

# Adenosine Triphosphate Quantification Correlates Poorly with Microbial Contamination of Duodenoscopes

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## Introduction

- Recent reports of infections due to multidrug-resistant bacteria attributed to contaminated duodenoscopes heighten the importance of ensuring adequate reprocessing of duodenoscopes.
- The current gold standard is obtain bacterial cultures from the duodenoscope after reprocessing and high-level disinfection and prior to patient use. The main disadvantage of microbiological testing is the need to sequester the duodenoscopes while awaiting for results (>48h).
- A proposed alternative method is the use of adenosine triphosphate (ATP) bioluminescence assay. The ATP molecule is found in all living organisms and this assay can be used as an indirect indicator of microbial contamination. The main advantage for hospital operations is that this test is quick, easy to use and provides results within 5 minutes without the need to sequester the duodenoscopes.
- Limited data is available to support the use of ATP in the surveillance of duodenoscopes and current CDC recommendations suggest "...more work is needed to interpret [ATP] results since non-culture methods lack consistent correlation to bacterial concentrations."

*Interim Duodenoscope Surveillance Protocol. Centers for Disease Control and Prevention <http://www.cdc.gov/hai/organisms/cre-duodenoscope-surveillance.protocol.html>, 04/03/2016, accessed 04/27/16.*

## Goal

- To quantify the correlation between ATP measurements and bacterial cultures from duodenoscopes for evaluation of contamination following high level disinfection.
- To evaluate the usefulness of implementation of this alternative method during duodenoscope reprocessing at BIDMC.

## The Interventions

### Setting:

- Stoneman 4 Advanced Endoscopy Unit

### Sampling methods:

- Duodenoscope (Olympus TJF-Q180V) sampling was performed after the completion of reprocessing and prior to patient use.
- Microbiologic cultures and ATP samples were obtained concomitantly.
- The elevator mechanism (EM) and surrounding surface was sampled with a dry swab.
- The working channel (WC) was sampled using a "flush-brush-flush" method with sterile water.
- The study period was November 2015 to March 2016.

### Outcome:

- Total of 390 encounters.
- Growth of CFU >0, and ATP RLU >0 was considered a contaminated result.



The elevator mechanism is challenging to clean



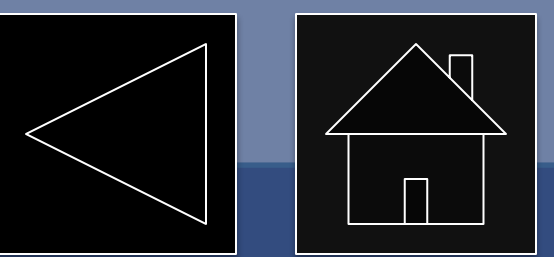
The long working channel was rigorously sampled with water and brush

## The Team

- **Infection Control:** Lovisa B. Olafsdottir, MD, Sharon B. Wright MD, MPH, Anne Smithey, Riley Heroux, Alice Chen, Benjamin Lane, Graham M. Snyder, MD, SM
- **Gastroenterology:** Mandeep S. Sawhney MBBS MS, Mischelle Sheppard L., R.N, Technicians at the Stoneman 4 Advanced Endoscopy Unit
- **Pharmacy and Health System Sciences:** Elizabeth B. Hirsch, PharmD

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## Results

### Working channel (WC)

Median (range): CFU 0 (0-7,352) ATP RLU 13,836.5 (0-844,212)

		Aerobic bacterial culture (%)		Total (%)
		CFU = 0	CFU ≥ 1	
ATP (%)	RLU = 0	300 (77)	<b>38 (10)</b>	338 (87)
	RLU ≥ 1	<b>44 (11)</b>	8 (2)	52 (13)
Total (%)		344 (88)	46 (12)	390 (100)

