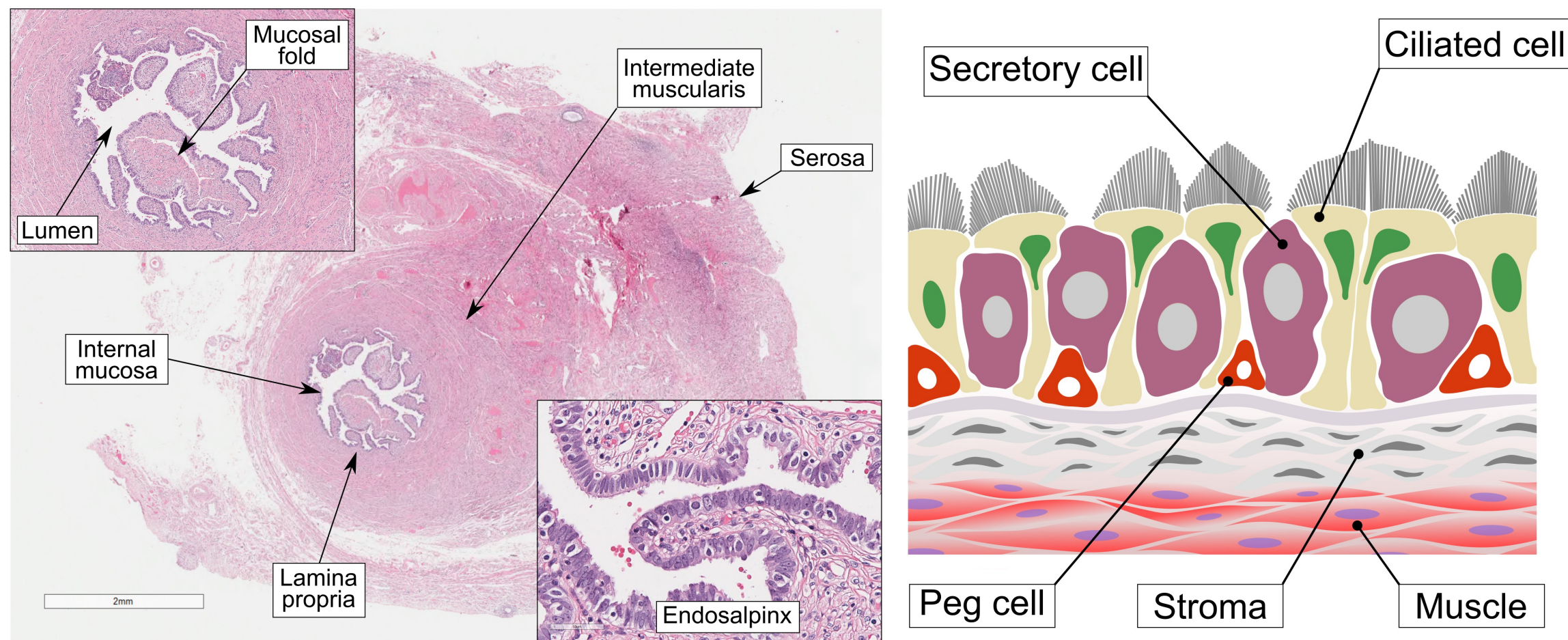


Background

Histologically the fallopian tubes (FT) consist of three layers, the external mucosa, intermediate muscularis and internal mucosa, which are primarily composed of secretory, ciliated and peg cells.¹ There is evidence to suggest that tubal epithelial cells exhibit characteristic changes during the course of the menstrual cycle, with increased epithelial height, ciliation and mitotic activity associated with the oestrogen-dominant preovulatory phase.^{2,3} In addition to epithelial cells, several studies have also reported a population of immune cells within the FT.^{1,4,5} Characterisation of this population could be vital in promoting a better understanding of tubal pathologies and their influence on infertility, leading to improvements in women's sexual and reproductive health.



Objective

Present a comprehensive analysis of the immune cell populations in the human FT both in health and benign pathology, through identification and appraisal of existing literature.

