

# Superinfection identification and antimicrobial appraisal in COVID-19 patients combined with application of metagenomic sequencing: a Shanghai cohort study

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# DISCLOSURE

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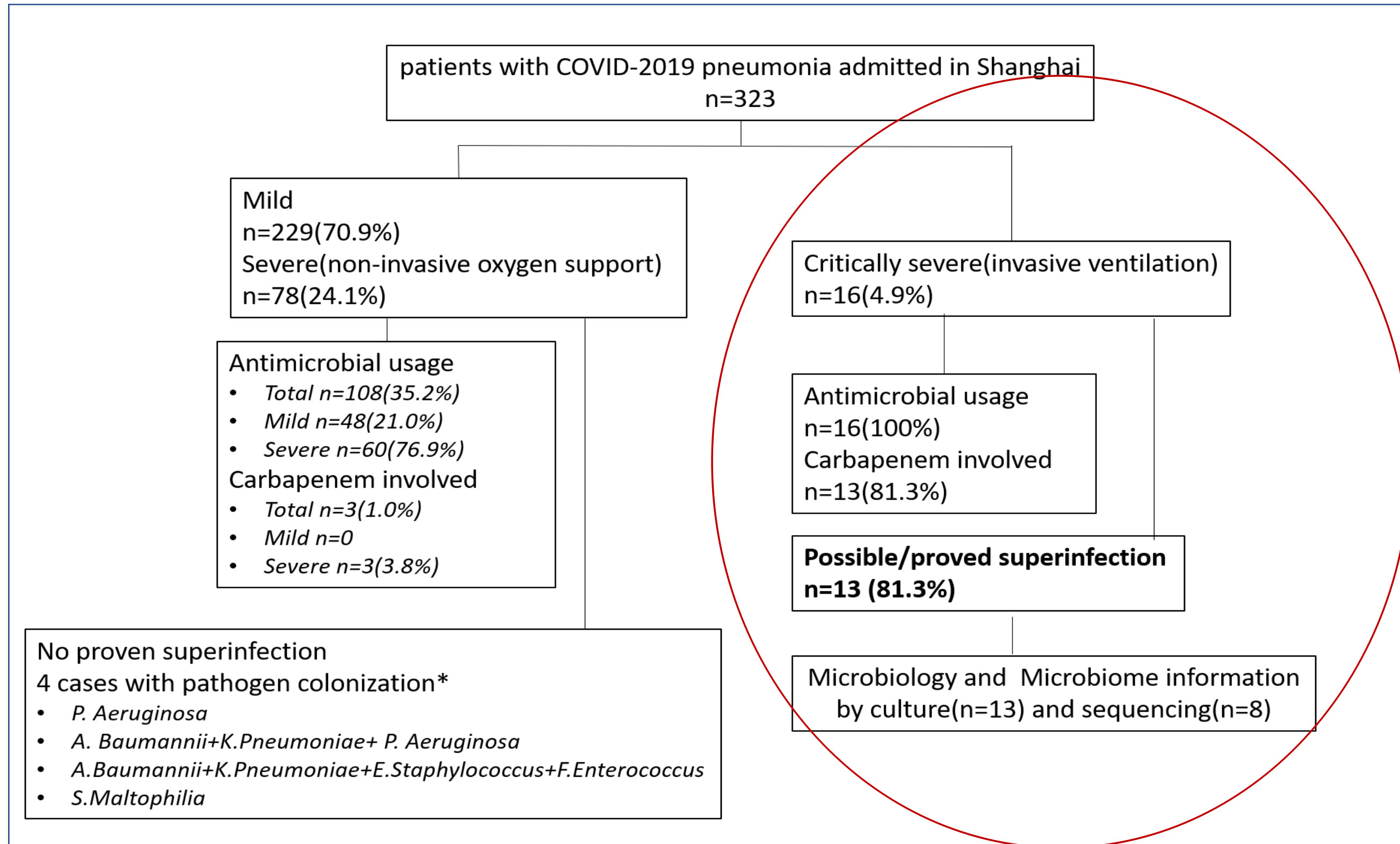
- No financial conflict of interest

# BACKGROUND & AIM

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- information regarding coinfection is limited, and the recommendation for use of empirical antimicrobials is challenging
- Whether metagenomics is helpful for revealing more co-infection events and guiding appropriate antimicrobial usage.

