**Title:** Exploring the art of ciliary beating: the benefits of high-speed video analysis

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We enjoyed reading Kempeneers *et al’s* study whichinvestigated the variability of ciliary beat pattern (CBP) in nasal epithelium from healthy volunteers [1]. We routinely use high speed video (HSV) analysis to assess ciliary motility, and fully agree that areas of abnormal CBP occur in healthy individuals. This is a well-known observation in the primary ciliary dyskinesia (PCD) diagnostic field with secondary dyskinesia caused by infections, inflammation or by the trauma of sampling. We note that the authors found the majority of epithelial edges exhibited uniform normal CBP and only 1% exhibited uniform stiff cilia or 1% asynchronous cilia [1]. In our collective experience of patients with respiratory symptoms referred for diagnostic testing for PCD, secondary dyskinesia is considerably more common. The evidence-based European Respiratory Society (ERS) Guidelines therefore recommend reanalysis of CBP following cell culture in an attempt to mitigate secondary defects, and reduce the need for repeat brushings [2,3]. Kempeneers *et al* have confirmed our experience that ‘normal HSV’ does not require every strip of epithelium to exhibit normal CBP; the vast majority of cilia should beat normally and we would expect to see effective particle clearance.

The ERS Guidelines [2], North American PCD Research Consortium [4] and ERN-LUNG [5] recommend that HSV analyses should be conducted in centres with a high referral rate, by experts with extensive experience of normal and abnormal beating; there is an art to interpreting the science. Ideally centres should combine complementary tests: nasal nitric oxide (nNO), HSV, transmission electron microscopy (TEM), genotyping and possibly immunofluorescence labelling [2]. “Hallmark” CBP abnormalities of PCD (e.g. immotile, hyperkinetic or circular) correspond to genotype and are uniform in most patients with PCD; HSV is therefore extremely helpful for supporting the diagnosis [2]. HSV is the most sensitive test in the diagnostic algorithm and is invaluable in driving the pursuit of a diagnosis in difficult cases, such as normal TEM and genotype (16% and 35% of cases) [2]. If HSV and nNO are normal, the diagnosis is considered very unlikely. However some patients have subtle abnormalities of CBP and, even in the hands of experts, HSV interpretation can be difficult. Discussion of ‘difficult’ cases between centres is now a feature of the UK Diagnostic Centres and of the BEAT-PCD network ([www.beatpcd.org](http://www.beatpcd.org)), and will become an option with the ERN-LUNG (<http://ec.europa.eu/health/ern/policy_en>).

As highlighted by the ERS Guidelines and by the editorial [4] accompanying Kempeneers’ manuscript there is the need for standardization of methodology and reporting of HSV, alongside a need to evaluate the accuracy of HSV to differentiate individuals with and without PCD.

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