Methods

Literature search using CINAHL, EMCARE, EMBASE, PubMed and Scopus:

Leukocyte OR Leucocyte OR Macrophage OR Neutrophil OR Lymphocyte OR "NK cell" OR "Natural killer cell" OR Monocyte OR Eosinophil OR Basophil OR "T cell" OR "B cell" OR "Immune cell" OR "White blood cell"

AND

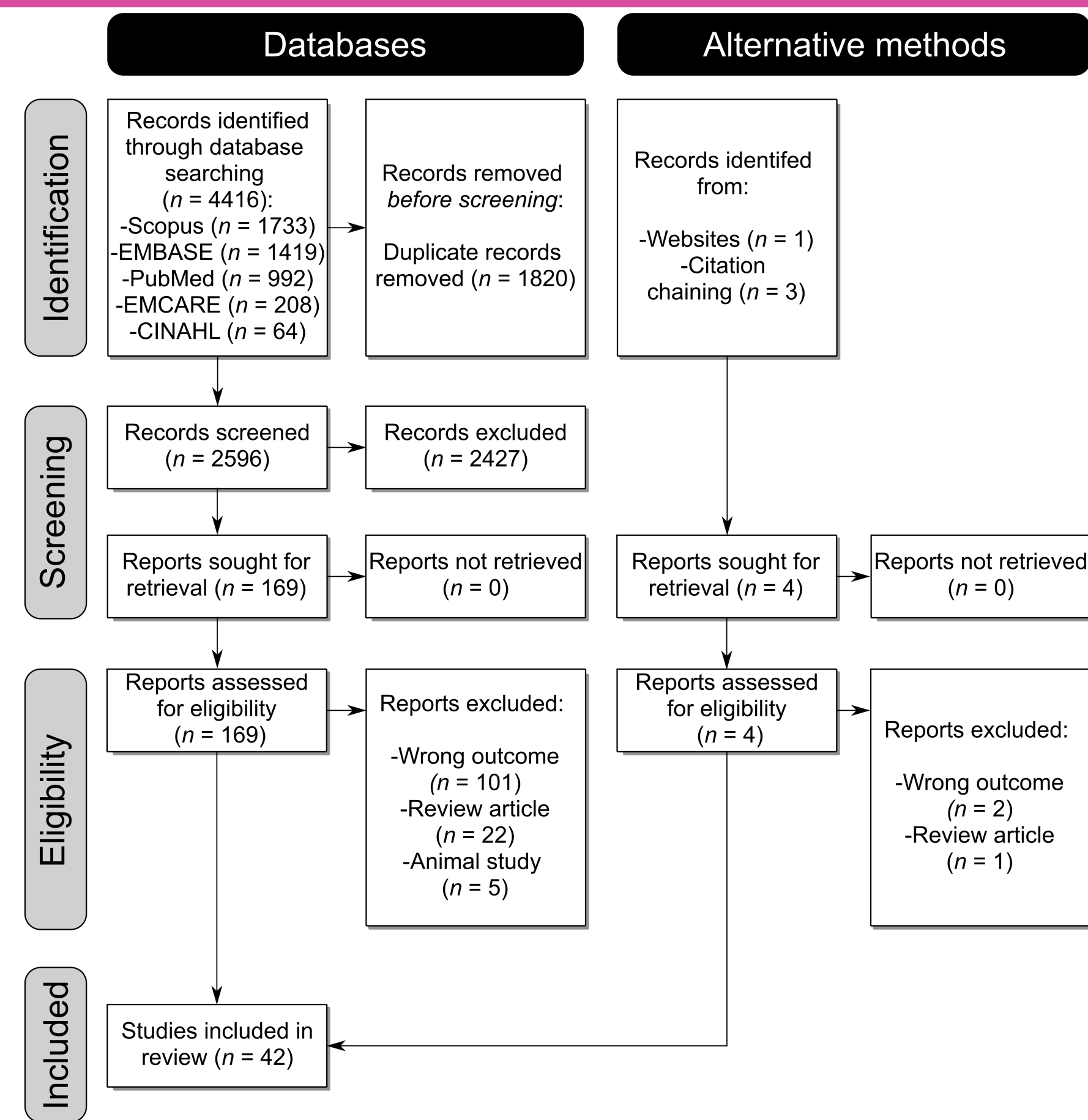
"Fallopian tube" OR Oviduct OR "Uterine tube"

Abstract screen and full text reviews were conducted based on inclusion and exclusion criteria. Quality assessment of included studies was performed using the Newcastle Ottawa Scale and a modified version by Murad *et al.*^{6,7}

Results

The search strategy identified 4416 publications. Following application of the inclusion and exclusion criteria, full text reviews were conducted, from which 42 eligible studies were included for analysis and their findings extracted.

