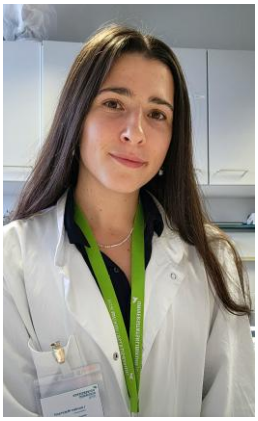
ImmunoTools *special* Award 2025



Lourdes Materazzi, PhD

Placenta Lab, Jena University Hospital, Jena, GERMANY

Immune cell communication in reproductive tissues during female aging

Tissue-resident immune cells are essential for maintaining organ homeostasis and adapting to physiological changes such as aging. In female reproductive tissues, these immune cells play critical roles in endometrial remodelling, follicular development, and embryo implantation. However, how aging alters their composition and function in these organs remains poorly understood.

We have identified that an imbalance between distinct subsets of endometrial stromal cells—mature and senescent decidual cells—compromises uterine receptivity. Senescent decidual cells produce a senescence-associated secretory phenotype (SASP) that recruits and modulates local immune cells and contributes to implantation. However, the persistence of this senescent response may lead to reproductive impairments. With advancing age, chronic low-grade inflammation (inflammaging) may exacerbate this imbalance, further compromising tissue function. To begin characterizing these senescent subpopulations and their inflammatory roles in primary human endometrial stromal cells from donors of different ages, we propose using a panel of ImmunoTools antibodies. Specifically, **CD45-PE, p53-FITC,** and **IL-6-APC** will enable the identification of inflammatory senescent cells and help assess age-associated alterations in SASP-driven immune activation.

In our ongoing work, we are also investigating the role of $CD8^+$ T cells in the clearance of senescent stromal cells and how this process is regulated by monocyte-derived myeloid-derived suppressor cells, with particular interest in whether these interactions are disrupted during aging. In parallel, we are characterizing macrophages from follicular fluid to determine how their phenotype and secretory profile change with reproductive age. Our next goal is to explore whether these macrophages communicate with the endometrium through paracrine mediators such as extracellular vesicles, potentially influencing local immune balance and uterine receptivity.

To further delineate the diversity of immune populations involved in the aging microenvironment, we aim to characterize inflammatory macrophages using **CD86-APC** and **IL-8-PE**, and to quantify SASP-associated cytokines using an **IL-1β ELISA**. Together, these analyses will help define how inflammatory signatures evolve with age across ovarian and endometrial compartments.

This research is particularly relevant in the context of the global trend toward delayed motherhood, as women increasingly conceive beyond the age of 35—considered advanced maternal age—when reproductive success declines sharply. By integrating transcriptional, phenotypic, and functional analyses of tissue-resident and fluid-derived immune cells, this project seeks to elucidate how aging reshapes immune homeostasis in the female reproductive tract, providing new insights into ovarian–endometrial crosstalk and age-related reproductive decline.