# Created equal? Exploring intra-individual differences between carotid bodies

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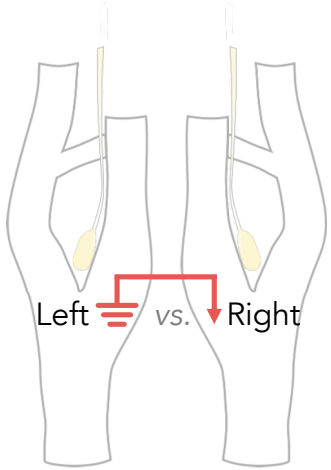
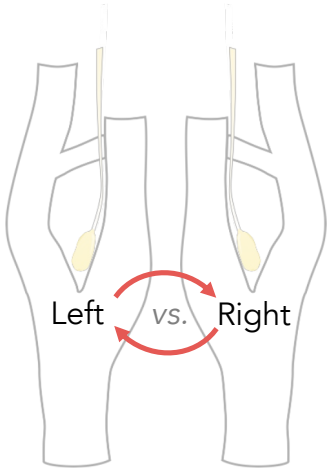



Sidedness

**Sidedness** – intra-individual **differences between the left *versus* the right**

*Does **gene A** have higher expression in the right CB compared to the left?*




Laterality

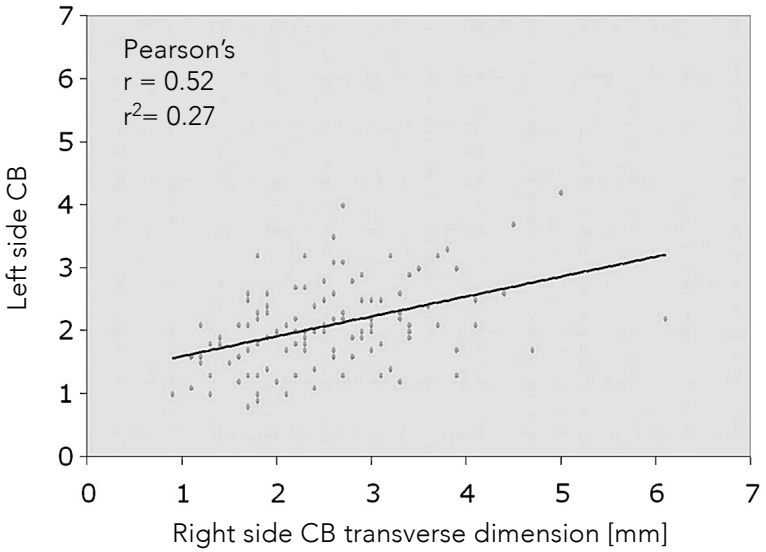
**Laterality** – intra-individual **differences that occur in either side**

*Is **gene A** is differentially expressed between the two sides?*

# Carotid Body Detection on CT Angiography

**Nguyen *et al.*** (2011) AJNR Am J Neuroradiol; PMID: 21393408

- **Weak correlation** (transverse); Pearson ***r* = 0.52**; *p<0.0001*
- **Weak correlation** (sagittal); Pearson ***r* = 0.42**; *p<0.0001*




**Nair et al.** (2013) Neuroradiology. PMID: 24005832

- **No correlation**; Pearson ***r* = 0.14**; *p* = 0.94

Why are CBs asymmetrical?

↑ size == ↑ output ??

In association with increased output CBs are enlarged in

Patients
- Hypertension
- Diabetes
- Chronic heart failure

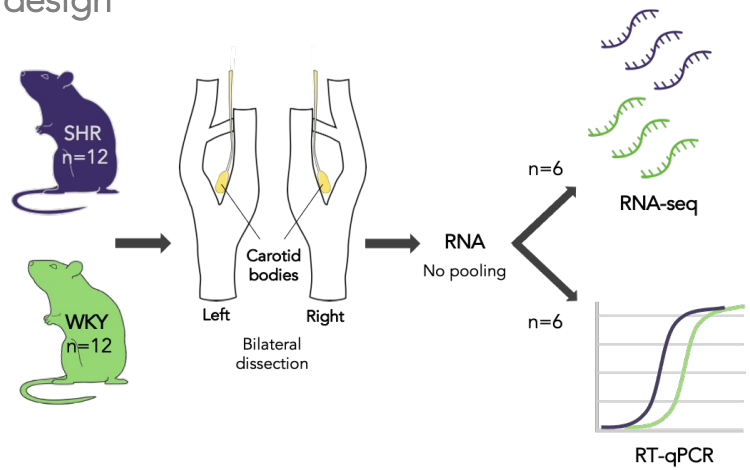
Animal models
- Chronic hypoxia
- SHR
- Diet-induced metabolic syndrome

Does asymmetry in CB size inform about differences in their function?

