

YEAR 1 ENDOCRINOLOGY

THE GONADS

Dr P Cover

THE GONADS

- *IN MALES:*

DEVELOP AS

THE TESTES

- *IN FEMALES:*

DEVELOP AS

THE OVARIES

FUNCTIONS OF THE GONADS

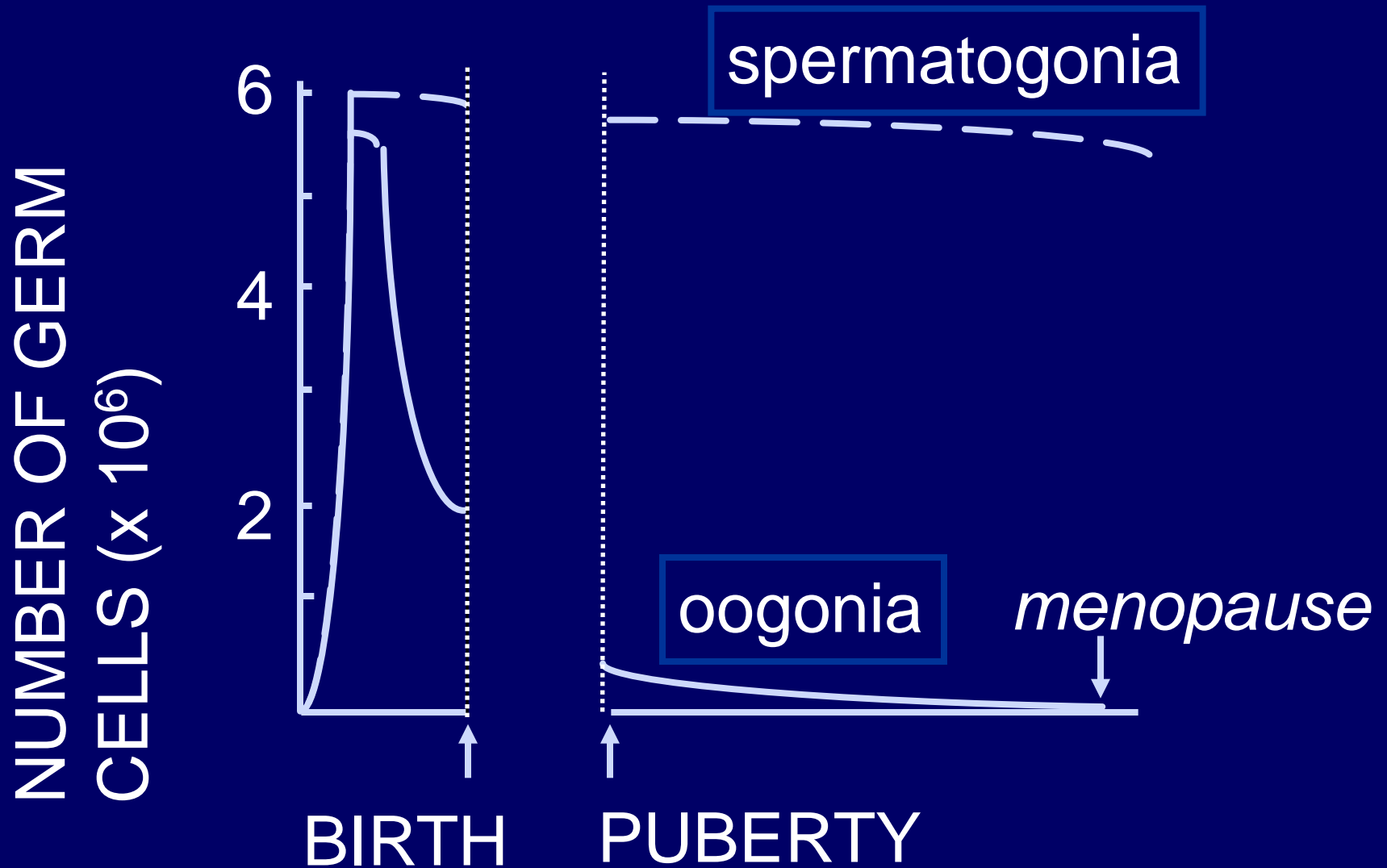
1. PRODUCTION OF GAMETES FOR REPRODUCTION (GAMETOGENESIS)

IN MALES: SPERMATOGENESIS
(production of mature spermatozoa)
IN FEMALES: OOGENESIS
(production of ripe ova)

2. PRODUCTION OF STEROID HORMONES (STEROIDOGENESIS)

IN MALES: ANDROGENS
(oestrogens, progestogens)
IN FEMALES: OESTROGENS,
PROGESTOGENS
(androgens)

ACTIVATION OF GERM CELLS



SPERMATOGENESIS

GERM CELL

44+XY (diploid)



SPERMATOGONIA

44+XY (diploid)

(mitotic division)



PRIMARY SPERMATOCYTES

44+XY (diploid)

(first meiotic division)



SECONDARY SPERMATOCYTES

22X or 22Y (haploid)

(second meiotic division)



SPERMATIDS

22X or 22Y (haploid)



