



## Virucidal efficacy of per acetic acid for automated washer disinfectors in tests simulating practical conditions

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## Virucidal activity of per acetic acid (PAA)

- ▶ 1960: first description of PAA as virucidal agent by Kline and Hull (PV, AdV, Coxsackie- and ECHOviruses, HSV).  
*0.04% PAA (5 min) was equal to 5% formaldehyde (30 min) (PV tested)*
- ▶ since 1963: important contributions by Sprößig and Mücke in Erfurt regarding virus inactivation by PAA mainly in the presence of alcohols.





## PAA as active ingredient of automated chemo-thermal instrument disinfection

- ▶ In general, thermolabile instruments are processed by PAA, which cannot be disinfected at temperature  $>80^{\circ}\text{C}$ , e.g. flexible endoscopes
- ▶ PAA can be used at temperatures  $<40^{\circ}\text{C}$
- ▶ advantages: expecting general broad spectrum with short exposure times, lower temperature stress for the instruments, short cycle
  
- ▶ Alternative with a comparative spectrum of virucidal activity: only aldehydes
  - ▶ disadvantage of aldehydes: higher temperature of  $50-60^{\circ}\text{C}$  necessary, longer processing times



## Aim of our study:

Virucidal activity / efficacy of PAA in the  
quantitative suspension test and in a carrier test

- ▶ **Quantitative suspension assay** according to EN 14476 in clean conditions (precleaned instruments)
- ▶ **Test simulating practical conditions** on frosted glass with test viruses already used in the quantitative suspensions tests





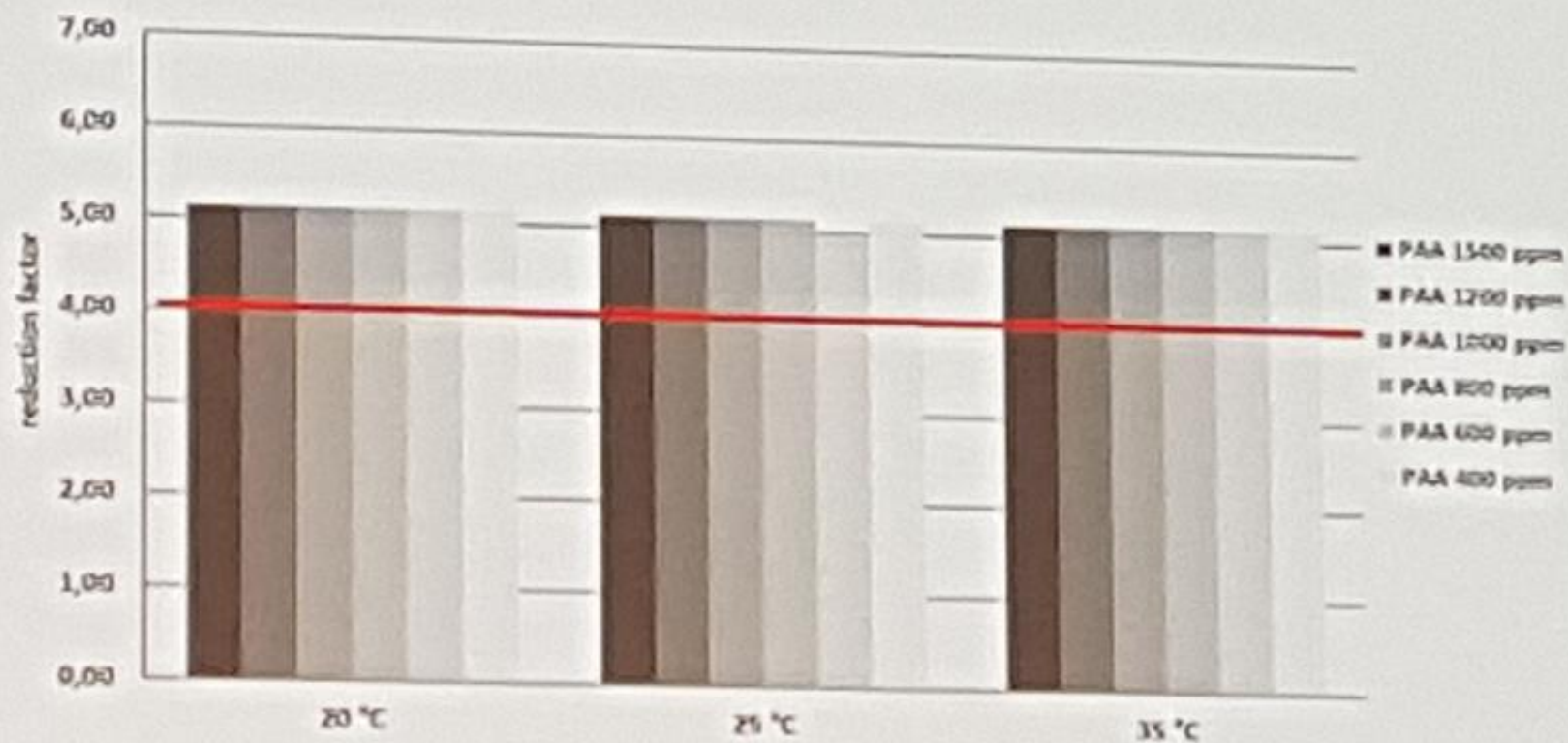
## EN 14476:2015/prA2:2017 (quantitative suspension assay, now in formal vote by CEN)

