HelmholtzZentrum münchen
German Research Center for Environmental Health

Scientific Highlight October 2013

☐ co-ordinated with the Director of the Institute / Research Unit

Institute of Diabetes and Regeneration Research

PSP-Element:
G-502300-001

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Title of the highlight:
Wnt/β-catenin signalling regulates Sox17 expression and is essential for organizer and endoderm formation in the mouse

Keywords:
Wnt/β-catenin, Sox17, organizer, endoderm, embryonic patterning

Central statement of the highlight in one sentence:
Wnt/β-catenin signalling and posterior extra-embryonic endoderm is essential for gastrula organizer formation and patterning of the three principal germ layers

Text of the highlight:
Understanding the temporal and spatial involvement of signalling cascades in embryonic patterning provides the basis for successful differentiation of stem cells into mesoderm, endoderm and ectoderm lineages. To address the role of Wnt/β-catenin signalling in this process, β-catenin was deleted in extra-embryonic and embryonic endoderm. The analysis exhibited that active Wnt signalling in extra-embryonic endoderm is required for anterior head and posterior tail organizer formation. These organizer structures secrete signalling molecules that pattern the embryo to establish the basic body plan. We provide first evidence that posterior extra-embryonic endoderm (PVE) is crucial for gastrula organizer formation. Additionally, in the embryonic endoderm, canonical Wnt signalling is essential for lateral and posterior endoderm, which form the mid- and hindgut endoderm, respectively. On the molecular level, Wnt/β-catenin activates Sox17 and an endoderm program. Taken together, these results are not only important to understand embryonic axis formation in the mouse, that provides the blueprint for the mammalian body plan, but are also highly relevant to differentiate embryonic stem cells towards differentiated cell types of the lung and pancreas for cell-replacement therapies.

Publication:
Engert S, **Burtscher I**, Liao WP, Dulev S, Schotta G, **Lickert H.** Wnt/β-catenin signalling regulates Sox17 expression and is essential for organizer and endoderm formation in the mouse. Development. 2013 Aug;140(15):3128-38. doi: 10.1242/dev.088765. Epub 2013 Jul 3. PubMed PMID: 23824574.

Taking account of the HMGU mission:
Understand the development of the lung and pancreas provides molecular targets for therapy and allows to establish embryonic stem cell differentiation protocols for cell-replacement therapy.

The internal HMGU co-operation partners with whom the highlight was compiled, if appropriate:
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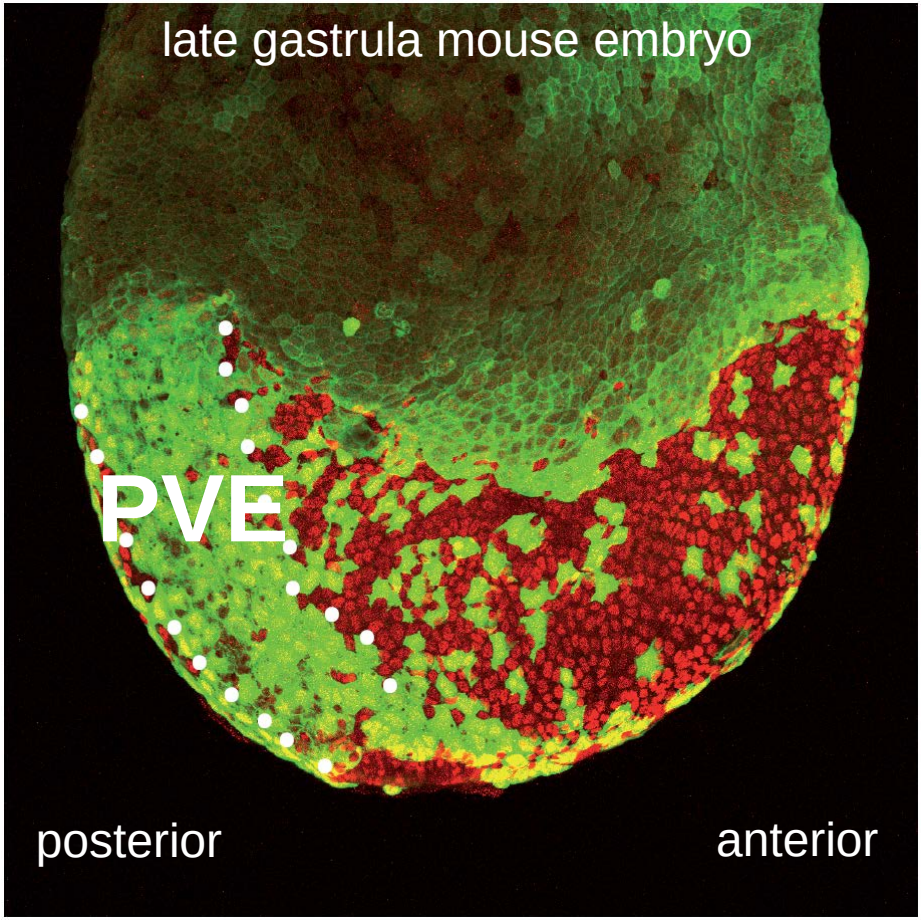
Wnt/β-catenin signalling regulates *Sox17* expression and is essential for organizer and endoderm formation in the mouse



extra-embryonic endoderm / embryonic endoderm

Patterning of the endoderm translates into lung, liver & pancreas formation

Wnt/β-catenin via the Sox17 transcription factor is essentail for organizer formation

For the first time, we show that the posterior visceral endoderm (PVE) is crucial for gastrula organizer formation

Understanding how the gastrula organizer patterns the endoderm is essential to to derive organ-specific cell types