# Overview of superinfection and antimicrobial usage



# Comparison of infection-associated indexes between survivors and deaths in critically ill patients

	Total(n=16)	Die(n=7)	Survive(n=9)	p value
Possible and proven Infection <sup>c</sup>	12(75)	5(71.4)	7(77.8)	1
Proven infection	5(31.3)	4(57.1)	1(11.1)	0.1058
Site of all infection				
<i>Respiratory</i>	11(91.7)	5(100)	6(85.7)	0.839
<i>Urinary</i>	7(58.3)	2(40)	5(71.4)	0.28
<i>Bloodstream</i>	3(25)	3(60)	1(14.3)	0.146
Site of improven infection				
<i>Respiratory</i>	1(20)	1(25)		
<i>Urinary</i>	1(20)	0		
<i>Bloodstream</i>	1(20)	1(25)		
SYSTEMIC	2(40)	2(50)		
Pathogen of all infection				
NFB	10(83.3)	5(100)		
<i>Enterobacteriaceae</i>	8(66.7)	4(80)		
G+ microbe	8(66.7)	4(80)		
Fungus	8(66.7)	3(60)		
Pathogen of improven infection				
<i>Enterobacteriaceae</i>	2(40)	1(25)	1(100)	0.849
G+ microbe	1(20)	1(25)	0(0)	0.242
Fungus	3(60)	3(75)	0(0)	0.063
Non-COVID-19 virus detection by MS	8	4	4	
<i>virus colonization</i>	8(100)	4(100)	4(100)	0.614
<i>virus activation</i>	6(75)	1(25)	4(100)	0.197

