European Cystic Fibrosis Society

Journal of Cystic Fibrosis
The Official Journal of the European Cystic Fibrosis Society

Cystic Fibrosis Research News

Title:
NEEDLE-FREE IONTOPHORESIS-DRIVEN β-ADRENERGIC SWEAT RATE TEST

Lay Title:
Needle-free bubble test

Authors:
Audrey Reynaerts[1a], François Vermeulen[2b], Angélique Mottais[1a], Sophie Gohy[2a], Patrick Lebecque[2a], Raphaël Frédérick[3a], Rita Vanbever[4a]; Teresinha Leal[1a]

Affiliations:
[1]Louvain Center for Toxicology and Applied Pharmacology, Institut de Recherche Expérimentale et Clinique;
[2]Cystic Fibrosis Center;
[3]Medicinal Chemistry Research Lab, Louvain Drug Research Institute;
[4]Advanced Drug Delivery & Biomaterials, Louvain Drug Research Institute;
[a]Université catholique de Louvain (UCLouvain), Brussels – Belgium;
[b]Katholieke Universiteit Leuven (UZLeuven), Leuven – Belgium

What was your research question?
We focused our work on a sweat rate test claimed to be able to evaluate the efficacy of new CF treatments and to assist in the diagnosis of difficult cases. We wished to develop a new version of the test not requiring injections in the skin, as initially described.

Why is this important?
Making the test needle-free would broaden up its application, thereby promoting advances in precision of markers of efficacy of new personalized treatments for CF that must parallel the present intensive and fruitful effort in the field of drug development programs. Diagnosing mild forms of CF may be particularly challenging as they may present with intermediate or even normal sweat chloride results obtained by routine sweat tests in people without two known causing mutations.

What did you do?
We developed a needle-free sweat drop ("bubble") test. First, we determined, in healthy controls, the optimal conditions and the most adequate drug protocol to stimulate sweating while replacing injections into the skin by iontophoresis, a well-known needle-free method to

transport drugs through the skin; the method has been used for decades in routine sweat tests, even in babies. Next, after measuring the numbers and the sizes of bubbles serially imaged in adults with CF, in parents of patients and in healthy subjects, we evaluated the use of selected parameters of the test to act as markers of CFTR function.

What did you find?

We found that the new bubble test was safe, well-tolerated and no adverse events were observed after two successive iontophoresis sessions performed at the same skin area of a forearm. By applying a proper statistical analysis integrating different sources of variability of bubble sizes, we demonstrated that the test fully distinguished subjects with CF from controls. Compared to controls, the size and the rate of growth of bubbles in response to CFTR-dependent stimulation were blunted in CF and half-normal in numerous parents of patients.

What does this mean and reasons for caution?

In our work, we succeeded for the first time in performing a needle-free “bubble” sweat test that is very sensitive and specific to distinguish between people with CF and people without CF. By integrating different sources of variability of the responses, the new test allowed quantifying minimal or half-normal CFTR-dependent responses. The new version of the test hold promises for its validation by other CF centers and its broad application to study drug effects in treatments with CFTR modulating drugs, in particular in children.

What’s next?

Improving our optical set up to a miniature device allowing movements of the arm during the test without disturbing alignment of serial images would make the test even easier and comfortable for application in infants, for example in newborn screening programs.

Original manuscript citation in PubMed

https://pubmed.ncbi.nlm.nih.gov/34489187/

cfresearchnews@gmail.com