Detection of lymphocytic choriomeningitis virus (LCMV) by Exhaust air dust (EAD) in IVC racks

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1 INTRODUCTION

Whereas numerous prevalent infectious agents were demonstrated to be very efficiently detected with EAD samples, this was not yet established with any zoonotic agents. It was hence important to know for safety and biosecurity reasons if the in-line EAD capture media would allow the detection of zoonotic agents.

Experimental infection of mice with LCMV in biosafety level (BSL) 2/3 environment is frequently used as a mouse model to study acute and chronic viral infections. This study was performed to assess EAD samples for the detection of LCMV in IVC racks.

2 MATERIAL AND METHODS

The study mice (C57BL/6, females) were infected intravenously ($2x10^6$ pfu) with the LCMV *Armstrong* strain (Acute LCMV, shedding = 7 to 10 days) and the LCMV *docile Clone 13* strain (Chronic LCMV, constant shedding). Two IVC racks were each populated with 2 infected mouse cages (2 to 5 mice each). The cages were on the lowest row, opposite to the rack exhaust as shown in the figure 1. A third rack was used as negative control with non-infected mice.

The in-line EAD capture media was placed in at the air exhaust of each rack plenum according to manufacturer instructions (Fig1). Six weeks later, three types of samples were collected: in-line EAD capture media (N=3), plenums swabs (N=3) from all racks and feces (N=6) from all racks. All samples were sent to the laboratory for LCMV real-time PCR testing.

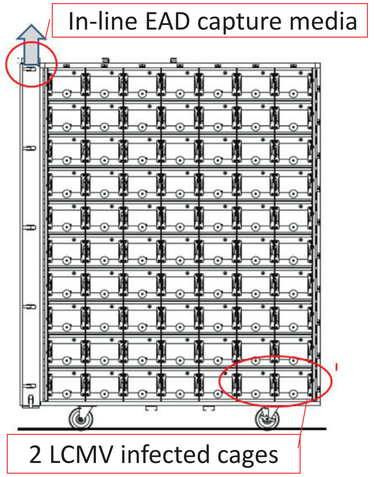

Figure 1: IVC rack set up

4 CONCLUSION

- This is the first evidence of the detection of a major zoonotic agent such as LCMV by exhaust air dust in IVC racks.
- This alternative health monitoring technique may consequently be considered for the detection of prevalent and zoonotic agents.

3 RESULTS

There was no detection of LCMV in any of the three samples types from the negative control rack. LCMV was detected at 50% in EAD capture media as well as plenums and feces (Table 1). EAD in-line capture media and feces were positive for chronic LCMV. Plenum swabs were positive for acute LCMV. Copy numbers in all samples were very low (1-12 copies), indicating that the virus was shedding at a low level (Fig.2). The absence of LCMV virus in the feces for the acute LCMV rack was the result of the clearance of the virus by the host at 42 days post infection. The difference of LCMV strain detection between EAD capture media and plenum was due to the low level of viral shedding. The limit of the LCMV PCR assay was between 1-10 copies which is the level of copy numbers found in the samples.

Sample type	EAD capture media			Plenum swabs			Feces		
Rack type	acute LCMV N=1	chronic LCMV N=1	neg. control N=1	acute LCMV N=1	chronic LCMV N=1	neg. control N=1	acute LCMV N=1	chronic LCMV N=1	neg. control N=1
Number of positive sample	0	1	0	1	0	0	0	2	0
Percentage of positive per sample type	50%		0%	50%		0%	50%		0%

Table 1: Number of positive sample per sample types and per LCMV infection types

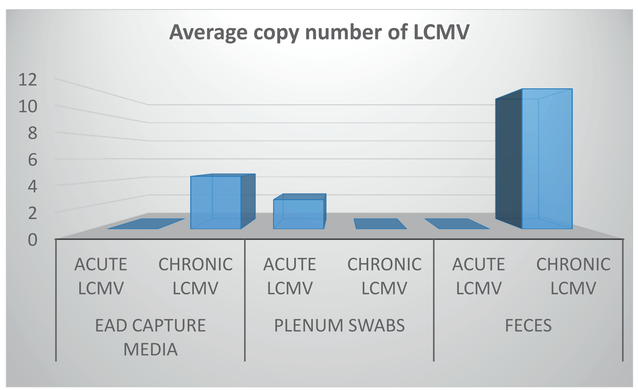

Figure 2: Average copy number/ µl of nucleic acide