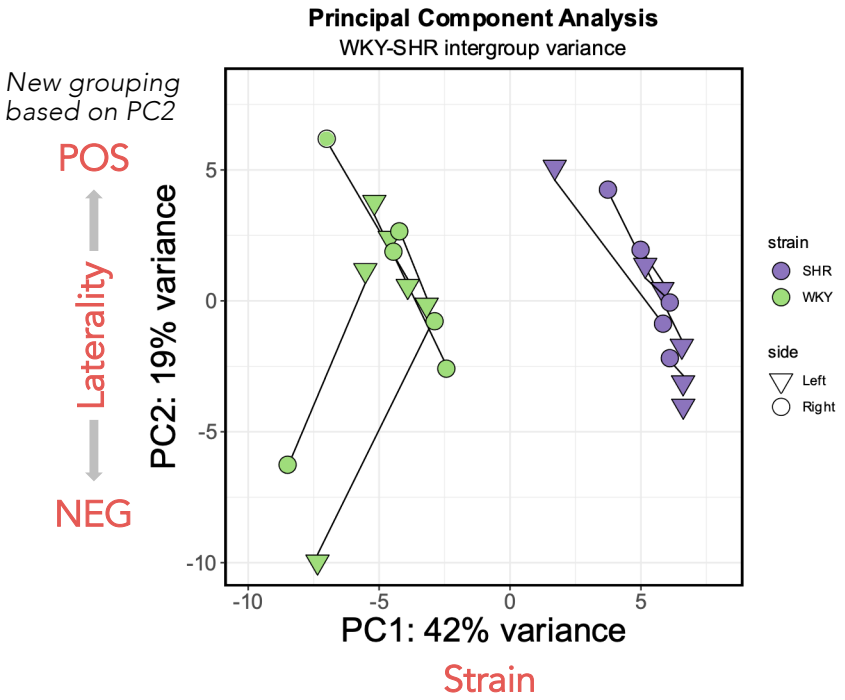
## Hypothesis:

If present, differences in function would be reflected in the CB transcriptome permitting identification of differentially expressed genes between the bilateral carotid bodies

## Study design




**Pauza et al.** (2022) Circ Res. PMID: 35100822




*Adamts20, Mag, Bcas1,* ***Slc9a3,*** *Adamts17, Mpz, Rasgef1a, Ncmap, Mal, Kif19, Gas2l3, Mbp, Col2a1, Prss12, Drp2, Ddn, Pou3f1, Prkcq, Prx, C1qtnf12, Ugt8, Fa2h, Rhpn1, Dusp15, Cacng4, Cnp, Psat1, Pmp22, Arhgap19,* ***Trpv3,*** *Il16, Ryr3, Cadm3, Neb, Myh14, Sema3b, Gatm, Lpcat2, Col9a3, Eda, Cfap100, Cuedc2, Tmprss5, Celsr2, Aatk, Itpr3, Sh3tc2, Ston1, Srd5a1, Kank4, Cpa4, Cyp2c11, Serpina4, Ca3, Pck1, Sult1e1*

## Differential gene expression results

| Comparison | # of DEG |
|---|---|
| **Strain:** WKY vs SHR | 2982 |
| **Side**: Left vs Right | 0 |
| **PC2**: Pos vs Neg | 57 |

## TRPV3

Transient receptor potential cation channel, subfamily V, member 3

- Nonselective cation channel
- Similarly expressed and functionally similar to TRPV1 previously shown to mediate CB sensitization induced by LPA

**Jendzjowsky et al.** (2018)
PMID: 30279412

## *Slc9a3* (NHE-3)

Sodium–hydrogen antiporter 3

- $Na^+$ into the cell
- $H^+$ out of the cell

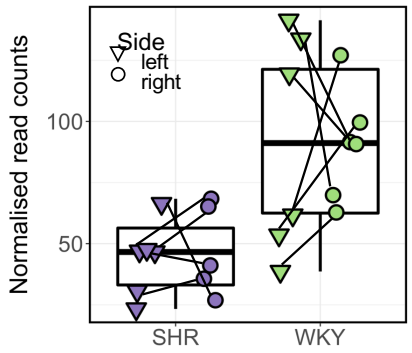
- Stimulated by PKC
- Inhibited by PKA
- Also stimulated by insulin

- Controlled by ***Slc9a3r1***, ***Slc9a3r2*** regulatory proteins highly expressed in the CB

