

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

**Institute of Stem Cell Research (Mammary Stem Cells)**

**PSP-Element:**

G-552300-001

**Person to contact for further enquiries:**

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**Title of the highlight:**

Mini-breasts in petri dishes: an organoid-assay of the human mammary gland provides a new model to study regeneration and breast cancer

**Keywords:**

Regeneration, Stem Cell, Mammary Gland, Organoid, Personalized Medicine

**Central statement of the highlight in one sentence:**

The Scheel group at the Institute of Stem Cell Research developed a new in vitro model where cells from human mammary glands develop into multicellular structures that mimick the complex system of ducts that make up the functional units of the breast.

**Text of the highlight:**

A technological breakthrough opens new avenues for mammary gland biology and basic breast cancer research. The independent young investigator research group, led by Dr. Christina Scheel, developed a mammary organoid assay whereby cultured human breast epithelial cells regenerate the three-dimensional duct-system of the mammary gland. For this purpose, the researchers utilize a flexible collagen gel in which cells proliferate and form hollow ducts, similar to the developing mammary gland during puberty. Throughout the reproductive lifespan of a woman, the mammary gland is constantly remodeled and renewed in order to guarantee milk production even after multiple pregnancies. This high cellular turnover hints at the presence of cells with regenerative capacity, i.e. stem cells and may explain why breast cancer is such a common disease. Indeed, through their mammary organoid assay, the researchers were able to identify regenerative stem cells in the human mammary gland, which provides them with basis to elucidate the molecular pathways governing both normal regeneration as well as breast cancer development. Another reason the mammary organoids are a particularly valuable experimental tool is, because the

cells that build these structure are directly isolated from patient tissue. In this case, healthy tissue from women undergoing aesthetic breast reduction is used. A uniquely efficient human tissue pipeline the Scheel group has build enables high-powered longitudinal studies in the area of personalized medicine and breast cancer prevention.

Work in the Scheel group is supported by the prestigious Max Eder Program of the German Cancer Aid/Deutsche Krebshilfe

**Publication:**

**Special Issue on human development:**

Quantification of regenerative potential in primary human mammary epithelial cells.

Linnemann JR, Miura H, Meixner LK, Irmeler M, Kloos UJ, Hirschi B, Bartsch HS, Sass S, Beckers J, Theis FJ, Gabka C, Sotlar K, Scheel CH.

Development. 2015 Sep 15;142(18):3239-51. doi: 10.1242/dev.123554. Epub 2015 Jun 12.

PMID: 2607149

**Editorial:**

Human development: a Special Issue

Olivier Pourquié

Development 2015 142: 3071-3072; doi: 10.1242/dev.129767

**Nature Research Highlight:**

Mammary ducts made in a dish

Nature **522**, 259 (18 June 2015) doi:10.1038/522259e

Published online 17 June 2015

**Time Magazine:**

Researchers grow a breast in a dish

<http://time.com/3919261/growing-a-breast-in-a-dish/>

**Patent Application:**

LU92706, Means and Methods for generation of Breast Stem Cells, 31.4.2015, Scheel CH, Linnemann JR, Meixner LK, Miura H.

**Taking account of the HMGU mission:**

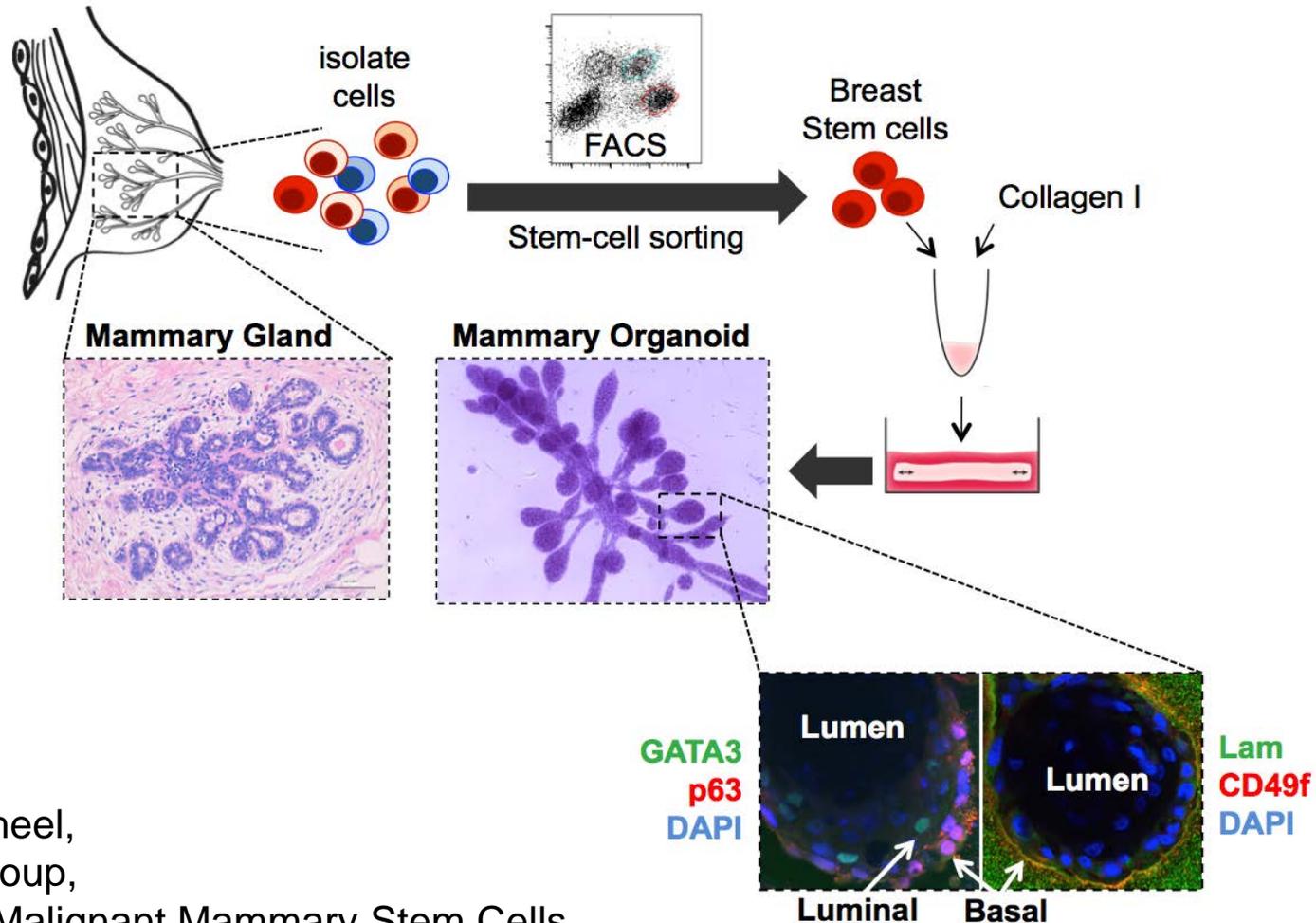
The Scheel group has developed a unique experimental model to elucidate the fundamental principles of regeneration and breast cancer development using primary human cells. Thereby, they have build the basis for developing personalized strategies to prevent breast cancer and to generate replacement epithelial tissues for regenerative medicine.

**The internal HMGU co-operation partners with whom the highlight was compiled, if appropriate:**

Not applicable

# A Mammary Organoid Assay to study regeneration and breast cancer development

Institute of Stem Cell Research



Christina Scheel,  
Max Eder Group,  
Normal and Malignant Mammary Stem Cells