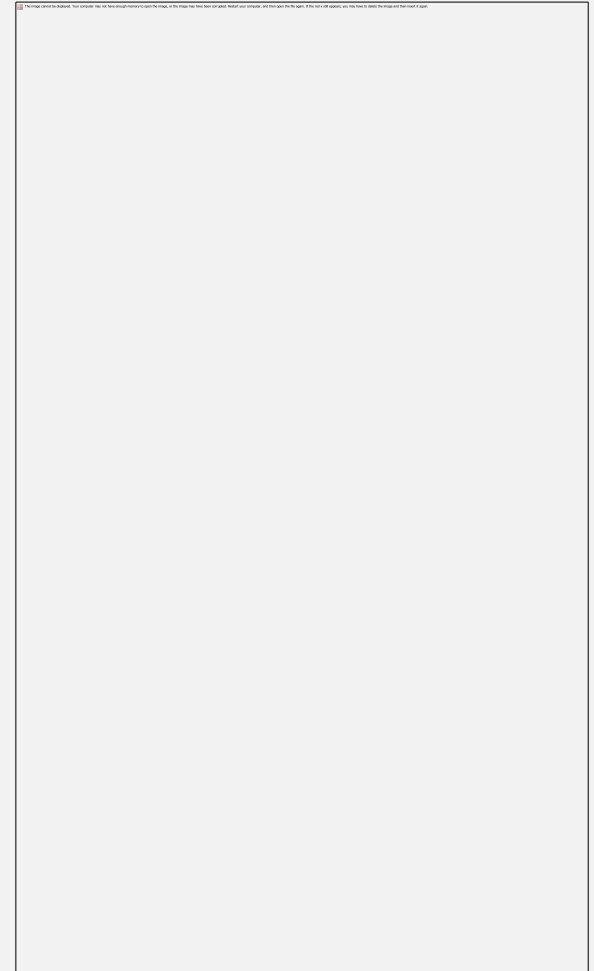
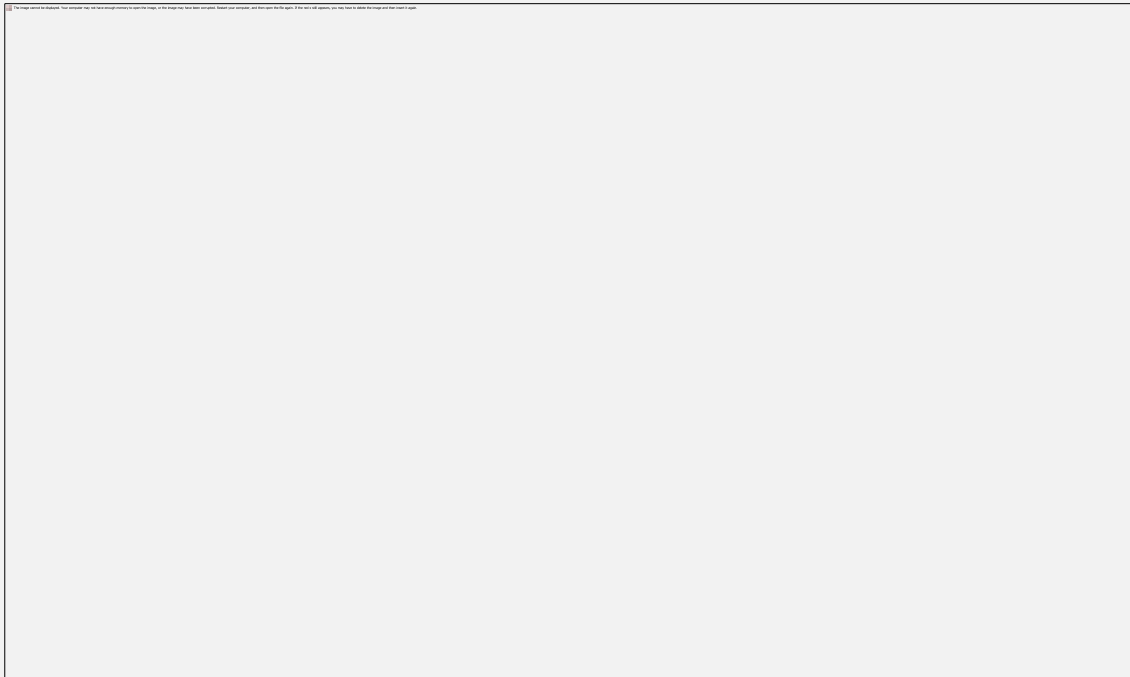
## Independently operating AMOs



