

Bioaerosol Exposures and the Microbiome

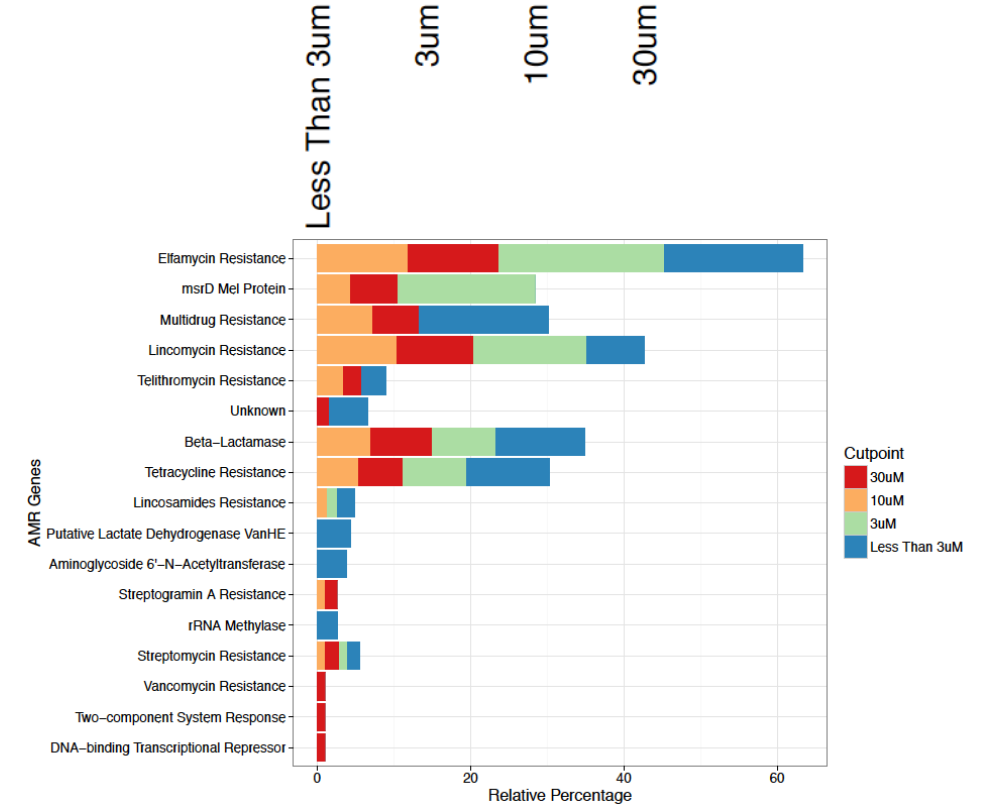
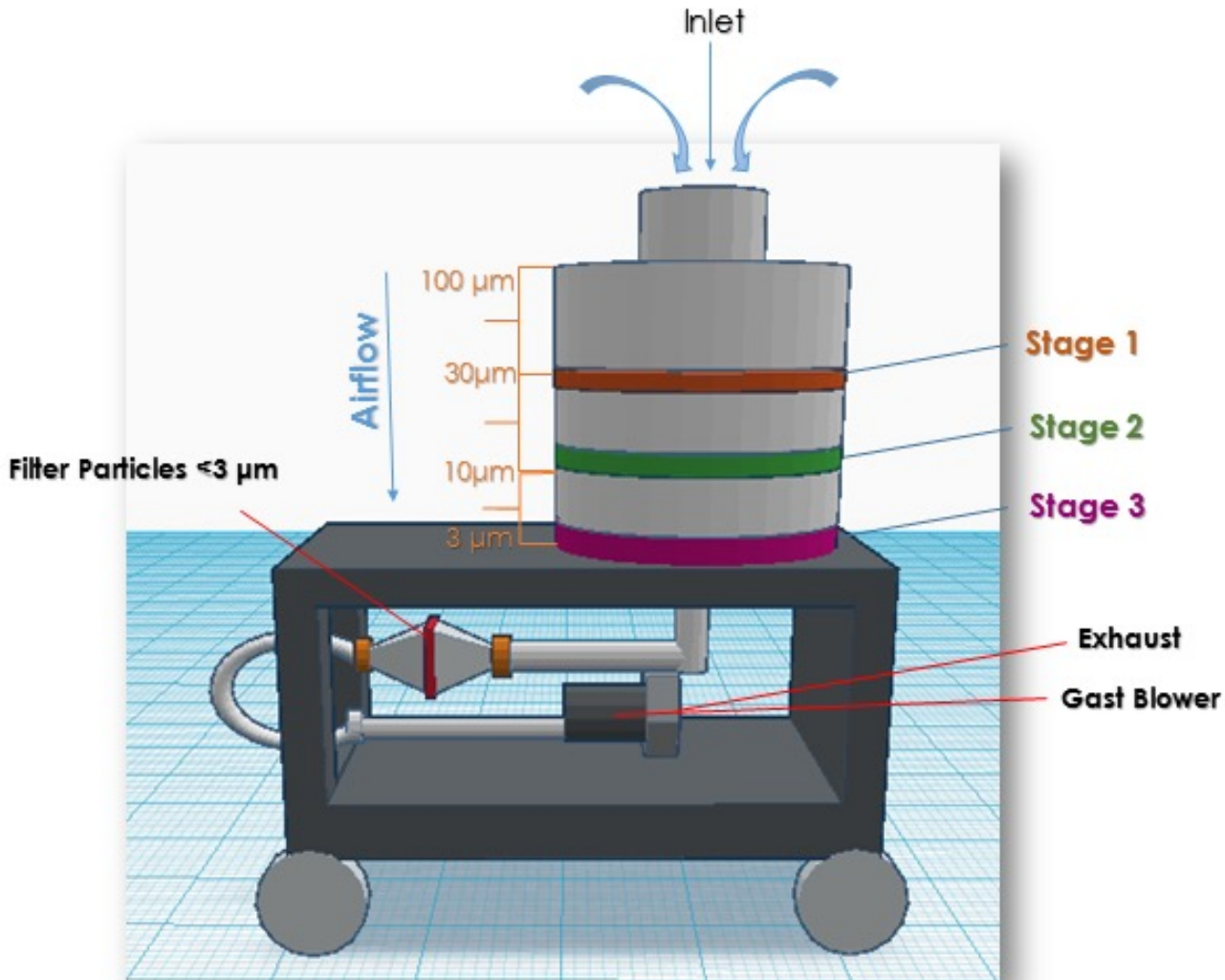
