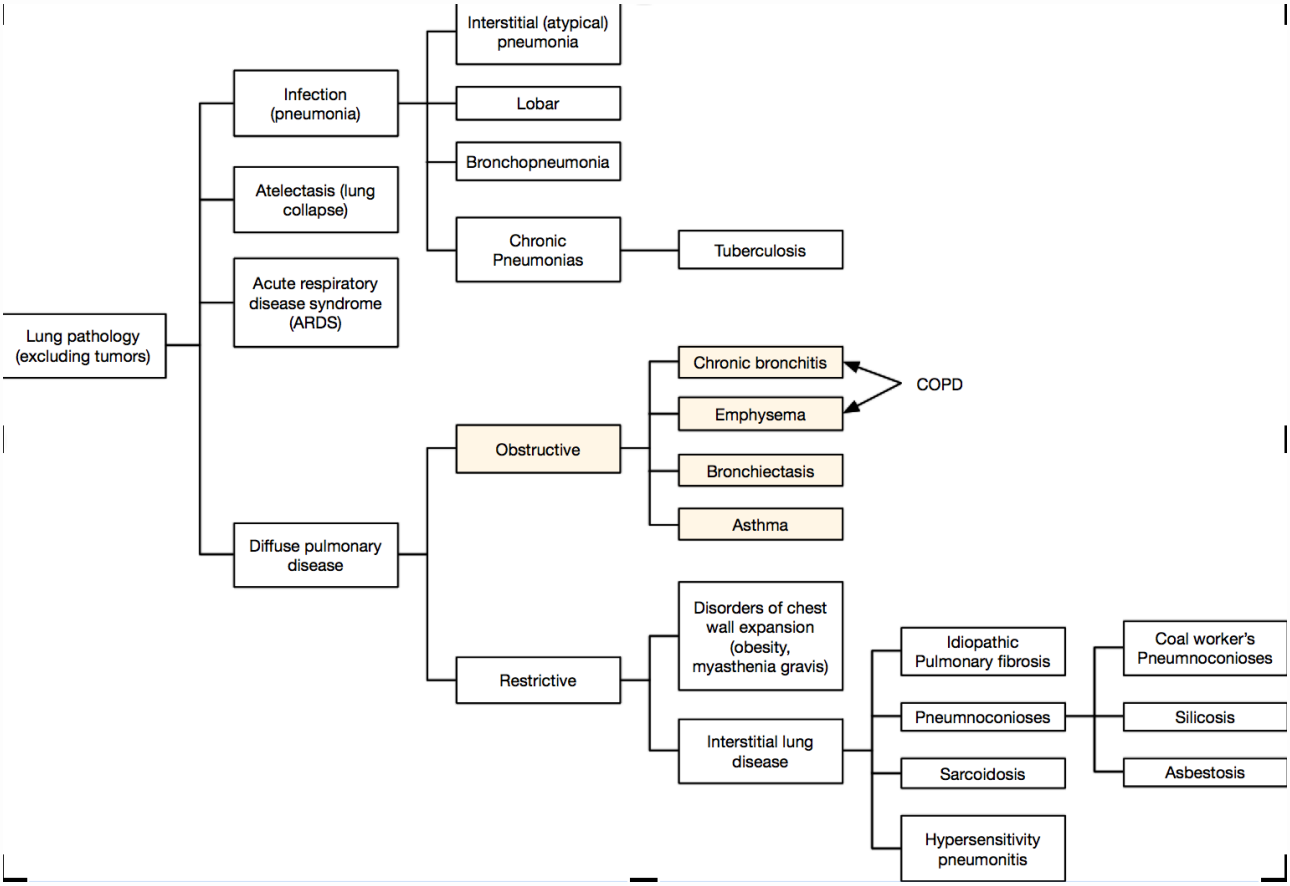
Introduction to COPD

by Alex Goodell | View online

Starting with the basics, I've made a map of the major pathologies outlined in Robbins and First Aid (obviously these are not all mutually exclusive, or fully complete).