Table 1 — Minimum and additional test conditions

Test Conditions	Hygienic handrub and handwash	Instrument disinfection	Surface disinfection	Textile disinfection
Minimum spectrum of test organisms	<i>Poliovirus</i> <i>Adenovirus</i> <i>Marine Norovirus</i>  Limited spectrum virucidal activity <sup>a</sup> <i>Adenovirus</i> <i>Marine Norovirus</i>  Virucidal activity against enveloped viruses <sup>b</sup> <i>Porcine Coronavirus</i>	<i>Poliovirus</i> <i>Adenovirus</i> <i>Marine Norovirus</i>  when temperature is 40 °C or higher: only <i>Ferrovirus</i>	<i>Poliovirus</i> <i>Adenovirus</i> <i>Marine Norovirus</i>  Limited spectrum virucidal activity <sup>a</sup> <i>Adenovirus</i> <i>Marine Norovirus</i>  Virucidal activity against enveloped viruses <sup>b</sup> <i>Porcine Coronavirus</i>	<i>Ferrovirus</i>
Additional	Any relevant test organisms			



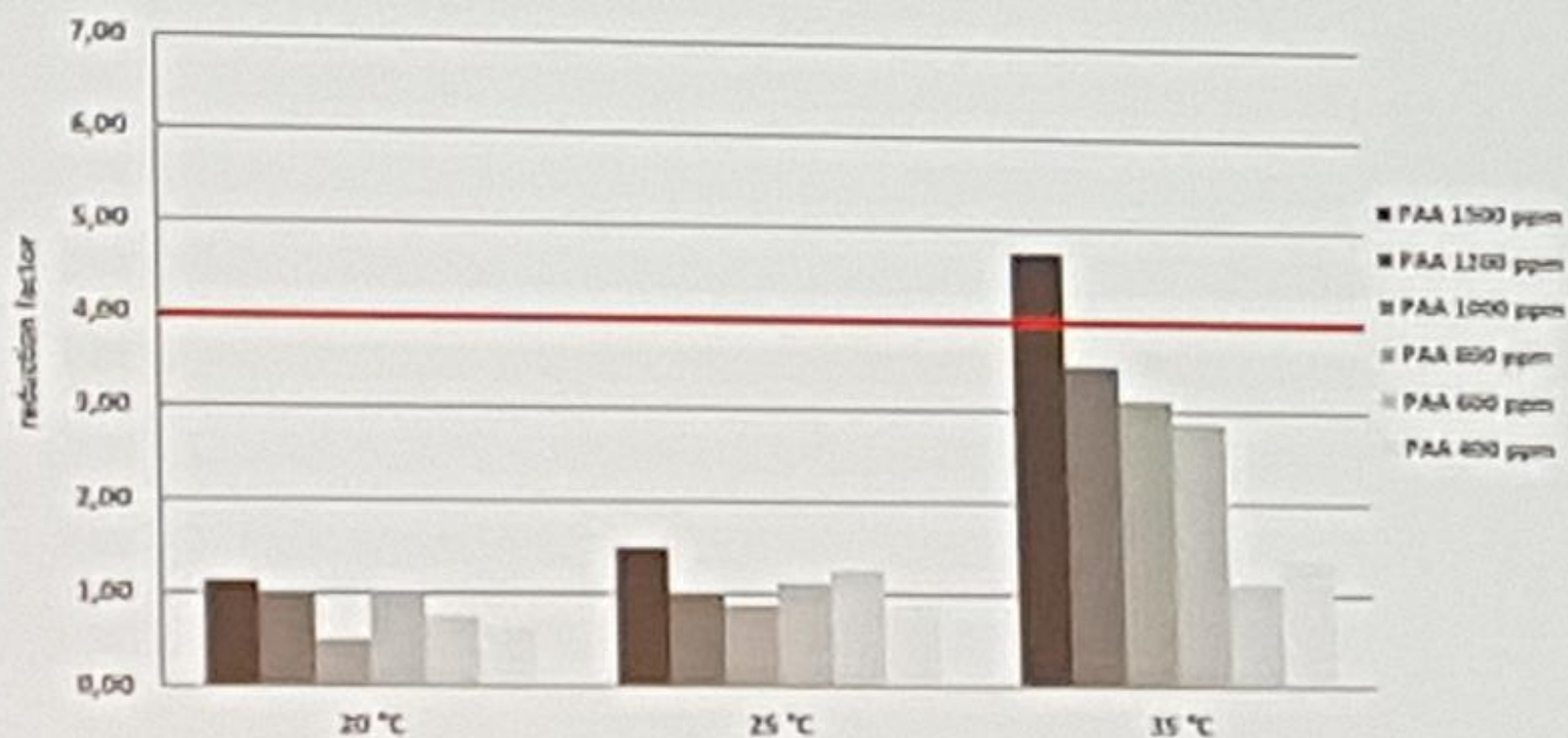
## Activity of 400 – 1500 ppm PAA towards adenovirus according EN 14476 (5 min, clean conditions)







## Activity of 400 – 1500 ppm PAA towards poliovirus according to EN 14476 (5 min, clean conditions)





## Frosted glass carriers for instrument disinfectants according to WI 00216103 (carrier test)



### Preparation of carriers:

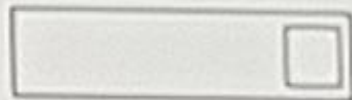
- boiling in 10 min 2.5% Decon 90
- boiling in 3 x 5 min in Aqua dest.
- flushing with ethanol
- drying



marking a square and  
sterilisation for 15 min at  
121 °C



2 mm  
of the edges





## Preparation of frosted glass carriers according to WI 00216103 (carrier test))



virus inoculum

(9 parts of virus + 1 part soil load)



