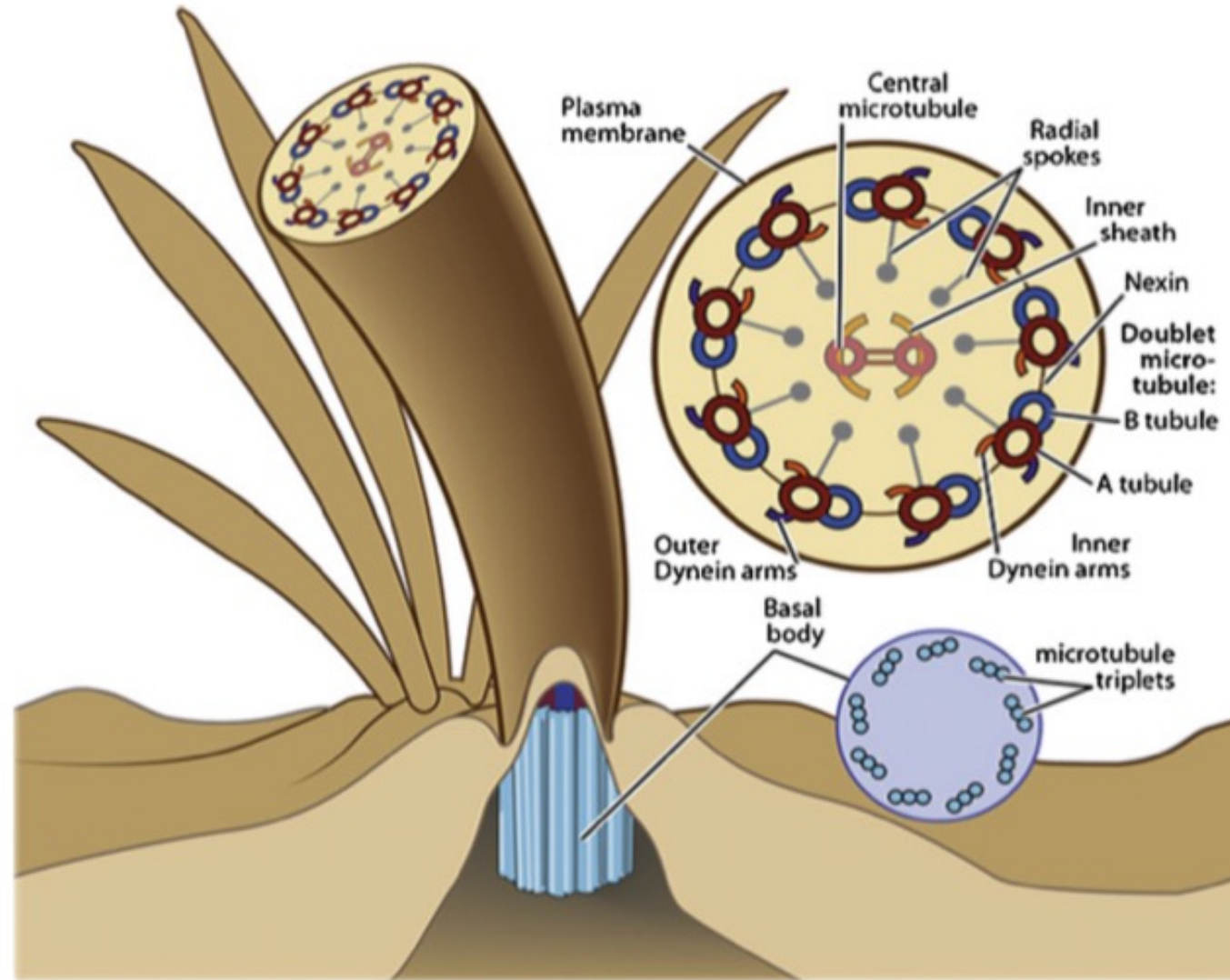
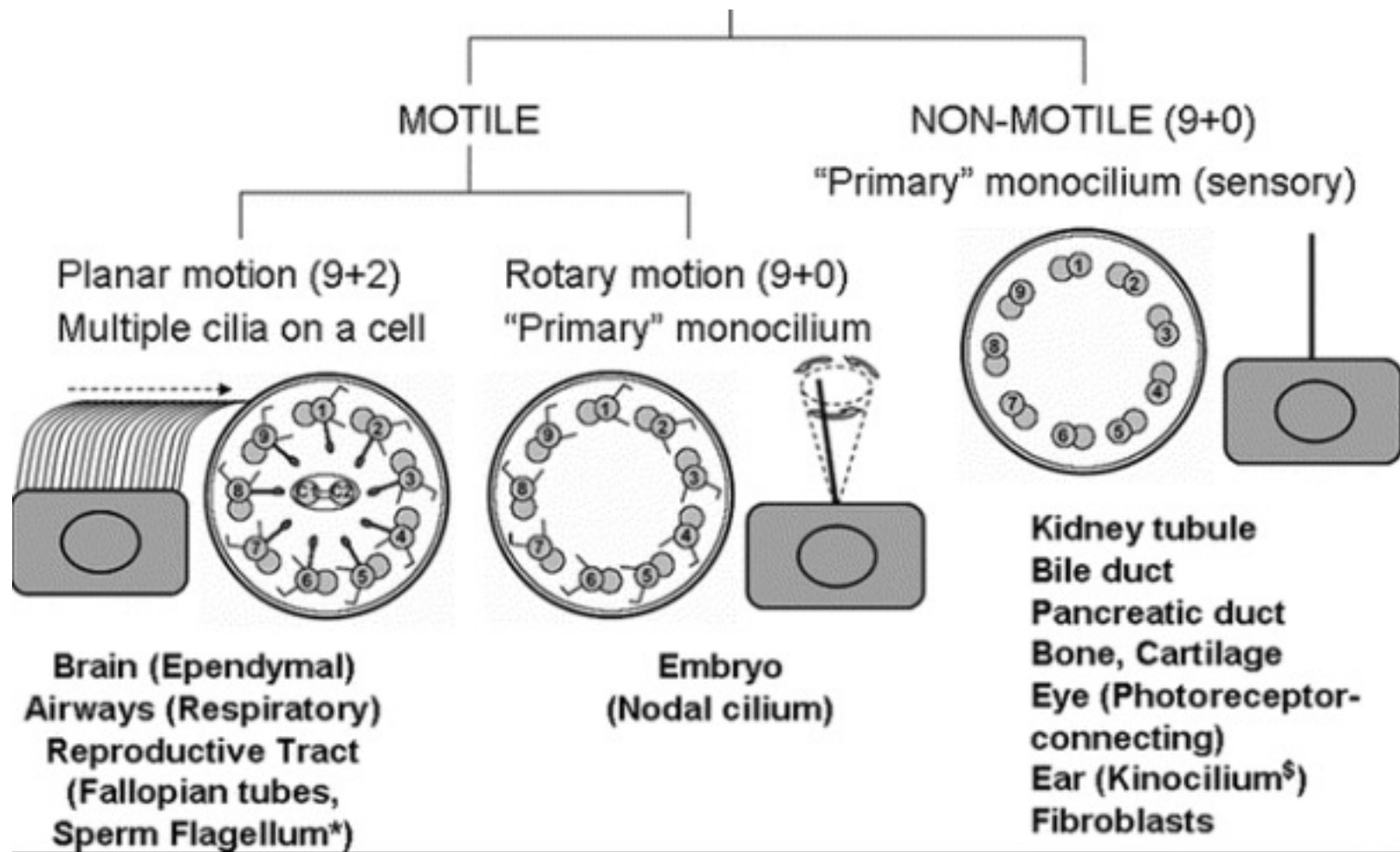
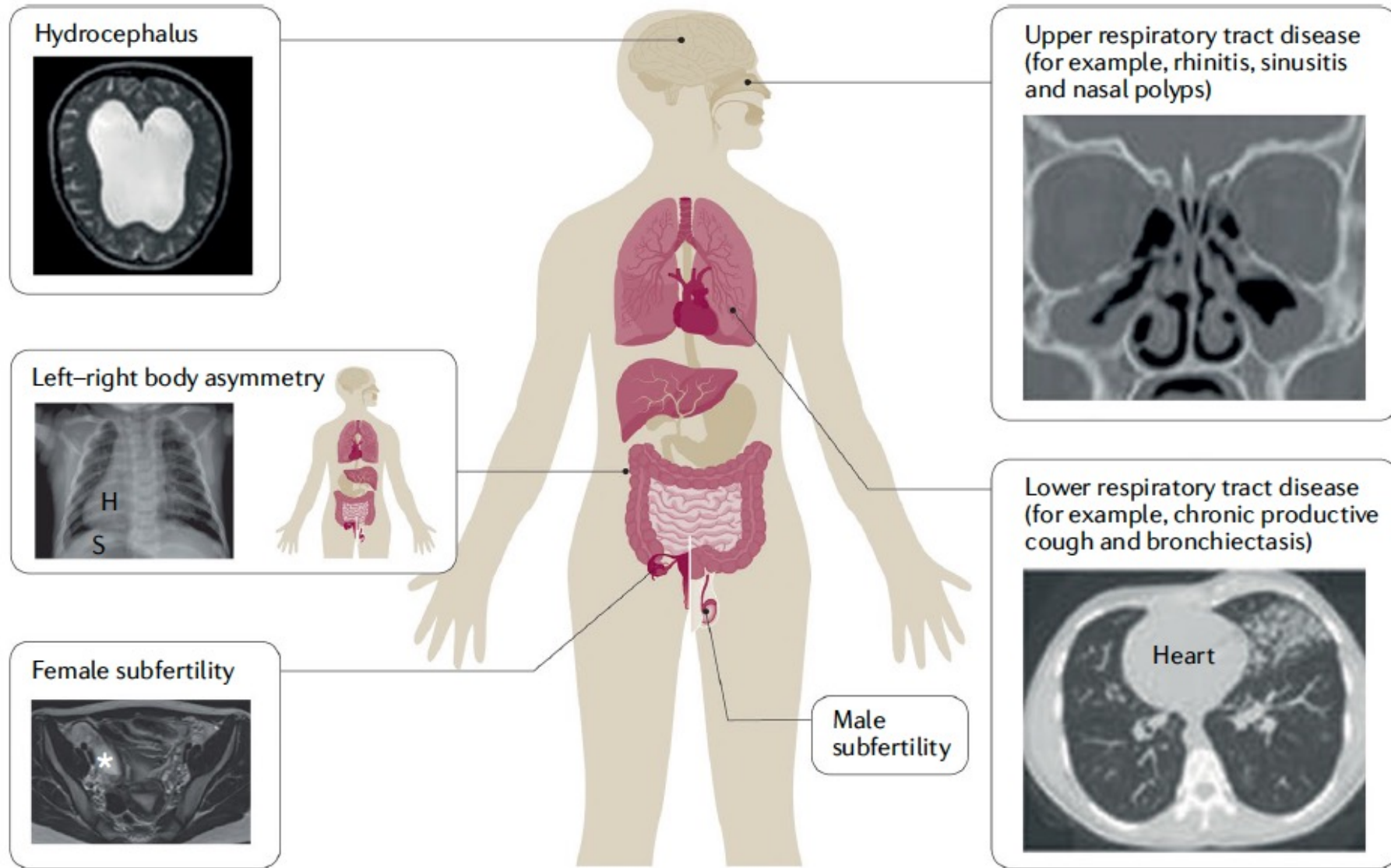


