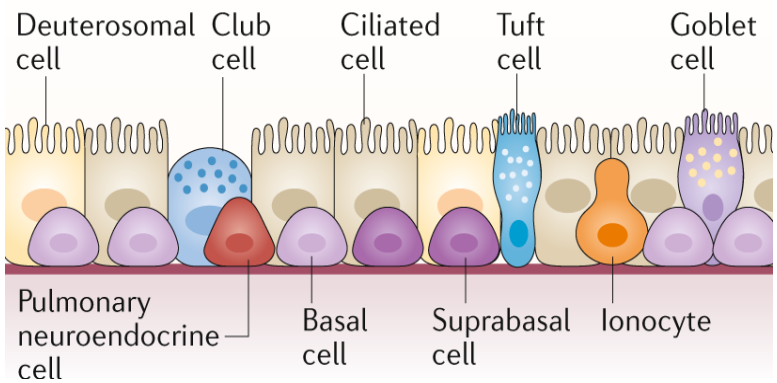
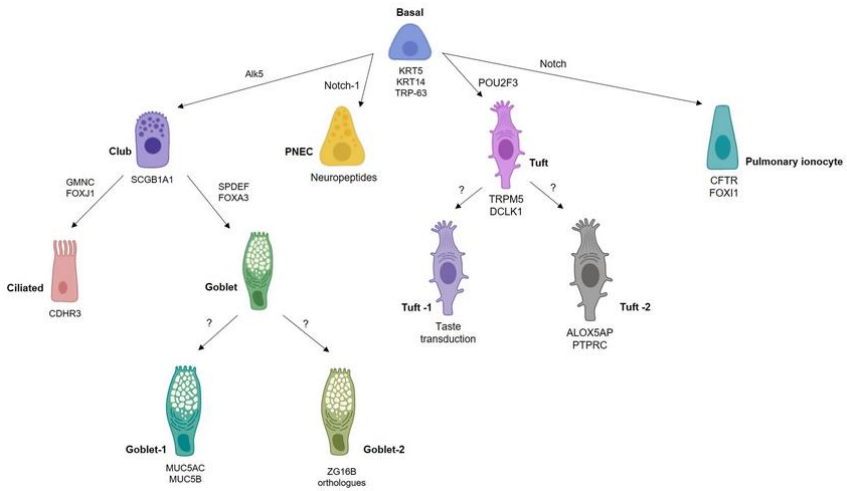
CFTRc/PACB (Primary Airway Cell Biobank) platform

Airway epithelium consists of many cell types with distinct functions and critical roles in disease

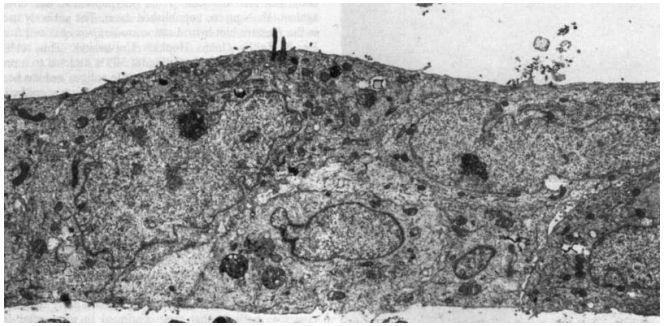




Disease	Cell	Proposed contributions to disease
COPD	Basal	Hyperplasia; smoking-induced loss of regenerative capacity and gene upregulation; increased cytokine secretion
	Ciliated	Reduced numbers of ciliated cells
	Goblet	Mucus hyperproduction; elevated SPDEF and Foxa3 expression
Asthma/Allergic asthma	Club	Decreased CC16 concentrations due to reduced Scgb1a1 expression
	Ciliated	Cdhr3 overexpression increases asthma susceptibility
	Goblet	Increased cell numbers; upregulation of proinflammatory and remodeling genes; elevated SPDEF and Foxa3 expression; MUC5AC overproduction
	PNEC	Bombesin-induced mast cell recruitment; CGRP-induced mucus secretion and ILC2 activation; yaminobutyric acid-induced goblet cell hyperplasia.
	Tuft	Express TAS2 receptors thought to attenuate allergic asthma symptoms
Cystic fibrosis	Pulmonary ionocyte	Possibly via mutation in CFTR, affecting chloride ion transport and leading to fluid accumulation in the airways, although the exact role of CFTR in ionocytes has not been described
Lung cancer	Basal	Overexpression of basal cell genes
	Club	Decreased serum CC16 concentrations
	PNEC	Source of lethal SCLC
	Tuft	POU2F3 expression characterizes a variant form of SCLC
Rhinovirus	Ciliated	High expression of Cdhr3 facilitates rhinovirus entry
PCD	Ciliated	Impaired cilia formation/function impedes mucociliary clearance
	Goblet	Aberrant mucus production
SIDS	PNEC	Hyperplasia and hypertrophy
Helminth infection	Tuft	Secrete IL-25 to maintain an intestinal IL-13 producing ILC2 population that stimulates tuft cell proliferation
Tuberculosis	Microfold	Facilitate Mtb binding and translocation via the B1 scavenger receptor