50  $\mu$ l

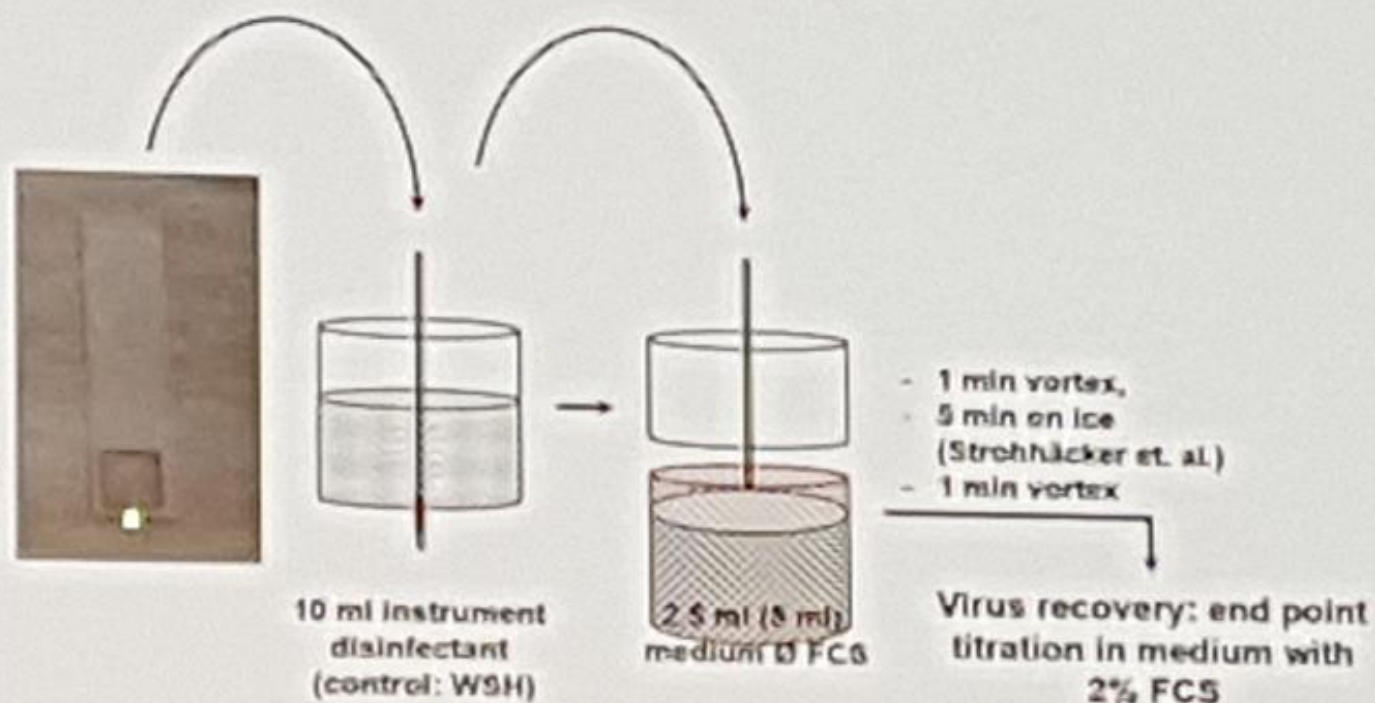
(distribution on marked area)



(carrier 15 x 60 x 1 mm, drying in laminar flow for max. 60 min)