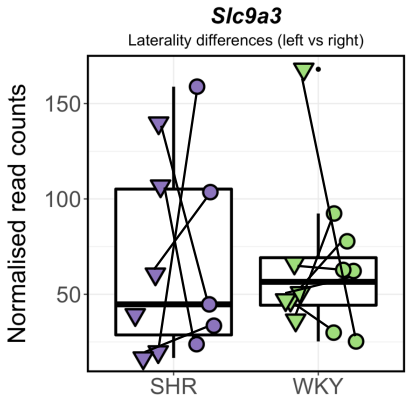
## RNA-seq

Initial cohort, n=6

### Sidedness

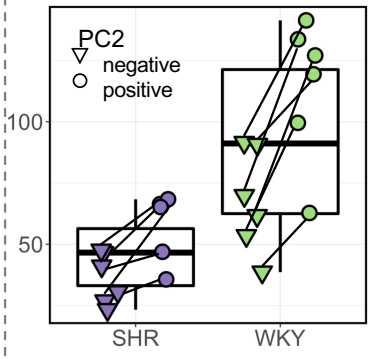



No difference

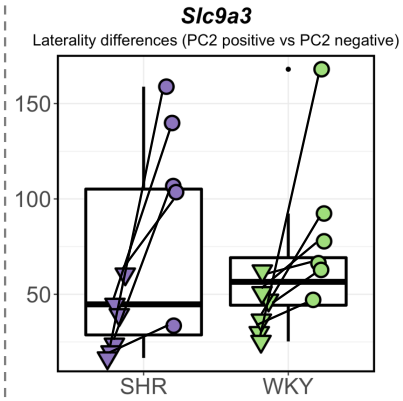



No difference

### Laterality




**64% difference** (1.64 fold-change)

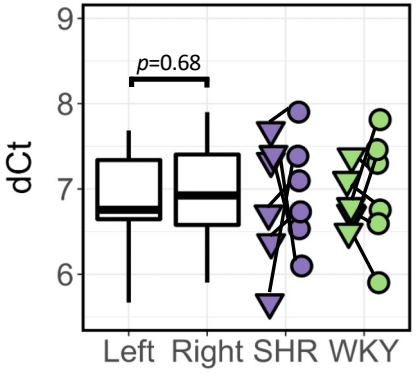



**155% difference** (2.55 fold-change)

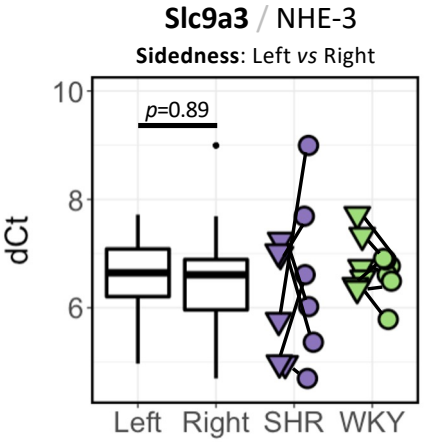
## RT-qPCR

Independent cohort, n=6

### Sidedness

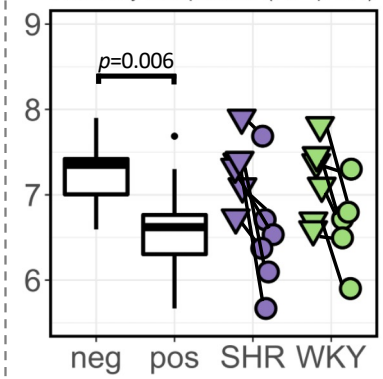



**No difference**

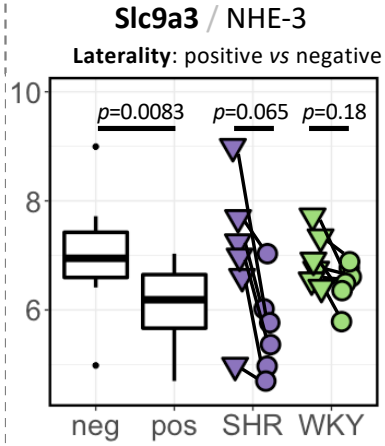



No difference

### Laterality




**68% difference** (1.68 fold-change)




**122% difference** (2.22 fold-change)

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# Conclusions

1. Transcriptomic data indicate the existence of intra-individual lateral differences between the carotid bodies

2. These differences are NOT linked to a specific side of the body suggesting CB laterality but not sidedness


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Keen to hear your thoughts

## Let's connect!