Take a look at the group of diseases called diffuse pulmonary disease. Under this category, we find two important types of lung disease: obstructive and restrictive lung disease. **Obstructive** lung disease is caused by a narrowing or loss of elasticity in the airways, while **restrictive** is caused by a decreased ability to expand the lungs. In obstructive disease, the vital capacity (FVC) is generally normal or slightly lower, while the expiratory volume over one second (FEV1) is greatly decreased. The classic measure used for measurement of obstructive disease is FEV1/FVC, which will be markedly decreased. For example, normally you exhale about 4L of air in one second, while your lungs can hold about 5L, meaning your FEV1/FVC is about 80%. In an obstructive disease, you might decreased your FEV1 to 3L, producing a FEV1/FVC of 60%. By contrast, in restrictive disease, the FEV1/FVC should be nearly normal.

There are four major prototypes of obstructive lung disease: chronic bronchitis, emphysema, bronchiectasis, and asthma. Chronic obstructive pulmonary disease (COPD) refers to chronic bronchitis and/or emphysema, though there is significant overlap between these two, as well as with asthma. We will discuss emphysema and chronic bronchitis separately, but first a few key points about COPD as a whole:

- Firstly, the **definition of emphysema is morphologic** (ie, gross and histopatholoical findings),

whereas **chronic bronchitis is based on clinical features**.

- Chronic bronchitis initially involves the large airways then the **small airways**, whereas emphysema affects the groupings of aveoli at the end of the airway, called the **acinus**.
- Lastly, there is a large overlap between chronic bronchitis and emphysema. Although it is possible for these diseases to arise separately, they often occur together (especially for tobacco cigarette smokers), explaining why these are lumped together in this COPD framework.

Histology review

Before we jump into the pathologies of these conditions, I think it is worthwhile to review how air gets to the aveoli. Borrowing from Simon's 4.1.1, there is a long pathway.

Conducting zone

We begin in trachea, which breaks into the bronchus, then lobar bronchus, and finally the segmental bronchus. Note that each of these steps has particular histological findings that allow it to be classified as such. Now take a look at Figure 2 below, and find the segmental bronchus at the top left. This is then broken into the smaller bronchi then into the bronchioles. Bronchioles then break into lobules, which contain terminal bronchioles. From the trachea to the terminal bronchioles is considered the conducting zone, because its job is to conduct air from the mouth downward – it does not exchange any gas, meaning it is considered anatomic dead space.

Respiratory zone

Once we are past the level of the terminal bronchiole, we have reached the level of the **acinus**, or the grape-like cluster of alveoli at the end of the airway tract. This is where all the gas-exchange action occurs, and so is referred to as the *respiratory zone*.

