

Research Summary

Genetic interactions defining the major air passage way to the lungs - the trachea

Diseases can appear clinically at any stage of life and many diseases have origins during development. Regardless of when a disease is diagnosed, understanding the development of organs provides considerable insight into disease prevention and treatment. Fundamental science knowledge has proven to be essential to the prevention and treatment of diseases, as has clearly been demonstrated in the current global pandemic.

This study will focus on development of the proximal area of the lung, specifically the region that becomes the major air passageway to the lung, the trachea. Abnormal development of the trachea is associated with congenital birth defects. Furthermore, tracheal diseases such as the development of scar tissue after prolonged intubation (tracheal stenosis) and tracheobronchomalacia, which develops from chronic obstructive pulmonary disease (e.g. from cigarette smoking) can result in collapse or closure of the trachea, impacting breathing and potentially resulting in death. The signals involved in lung and trachea development are the same signals that are involved in lung and tracheal disease, therefore it is critical that we understand how these signals interact with one another.

This study will build on previous work utilizing the chicken embryo as a model organism to study the respiratory system as this organism offers many advantages over other model organisms (e.g. mice) such as the ability to easily manipulate single gene pathways. This study will provide a deep understanding of which signals are critical for proper development of this critical proximal lung region and how these signals interact with one another. As these same signals are known to play critical roles in lung and tracheal disease, by understanding how they work together, we will be able to develop targeted gene therapies and other interventions to prevent progression (or even onset) of diseases of the trachea. Nova Scotia has the highest incidence of chronic obstructive pulmonary disease in the Canada and records the greatest number of deaths due to cancer of the trachea, bronchus and lung. With 1 in 5 Nova Scotians living with lung disease, methods to prevent lung disease must be a priority.