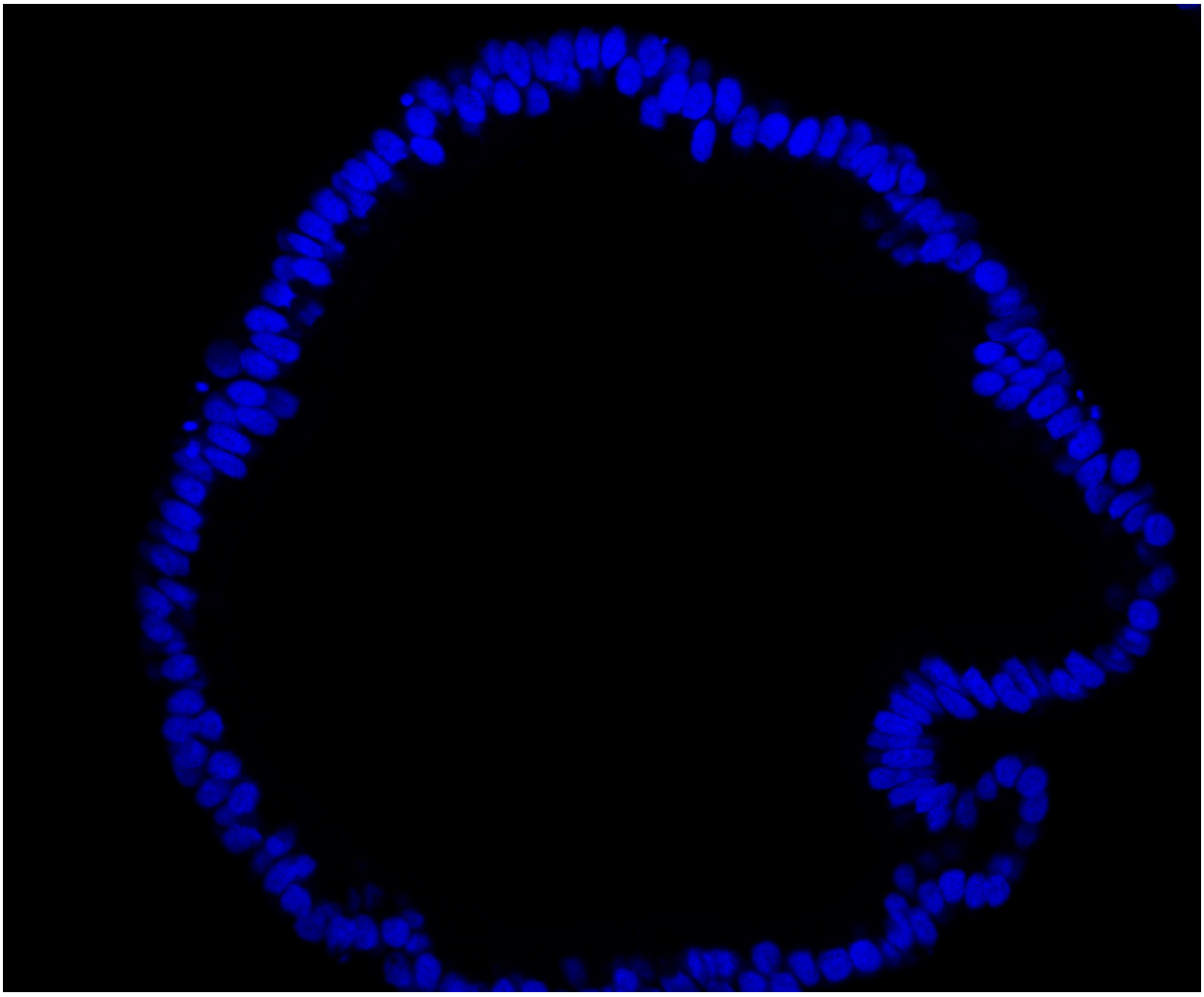
New culture model makes fallopian tube accessible

December 11 2015



A section through a human Fallopian tube organoid showing polarized epithelial cells enclosing the internal lumen. Credit: MPI for Infection Biology

A new way of growing fallopian tube cells in culture is expected to give a boost to our understanding and prevention of female gynecological diseases, such as infertility, inflammatory disease, and ovarian cancer. The tubes, which connect the ovaries with the uterus, are the site of fertilization but they are now also believed to be the site from which high-grade serous ovarian carcinoma originates - the deadliest form of gynecological cancer. From the open end of the tube early cancer cells appear to spread not only to the ovaries, but also to other organs in contact with the abdominal cavity. Ascending gynecological infections, on the other hand, can lead to inflammation, scarring and closure of the fallopian tubes, which frequently leads to infertility or ectopic pregnancies. Both ovarian cancer and pelvic inflammatory disease often start silently and are not diagnosed until the late stages, as the inner lining of the tube, the fallopian epithelium, is inaccessible to direct clinical examination.

Until now, research into the origins and etiology of the diseases has also been restricted because fallopian epithelial cells cannot readily be grown in the laboratory. Together with researchers at the gynecology centers of the Charitè University Hospital, a team led by Thomas F. Meyer at the Max Planck Institute for Infection Biology in Berlin has now harnessed a new method of growing human epithelial cells as hollow spheres, so called 'organoids', in order to culture cells from clinical fallopian tube samples. By adapting the culture conditions to the specific needs of the tissue, they were able to keep the adult stem cells of the fallopian tube alive, so that they continue to proliferate and produce the cells typical of this tissue.

Importantly, the fallopian organoids have the same composition and structure as the epithelial lining of the tube. 'We have learned not only how to achieve conditions that allow cells to develop all features present in the human body, but also how to control their specialization into the different cell types found in the fallopian tubes' says Mirjana Kessler,

the first author of a paper that just appeared in *Nature Communications*. 'The fallopian tube represents a crucial organ for female health: it is accessible to pathogenic microbes such as Chlamydia and at the same time provides a conduit into the abdominal cavity. It is the site of origin of several clinically important diseases for women, such as ovarian cancer, pelvic inflammatory disease and infertility.'

The new model should now enable scientists to investigate in detail different aspects of fallopian tube functions, such as its role in reproduction, impact of infections and the basic mechanisms behind serous ovarian carcinoma development offering numerous avenues of approach towards the development of much needed therapies and novel diagnostic tools.

Provided by Max Planck Society