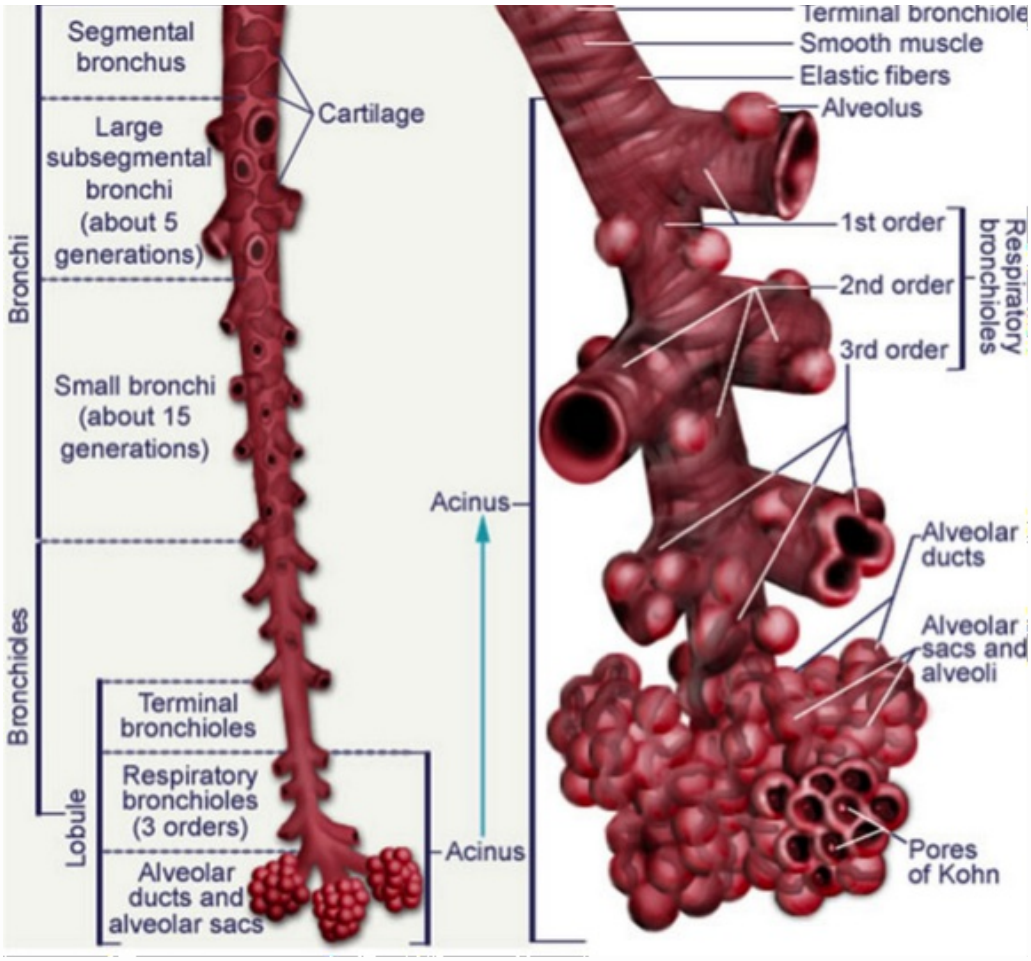


Figure 2. Schematic showing brances of trachea to acinus.

Now that we are into the level of the acinius, we can peal away the epithelium, and take a look at the structures lying within the acinus. In Figure 3, we see two acini, with each acini having a *respiratory bronchiole* feeding it fresh air (green arrows). These acini each have many aveloi pouching out from them, connected by a space of open air called the alveolar duct.

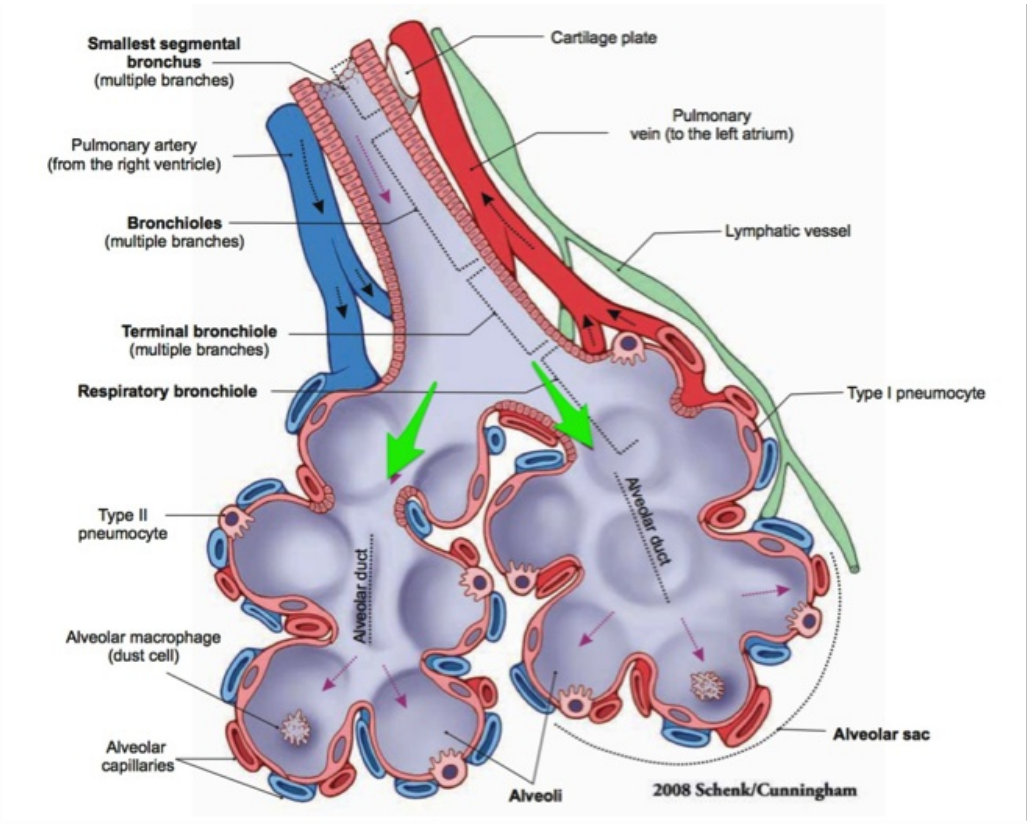


Figure 3. Schematic of two acini of aveloi fed by separate respiratory bronchioles (green arrows).