Healthy FT - T lymphocytes, primarily CD8⁺ cytotoxic T cells, represent the most abundant immune cell population. B lymphocytes, macrophages, natural killer (NK) cells and dendritic cells have also been identified.



Cohort studies											Case series and reports														
Author	Year	Selection				Comparability		Outcome			Total	Author	Year	Selection	Ascertainment			Causality			Reporting		Total		
		1	2	3	4	5	6	7	8	9				1	2	3	4	5	6	7	8				
Copperman et al.	2006	★	★		★		★		★	★	8	Good	Ardighieri et al.	2014			★	★	★	-	-	★	4	Fa	
Earl et al.	1987					★				★	2	Poor	Boehme et al.	1992			★	-	★	-	-		3	Poc	
Edelstam et al.	1996					★	★			★	4	Poor	Crow et al.	1994			★	★	-	★	-	★	5	Go	
Geppert et al.	1977					★				★	3	Poor	Dinh et al.	2021		★	★	★	-	★	-	★	3	Fa	
Haney et al.	1983					★	★	★	★	★	7	Fair	El-Din Sawfat et al.	2008			★	★	★	-	★	-	★	5	Go
Kutteh et al.	1990	★			★	★	★	★	★	★	5	Fair	Gaytán et al.	2007		★	★	★	-	★	-	★	5	Go	
Matsushima et al.	2002	★	★		★	★	★	★	★	★	7	Good	Givan et al.	1997		★	★	★	-	★	-	★	4	Fa	
Pröll et al.	2000	★				★		★	★	★	5	Poor	Gray et al.	2001		★	★	★	-	★	-	★	5	Go	
Shaw et al.	2011	★			★	★		★	★	★	5	Fair	Hagiwara et al.	1998		★	★	-	-	-	-	★	2	Poc	
Ulzibat et al.	2006					★	★	★	★	★	5	Poor	Idrees et al.	2007		★	★	★	-	★	-	★	5	Go	
Von Rango et al.	2001	★				★	★	★	★	★	6	Poor	Morris et al.	1986		★	★	★	-	-	-	★	4	Fa	
Wang et al.	2020	★	★		★	★	★	★	★	★	8	Good	Mselle et al.	2007			★	★	-	★	-	★	3	Fa	
Wicherek et al.	2008	★	★		★	★	★	★	★	★	7	Good	Rabi et al.	2014			★	★	-	★	-	★	3	Fa	
Case-control studies												Rabi et al.	2014				★	★	-	★	-	★	4	Fa	
Kemp et al.	2007	★	★	★		★		★	★	★	7	Good	Ramraj et al.	2018	★		★	★	-	★	-	★	4	Fa	
Kemp et al.	2011	★	★	★		★	★		★	★	8	Good	Suárez-Vilela et al.	2011		★	★	★	-	★	-	★	5	Go	
Kinnunen et al.	2000	★			★			★	★	★	5	Poor	Suenaga et al.	1998		★	★	★	-	★	-	★	5	Go	
Laskarin et al.	2010					★		★	★	★	5	Poor	Varga et al.	2019		★	★	★	-	★	-	★	3	Fa	
Marx et al.	1999				★	★		★	★	★	6	Fair	Wollen et al.	1994			★	★	-	★	-	★	4	Fa	
Ordi et al.	2006		★		★			★	★	★	6	Fair	Zhang et al.	2012		★	★	★	-	★	-	★	4	Fa	
Vassiliadou et al.	1998	★			★	★		★	★	★	6	Fair	Zorzi et al.	2010		★		★	-	-	-		2	Poc	
Wicherek et al.	2006	★	★	★		★	★	★	★	★	8	Good													

Results cont.