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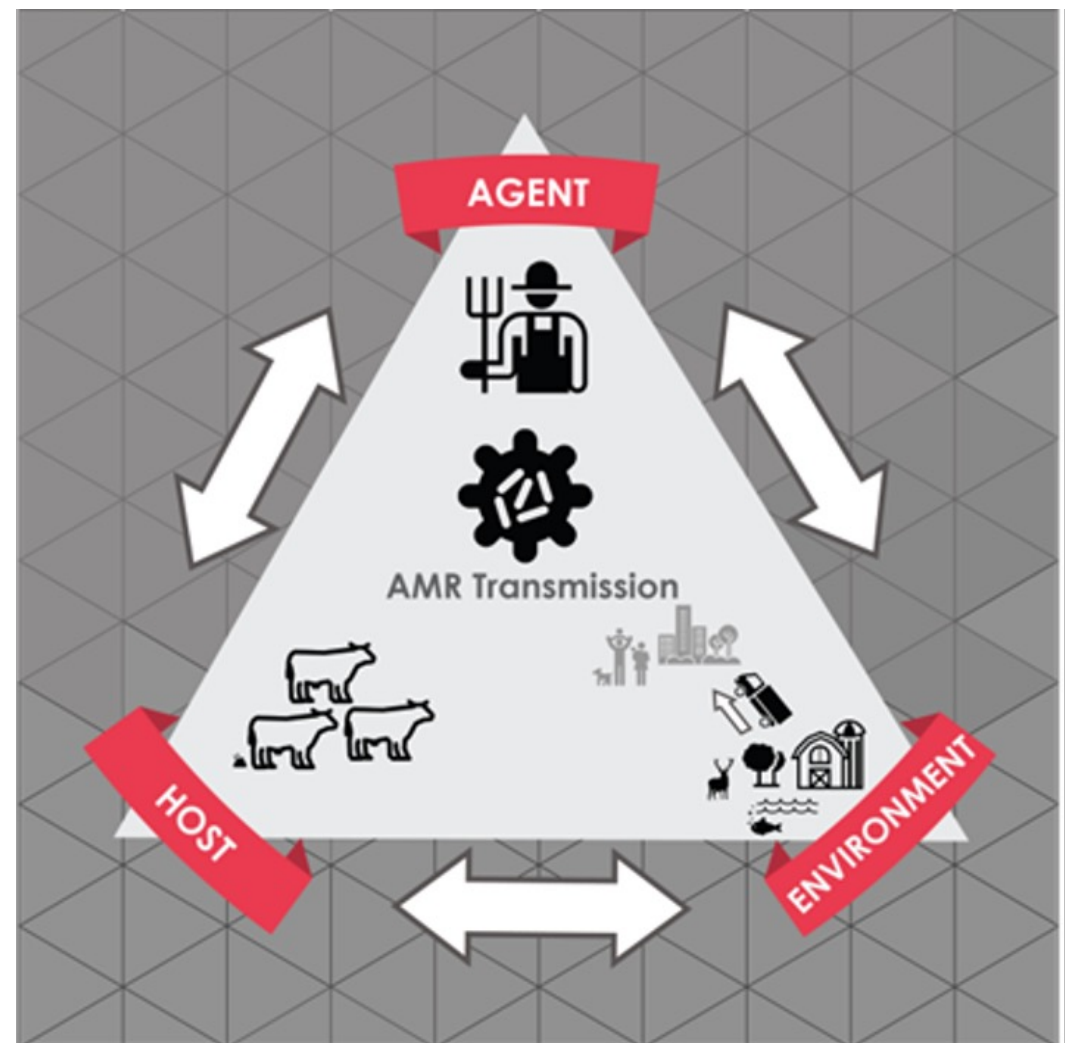
Colorado State University