Improved infection of fungus was associated with poor prognosis

No significant difference

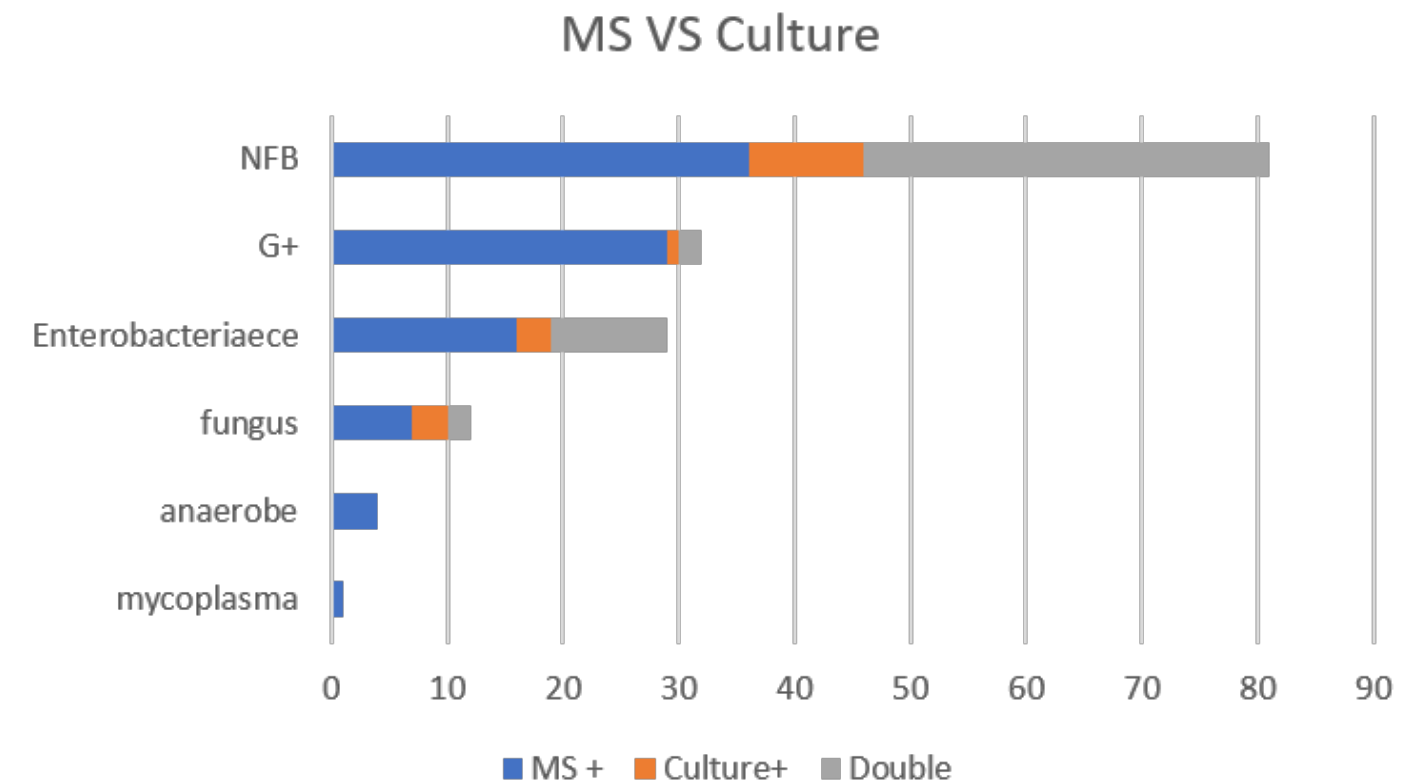
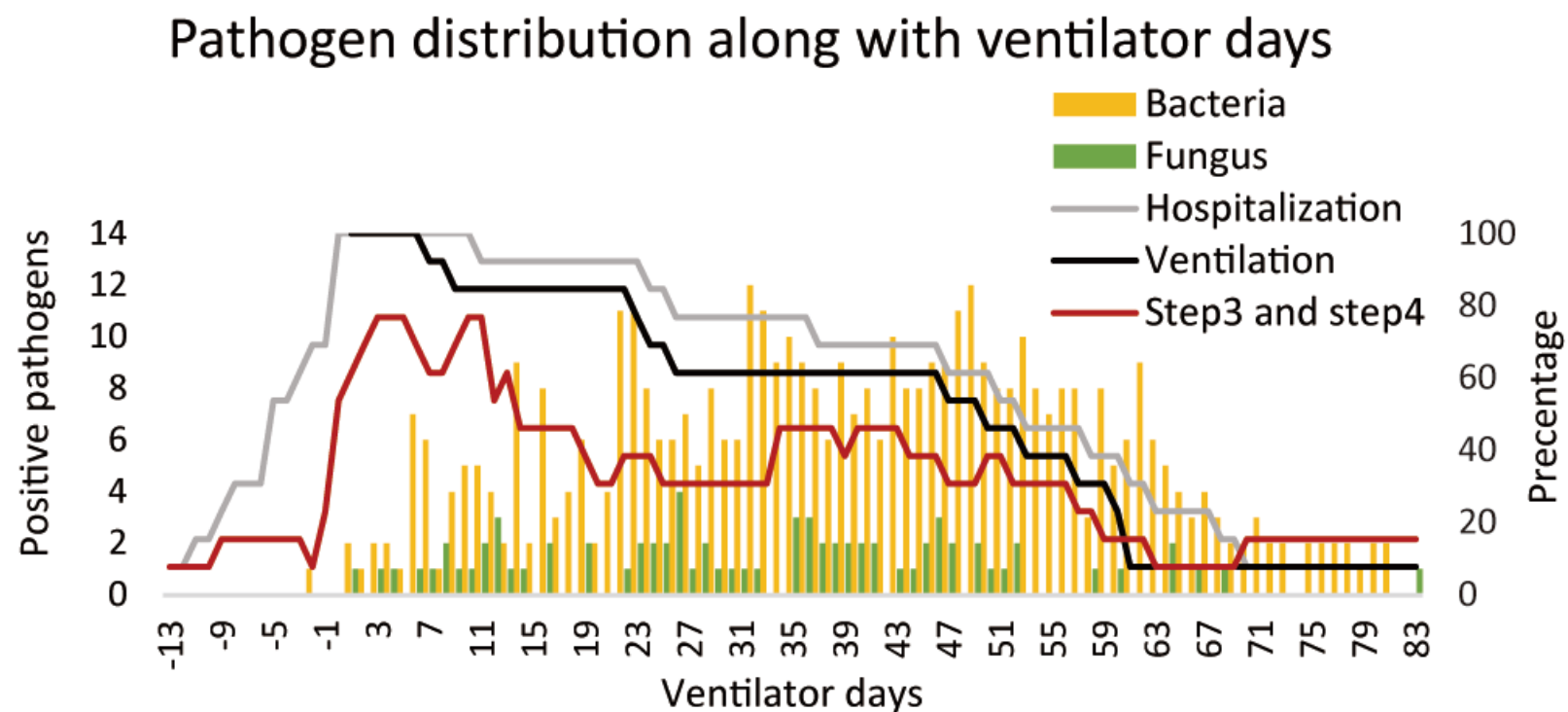
with:

✓ Infection site

✓ Pathogens

✓ Antibiotics such as anti-G-, anti-G+, anti-fungus and anti-CD

# Pathogen distribution

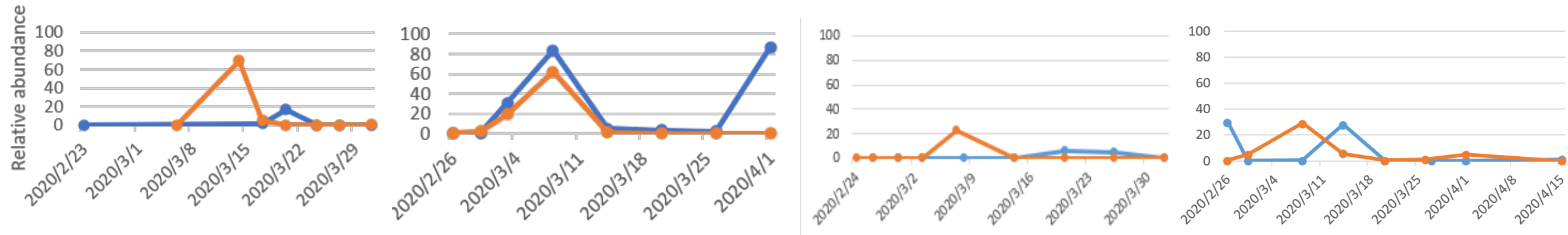


- ✓ The peak bacterial yield rate was between day 35 to 51 post-ventilation, suggesting that most co-bacteria infection were secondary to prolonged ventilation.
- ✓ MS showed higher sensitivity rate than culture, especially for mycoplasma and anaerobe.
- ✓ No unexpected organism were identified by MS.

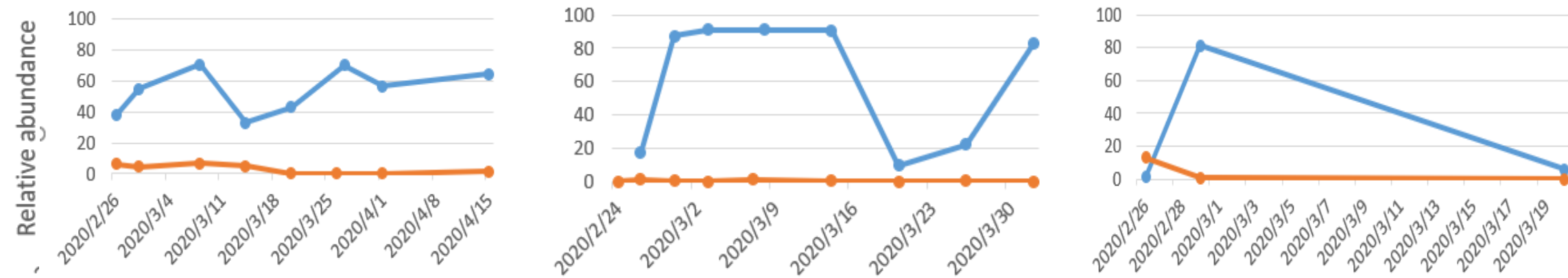
# Plasma vs airway surveillance by MS

—●— airway —●— blood

## Enterococcus



## Baumanii



Due to higher sensitivity and semi-quantity, MS was helpful for:

- ✓ Early warning for BSI
- ✓ Ruling out secondary BSI



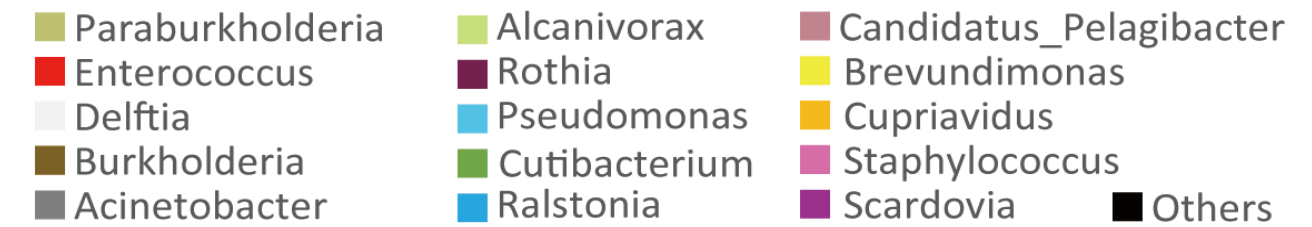
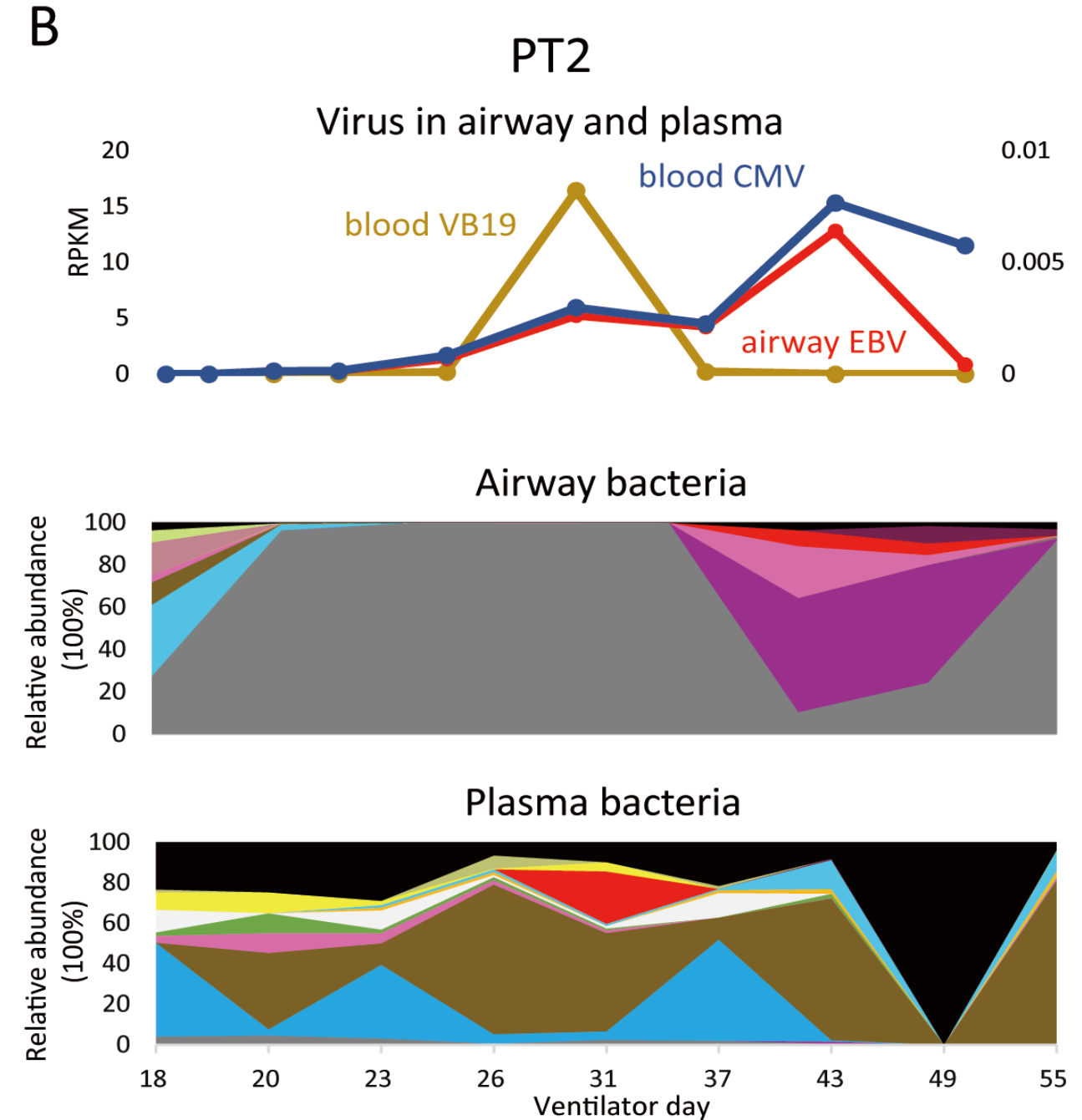