# Motile cilia ultrastructure



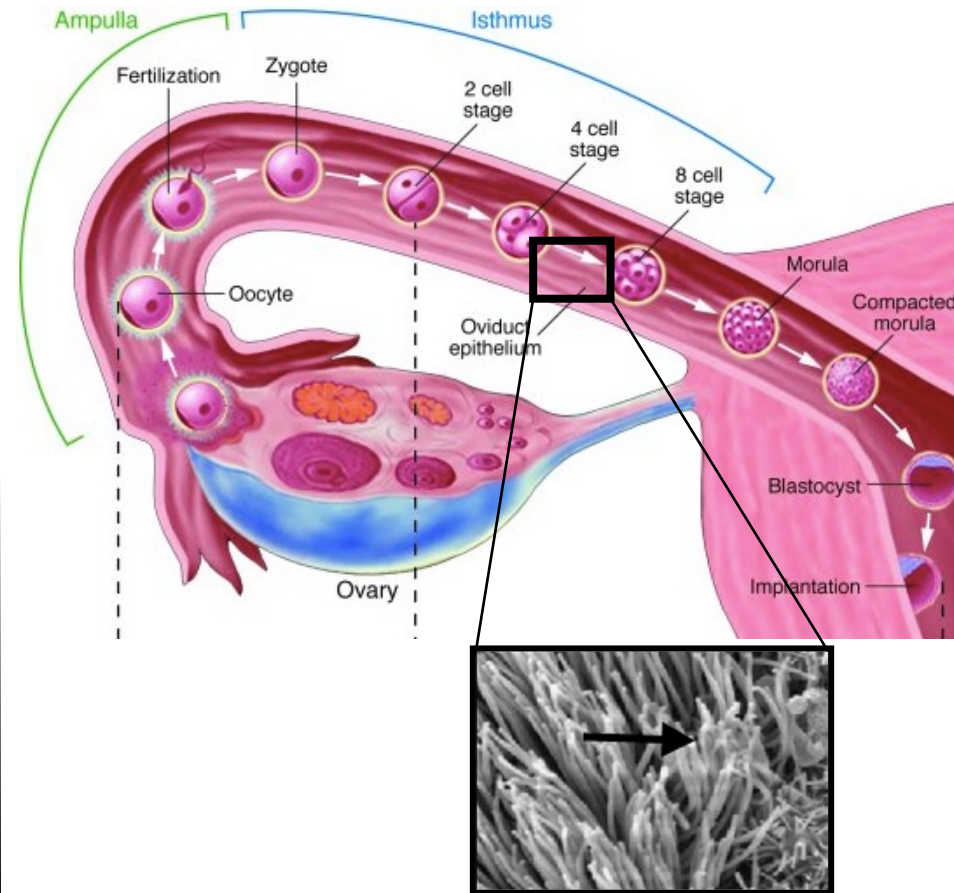
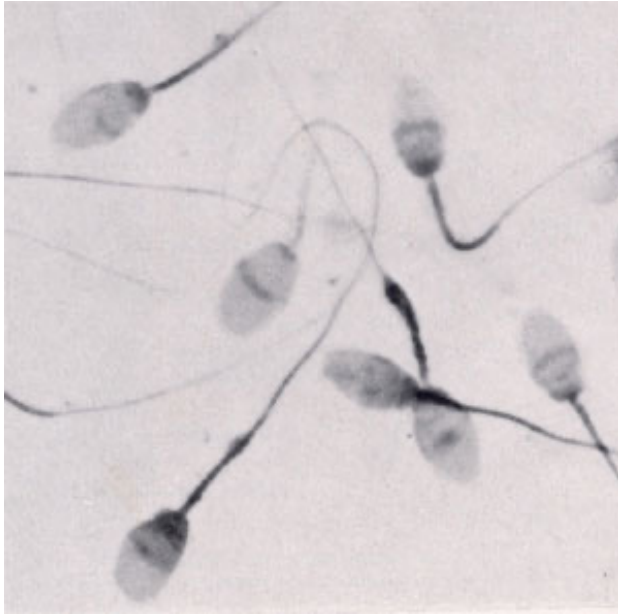


# Primary Ciliary Dyskinesia

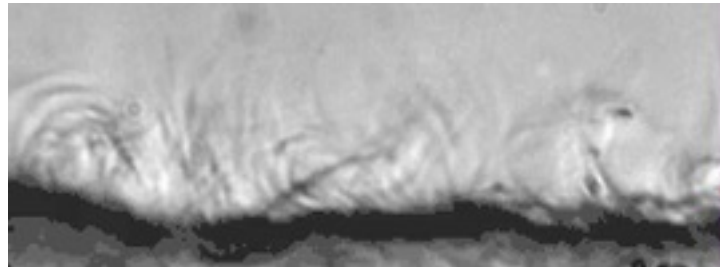
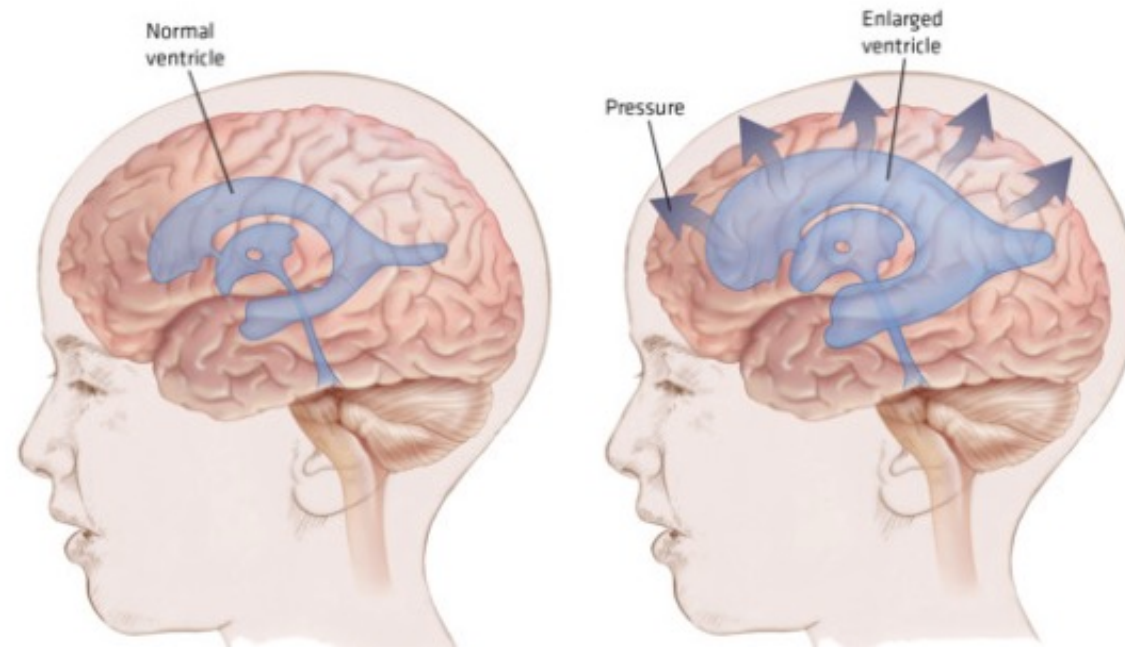




