Cooperation of Tecniplast and Helmholtz Zentrum München to establish environmental samples to improve microbiological monitoring of mouse colonies in IVCs

Abstract

The original idea of using nucleic acids associated with particles in the exhaust air of IVC cage rack systems for microbiological monitoring was elaborated at the Helmholtz Zentrum München and laid down in a Helmholtz patent application in 2009.

Since 2010 an intensive research was conducted at the Zentrum with the aim of identifying the materials and the most reliable methods to be applied to environmental microbiological monitoring of IVCs.

Tecniplast was then chosen as a cooperation partner for the technical aspects of the project.

Multiple jointly designed sampling devices were tested in order to define the most suitable sampling position.

Different collection surfaces were tested to optimize the sampled particle quality for downstream applications.

Finally, attention was taken to allow contamination-free sampling.

This multi-year endeavor allowed the identification of the most suitable material and position for the Tecniplast IVC systems.

HOUSING

TECNIPLAST
innovation through passion

Validation with Mouse Norovirus (MNV)

While working on the technical aspects, several studies have been undertaken to compare the new technology with the standard method Used Bedding Sentinel (UBS) serology.

A field study in an MNV naturally infected unit comprising 13 animal rooms compared 98 quarterly monitoring periods.
Environmental sampling from the prefilter site of a Tecniplast Air Handling unit for GM500 IVCs detected 97% of infections whereas serology of weekly exposed UBS detected only 34%.

As the MNV prevalence of the mouse colonies monitored in this study was determined to be high, the following conclusion could be drawn from the study: MNV infections, even at high prevalence, were mostly overlooked by UBS serology and dust PCR reliably detects MNV infections at least at a high prevalence.
In order to get a better idea of the sensitivity of the new technology, a study with a known (low) prevalence of MNV was conducted.
In order to get significant results six monitoring periods of at least 12 weeks were performed.
Tissue placed in the exhaust air prefilter tested weekly was compared to UBS serology tested after 12 to 13 weekly expositions to dirty bedding.
In summary the following results were obtained:

- Dust PCR detected MNV in all, UBS serology in only 1 out of 6 monitoring periods.
- Dust PCR detected a minimum of 5 MNV-positive animals within one week, thus dust PCR exhibits high sensitivity and time resolution.

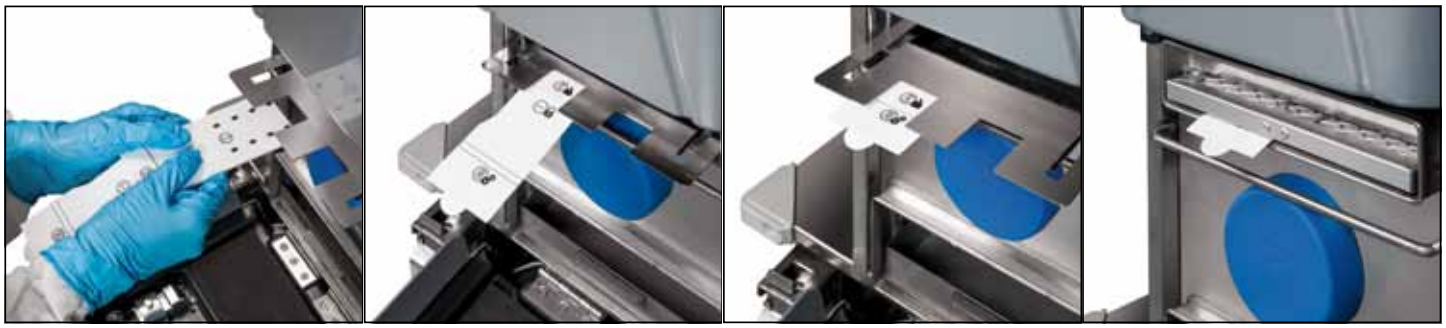
Preliminary results were presented at FELASA 2013 (Barcelona) and AALAS 2014 (S. Antonio). Two manuscripts have been submitted for review and recent results will be presented at FELASA 2016 (Brussels). More agents, traditionally difficult to detect by the Used Bedding Sentinels system were recently tested by dust PCR and (preliminary) results are summarized in Table 1.

Agent	Soiled Bedding Sentinel	Prefilter dust PCR	Minimum prevalence for pos. result with dust PCR within 1 week
MNV	16,6%	100%	1/63 cages
P. pneumotropica	0%	100%	1/63 cages
H. hepaticus	0%	100%	n.d.

Table 1. Detection of agents at low prevalence (1 to 5 cages per rack of 63 cages)

Conclusions

This collaboration led to the development of Interceptor, a new system that improves the microbiological environmental monitoring of IVCs: Interceptor collects particles moving from cages to the exhaust filtration area, that are thus ready for microbiological screening.



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