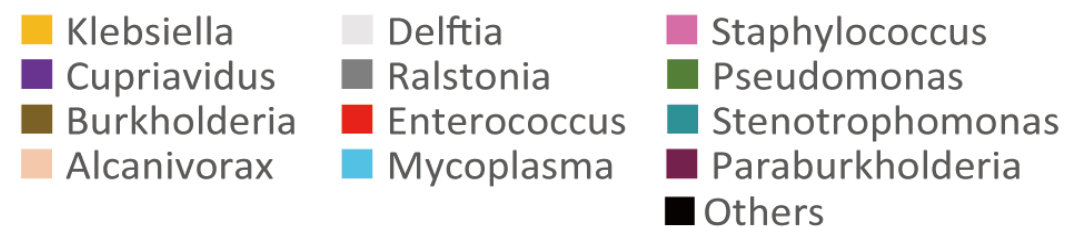
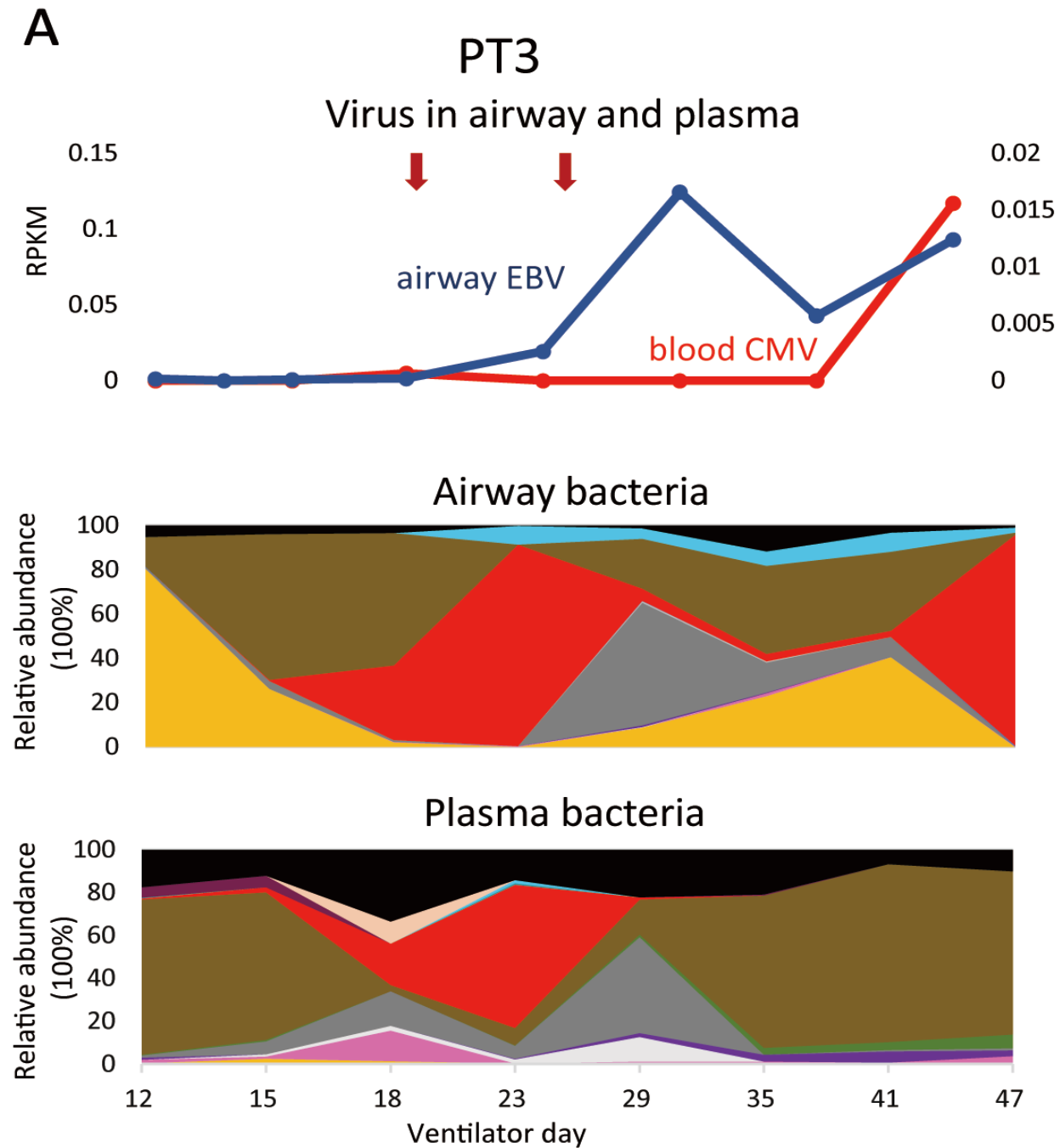
# Non-COVID-19 virus detection by MS