# Infertility in both male and female



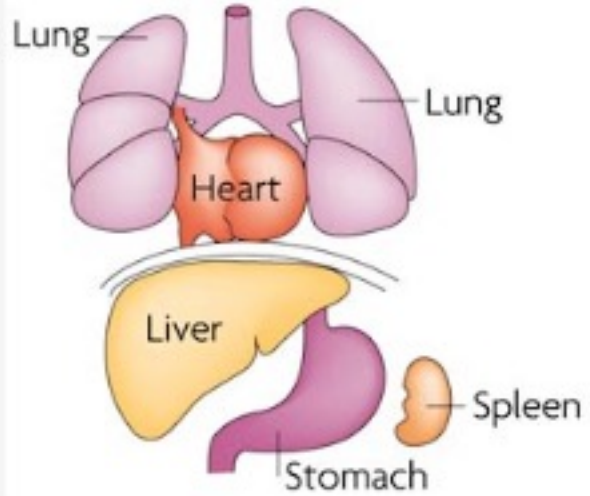
# Hydrocephaly



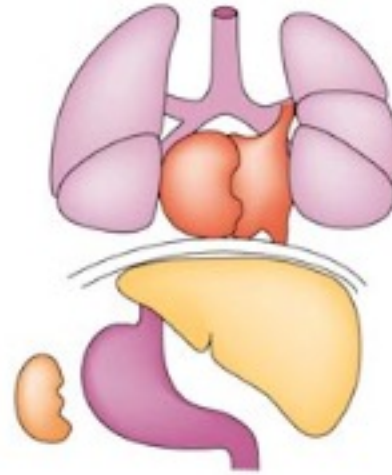
# Internal organ laterality

## a Laterality defects

*Situs solitus*



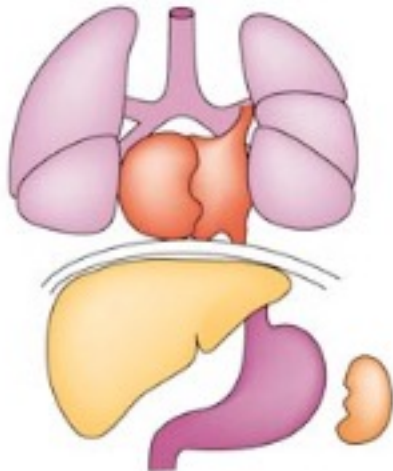
*Situs inversus totalis*



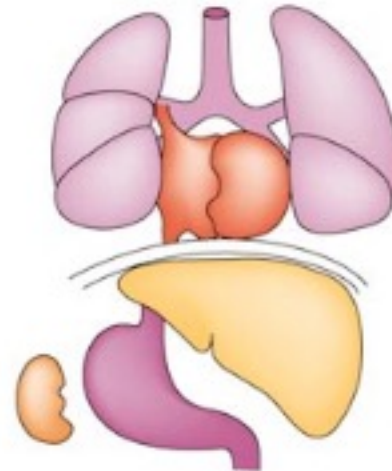
Left isomerism (polysplenia)



*Situs inversus thoracalis*



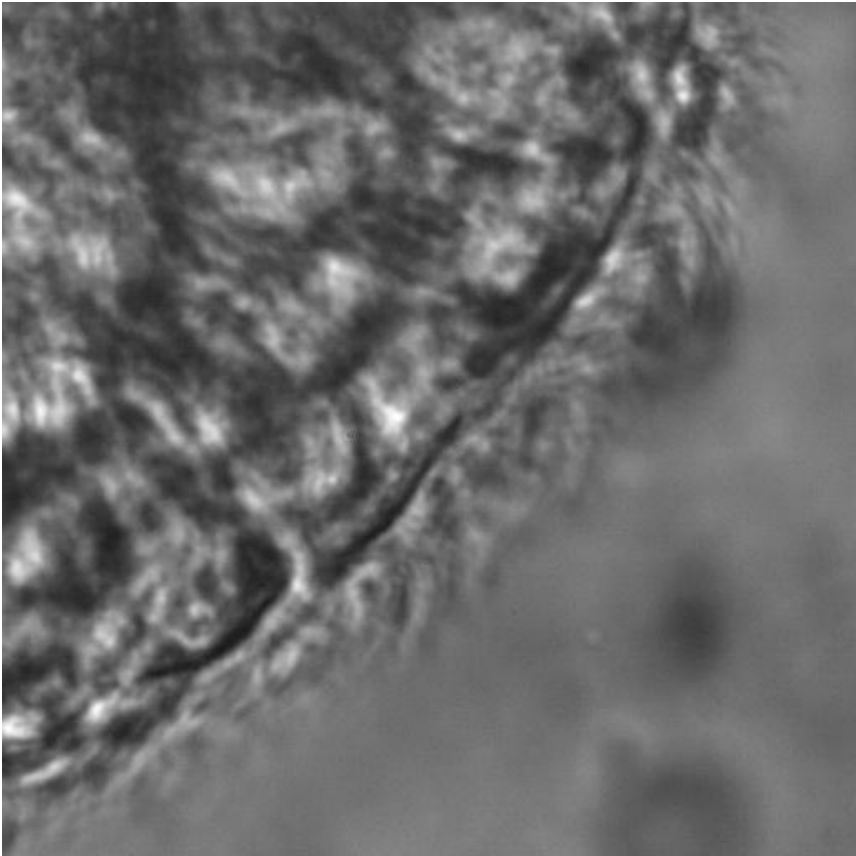
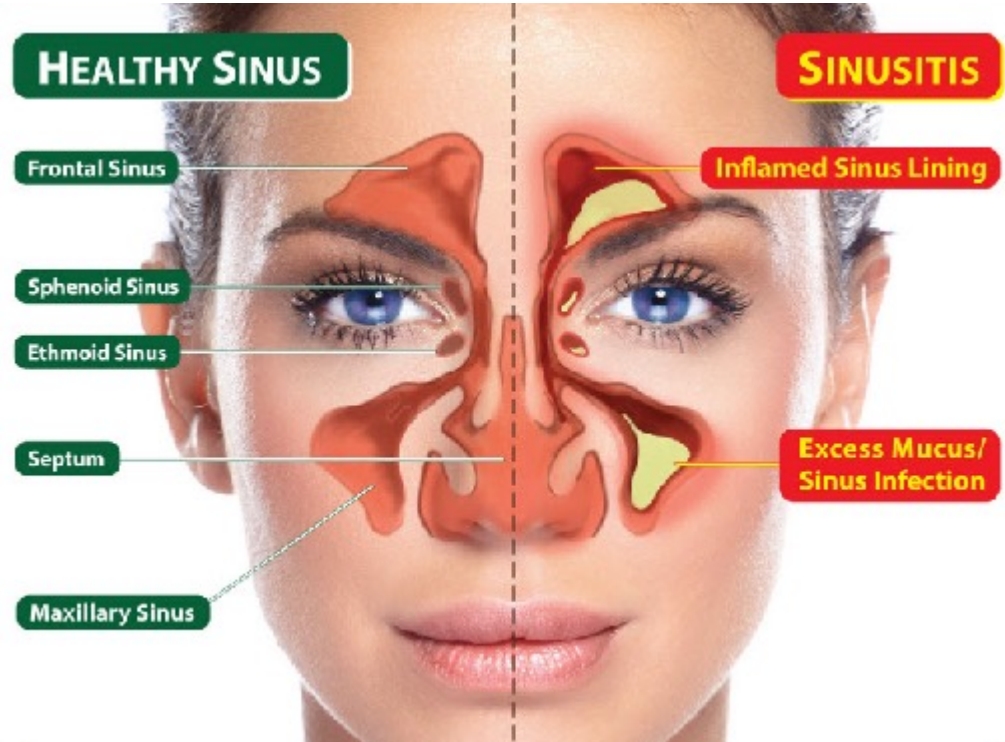
*Situs inversus abdominalis*



Right isomerism (asplenia)

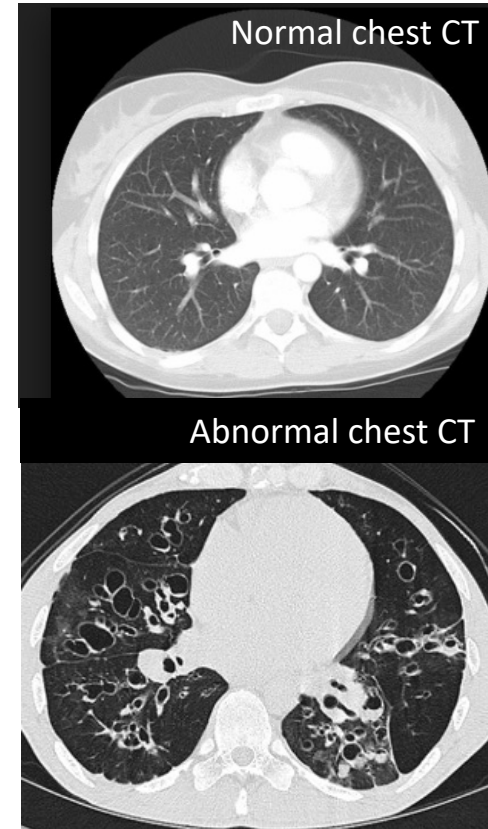
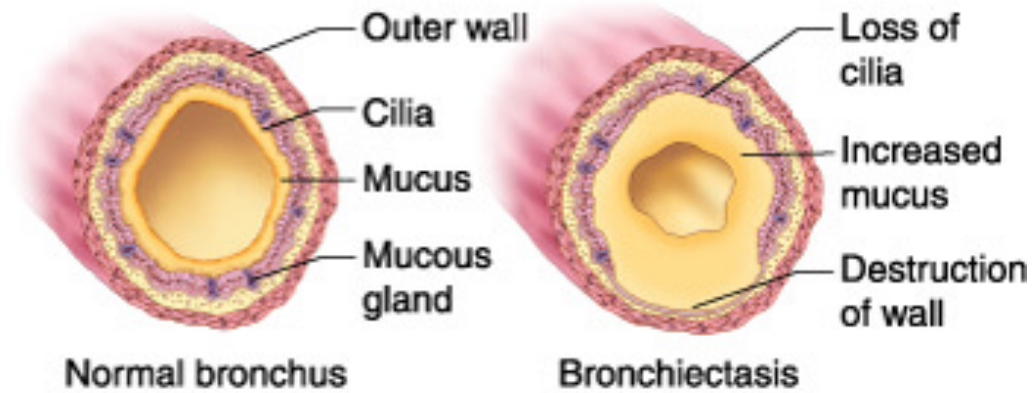
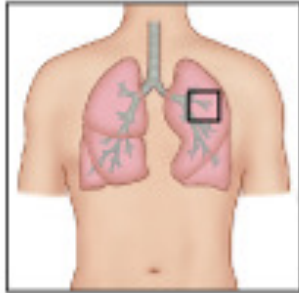


