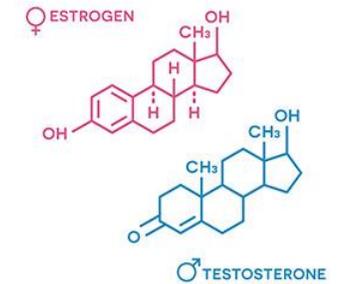


# Hormone: Welchen Einfluss haben Sie auf Gesundheit und Lebensqualität

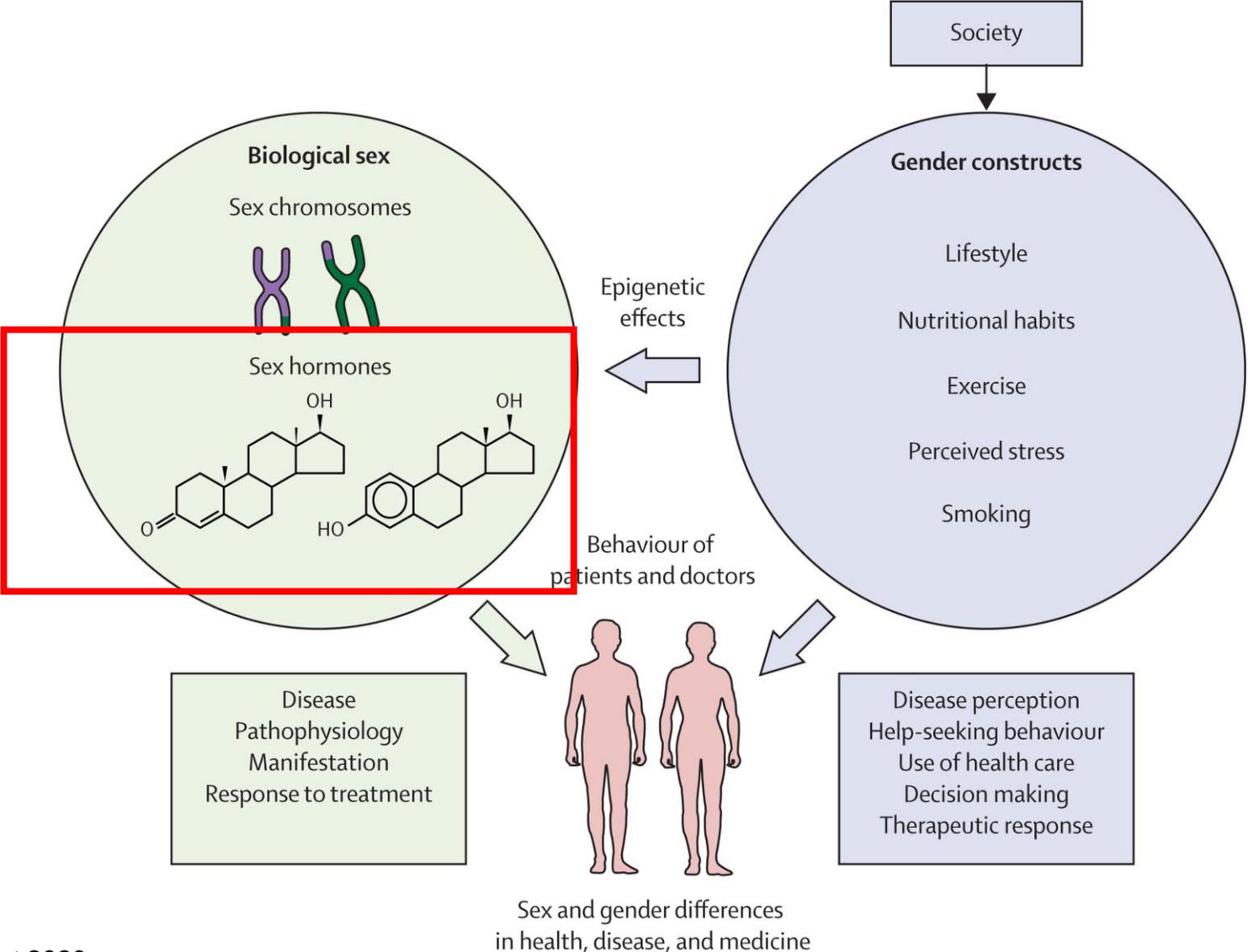


Prof. Dr med. et phil. Lia Bally

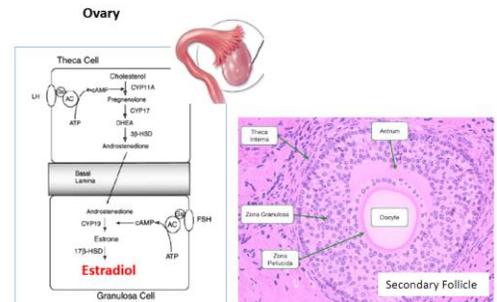