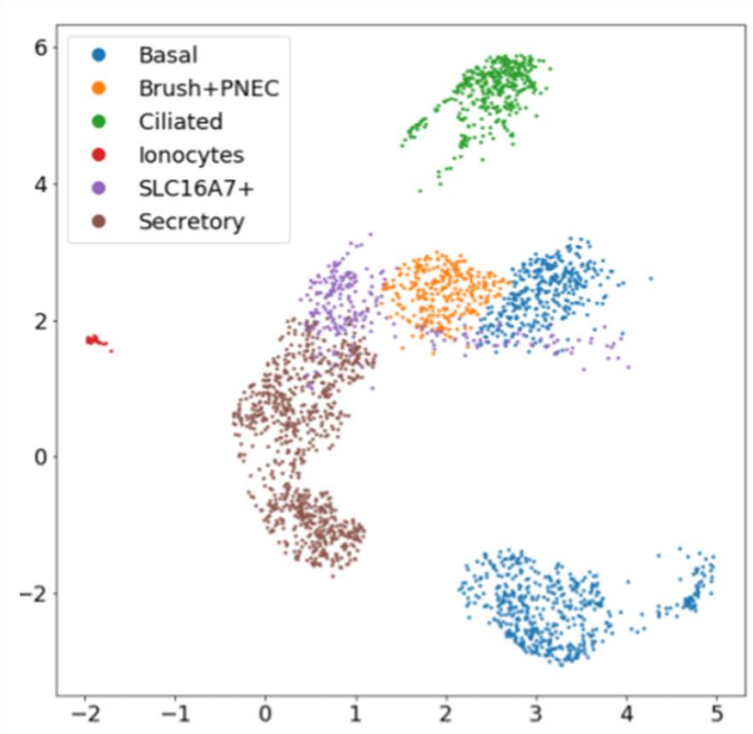
from: Davis and Wypych 2021 Mucosal immunology 14:978