# Impaired mucociliary transport in upper respiratory tract

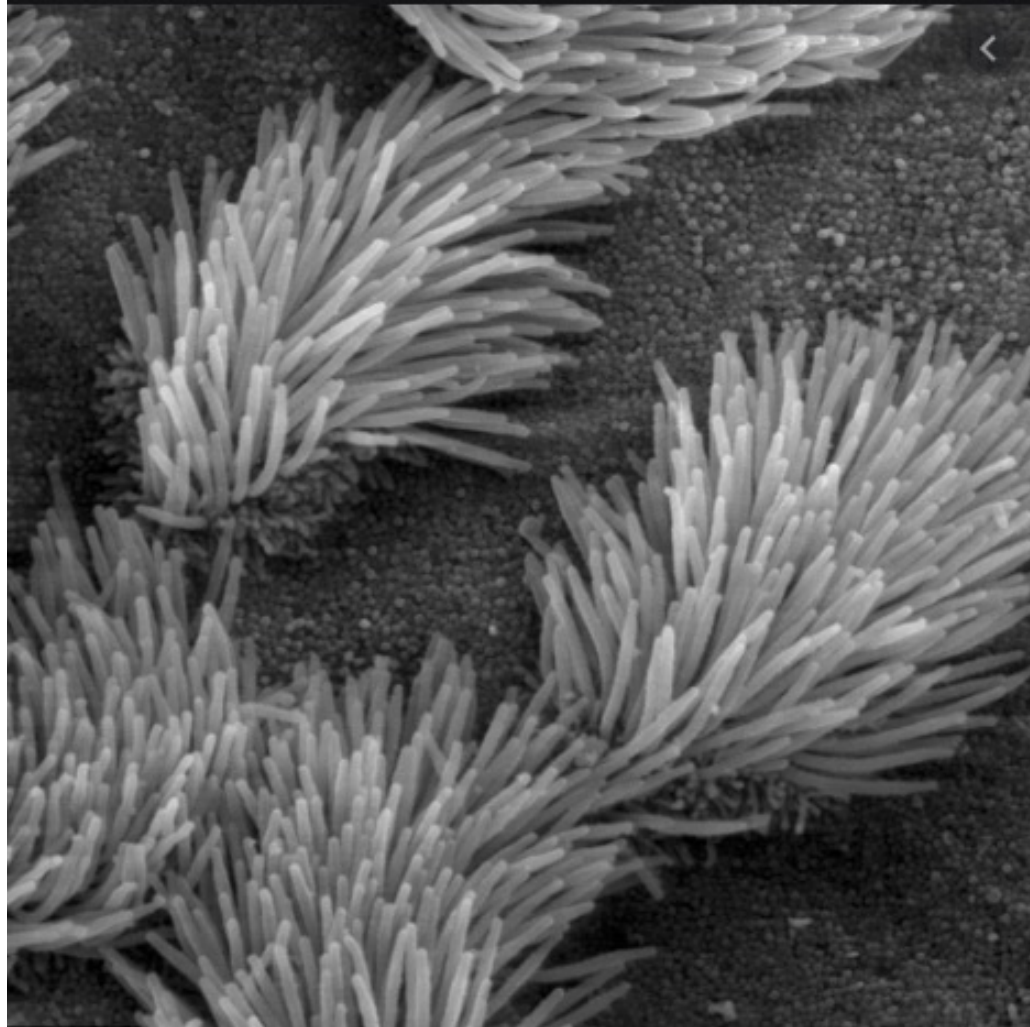




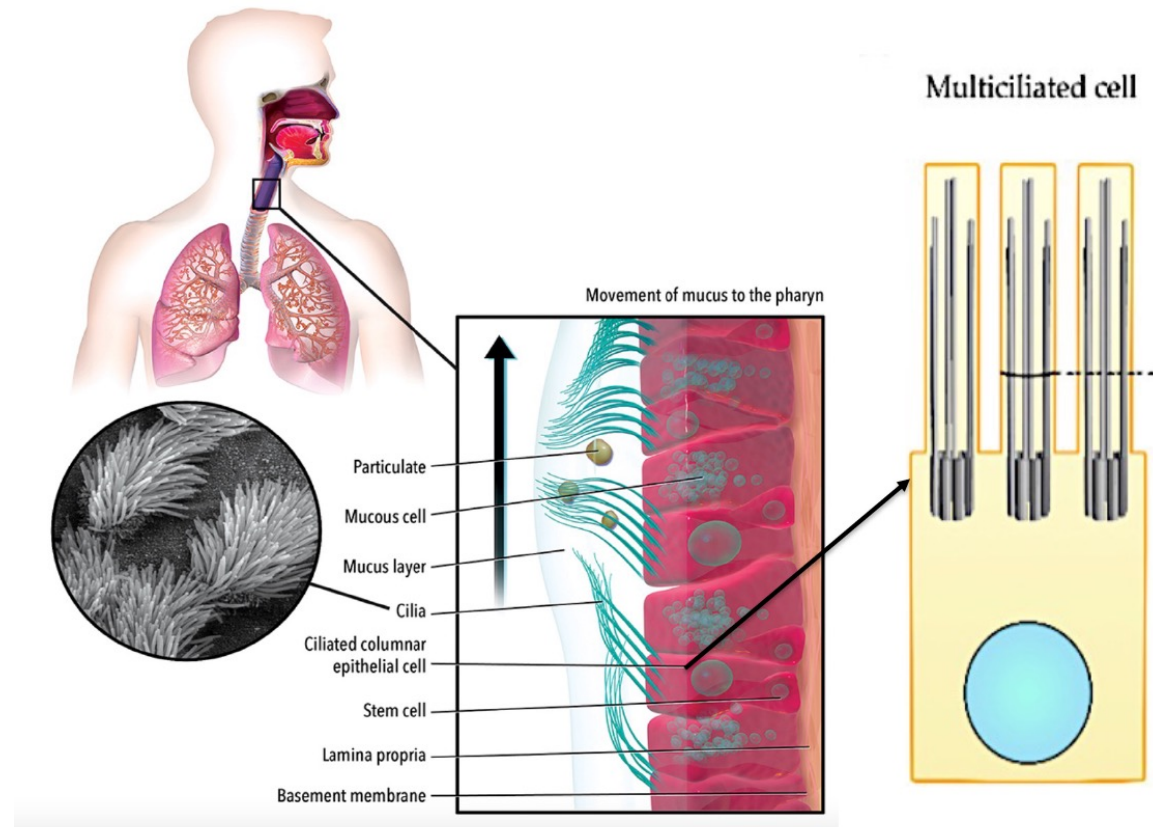
# Lower respiratory tract - Bronchiectasis



## Motile cilia from the respiratory system

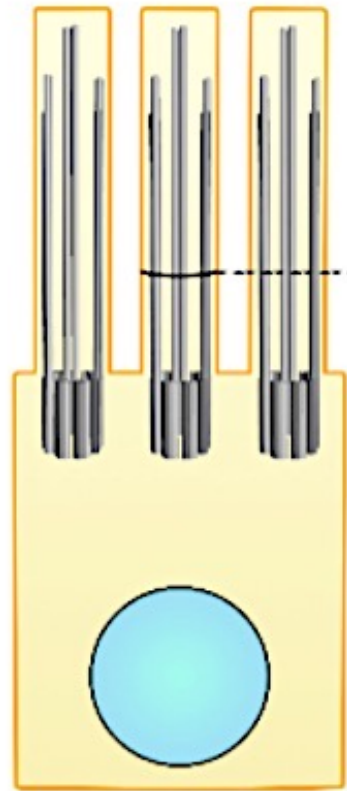


# Respiratory multiciliated cells perform mucociliary clearance

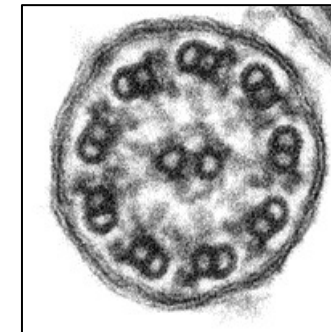
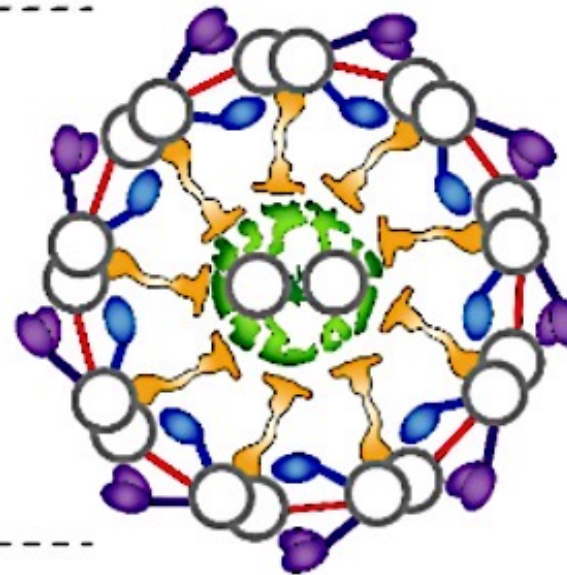