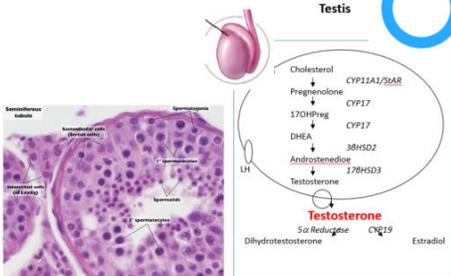
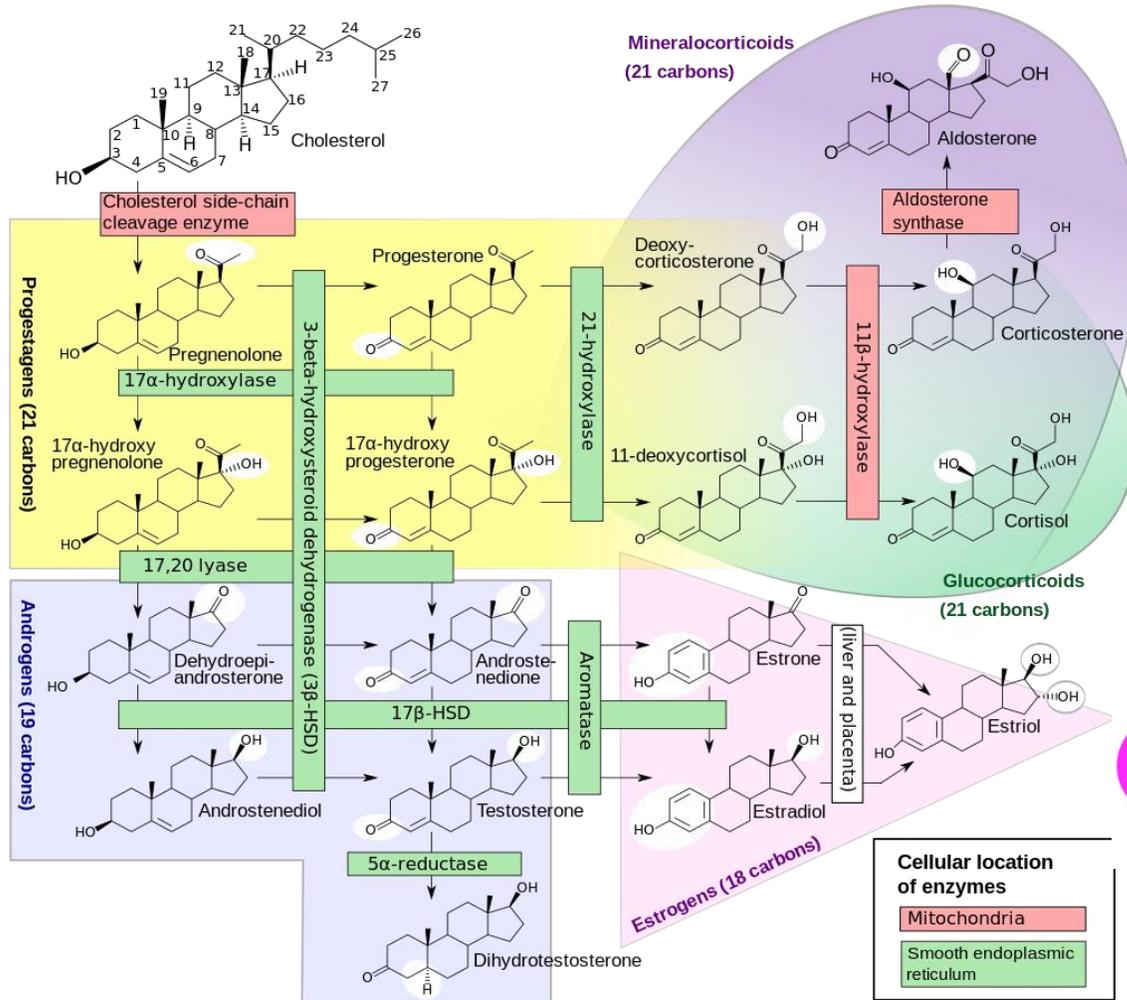
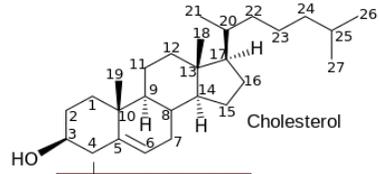
Leitende Ärztin, Leiterin  
Ernährungsmedizin, Metabolismus und  
Adipositas