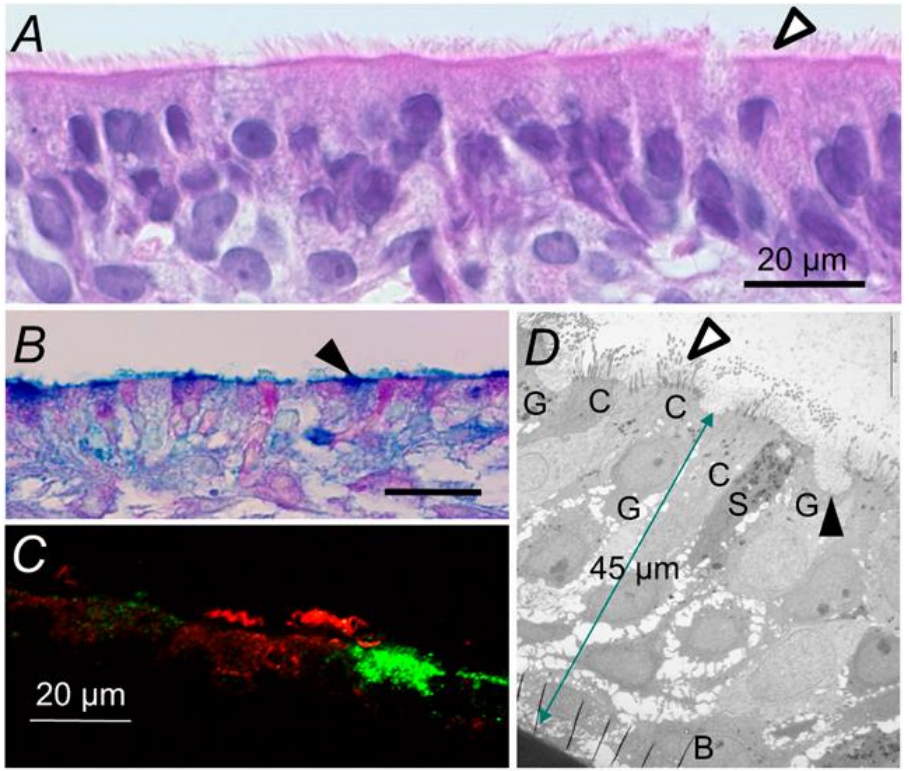
16HBE14o- cell line



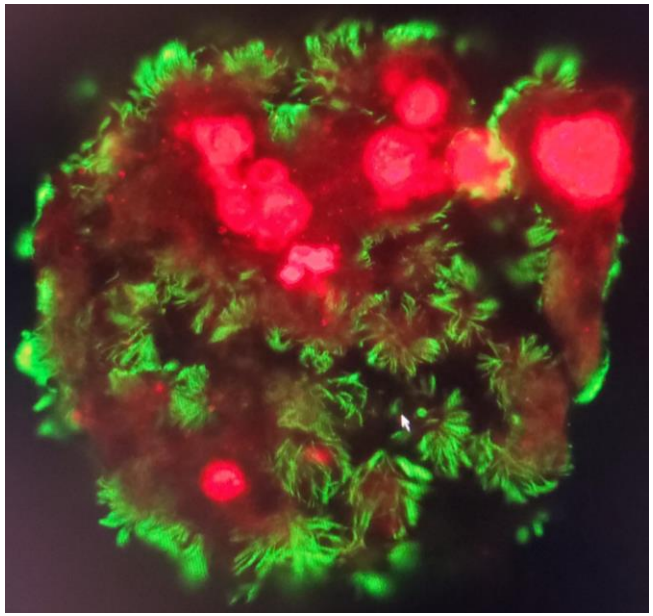
from: Cozens et al. AJRCMB 1994

Transcriptomics using well differentiated HBE cells from the PACB





from: LeSimple et al. AJRCMB 2013

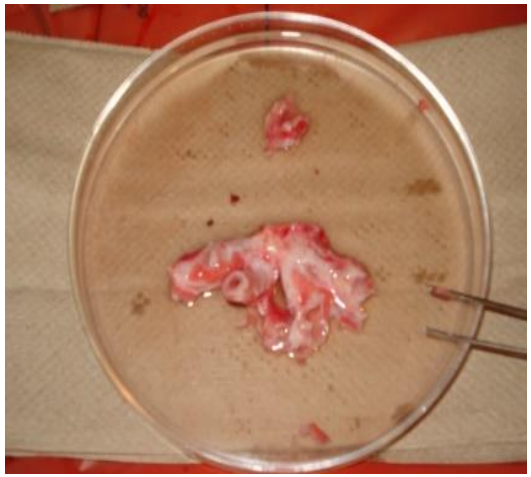


"Apical-out" epithelial organoid from human bronchus prepared in the PACB

>140 lungs have been biobanked

7.2 billion cells have been supplied to researchers world-wide

usually distributed in cryovials of 2 million cells



Quality control performed on every cell isolation:

- safety screening for viral contaminants (HIV 1,2, Hepatitis A,B,C, Hantavirus, HTLV) and Mycoplasma
- check cell viability after thawing, contamination
- confirm that cells form good monolayers at ALI and grow well on plastic
- for CF donors, confirm CFTR genotype of (I, II, III, IV)
- histology of well-differentiation cells (Hematoxylin & Eosin, and Alcian Blue-Periodic Acid Schiff)
- each preparation tested with CFTR modulators (from Trikafta) to assess responses of different CF donors
- other lung cell types, tissue blocks for histology, mucus samples etc also biobanked

The PACB is accredited by

- International Society of Biological and Environmental Repositories (ISBER)
- Office of Biobank Education and Research Biobank Certification Program
- Association of Biomolecular Resource Facilities (ABRF)

PACB resource is authorized by the Cystic Fibrosis Foundation
https://www.cff.org/researchers/cf-foundation-biorepository#ExBiorepositories

Other platform services: functional assays (e.g. electrophysiology), histology, custom organoids

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