# Multiciliated cells

Multiciliated cell



Cilium cross-section



outer doublet

radial spoke (RS)

nexin-dynein regulatory complex (N-DRC)

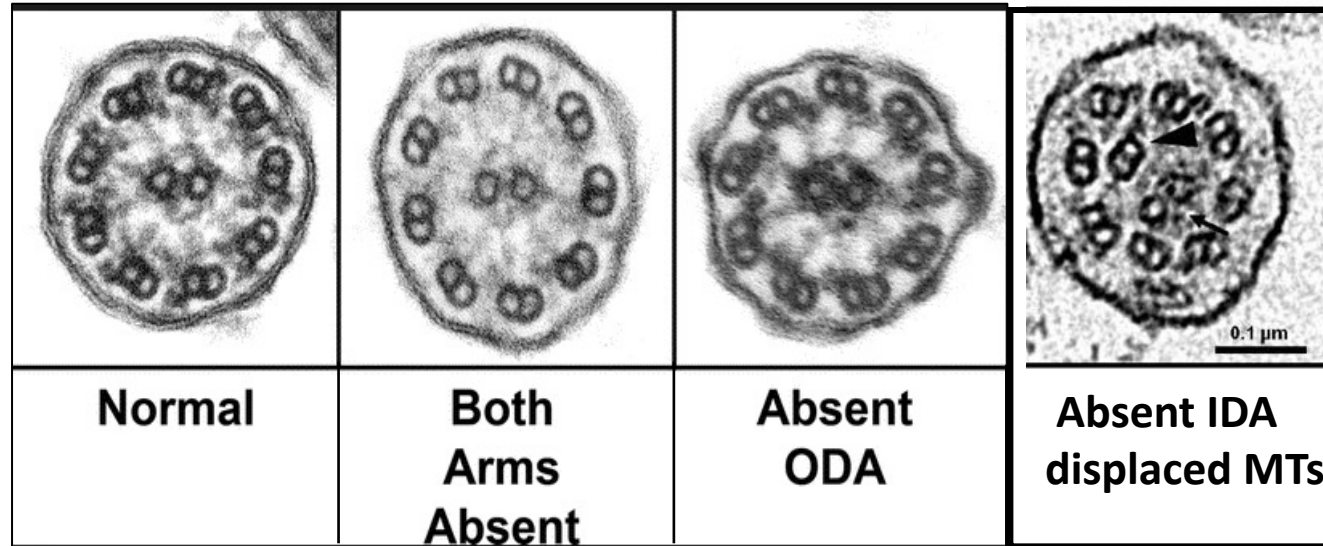
central apparatus

outer dynein arm (ODA)

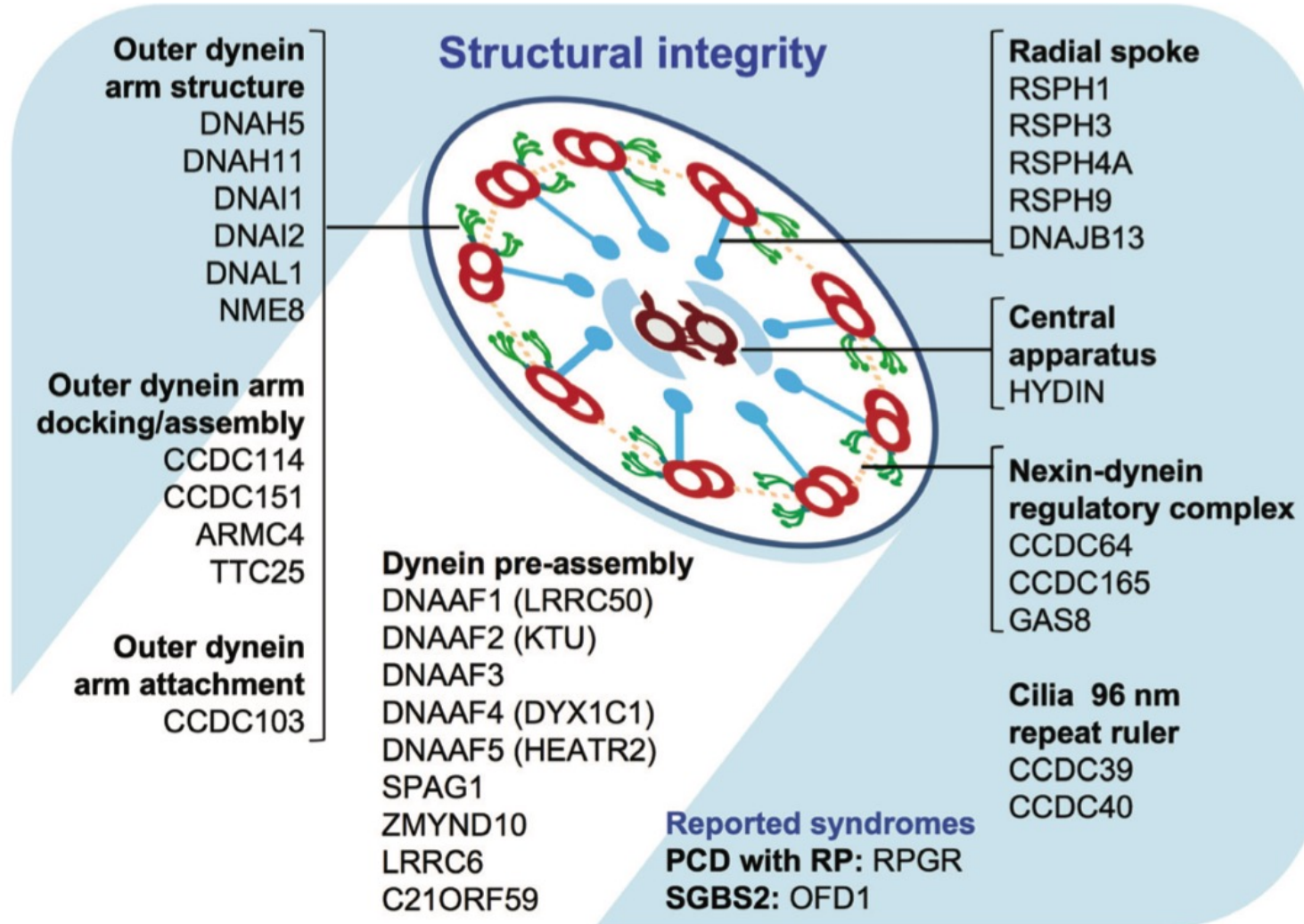
inner dynein arm (IDA)



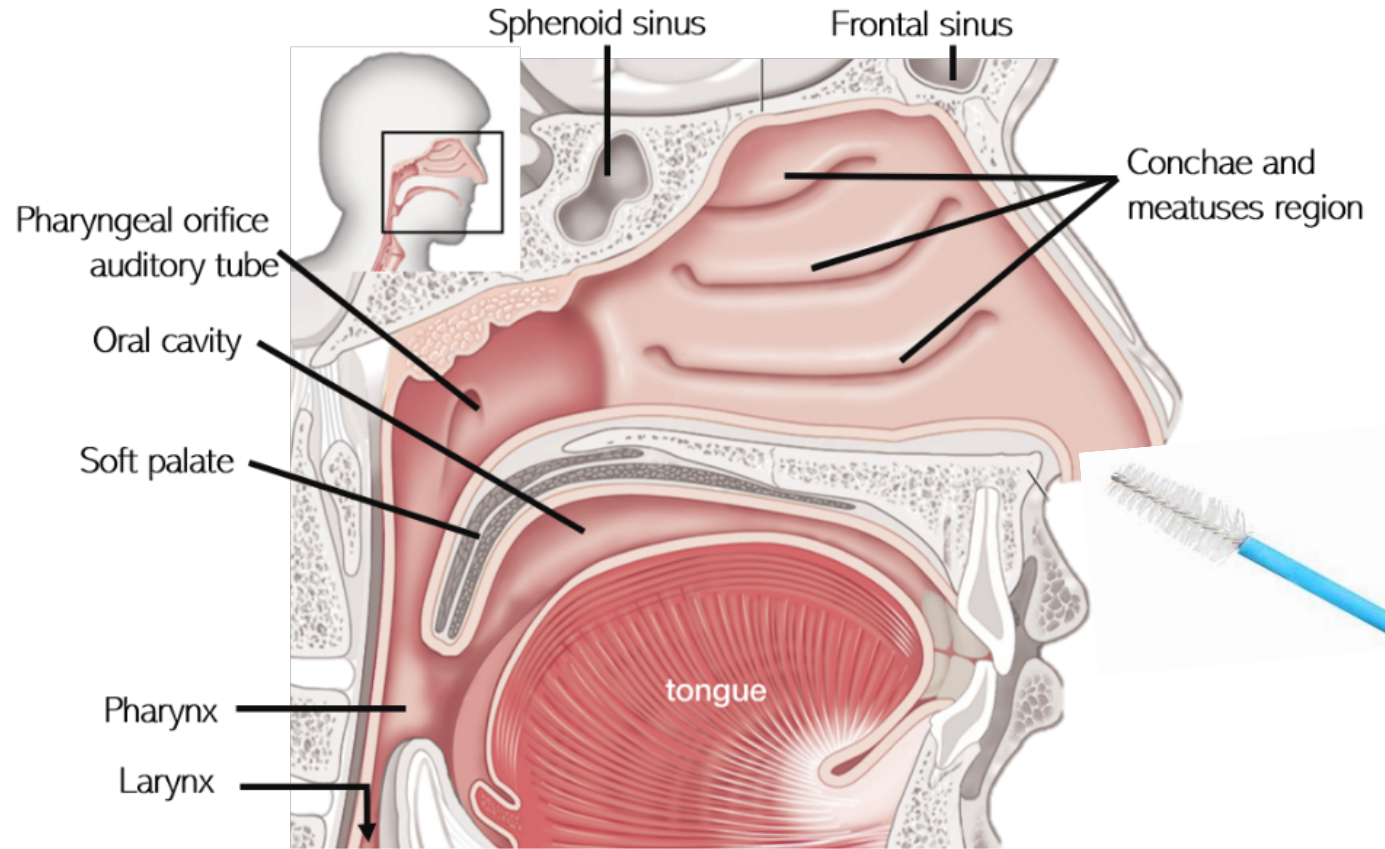
## Some structural defects observed in PCD patients