Inselspital Bern, Universität Bern

# Was unterscheidet Frau von Mann?



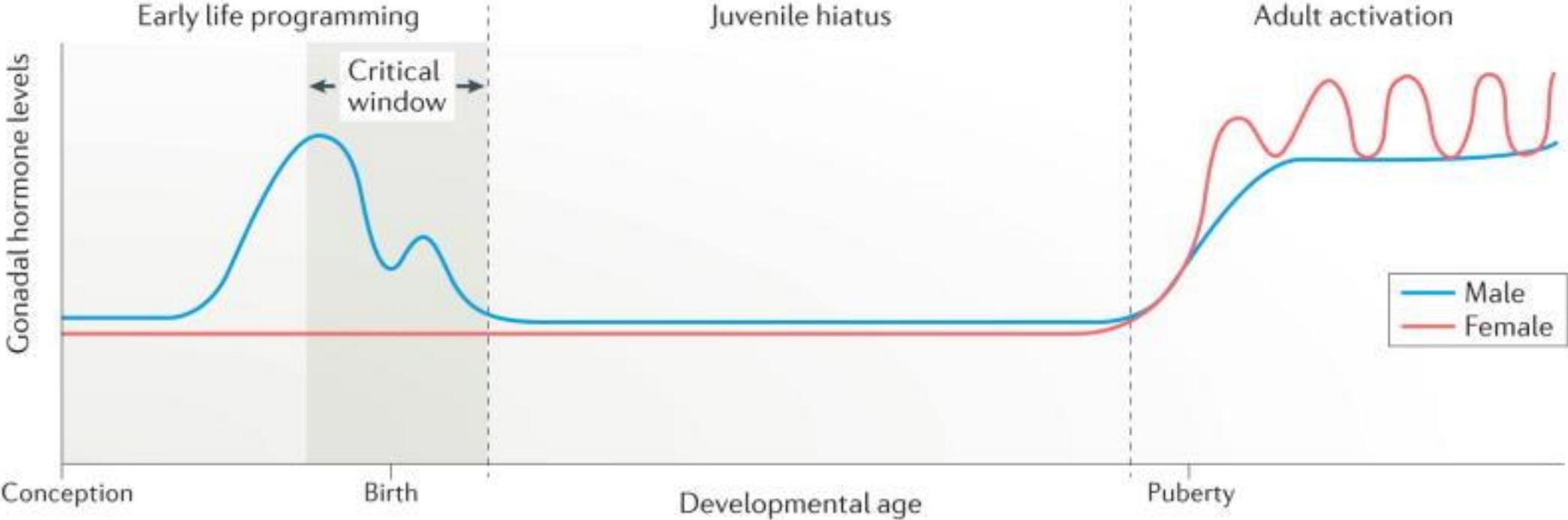
# Geschlechtshormone



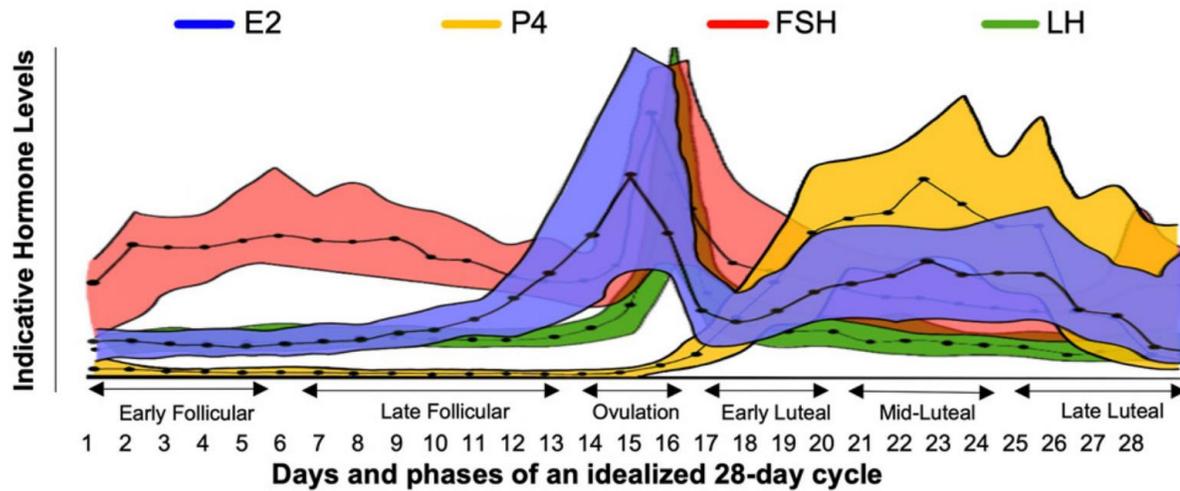


Sex	Sex hormone	Reproductive phase	Blood production rate	Gonadal secretion rate	Metabolic clearance rate	Reference range (serum levels)	
						SI units	Non-SI units
Men	Androstenedione	–	2.8 mg/day	1.6 mg/day	2200 L/day	2.8–7.3 nmol/L	80–210 ng/dL
	Testosterone	–	6.5 mg/day	6.2 mg/day	950 L/day	6.9–34.7 nmol/L	200–1000 ng/dL
	Estrone	–	150 µg/day	110 µg/day	2050 L/day	37–250 pmol/L	10–70 pg/mL
	Estradiol	–	60 µg/day	50 µg/day	1600 L/day	<37–210 pmol/L	10–57 pg/mL
	Estrone sulfate	–	80 µg/day	Insignificant	167 L/day	600–2500 pmol/L	200–900 pg/mL
Women	Androstenedione	–	3.2 mg/day	2.8 mg/day	2000 L/day	3.1–12.2 nmol/L	89–350 ng/dL
	Testosterone	–	190 µg/day	60 µg/day	500 L/day	0.7–2.8 nmol/L	20–81 ng/dL
	Estrone	Follicular phase	110 µg/day	80 µg/day	2200 L/day	110–400 pmol/L	30–110 pg/mL