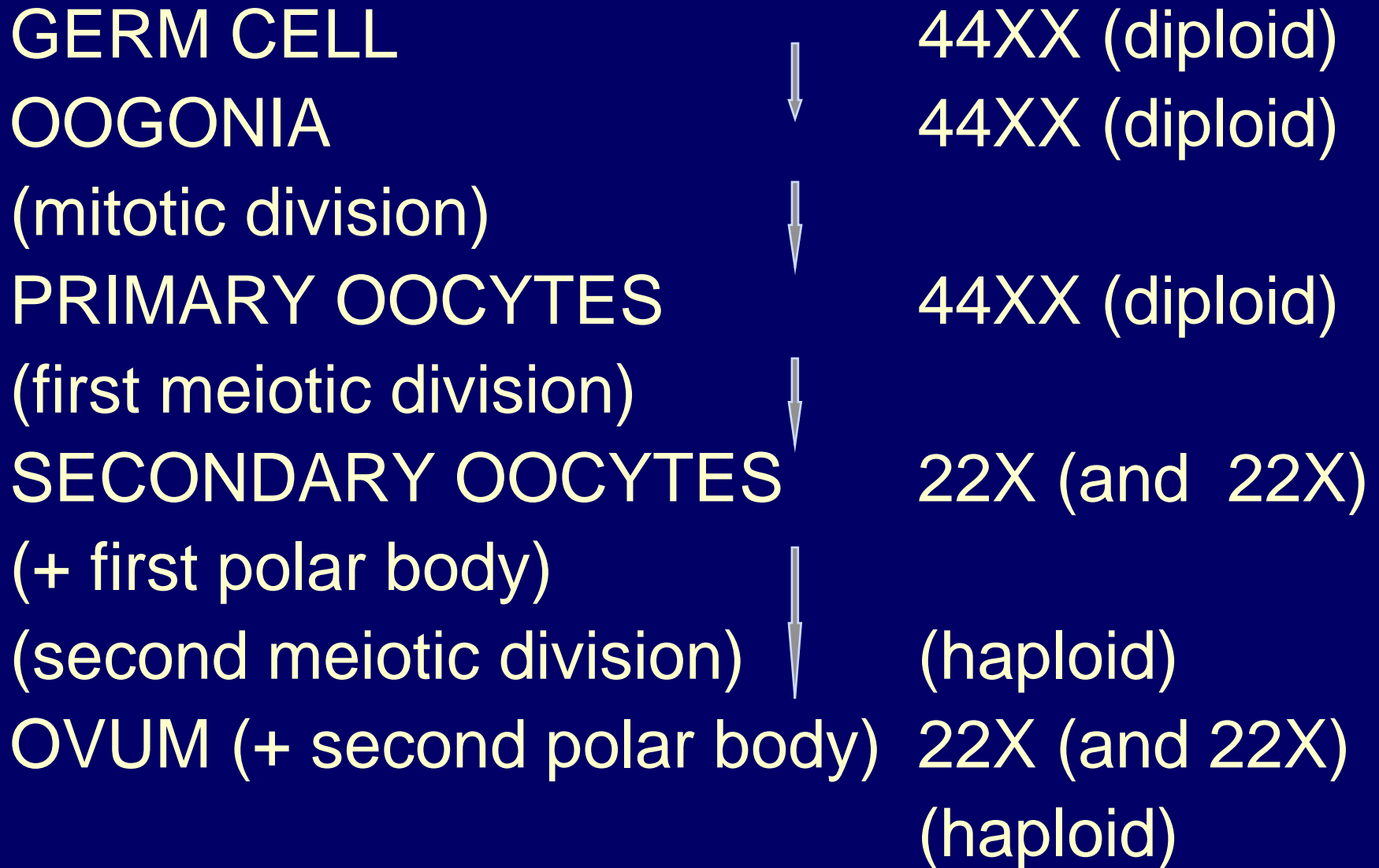
SPERMATOZOA

22X or 22Y (haploid)

PRODUCTION OF GAMETES

- MALES:
- Gametogenesis begins at puberty.
- Some primary spermatocytes continually return to quiescent stage; consequently, a pool of spermatogonia remains available for subsequent spermatogenic cycles throughout life.
- Thus males normally retain some spermatogenic capability throughout life, producing 300-600 sperm/gm testis/second

