Paired-like homeodomain transcription factor 2 (*Pitx2*) is involved in the embryonic left-right (L-R) patterning of heart and lung. So far, there is no known function for PITX2 in the adult heart. We recently demonstrated that *Pitx2c* is expressed highly and selectively in left atria of adult mice and humans compared to the right atria (Kirchhof *et al*., 2011), indicative of a functional role for *Pitx2c* in the adult left atrium. Furthermore, there is a strong association between polymorphisms close to the *PITX2* locus (on chromosome 4q25) and atrial fibrillation (AF) (Gudbjartsson *et al*., 2007; Kaab *et al*., 2009). We hypothesise that alterations in the L-R atrial expression ratio could promote the development of ectopic stimuli and AF.

Gene array analysis previously identified a number of genes differentially regulated between left and right atria in wildtype adult mice (Kahr *et al*., 2011). Indirect comparison with gene arrays performed in conjunction with these experiments, suggested that *Ccl21, Ddit4l and Ppp1r1b* were downregulated in the left atria of *Pitx2c* heterozygous mice, suggestive of downstream Pitx2-dependent expression in the adult left atrium.

In this current work we have sought to quantify differential expression levels of Chemokine ligand 21 (*Ccl21*); DNA damage-inducible transcript 4-like (*Ddit4l*); Pleckstrin homology-like domain family A, member 1 (*Phlda1*); Protein phosphatase 1 regulatory subunit 1B (*Ppp1r1b*); Scavenger receptor class A (*Scara5*); Troponin I2 type 2 (*Tnni2*) and Chemokine ligand 14 (*Cxcl14*) by RT-PCR in the left and right atria of 18 mice (9 *Pitx2c* heterozygous and 9 litter mate controls) aged between 14-20wks. RT-PCR was performed using SYBR Green and the ΔΔCt Method. All genes were found to be differentially expressed between the left and right atria in both wildtype and *Pitx2c* heterozygous mice. There was a trend towards differential fold change reduction in the left atria of *Pitx2c* heterozygous mice compared to wildtype for all candidate genes. The L-R ratios between *Ccl21* and *Ddit4l* differ significantly (*Ccl21* 0.372, p=0.01; *Ddit4l* 0.275, p=0.04). *Ddit4l* encodes a protein involved in DNA-damage and hypoxia-induced cell death whilst disruption of the CCL21 pathway in mice improved myocardial dysfunction suggesting that CCL21 levels actively impact upon cardiac pathology. These results support the hypothesis that *Ccl21* and *Ddit4l* are positively regulated by *Pitx2c*, and may suggest that *Pitx2c* maintains leftness in the adult atrium; hence the contribution of these genes to AF pathology warrants further investigation.

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