		Luteal phase	260 µg/day	150 µg/day	2200 L/day	310–660 pmol/L	80–180 pg/mL
		Postmenopause	40 µg/day	Insignificant	1610 L/day	22–230 pmol/L	6–60 pg/mL
	Estradiol	Follicular phase	90 µg/day	80 µg/day	1200 L/day	<37–360 pmol/L	10–98 pg/mL
		Luteal phase	250 µg/day	240 µg/day	1200 L/day	699–1250 pmol/L	190–341 pg/mL
		Postmenopause	6 µg/day	Insignificant	910 L/day	<37–140 pmol/L	10–38 pg/mL
	Estrone sulfate	Follicular phase	100 µg/day	Insignificant	146 L/day	700–3600 pmol/L	250–1300 pg/mL
		Luteal phase	180 µg/day	Insignificant	146 L/day	1100–7300 pmol/L	400–2600 pg/mL
Progesterone	Follicular phase	2 mg/day	1.7 mg/day	2100 L/day	0.3–3 nmol/L	0.1–0.9 ng/mL	
	Luteal phase	25 mg/day	24 mg/day	2100 L/day	19–45 nmol/L	6–14 ng/mL	

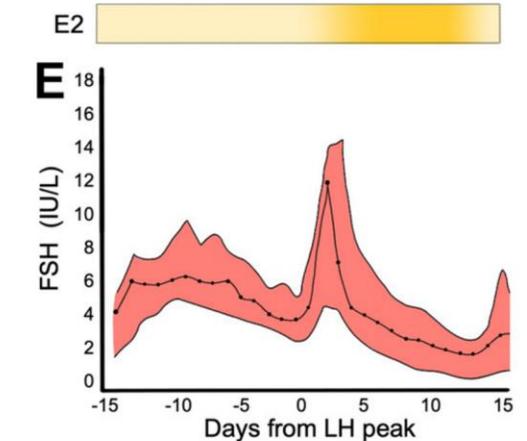
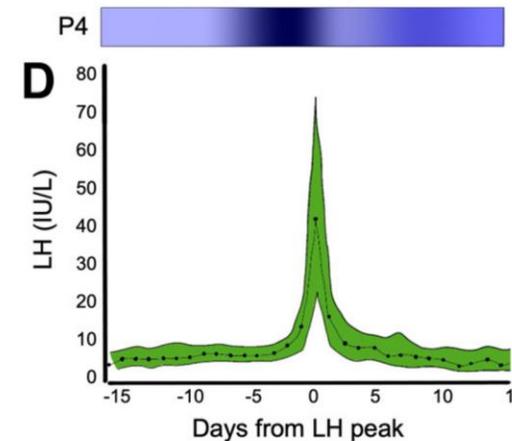
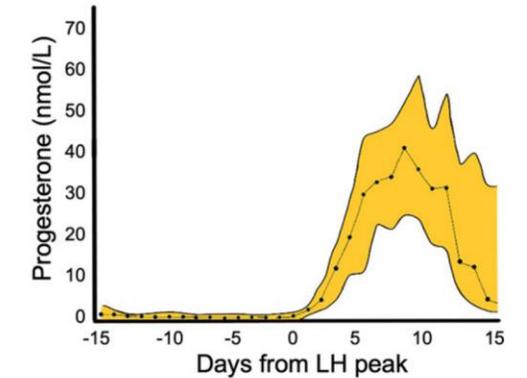
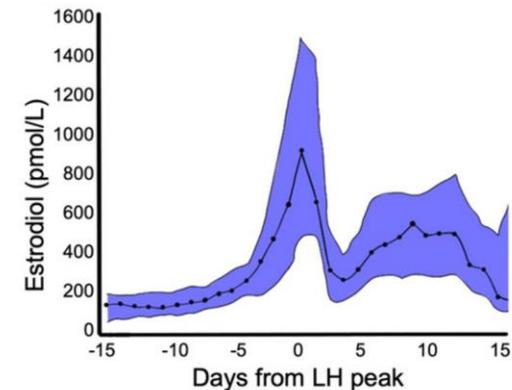
# Geschlechtshormon-Exposition in der Entwicklung