O O G E N E S I S

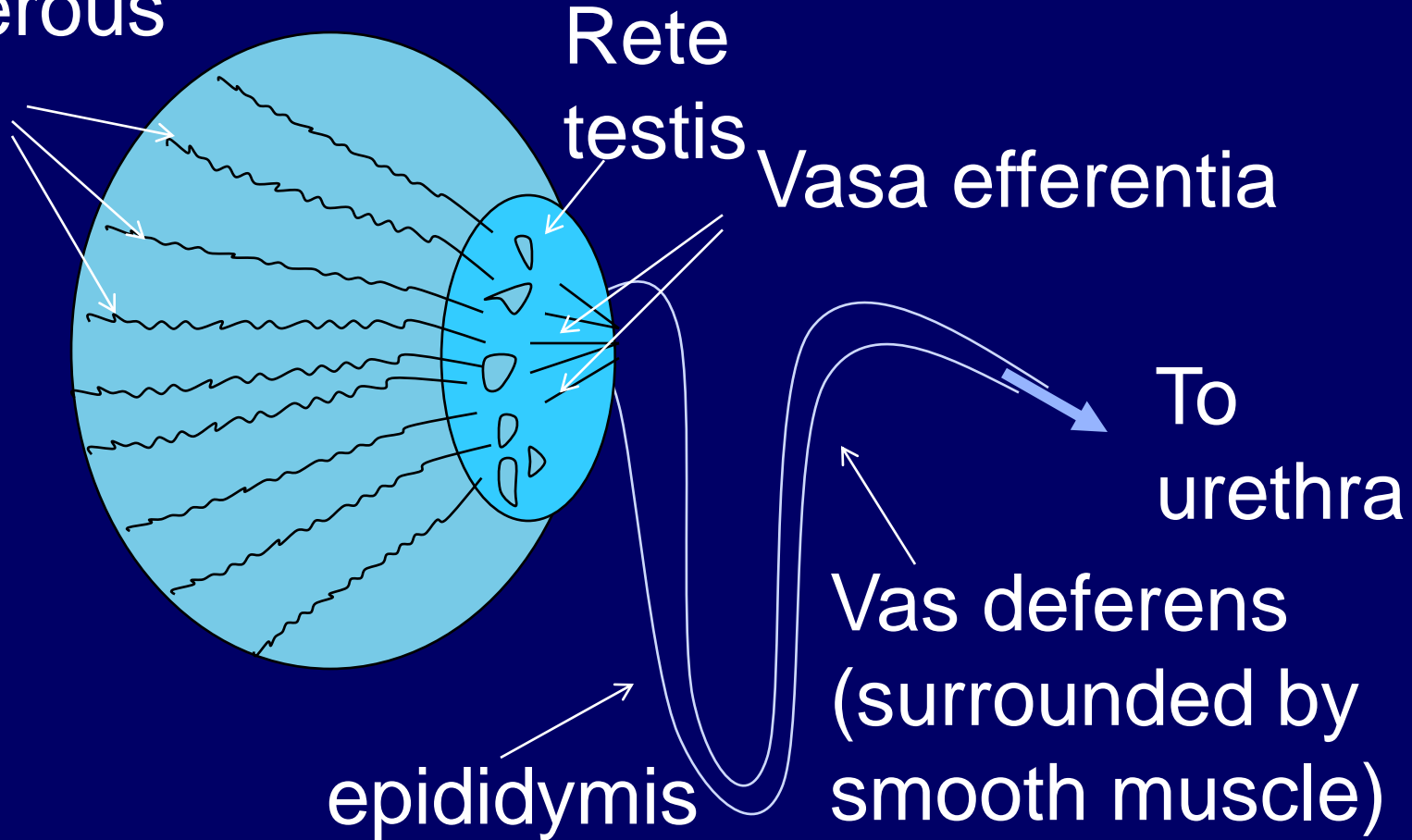


PRODUCTION OF GAMETES

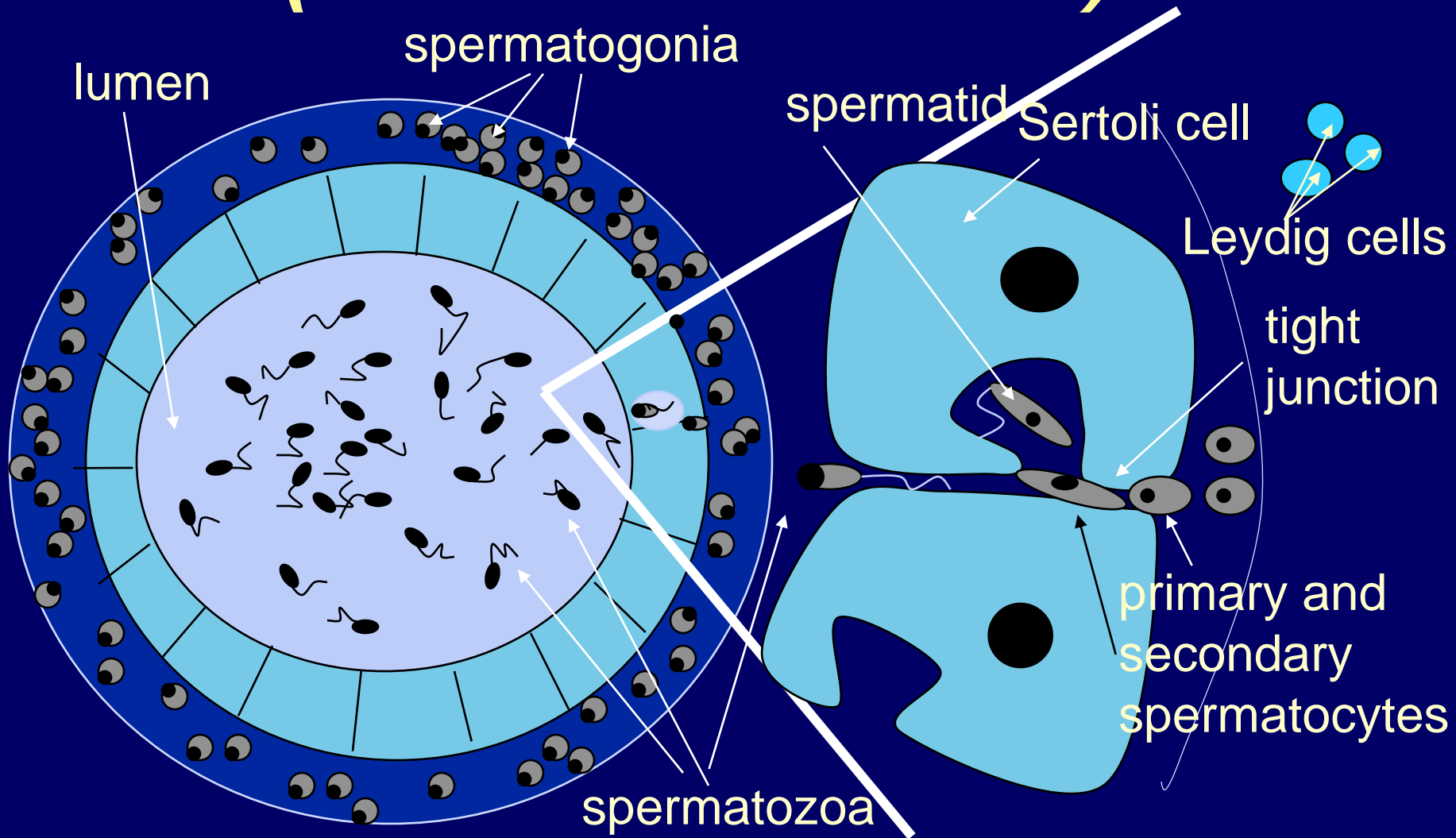
- FEMALES:
- Initial total number of oogonia in primordial follicles (in fetus) is approximately 6 million; early entry into meiosis halted in prophase.
- Primordial follicles, arrested in their development, enter process of atresia.
- By the time of birth the total number of oogonia remaining for potential development has dwindled to approximately 2 million, and by puberty less than 0.5 million remain.

