Shortened SF6 MBW is a repeatable and sensitive test in adults and children with CF. D. Hannon1, I. Bradbury2, J.M. Bradley3, A. Reid4, N.J. Bell5, J.S. Elborn1, K. O’Neill6. 1Centre for Infection & Immunity, Queen’s University Belfast, Belfast, United Kingdom; 2Frontier Science Ltd, Scotland, United Kingdom; 3Centre for Health and Rehabilitation Technologies (CHART), University of Ulster, Belfast, United Kingdom; 4Belfast Health and Social Care Trust, Belfast, United Kingdom; 5Respiratory Medicine Department, Bristol Royal Infirmary, Bristol, United Kingdom

Introduction: Lung Clearance Index (LCI) derived from SF6 multiple breath washout (MBW) is a sensitive measure of lung disease. However it can be time-consuming, limiting its clinical use. Aim: To compare the repeatability and sensitivity of LCI until 1/40th of starting concentration (LCI40) to a shorter version of LCI until 1/20th of starting concentration (LCI20).

Methods: Triplicate MBW test data from 30 stable CF patients and 30 healthy controls were selected from a larger prospective study. MBW tests were performed using 0.2% SF6 and a modified InnocorTM. LCI40 and LCI20 were calculated using SimpleWashout software. Repeatability was assessed using coefficient of variation (CV%). The proportion of CF patients with abnormal results was compared. LCI normal limits were determined from control mean±2SD. Receiver operating characteristics (ROC) curve statistics were calculated (1.0=accurate test).

Results: CV% of LCI40 and LCI20 was comparable and not significantly different to controls (Table 1). The sensitivity of LCI40, LCI20 and FEV1 was 67%, 63% and 47% respectively. Area under the ROC curve (95% CI) for LCI40, LCI20 and FEV1 were 0.87 (0.78–0.96), 0.87 (0.77–0.96) and 0.73 (0.60–0.86) respectively.

Conclusions: LCI20 is a repeatable and sensitive test that is shorter than LCI40, offering a more feasible clinical measure. Funded by a US–Ireland Project Partnership Grant.

Enhanced photoacoustic gas analyser (Innocor) for multiple breath washout. Improvements to analyser response time maintains accuracy at fast ventilation rates, and produces a system that meets all washout technology performance targets. A. Horsley1,2, K. Macleod3, R. Gupta4, N. Goddard4, N.J. Bell5. 1University of Manchester, Institute of Inflammation and Repair, Manchester, United Kingdom; 2Manchester Adult Cystic Fibrosis Centre, Manchester, United Kingdom; 3Great Ormond Street Hospital, London, United Kingdom; 4University of Manchester, School of Chemical Engineering and Analytical Science, Manchester, United Kingdom; 5University Hospitals Bristol NHS Foundation Trust, Department of Respiratory Medicine, Bristol, United Kingdom

Objectives: The Innocor device contains a highly sensitive photoacoustic analyser which allows multiple breath washout (MBW) measurements using very low concentrations of the tracer gas SF6. Previously, use in smaller subjects has been limiting its clinical use. The Innocor device can be enhanced to reliably generate highly accurate lung volume measurements down at volumes as low as those simulating infant lung settings. Signal alignment is a critical factor. With these enhancements, Innocor achieves all of the recent technical recommendations for MBW apparatus, including those for accuracy in infant settings.

Methods: A technical enhancement was developed to the Innocor analyser. The Innocor device was validated against the gold standard, SimpleWashout software, using 0.2% SF6 and a modified InnocorTM. LCI40 and LCI20 were calculated using SimpleWashout software. Repeatability was assessed using coefficient of variation (CV%).

Results: Acceptable values were obtained with each device in all subjects (51 adults: 21–58y, 41 children: 5–17y). Both devices were considered equally convenient by children and adults. Using a given apparatus, LCI values were similar in adults and children, which allowed to pool the data (n=92). On average, LCI NDD was consistently lower than LCI EM (6.54±0.57 vs 6.94±0.42, p=0.001, mean difference: −0.40, 95%CI: −1.19 to 0.79). EM yielded a narrower range of normal values (p=0.04). The intraindividual CV was lower using EM than using NDD (2.9±2.6% vs 5.5±3.7%, p=0.001). FRC NDD was lower than FRC EM (2.04±0.94 vs 2.7±1.28 L, p<0.001). FRC EM was measured in 11 adults and corresponded to 100% (±6) of FRC EM and 81% (±7) of FRC NDD. When compared to FRC He, underestimation of FRC by NDD was significant (p<0.001).

Conclusion: In normal subjects, LCI and FRC obtained using current versions of the EasyOnePro or the EcoMedics are not interchangeable. EcoMedics yields more reproducible LCI values, a narrower range of normal values and more accurate FRC measurements.

Multiple breath nitrogen washout in healthy children and adults: a comparison of two commercially available devices. W. Ponce1, A.-S. Aubriot1, P. Lebecque1. 1Cliniques Universitaires Saint-Luc, University of Louvain, Cystic Fibrosis Unit, Brussels, Belgium

Background: Multiple breath nitrogen washout (MBWN2) is a promising tool in pediatric pulmonology. Data comparing recent commercially available devices are lacking.

Objective: To compare the results obtained from 2 such devices in healthy children and adults.

Methods: Healthy subjects were recruited to perform MBWN2 tests in duplicate using two devices (EasyOne Pro, NDD, Switzerland – Exhalyzer D, EcoMedics, Switzerland), in random order on the same session. Agreement between devices was assessed by Bland-Altman plot. In a subset of adults, FRC was also measured using helium dilution (FRC He).

Results: Acceptable values were obtained with each device in all subjects (51 adults: 21–58y, 41 children: 5–17y). Both devices were considered equally convenient by children and adults. Using a given apparatus, LCI values were similar in adults and children, which allowed to pool the data (n=92). On average, LCI NDD was consistently lower than LCI EM (6.54±0.57 vs 6.94±0.42, p=0.001, mean difference: −0.40, 95%CI: −1.19 to 0.79). EM yielded a narrower range of normal values (p=0.04). The intraindividual CV was lower using EM than using NDD (2.9±2.6% vs 5.5±3.7%, p=0.001). FRC NDD was lower than FRC EM (2.04±0.94 vs 2.7±1.28 L, p<0.001). FRC He was measured in 11 adults and corresponded to 100% (±6) of FRC EM and 81% (±7) of FRC NDD. When compared to FRC He, underestimation of FRC by NDD was significant (p<0.001).

Conclusion: In normal subjects, LCI and FRC obtained using current versions of the EasyOnePro or the EcoMedics are not interchangeable. EcoMedics yields more reproducible LCI values, a narrower range of normal values and more accurate FRC measurements.