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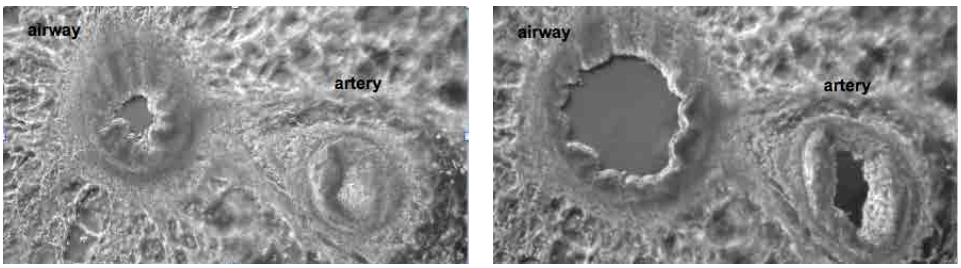
Our group explores the regulation of smooth muscle function in diseases of the lung and cardiovascular system. These chronic diseases have serious impacts on quality of life, and can be evident following premature birth (bronchopulmonary dysplasia) or may emerge during childhood (asthma), or develop in adulthood (COPD, pulmonary hypertension. Current therapies are not always effective in managing symptoms or preventing disease progression, and they do not provide a cure.

The goal of our research program is to identify new drug targets for these diseases – to protect against the development of the changes in lung structure and function or to treat symptoms under conditions where current drugs are ineffective. We are currently examining multiple novel dilators targeting small airways and arteries using a novel lung slice technique in which contraction, relaxation and calcium signalling can be visualized. These drugs are being assessed in animal models of chronic lung disease to support their future clinical development.

Research Projects

1. **Characterising changes in airway and vascular reactivity in chronic lung diseases**
2. **Identifying novel bronchodilators targeting intrapulmonary airways in asthma and COPD**
3. **Identifying novel vasodilators targeting intrapulmonary arteries in pulmonary hypertension and bronchopulmonary dysplasia**



Images showing airway and artery contraction within a lung slice

Selected significant publications:

1. Donovan C, Seow HJ, Royce SG, **Bourke JE**, Vlahos R. 2015. Cigarette smoke alters airway reactivity and reduces ryanodine receptor expression in mice. *Am J Respir Cell Mol Biol*. 53, 471-8.
2. **Bourke JE**, Bai Y, Donovan C, Esposito JG, Tan X, Sanderson MJ. 2014. Novel small airway bronchodilator responses to rosiglitazone in mouse lung slices. *Am J Respir Cell Mol Biol.* 50, 748-56.
3. **Bourke JE**, Li X, Foster SR, Wee E, Dagher H, Ziogas J, Harris T, Bonacci JV, Stewart AG. 2011. Collagen remodelling by airway smooth muscle is resistant to steroids and β_2-agonists. *Eur Resp J*. 37, 173-82.
4. Tan X, Dagher H, Hutton CA, **Bourke JE**. 2010. Effects of PPAR gamma ligands on TGF-beta1-induced epithelial-mesenchymal transition in alveolar epithelial cells. *Respir Res.* 23, 11-21.
5. Ward JE, Gould H, Harris T, Bonacci J, Stewart AG. 2004. PPARγ ligands 15-deoxy-$^{\Delta 12,14}$-prostaglandin J_2 and rosiglitazone regulate human cultured airway smooth muscle proliferation through different mechanisms. *Br J Pharmacol.* 144, 517-525.