COPD is a very common chronic and often progressive disease of lung inflammation and tissue destruction. Investigators have different ideas regarding the pathobiology of COPD and emphysema. While there is no debate that COPD is defined by lung function abnormalities relating to airflow resistance, there is in reality a spectrum of disease manifestations and phenotypes, ranging from cough and sputum production to significant loss of gas exchange units— as reflected in a low DLCO. To move forward and to develop new treatments for COPD patients we need to understand the pathobiology of COPD. The emphysematous disease component can be pathobiologically understood by mechanisms of proteolysis, oxidative stress, apoptosis of lung structure cells and impaired lung cell repair. We believe that the adult lung structure is maintained by a cellular and molecular structure maintenance program which is based on growth factors and transcription factors. Data will be presented that will identify some of these lung structure maintenance factors. Concepts will be presented that illustrate how treatments based on the information regarding mechanisms of lung tissue repair could be harnessed to halt the progression of the loss of lung gas exchange units. These concepts do not rely on the use of presently used anti-inflammatory drugs or agents, but on the inhibition of lung cell apoptosis and promotion of lung cell growth. A realistic outlook on new treatment strategies will have to take into account the permanent alteration of lung structure cells by decades of cigarette smoking and the limited repair potential of aged lungs that are characterized by a destroyed matrix scaffold and likely also by impaired stem cells.

NPPV or non-invasive positive pressure ventilation has grown widely in application over the last three decades. Originally pioneered in hypercapnic respiratory failure secondary to neuromuscular disease, it is now available in respiratory units for acute acidotic hypercapnic exacerbations of chronic obstructive pulmonary disease (COPD), where it has been shown to improve mortality, reduce the need for endotracheal intubation and decrease breathlessness. NPPV has a role in selected cases of acute hypoxaemic respiratory failure, such as acute cardiogenic pulmonary oedema. Long term domiciliary use extends survival in amyotrophic lateral sclerosis has almost doubled life expectancy in some neuromuscular disorders such as Duchenne muscular dystrophy, but randomized trials are difficult in this area for ethical reasons. One randomized control trial has shown survival advantage in chronic hypercapnic COPD patients, although quality of life did not improve. NPPV may be used to palliate symptoms in oncology patients with respiratory failure and children with severe spinal muscular atrophy. Careful goals should be set and the efficacy of therapy monitored closely by sleep studies and ventilatory downtrends. A new application of NPPV is adaptive servo ventilation (ASV) in chronic heart failure patients with central sleep apnoea. The role of ASV therapy is subject to a current randomised controlled trial (Serve-HF).