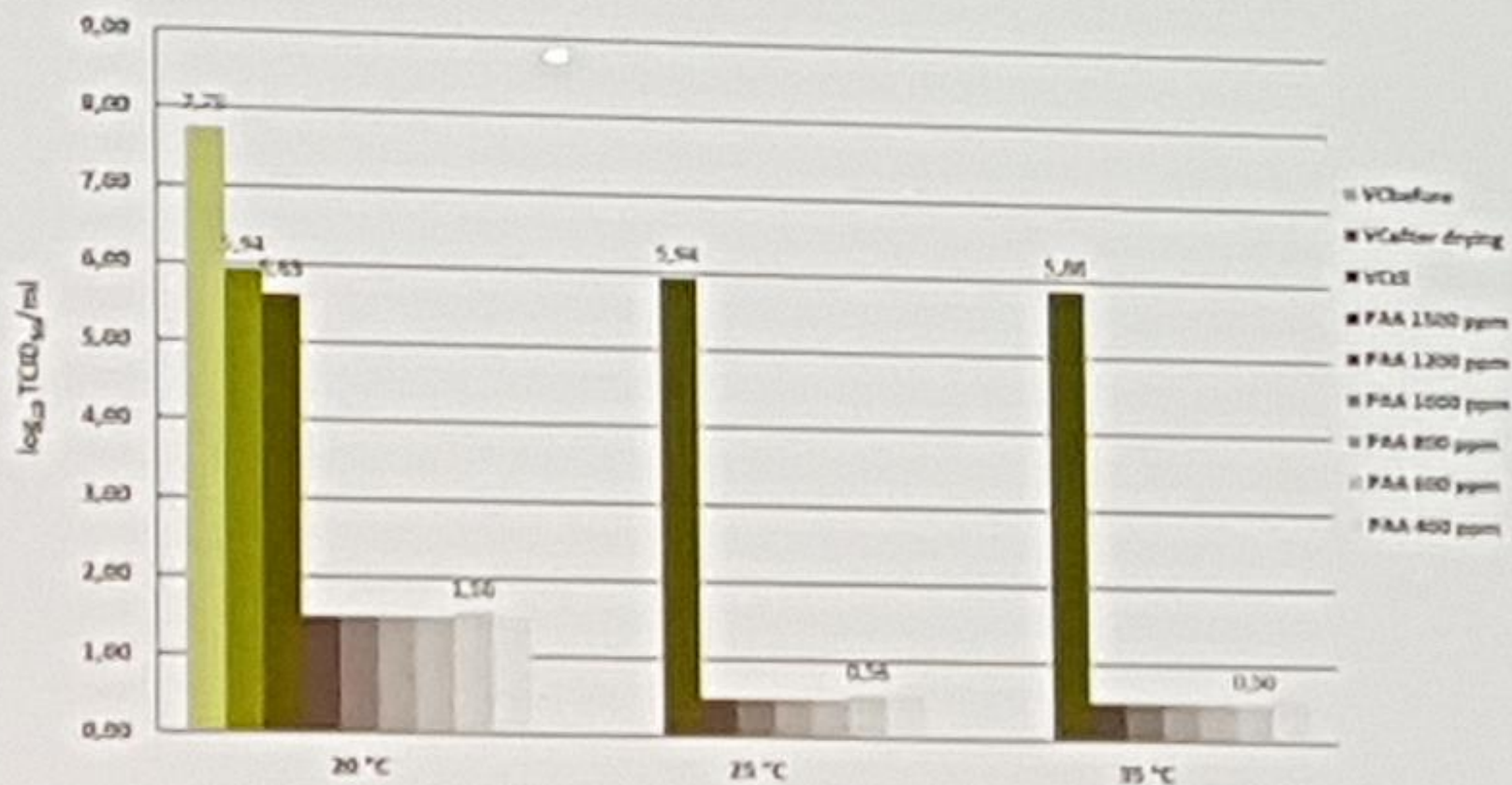
## Frosted glass carrier test for instrument disinfection according to WI 00216103