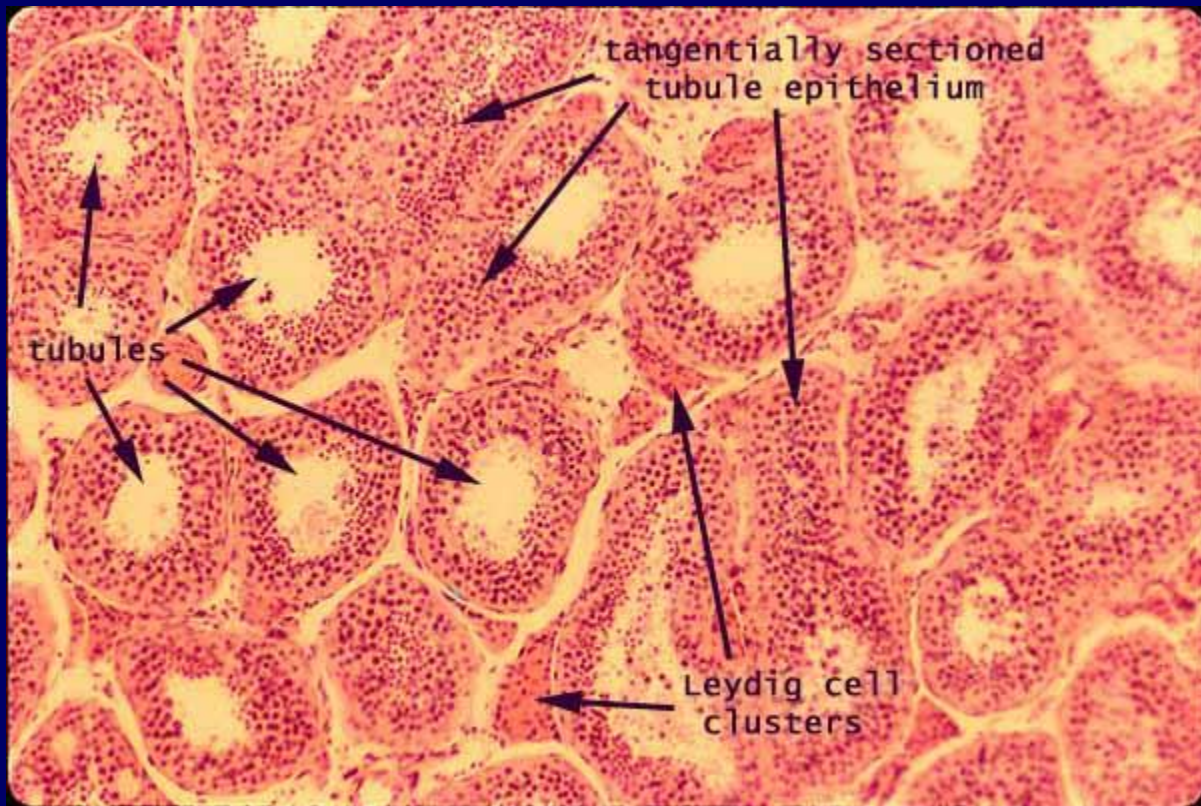
THE TESTES

Coiled
seminiferous
tubules



SEMINIFEROUS TUBULE (CROSS SECTION)





TESTICULAR CELLS

SERTOLI CELLS

- form the seminiferous tubules
- synthesise FSH and androgen receptors
- in response to FSH produce various molecules including INHIBIN
- are intimately associated with developing spermatocytes, etc..

