**Title:** Feasibility of Multiple-Breath Washout in the Clinical Setting and Prediction of its Duration in Children and Adults with Cystic Fibrosis

**Lay Title:** Is the Multiple-Breath Washout Test Reliable in Adults with Cystic Fibrosis?

**Authors:** Christine Allombaa, Leonie Busacka, Niklas Ziegahna, Charlotte O. Piocha, Alexandra N. Schnorra, Bent R. Fuhlrotta, Eva Steinkea-d, Marcus A. Malla-d, and Mirjam Stahla-d

**Affiliations:**

aDepartment of Pediatric Respiratory Medicine, Immunology and Critical Care Medicine, Charité - Universitätsmedizin Berlin, corporate member of Freie Universität Berlin and Humboldt-Universität zu Berlin, Augustenburger Platz 1, 13353 Berlin, Germany

bGerman Center for Lung Research (DZL), associated partner site Berlin, Augustenburger Platz 1, 13353 Berlin, Germany

cGerman Center for Child and Adolescent Health (DZKJ), partner site Berlin, Augustenburger Platz 1, 13353 Berlin, Germany

dBerlin Institute of Health at Charité – Universitätsmedizin Berlin, Anna-Louisa-Karsch-Str 2, 10178 Berlin, Germany

**What was your research question?**

Multiple-breath washout (MBW) is a specific lung function test. Until now, it has mainly been used in children and people with cystic fibrosis (pwCF) with mild lung disease. We wanted to investigate whether it can be performed in pwCF of any age and those with severe disease. We also identified factors which affected how long the test took and developed a model to predict how long a MBW test will take for each individuals.

**Why is this important?**

The MBW test measures how evenly air moves through the lungs. The test is used to calculate the Lung Clearance Index (LCI). LCIis a sensitive indicator of early abnormalities before they appear in standard lung function tests like spirometry. While MBW test are widely used in children with CF, it is less common in adults due to concerns about test length and feasibility. If MBW is shown to work well across all ages and its duration can be predicted, it can be more easily integrated into routine CF care, helping detect problems earlier, resulting in improving disease monitoring, and optimizing the time spend in clinic, especially for adults.

**What did you do?**

We analysed almost 1,400 MBW tests from people with CF aged from 2 to 80 years, as well as from healthy volunteers. We measured test success rates, trial times, and factors affecting duration, such as height, age, and lung health. We also compared single MBW tests to multiple tests to see if shorter testing is possible without losing accuracy. Using these results, we developed a formula based on height, lung volume, and LCI outcome to predict test duration.

**What did you find?**

MBW was successful in all healthy volunteers and in over 94% of people with CF, with slightly higher rates in children. In preschool children, the MBW test was more successful than standard spirometry. Average test times were about two minutes in people with mild disease, under three minutes in moderate, and around five minutes in pwCF and severe CF disease. In both children and adults, MBW detected lung changes even when spirometry appeared normal,. A single high-quality test produced results comparable to multiple MBW tests. Our prediction model was good at estimating test times in mild and moderate disease, but was less accurate in severe cases, where tests often lasted longer.

**What does this mean and reasons for caution?**

MBW is feasible across all ages and disease stages in CF, including adults with severe lung disease. It can reveal changes earlier than standard tests and may be scheduled?? more efficiently with the prediction tool. However, our high success rates may reflect the testing team’s experience and the fact that many participants became familiar with the MBW test after repeating it several times during the study, even if it was unfamiliar at first. Less experienced centres might initially have lower success. Recorded test times excluded preparation and rest periods, so real-world testing may take longer. The prediction model is less accurate in people with severe disease and needs further refinement.

**What’s next?**

Future studies should validate these findings in other centres, refine the prediction model for severe disease, and explore practical ways to integrate MBW into routine CF care, including the use of single high-quality trials to save time while maintaining the accuracy of MBW.

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