	CMV		HSV1		EBV		HSV7		HSV6		TTV		PV19		JCV		activation
	blood	airway	blood	airway	blood	airway	blood	airway	blood	airway	blood	airway	blood	airway	blood	airway	episode
PT1	√	√	√	√*	√	√		√			√*	√*	√*	√			3
PT2e	√*	√	√	√		√*		√	√		√	√	√*	√	√		3
PT3e	√*	√		√*		√		√									2
PT4e	√*	√	√			√*		√				√					2
PT5a	√	√	√	√					√								2
PT6ea	√*	√				√											1
PT7ea	√	√	√					√									0
PT9ea	√			√				√		√	√						0
virus detection	8/8		6/8		5/8		4/8		3/8		3/8		2/8		1/8		
virus activation	5/8		3/8		2/8		0/8		0/8		1/8		2/8		0/8		
e:ecmo,a:die																	
√ : detection																	
*: activation																	

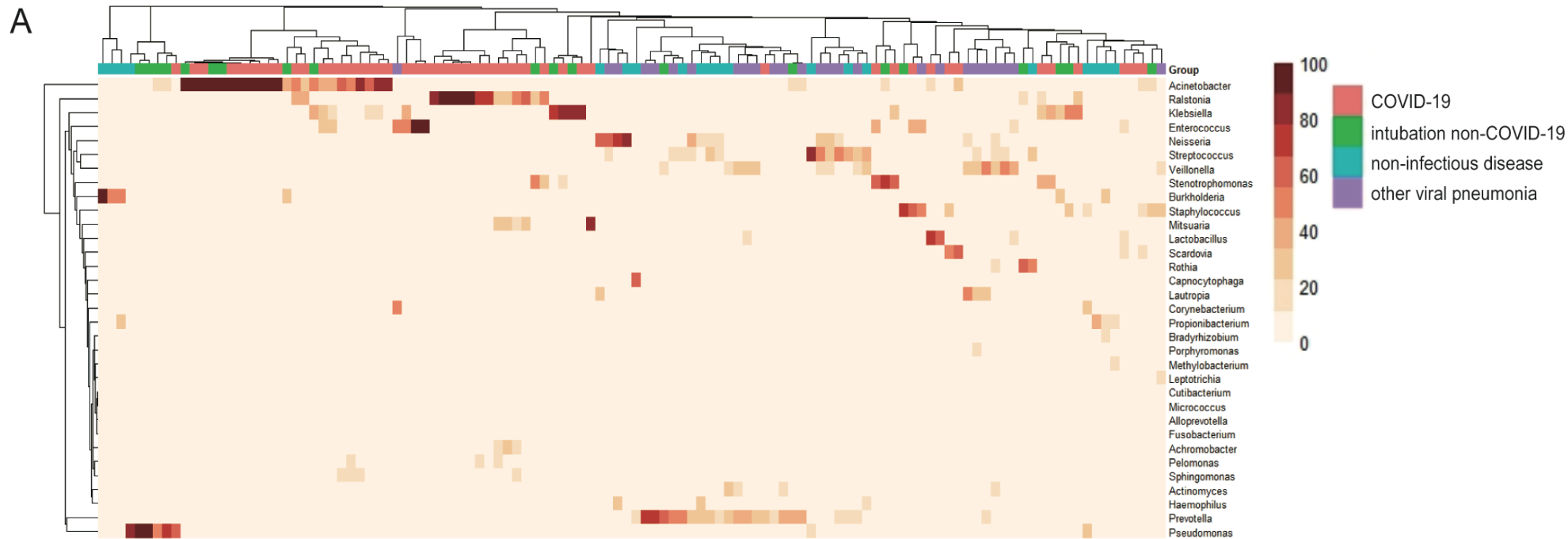
MS has revealed a high prevalence of virus colonization (8/8, 100%) and activation (5/8, 62.5%)  
CMV, HSV, EBV, HPVVB-19, JCV, TTV