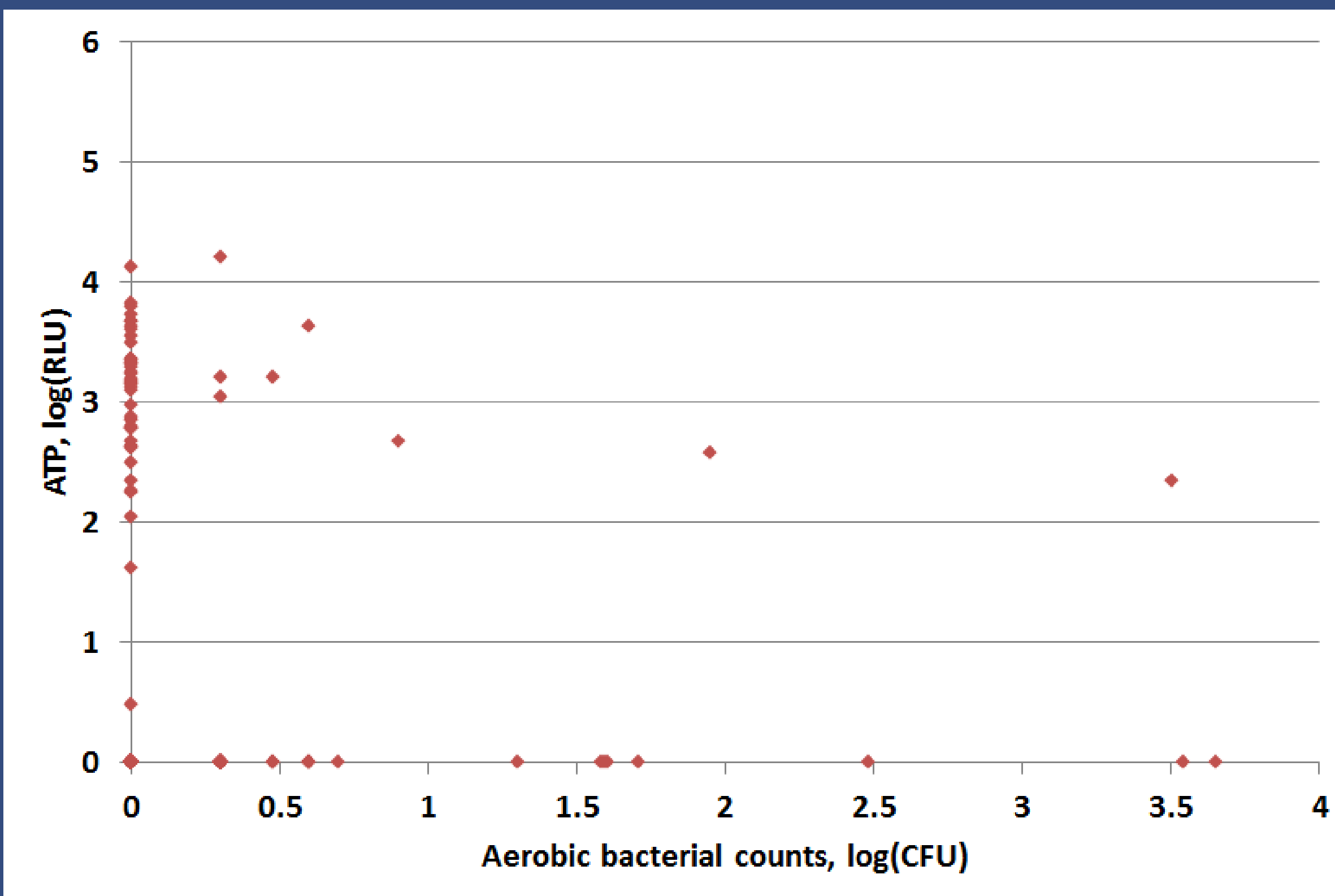
**Table 1** : Pairwise result of duodenoscope working channel (WC) sampling for aerobic bacterial culture and ATP