5U54-OH008085: Evaluation of the effectiveness of a nasal rinse intervention.
PI: Reynolds



1R01OH012046-01-00: Antimicrobial Resistant Bacteria: Exposures and Health of Cattle Workers.
MPIs: Magzamen, Reynolds, Schaeffer

Evaluation of the effectiveness of a nasal rinse intervention

- Bioaerosol exposure assessments conducted over 5 consecutive days
- Pre- and post-shift nasal lavages administered
 - 10 ml of normotonic (control) or hypertonic (treatment) saline
- Pro-inflammatory cytokines measured (Meso Scale Discovery)
- Influenza A, C, D and coronavirus assessed in aerosol and lavage samples (PCR)
 - Methicillin-resistant *Staphylococcus aureus* assessed in nasal lavages
- Bacterial communities characterized in aerosol and lavage samples (16S rRNA sequencing)

Evaluation of the effectiveness of a nasal rinse intervention: Pathogen Results

TABLE 1: Prevalence among participants (n=31)

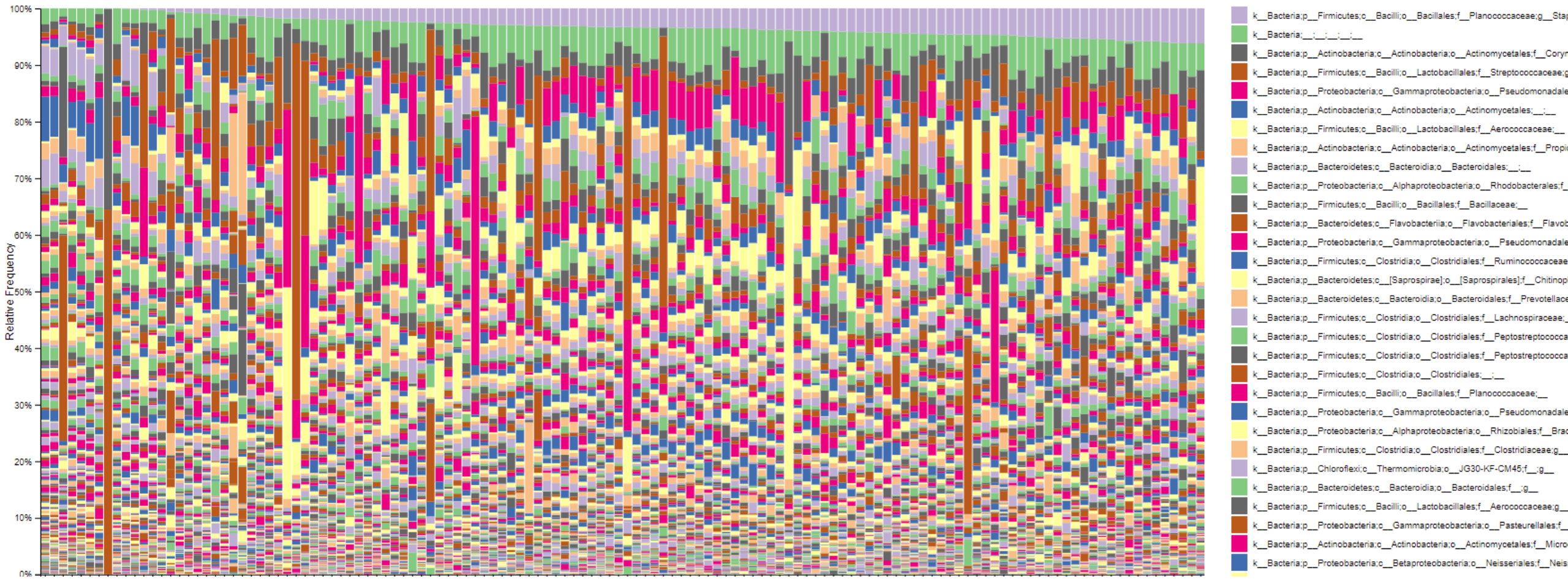
	Workday aerosol (integrated)	Nasal wash (pre-or post-shift)
Influenza D virus (IDV)	22.6% (7)	67.7% (21)
Influenza A virus (IAV)	16.1% (5)	1.94% (6)
Influenza C virus (IAC)	0% (0)	9.7% (3)
Pan-coronaviruses (CoV)	0% (0)	16.1% (5)
Methicillin Resistant Staphylococcus Aureus (MRSA)	Not measured	45.2% (14)