LEYDIG CELLS

- lie outside seminiferous tubules
- synthesise LH receptors
- In response to LH are the principal source of testicular androgens (mainly testosterone)

THE OVARIES

Follicles
undergoing atresia

Ovarian stroma

**GRAFFIAN
FOLLICLE**

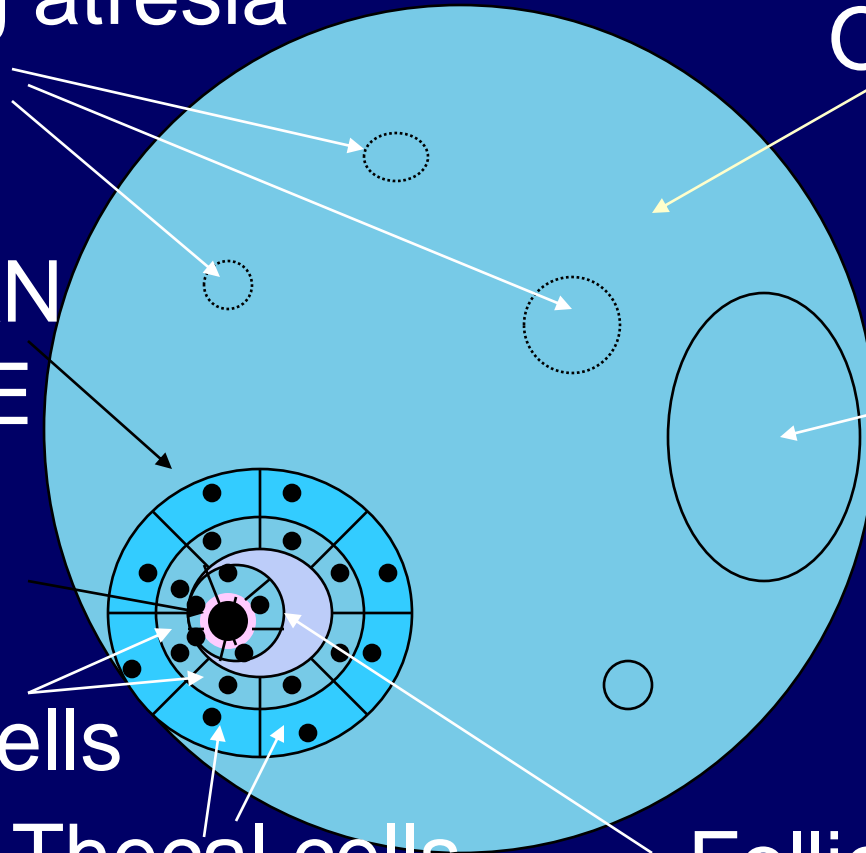
Remnants of
last corpus
luteum

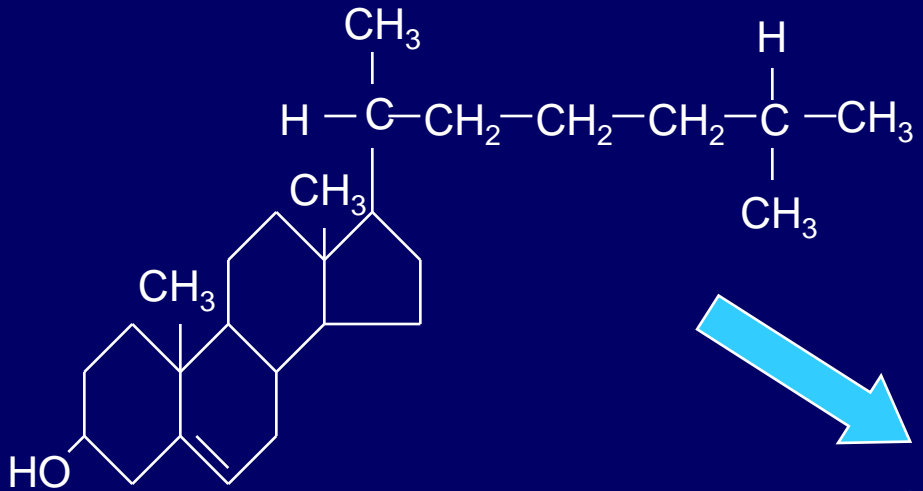
ovum

Granulosa cells

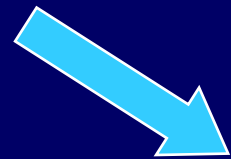
Thecal cells

Follicular fluid

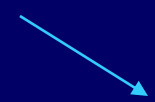




CHOLESTEROL



GONADS



PROGESTOGENS (C21)
ANDROGENS (C19)
OESTROGENS (C18)



ADRENALS



MINERALOCORTICOIDS
GLUCOCORTICOIDS
(ANDROGENS)

ADRENALS AND GONADS

CHOLESTEROL



PREGNENOLONE



PROGESTERONE



17-OH PROGESTERONE



ANDROSTENEDIONE



TESTOSTERONE



DIHYDROTESTOSTERONE

MAINLY GONADS NORMALLY

ADRENALS ONLY

ALDOSTERONE



CORTICOSTERONE



DEOXYCORTICOSTERONE

11-DEOXYCORTISOL



CORTISOL



OESTRONE



17 β - OESTRADIOL

OESTRONE



17 β - OESTRADIOL

THE MENSTRUAL CYCLE

- Usually taken as lasting approximately 28 days (but can last from 20 to 35+ days)
- Historically taken to begin on the first day of menstruation (loss of blood and cellular debris from necrotic uterine epithelium)
- The important reproductive event during the cycle is **OVULATION** (release of the ripe ovum) which occurs around day 14

THE MENSTRUAL CYCLE CONSISTS OF

OVARIAN CYCLE
(ovary)

FOLLICULAR PHASE



(OVULATION)



LUTEAL PHASE

ENDOMETRIAL CYCLE
(uterus)

PROLIFERATIVE PHASE



SECRETORY PHASE

THE MENSTRUAL CYCLE

OVARIAN CYCLE

ENDOMETRIAL CYCLE

FOLLICULAR PHASE

OESTROGEN
(17β -OESTRADIOL)