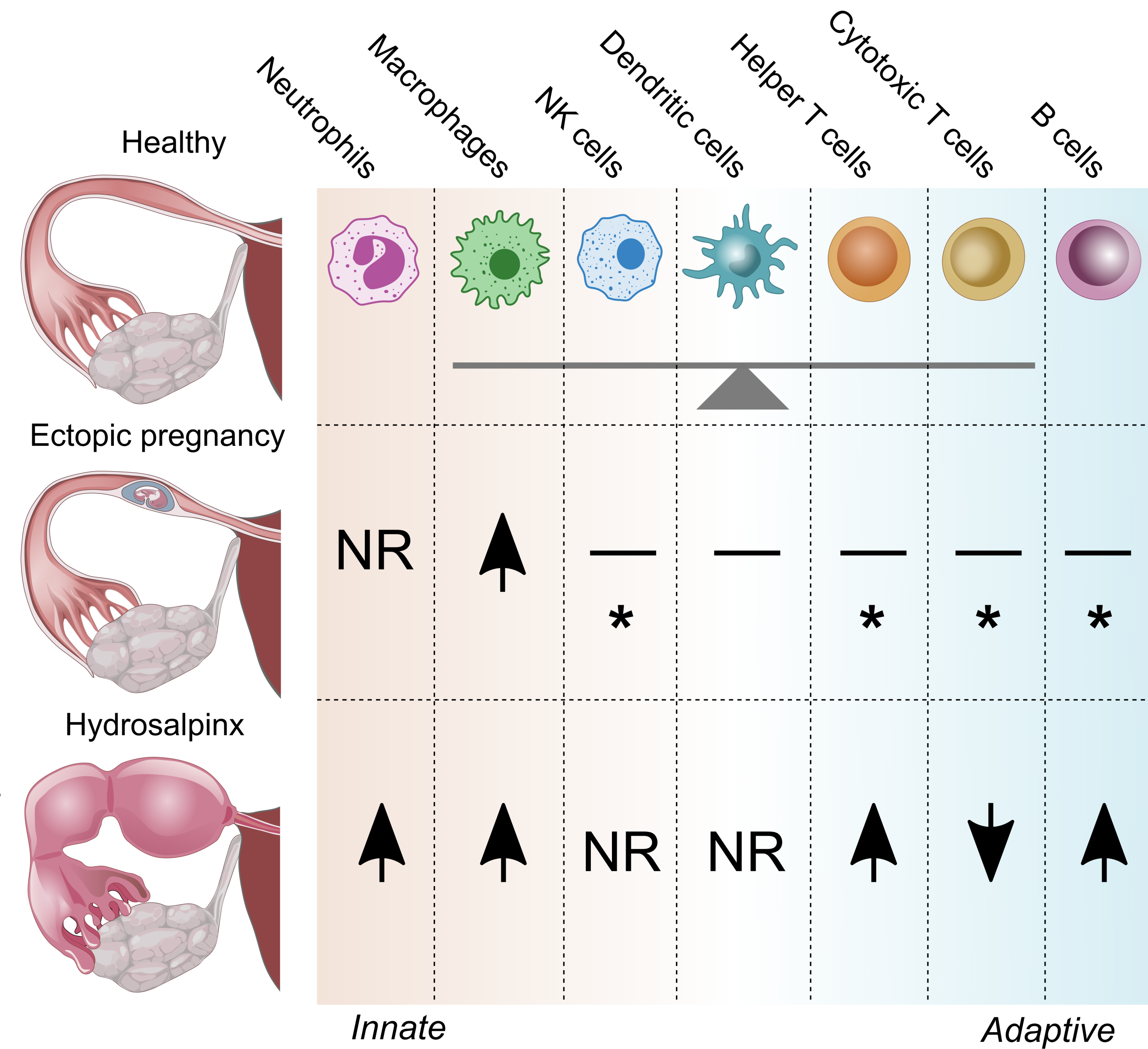
Menstrual phase variations - The number of macrophages demonstrated a consistent and significant increase during the progesterone-dominant secretory phase compared to the proliferative phase.

Menopausal status - Lymphocyte populations presented conflicting results, however proportions of macrophages were consistently reported as significantly lower in postmenopausal women, than those of reproductive age.

Tubal ectopic pregnancy - A similar distribution of lymphocytes was reported in tubal ectopic pregnancies to that in healthy tubes. Macrophages, dendritic cells, and NK cells were observed in tubal pregnancies, with a significant increase in the number of CD56⁺ and CD3⁺ cells in cases of tubal rupture.

Inflammation - Salpingitis, hydrosalpinx and tubal endometriosis were all characterised by an increased population of macrophages in comparison to healthy FT.

Rare pathology - Case reports of lipofuscin-laden histiocyte infiltration in the plicae of tubal mucosa. Findings were closely associated with endometriosis and pelvic inflammatory disease.



Conclusions and References

The FT possess a distinct population of immune cells from both the innate and adaptive subsystems. Variations in this population have been observed in several tubal pathologies and are dependent on exposure to reproductive hormones both during the menstrual cycle and after the ovaries cease to produce hormones in the postmenopausal period.⁸

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