# Clinical benefit of MS for antimicrobial usage



# Airway microbiome comparison of COVID-19

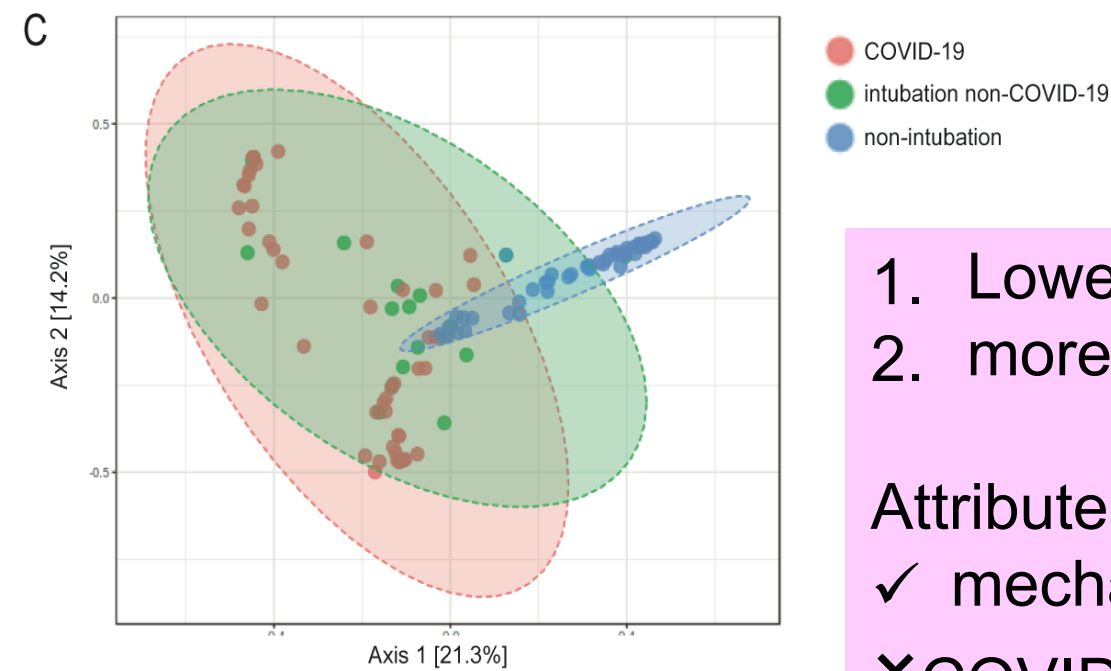
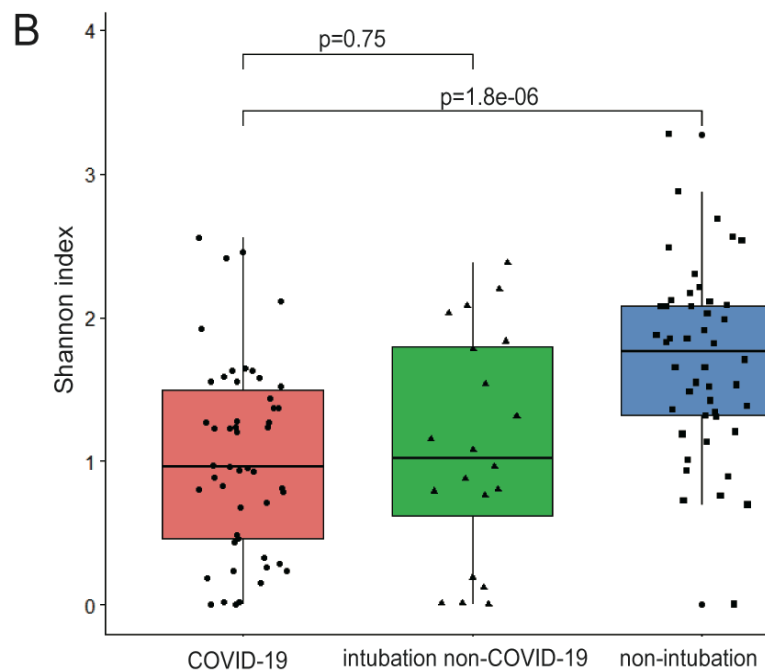


4 groups for clustering analysis:

- ✓ COVID-19
- ✓ Intubation non-COVID19
- ✓ Non-COVID-19 virus infection
- ✓ Non-infection

3 groups for comparison:

- ✓ COVID-19
- ✓ Intubation non-COVID19
- ✓ Non-COVID-19



1. Lower diversity
2. more richness in NFB, G+ and Enterobacteriaceae

Attribute to

✓ mechanical ventilation

✗ COVID-19 per se.

# CONCLUSION

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- In our cohort, superinfection **exclusively occurs** in critically ill COVID-19 patients, with a proven infection rate of **31.3%**.
- **Fungal coinfection** deserves intensive attention due to the high mortality risk.
- The **clinical benefit of MS** in guiding antimicrobial management warrants further investigation.

*Thank you !*