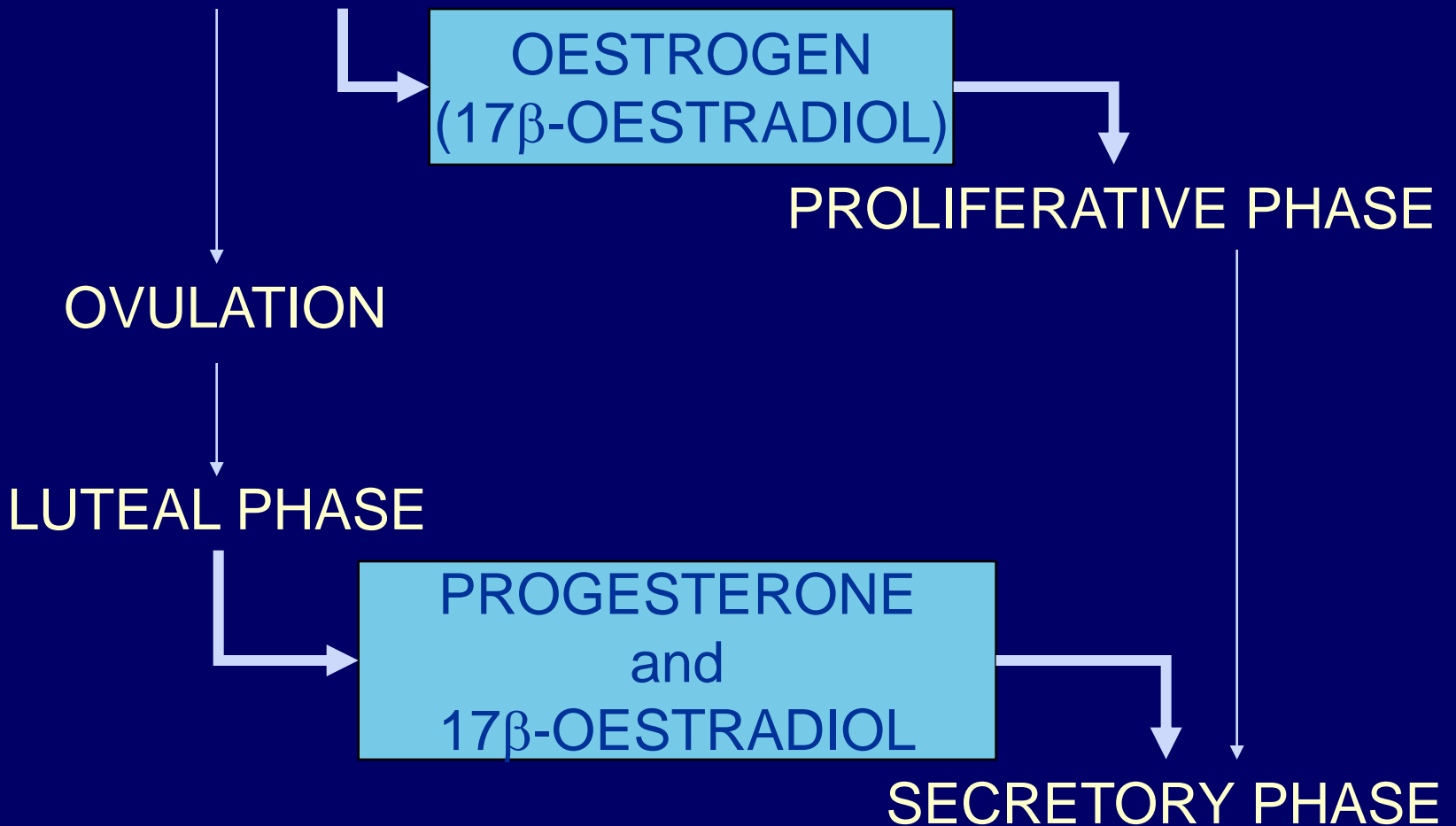
PROLIFERATIVE PHASE

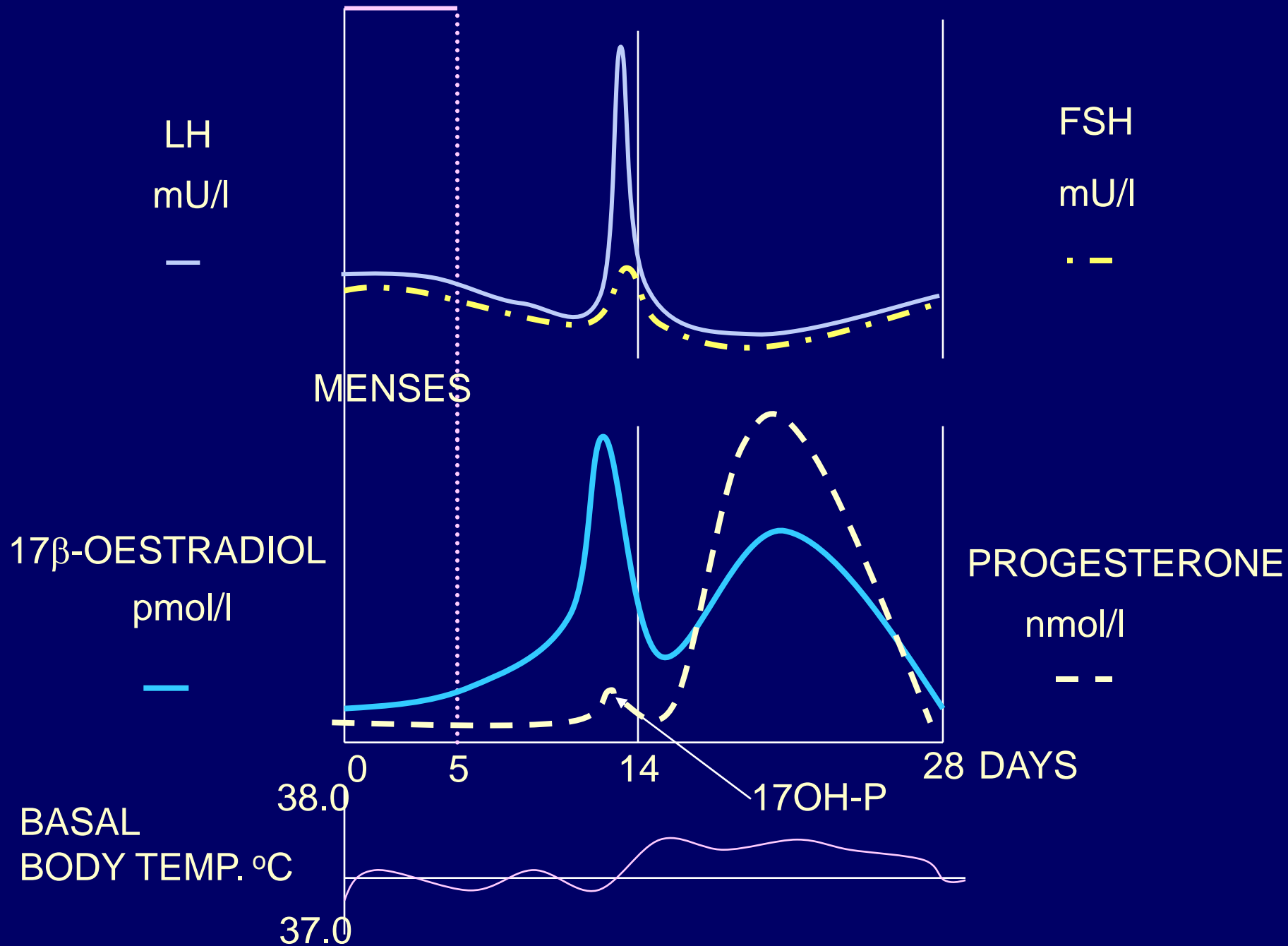
OVULATION

LUTEAL PHASE

PROGESTERONE
and
 17β -OESTRADIOL

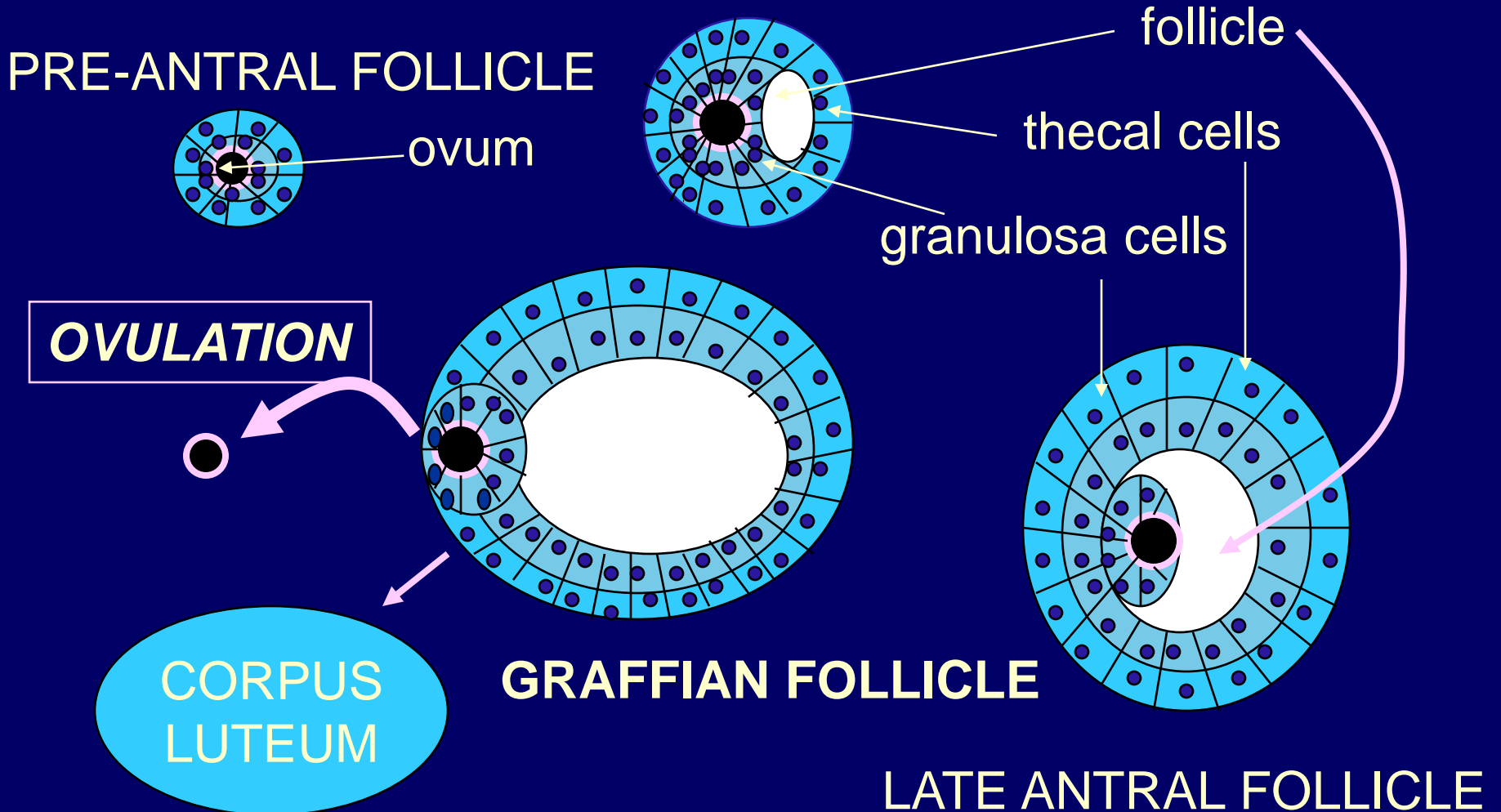
SECRETORY PHASE



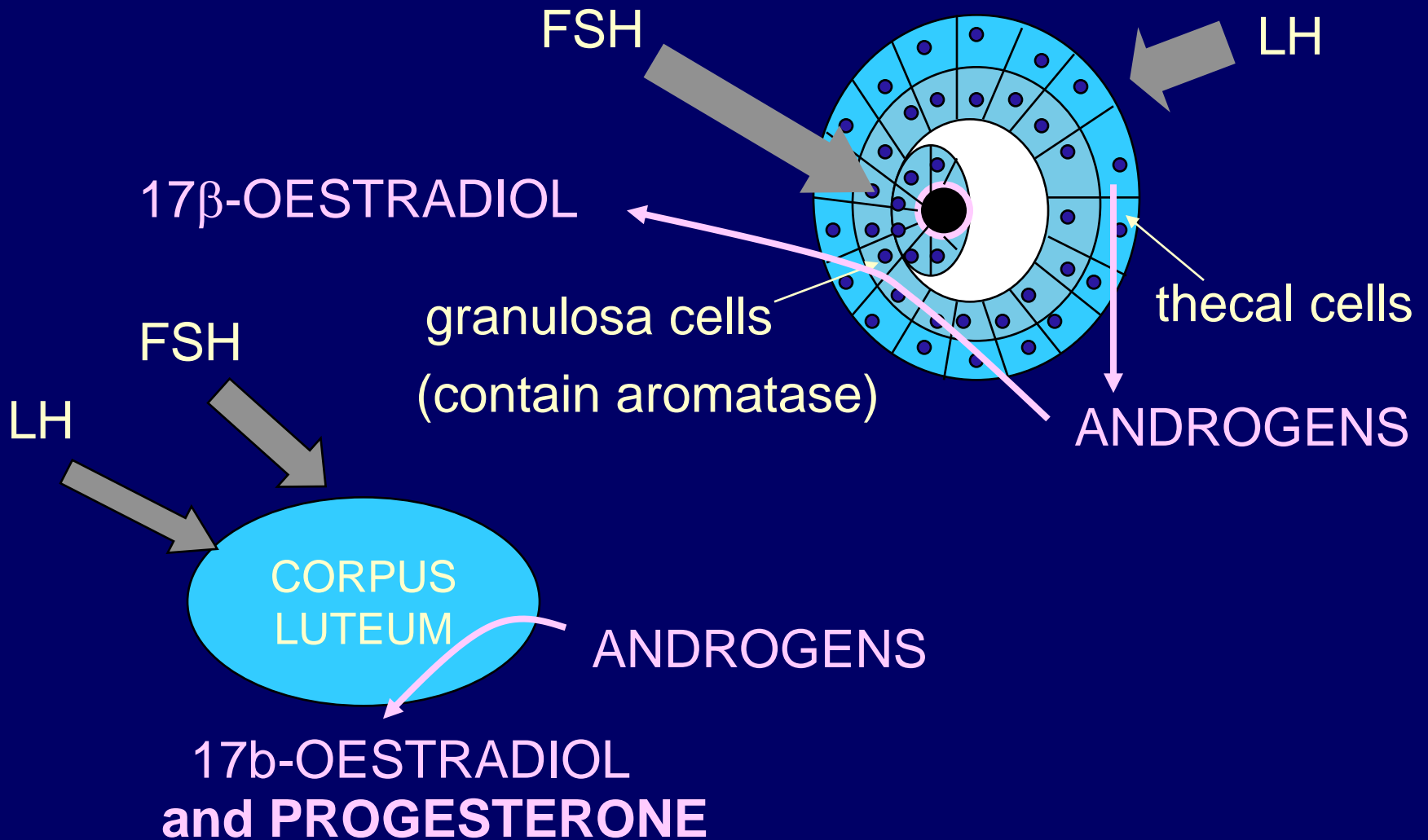


OVARIAN CYCLE

EARLY ANTRAL FOLLICLE



Hormone production during ovarian cycle



ENDOMETRIAL CYCLE

OVULATION

MENSTRUATION

DAY OF CYCLE

6

14

15

28

1

5

PROLIFERATIVE PHASE

SECRETORY PHASE

dominant **OESTROGEN**
influence

Dominant **PROGESTERONE**
influence
plus **OESTROGEN**

Early
phase

Late
phase

Endometrium: thin

thickens
(mitosis)

becomes secretory

Becomes
necrotic

Glands: straight

Enlarge, coil;
Increased
blood supply

Secrete (glycogen,
mucopolysaccharides,
etc.); mucosa engorged
with blood

and is shed