TABLE 2: Positive samples

	Workday aerosol (n=122)	Nasal wash (n = 237)
Influenza D virus (IDV)	7.4% (9)	17.3% (41)
Influenza A virus (IAV)	5.7% (7)	2.5% (6)
Influenza C virus (IAC)	0% (0)	1.3% (3)
Pan-coronaviruses (CoV)	0% (0)	2.1% (5)
Methicillin Resistant Staphylococcus Aureus (MRSA)	Not measured	11.4% (27)

- Six workers with molecular evidence of more than one influenza virus during workweek
- Eight nasal washes testing positive for both MRSA and an influenza virus

Evaluation of the effectiveness of a nasal intervention: 16S rRNA Results



Nasal Microbiome

- Nasal microbiome of dairy workers may play a protective role against opportunistic pathogens
 - Increased taxonomic diversity in dairy worker's nasal microbiome may inhibit staphylococci colonization (Shukla *et al.* 2017)
 - *Staphylococcus aureus* in airways shown to protect against influenza infections via TLR2 signaling (Domínguez-Díaz *et al.* 2019)
 - Currently comparing our pathogenic results to nasal microbiome results quantified from nasal lavages

Evaluation of the effectiveness of a nasal rinse intervention: Cytokine Results

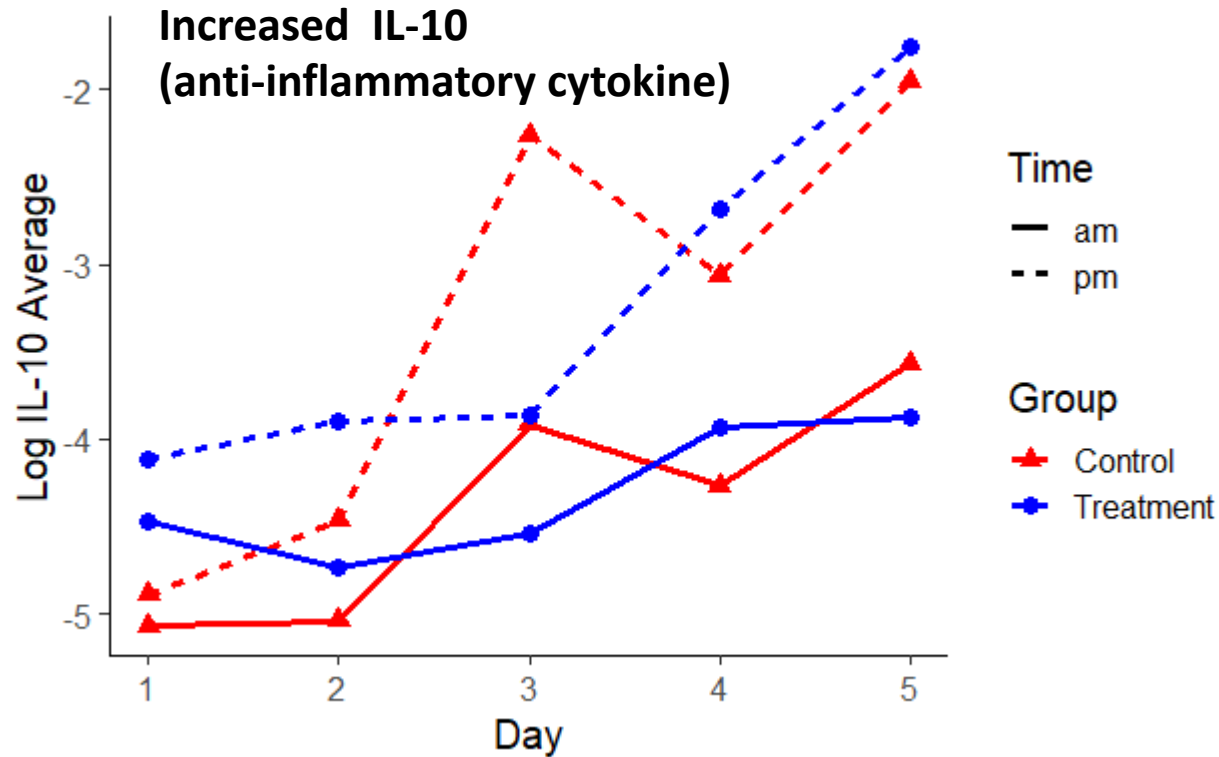


Figure 1. Average Log IL-10 across the five days for HTS Treatment (blue) and Normal Control groups (red) pre-shift (solid line) and post-shift (dotted line).

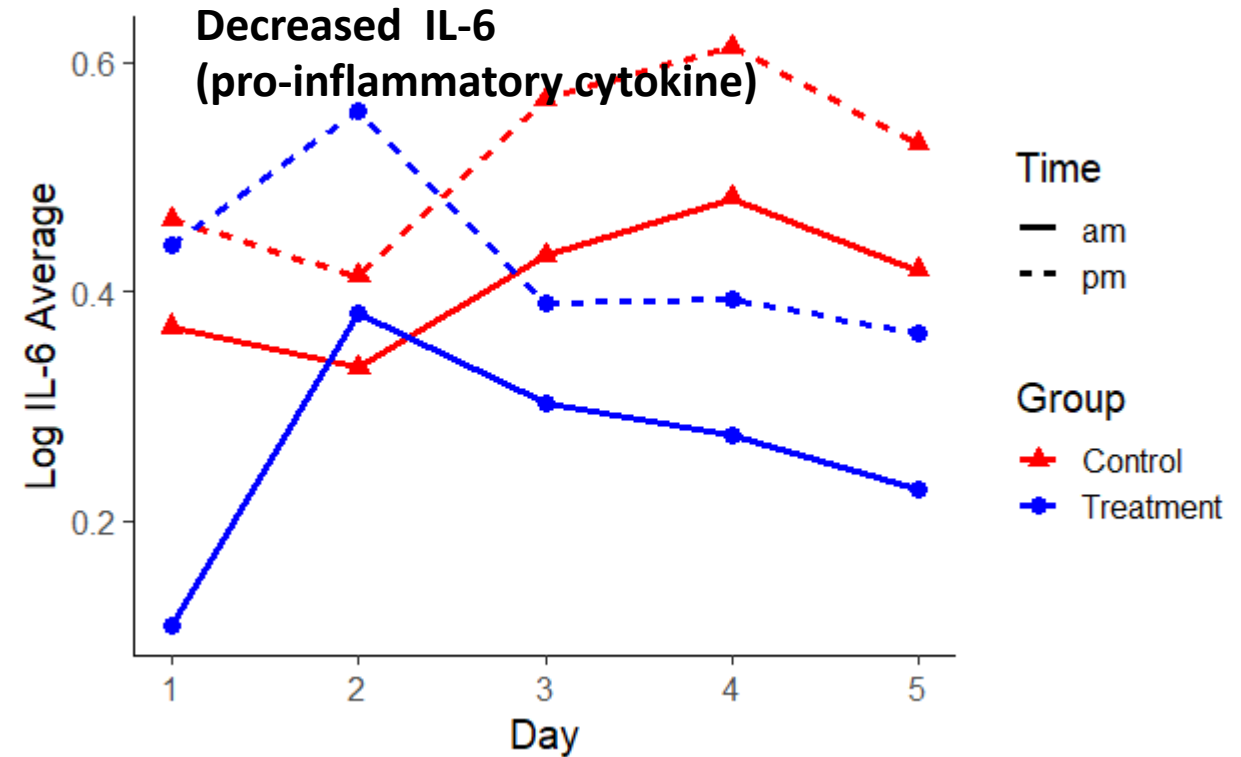


Figure 2. Average Log IL 6 across the five days for HTS Treatment (blue) and Normal Control groups (red) pre-shift (solid line) and post-shift (dotted line).

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