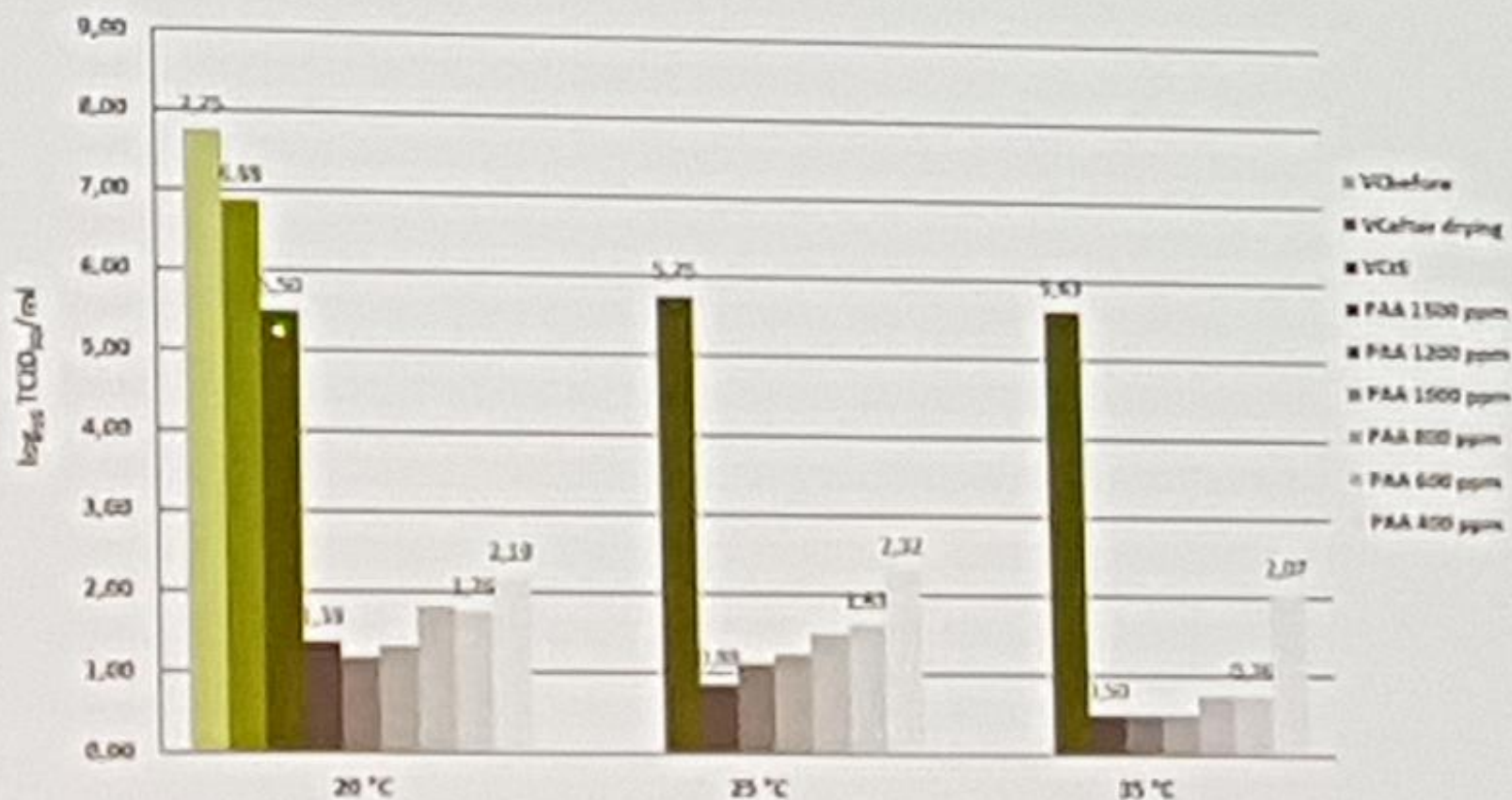


## Virucidal efficacy of 400 – 1500 ppm PAA towards adenovirus





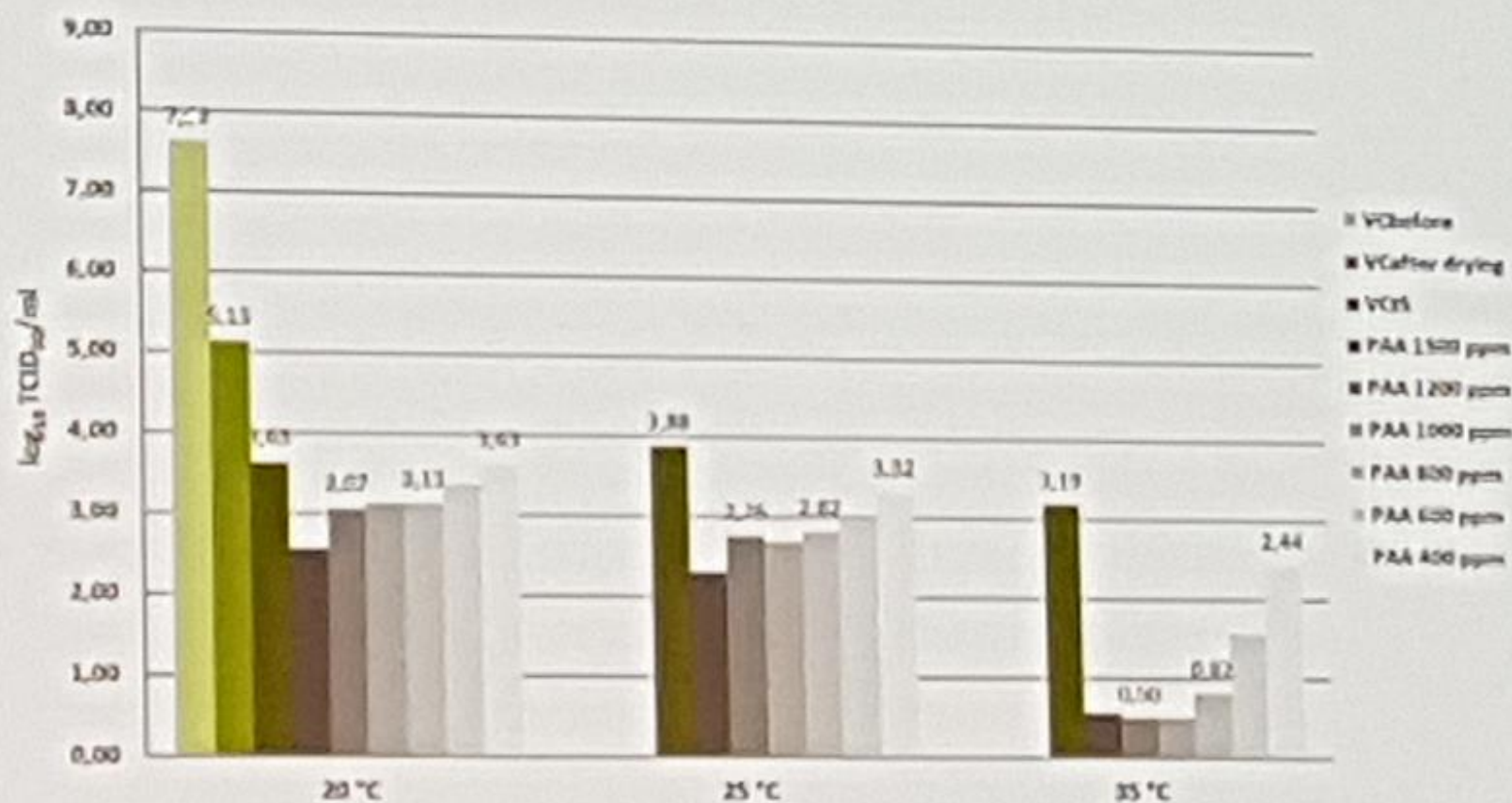
## Virucidal efficacy of 400 – 1500 ppm PAA towards murine norovirus







## Virucidal efficacy of 400 – 1500 ppm PAA towards poliovirus





From WI 00216103 (version 2016-11-04)

Table 1 — Minimum and additional test conditions

Test Conditions	Pre-cleaning products with a combined cleaner/disinfectant	Instrument disinfection when temperature is < 40 °C	Instrument disinfection when temperature is ≥ 40 °C
Minimum spectrum of test organisms <sup>a</sup>	<i>Modified Vaccinia virus Ankara</i> or <i>Vaccinia virus strain Elstree</i>	<i>Adenovirus<sup>b</sup></i> and <i>Norovirus<sup>c</sup></i>	<i>Parvovirus</i>