### Elevator mechanism (EM)

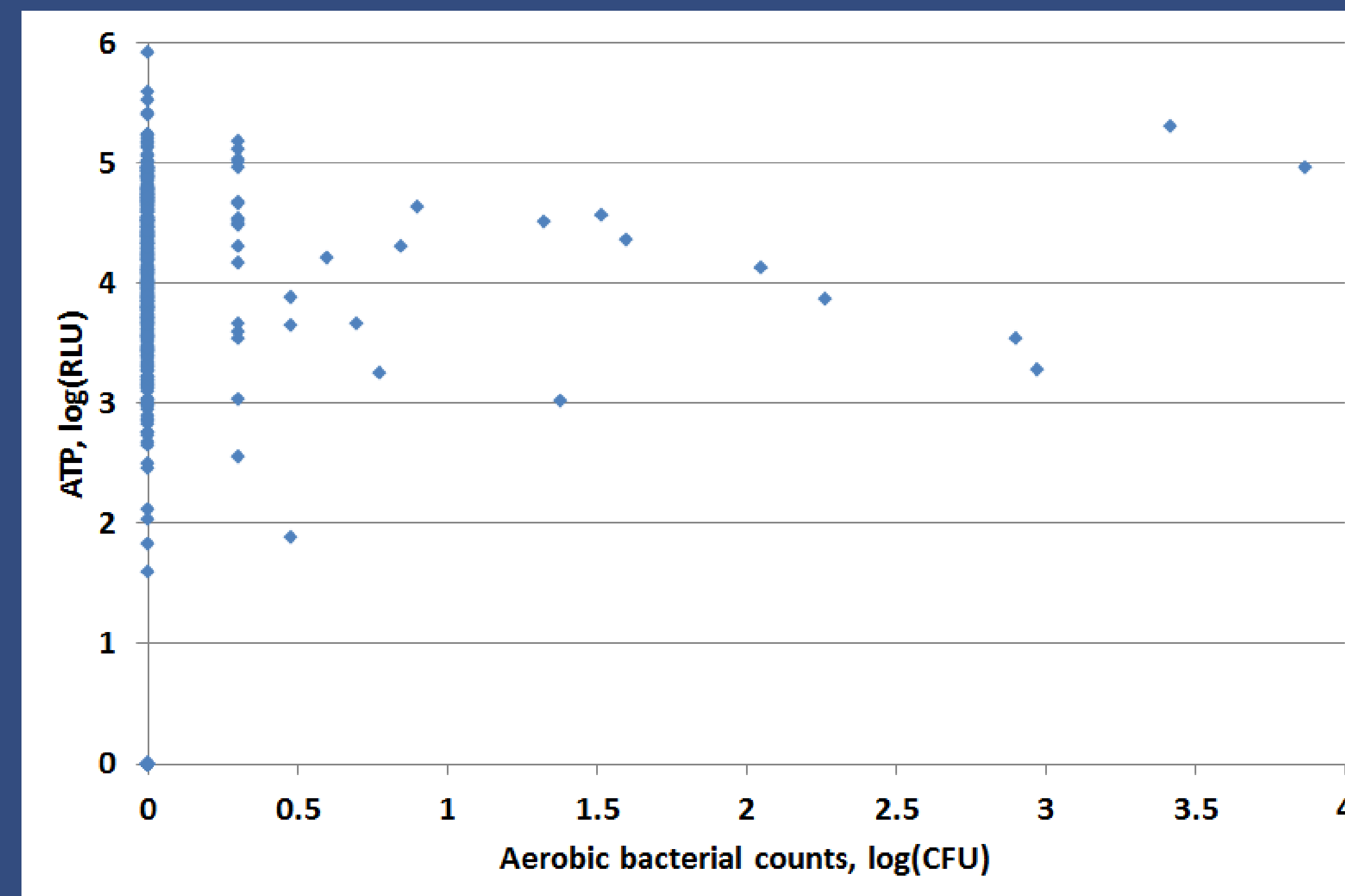
Median (range): CFU 0 (0-4,512) ATP RLU 0 (0-16,211)

		Aerobic bacterial culture (%)		Total (%)
		CFU = 0	CFU ≥ 1	
ATP (%)	RLU = 0	23 (6)	<b>0 (0)</b>	23 (6)
	RLU ≥ 1	<b>331 (85)</b>	36 (9)	367 (94)
Total (%)		354 (91)	36 (9)	390 (100)

**Table 2**: Pairwise result of duodenoscope elevator mechanism (EM) sampling for aerobic bacterial culture and ATP



**Figure 1**: Elevator mechanism aerobic bacterial contamination (CFU, log-transformed) versus ATP (RLU, log-transformed)



**Figure 2**: Working channel aerobic bacterial contamination (CFU, log-transformed) versus ATP (RLU, log-transformed)

## Lessons Learned

- ATP measurement does not agree with bacterial cultures following high level disinfection of duodenoscopes.
- ATP may reflect biological material other than viable bacteria.
- ATP should not serve as a surveillance method to detect bacterial contamination or adequacy of reprocessing of duodenoscopes.

## Next Steps

- At BIDMC we are not using ATP as a surrogate for bacterial culture.
- A protocol has been implemented using bacterial cultures for routine surveillance of duodenoscopes.
- The use of ATP could be investigated to confirm the quality of manual cleaning, the initial step in reprocessing

**For more information, contact:**