# Mutated Proteins identified in PCD patients



# 1 - Nasal brushings performed at hospital setting



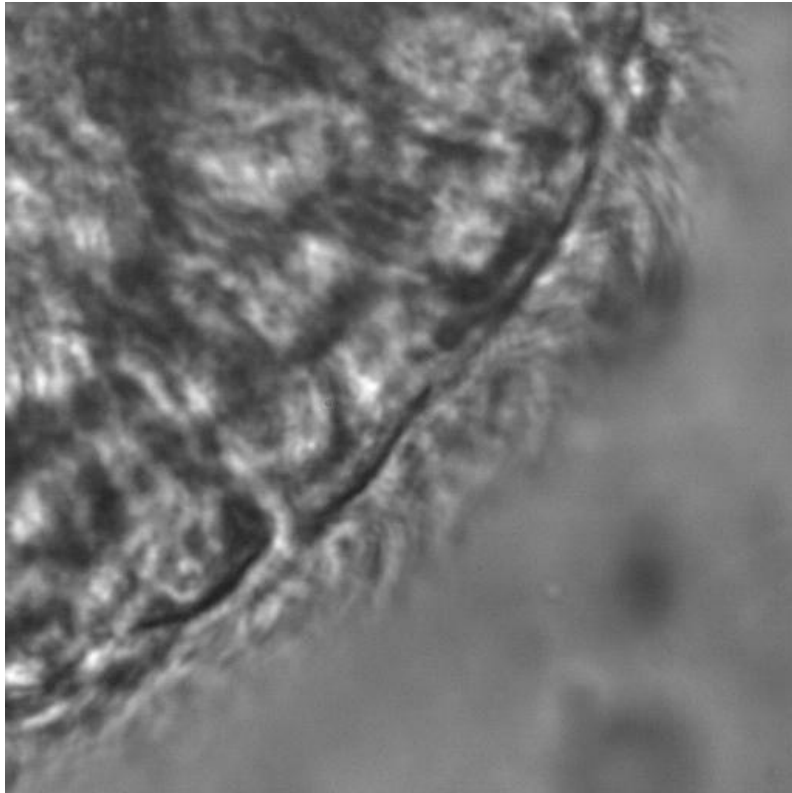
## 2 - High-speed Video-Microscopy Analysis (HVMA)



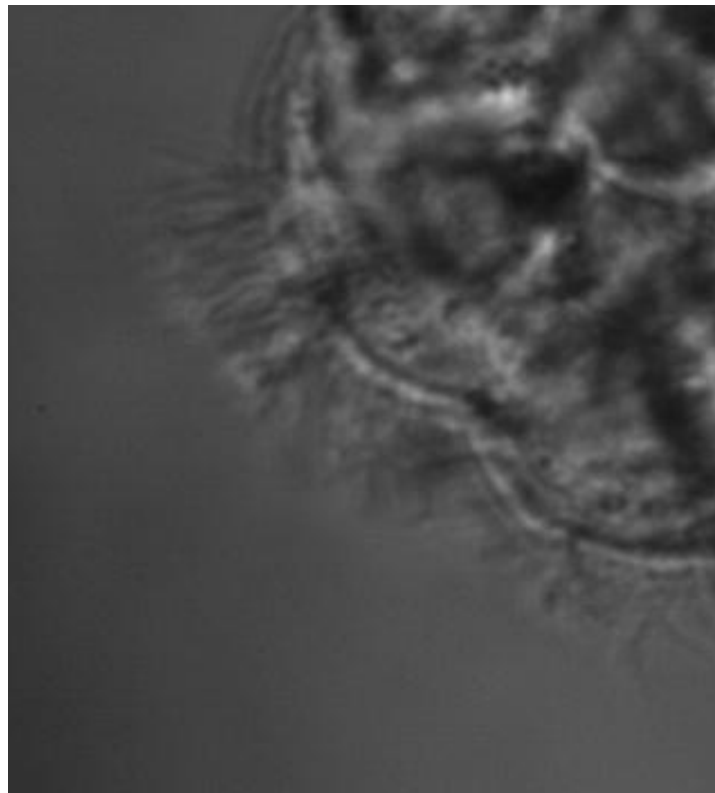
- Nikon Eclipse Ti-U
- FASTCAM MC2 camera (Photron)



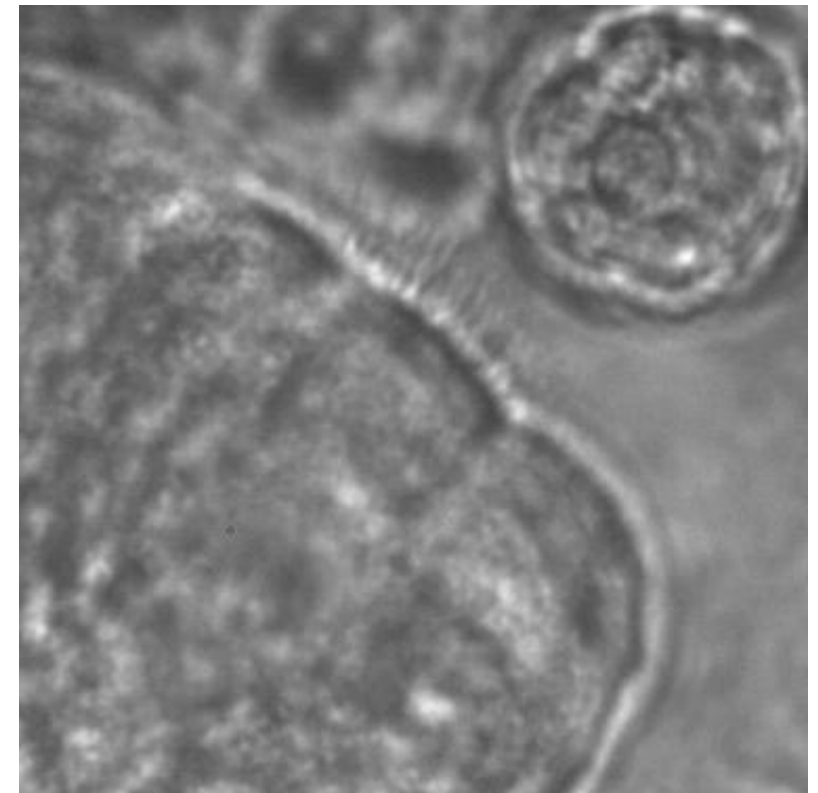
## Human nasal samples are used for PCD diagnostic



