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Title: Not all antistatic valved holding chambers have equivalent performance: An example why each valved holding chamber (VHC)-inhaler combination should be considered unique

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Body: RATIONALE: Electrostatic charge mitigation by the use of charge dissipative materials with VHCs is common, since initial pre-washing can be avoided. We compared 'antistatic' VHCs; Optichamber® Diamond® (OD), Phillips Healthcare with AeroChamber Plus® Flow-Vu® (AC Flow-Vu) Trudell Medical International) (n=4 devices/group), to determine suitability for patients delaying inhalation post-actuation. METHODS: An abbreviated Andersen impactor that determined fine particle mass < 4.7 µm at 28.3 L/min (FPM_{<4.7µm}) was used with an apparatus simulating 2, 5 and 10 s delay intervals following pMDI actuation (Flovent®, GSK plc, 125 µg/actuation fluticasone propionate (FP)). This approach conforms to guidance from European authorities that testing of VHCs should simulate delayed inhalation. Assay for FP was undertaken by HPLC-UV spectrophotometry. Measurements without delay were undertaken to assess mass recovery for FP, validating the procedure. All values are mean±SD. RESULTS: Mass recoveries (131.5±2.9 and 130.7±3.8 µg/actuation for the OD and ACPlus VHCs respectively) were close to label claim, validating system suitability. The variation of FPM_{<4.7µm} with delay interval is shown in the Table.

Relative Depletion of FPM_{<4.7µm}

	Delay (s)		
VHC	2	5	10
AC Flo-Vu	42.2±3.1	39.7±1.3	35.7±2.0
OD	35.0±3.2	29.2±1.7	23.0±2.8

The ratio FPM_{<4.7µm-ACPlus}/FPM_{<4.7µm-OD} increased from 1.2 (2-s) to 1.4 (5-s) and to 1.6 (10-s), demonstrating faster depletion of the therapeutically beneficial medication from the OD. CONCLUSION: Not all VHCs manufactured from anti-static materials provide optimum performance for patients who have poor

coordination.