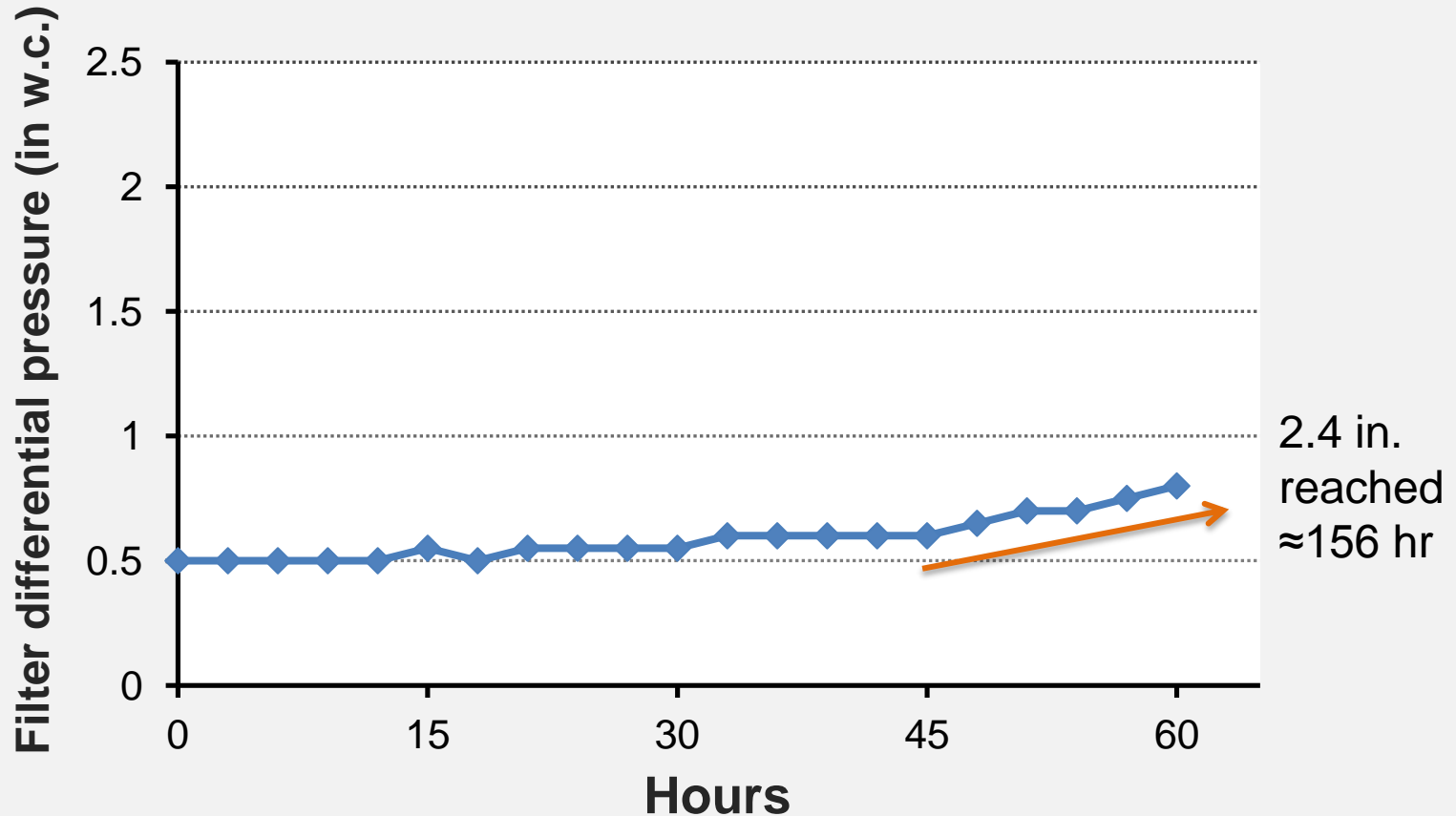


# Experimental Challenge of AMOs

- Glo Germ  $5 \times 10^7$  pt/mL ( $1 \times$  PBS/5% FBS)
- 20 psi compressed room air
- $\approx 22$  mL per 3 hours constant exposure
- Read filter differential pressure at start and end



## AMO performance with Glo Germ exposure



- **Aerosol management options can operate <2.4 inches w.c. for 6 months and longer.**
- **In-use AMO ULPA filters are operational beyond the manufacturer's recommendation of 180 hours.**
- **Under our Glo Germ challenge conditions, an AMO ULPA filter is operational for <180 hours.**

- **Is the ULPA lifespan with Glo Germ exposure <180 hours?**
  - Extend experimental challenge of AMO.
- **What is the estimated lifespan of in-use AMO ULPA filters at the NIH?**
  - Determine in-use exposure of AMO filters to cell sorter aerosols.

# Acknowledgements

- **Adam Clarkson, MPH, CBSP**
- **Megan Seltzer, Ph.D.**
- **Sara Cope, Ph.D.**
- **Sabena Blakeney, Ph.D.**
- **Brandon Hatcher, Ph.D.**
- **Christine Campos, Ph.D.**
- **Kevin Holmes, Ph.D.**
- **Marcus G. Hodges, Ph.D.**
- **RADM Deborah E. Wilson, DrPH, CBSP**