Healthy control

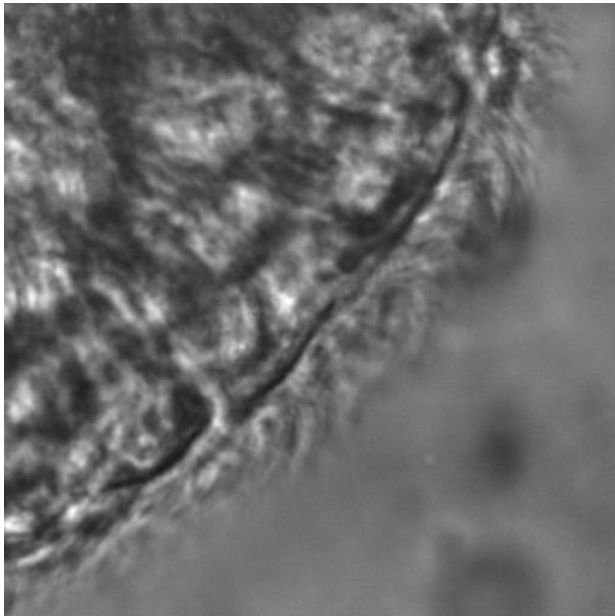


DNAH5 patient

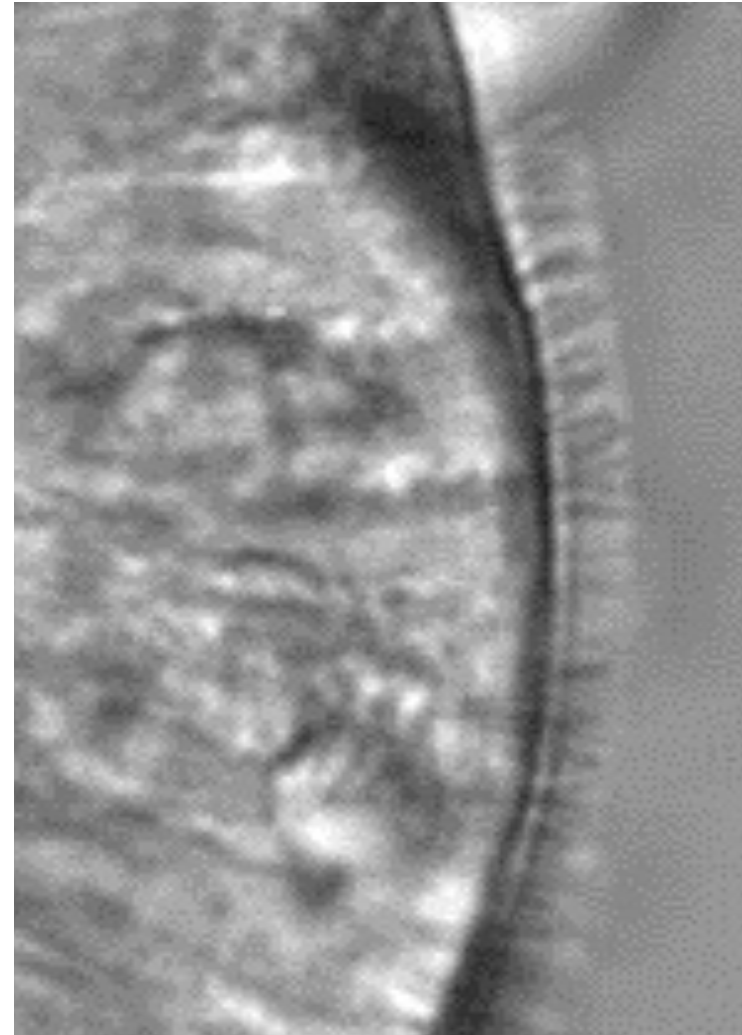


RSPH1 patient

# Coiled-Coil Domain-Containing Protein 40 (CCDC40)

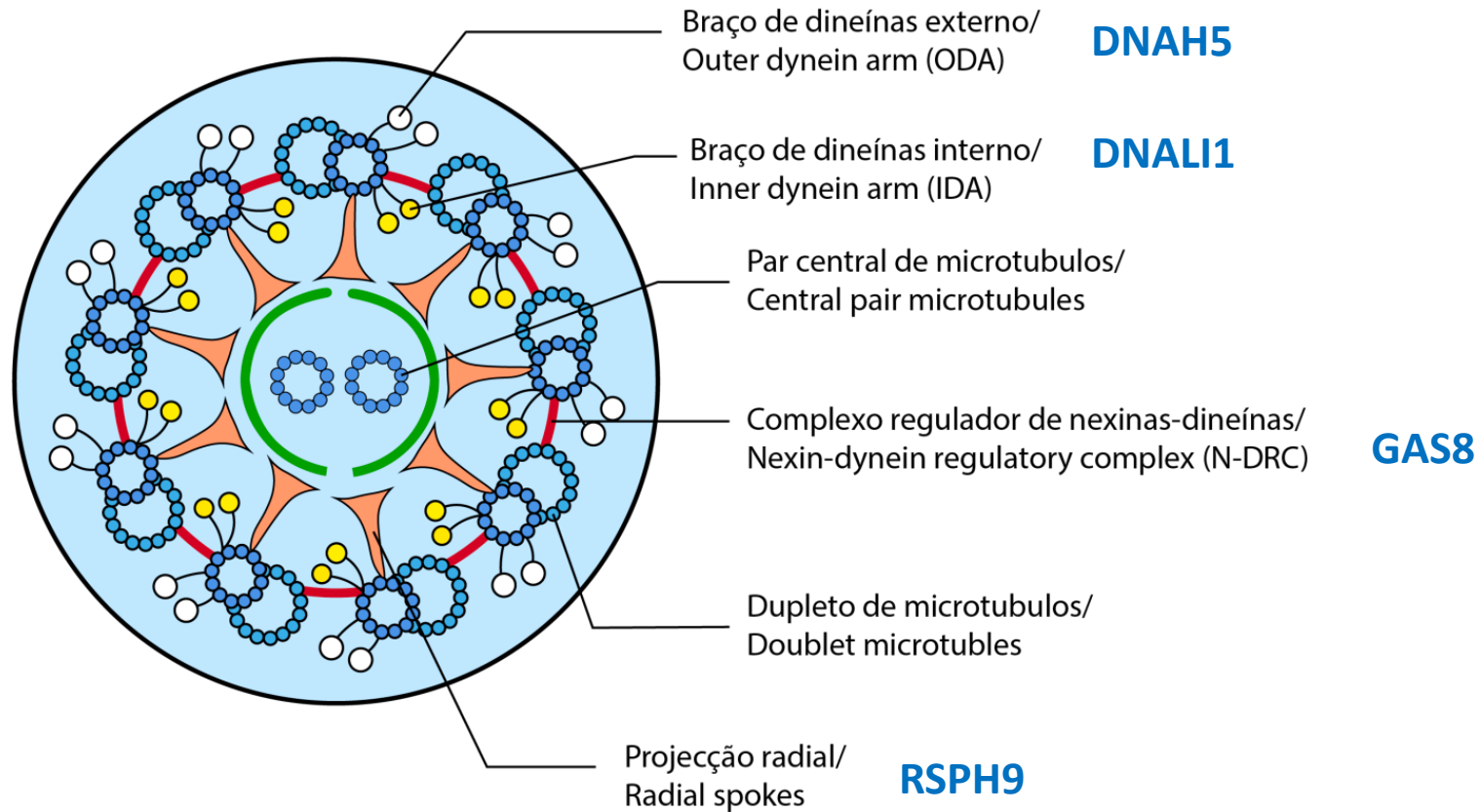


Healthy control

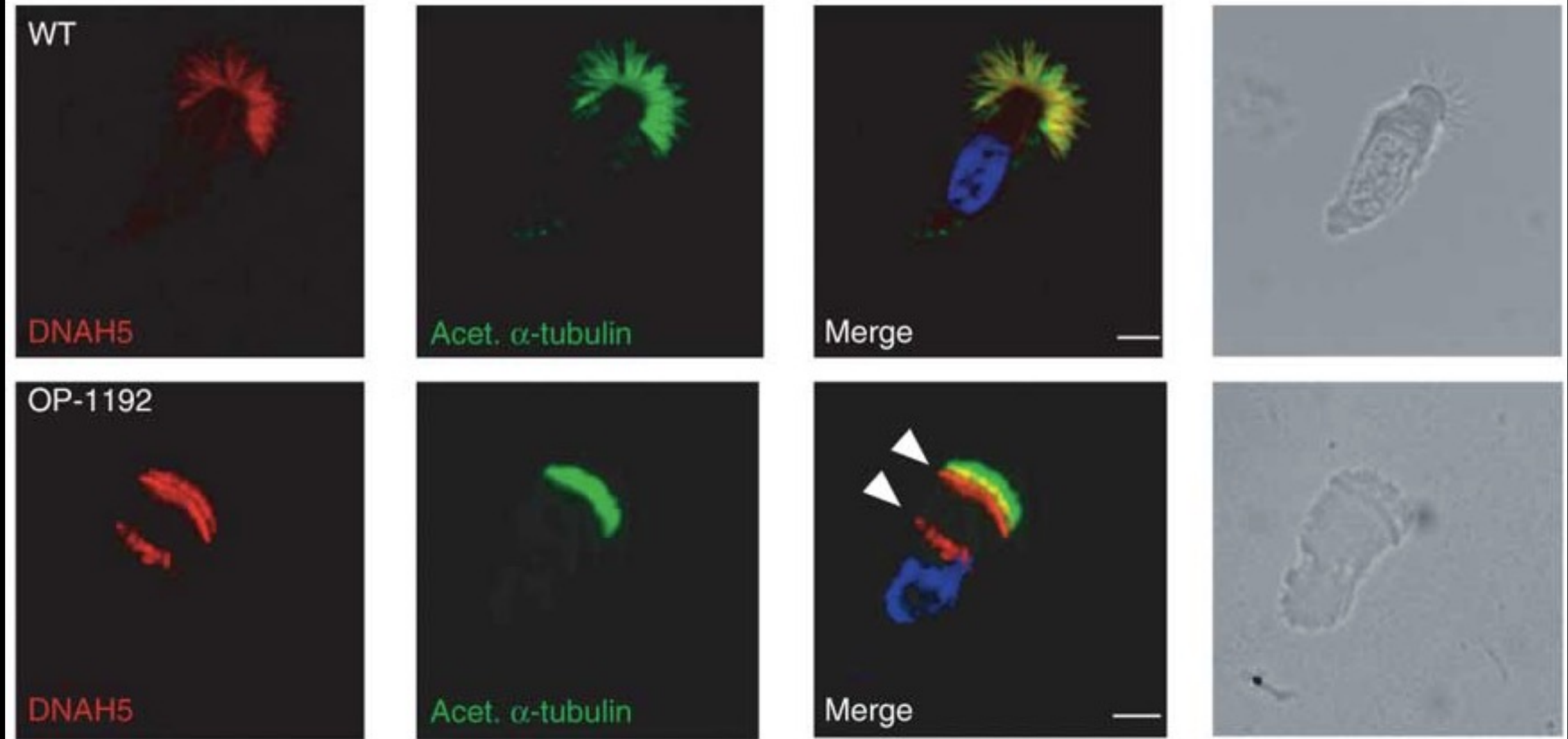


CCDC40 patient

### 3 - Detection of 4 proteins that will help to diagnose PCD

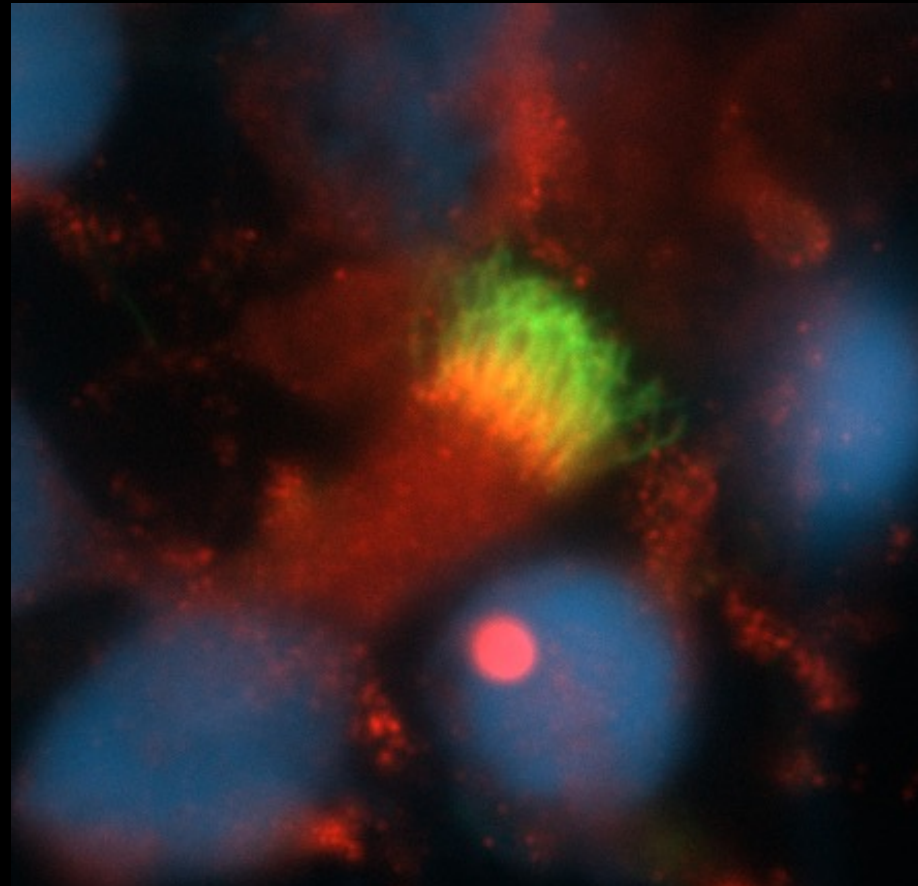