additional	Any relevant test organism		
Test temperature	according to the manufacturer's recommendation, but at / between		
	20 °C	20 °C and 40 °C	> 40 °C and 70 °C





## Summary

- ▶ Activity of instrument disinfectants in the future is based on suspension assays (at  $< 40^{\circ}\text{C}$  with PV, AdV, MNV) followed by a test simulating practical conditions.
- ▶ In the suspension assay with PAA PV is most stable.
- ▶ PV is the limited factor when testing  $< 40^{\circ}\text{C}$ . MNV and AdV require lower PAA concentrations in the carrier test than PV in suspension assay. Therefore, it is in discussion to use parvovirus in addition at  $< 40^{\circ}\text{C}$ .
- ▶ In the carrier test PV can not be used due to instability by drying. Candidates are MNV and AdV (at  $< 40^{\circ}\text{C}$ ) and MVM (??) (at  $\geq 40^{\circ}\text{C}$ ), respectively.
- ▶ Instrument disinfectants in the market with a virucidal claim (active against all viruses) must show a sufficient activity against PV, AdV and MNV in the suspension test. The carrier test for these products is still in discussion.





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Thank you for your  
attention

**Tulip Streak Disease**  
caused by **Tulip-breaking  
virus (TBV)**; family:  
potyviridae, virus aetiology  
first described in 1928!