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Dorothy H Andersen, A Woman in Science and her Importance in Cystic Fibrosis

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Editorial

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Editorial

Cystic fibrosis (CF) is the commonest autosomal recessive disease in the Caucasian population, with an incidence of 1 in 2500 newborns. Nowadays the molecular defect underlying the disease has been clarified and has become the target for both antenatal screening programmes and stratified approaches to treatment. The average life expectancy of a child with CF is presently about 40 years and this achievement owes a tremendous debt to women as Dorothy Hansine Andersen (1901-1963), a pathologist whose studies contributed to the improvement of. knowledge about cystic fibrosis. Born the only child to Hans Peter Andersen, a Danish farmer, and Mary Louise Mason, her intense existence was signed by sad events as when she was 13 years old, her father died, followed by her mother 6 years later.

She received her MD degree from the Johns Hopkins University in 1926 and, in the same year, she carried out some studies on the female reproductive system of the pig. At the beginning of her career, she was interested in surgery. Indeed, she moved to Strong Memorial Hospital in Rochester, NY, where she held a surgical internship and had a 1 year teaching position at the University of Rochester. As for many women in science during the 1900s, her story was characterized by overcoming sexual stereotypes. Even if Andersen wanted to become a surgeon, this was denied because of her sex. This event deeply influenced her life and she decided to move from clinical practice to medical research. In 1930, she was enrolled to the Department of Pathology at Columbia University College of Physicians and Surgeons in Manhattan, NY, where she spent 5 years studying endocrine glands and female reproduction. By these studies, she received her doctorate.

In 1935, Andersen moved to the Babies Hospital at Colombia–Presbyterian Medical Center (NY) where she spent more than 20 years. During this period her main interest was focused on studying by autopsies inherited malformations of the heart. It was while engaged in this work that Andersen made the most important discovery of her career. An autopsy of a child with coeliac disease revealed an unexpected lesion in the pancreas. Since then she dedicated her time to analyze hundreds of specimens from other children believed to have died from coeliac disease and searching the scientific literature for reports of infants with a similar disease state. In 1938, at the end of these studies, Andersen published a scientific report using, for the first time in the History of Medicine, the term "cystic fibrosis of pancreas" [1]. Her original description are as follows: "In 45 of the cases the pancreas presented a microscopic picture which is described by the term cystic fibrosis. The acini contain secretions of various sizes, and the acinar cells were flattened to form a thin epithelial wall around them. The smaller concretions were surrounded by relatively normal cells, which occasionally contained eosinophil granules. The size of the cysts varied in each case but large ones were not often noted in the youngest infants. Surrounding the acini and also the lobules there were moderate to large amounts of fibrous tissue, the quantity varying roughly with the age of the child. The islets of Langerhans were usually normal in number and appearance." It is noteworthy that this report, described not only the clinical changes in the pancreas, but also the changes seen in the lungs. Andersen observed "some congestion of the underlying mucosa", which we now understand to be caused by the primary defect that causes CF, inherited dysfunction of the CF transmembrane conductance regulator (CFTR),

which leads to a vicious cycle in the airways of defective mucus clearance, obstruction, infection and inflammation. This report also described the infection of airways, another important feature in view of present knowledge about the pathophysiology of cystic fibrosis. Importantly, most of the patients considered in her study had died of pneumonia aged less than 6 months. Others described squamous metaplasia of the respiratory epithelium, considered, by Andersen, to be related to vitamin A deficiency and a factor in perpetuating the respiratory infections. Indeed, she made the hypothesis that the vitamin A deficiency resulting from the intestinal malabsorption was important in causing the respiratory symptoms [2], however later on this was shown not to be the case.

Dorothy Andersen was a clear example of an innovative approach in Medicine, in which the laboratory investigation could be translated into the clinic. In 1942, the American Journal of Diseases of Children published a report entitled "Pancreatic enzymes in the duodenal juice in the celiac syndrome" [3]. In this report, Andersen for the first time described a laboratory test for cystic fibrosis, which involved an assay of the pancreatic enzymes in the duodenal juice. Results suggested that trypsin was more reliable than lipase. By this discovery, she anticipated that the measurement of immunoreactive trypsinogen in blood (due to the poor release from pancreatic ducts) would have been an important tool in the newborn screening programme of cystic fibrosis.

The collaboration of Andersen with Paul di Sant'Agnese, a pediatrician from Columbia University and eventually another leader in the CF field, had given another deep contribution in cystic fibrosis research. For the first time, they observed that increased salt content in sweat could be used to identify patients with cystic fibrosis [4]. This discovery represents a milestone in CF history as the so-called sweat test is one of the most important diagnostic method still used nowadays. In 1958, Andersen was appointed Chief of Pathology at the Babies Hospital and a full professor of pathology at Columbia University. The historical documentation concerning Andersen's personal life is poor. As "revolutionary woman", her hobbies were unfeminine—carpentry, hiking, and canoeing— which made her colleagues cheerful. She described herself a "rugged individualist", reflected by the fact that she mostly brought herself up and did not marry, but dedicated her life to her work. Being a heavy smoker, in 1963, she died of lung cancer.

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