# Immunofluorescence speeds-up PCD diagnostic





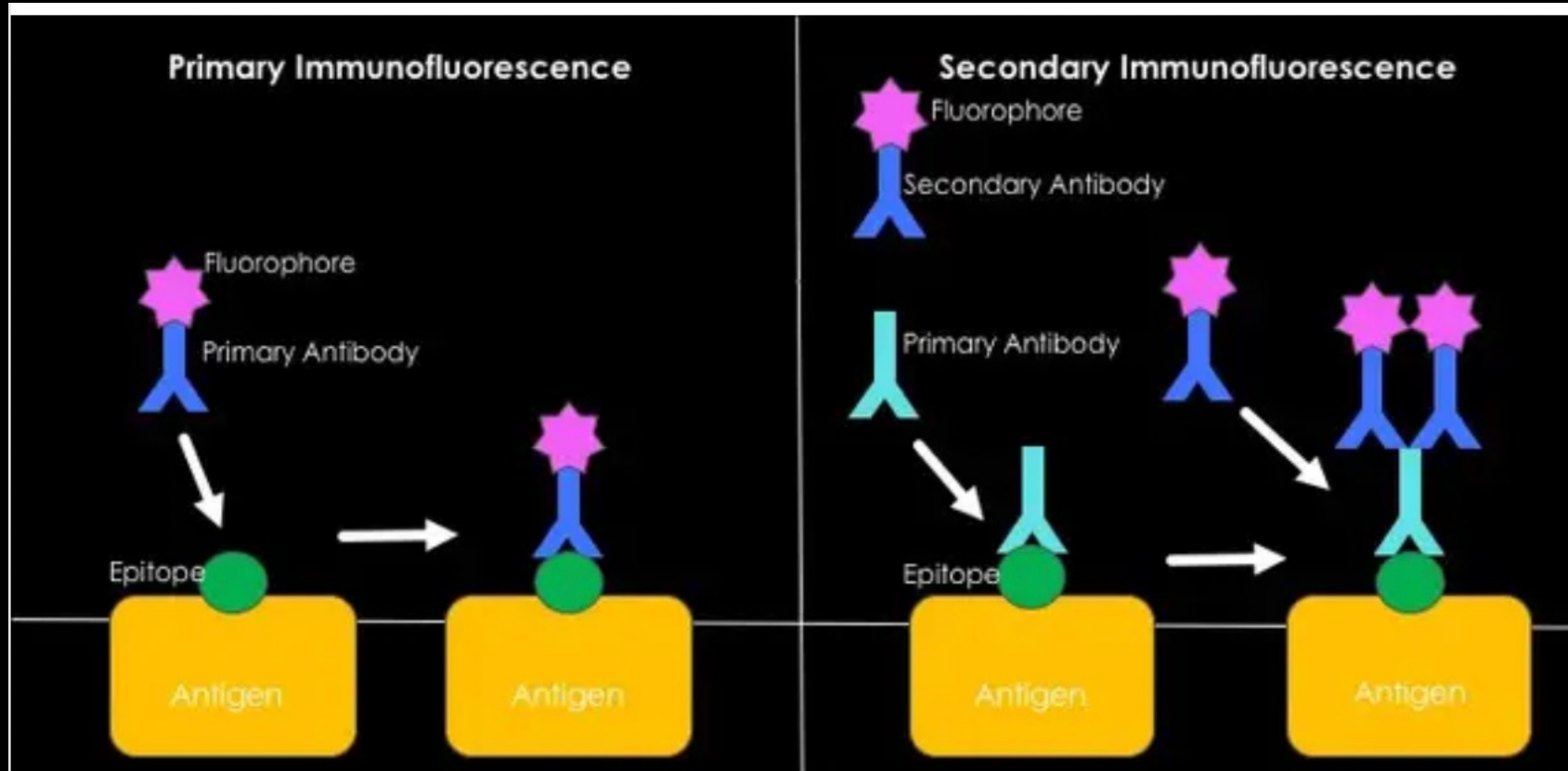
# Immunofluorescence in single cells helps PCD diagnostic



# Fluorescent immunostainings

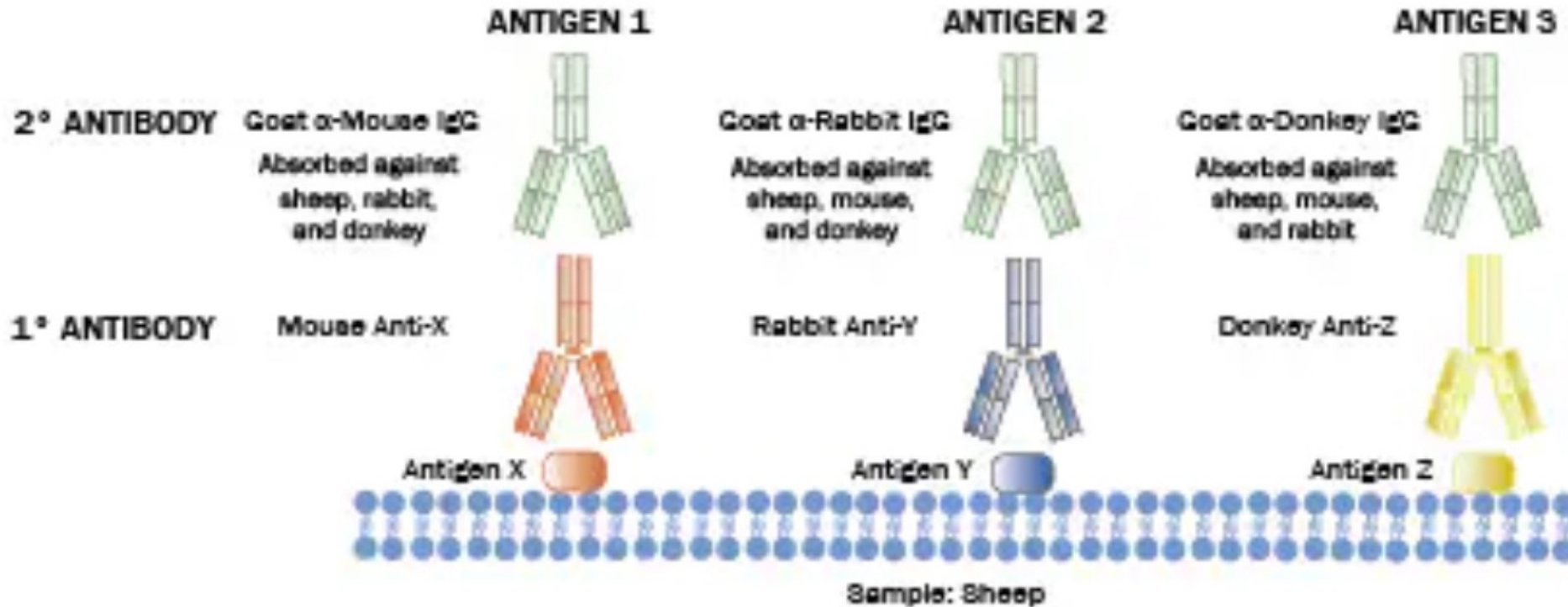
Deteção Direta

Deteção Indireta



# Detection of multiple proteins (antigens)

## Ideal Combination of Antibodies for Multi-labeling Experiment



Note: The blocking serum should be from goat