# Menstruationszyklus-bedingte Schwankungen

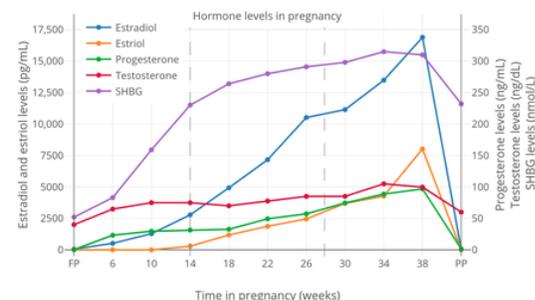
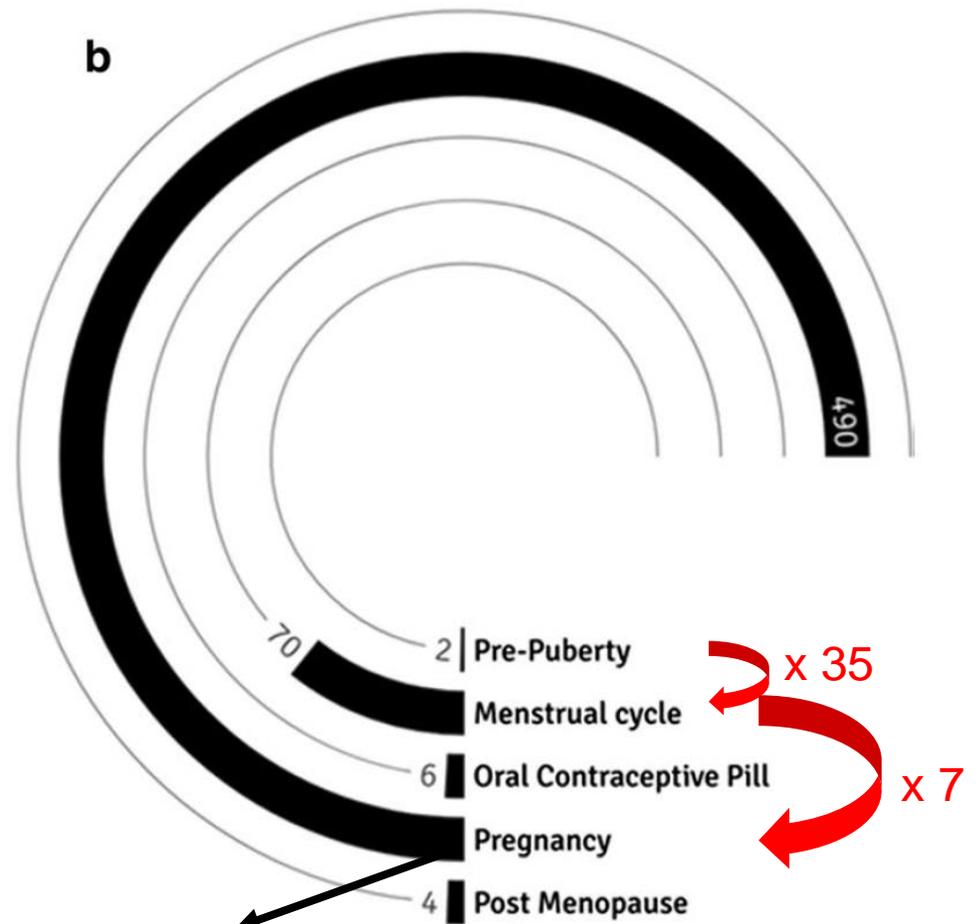
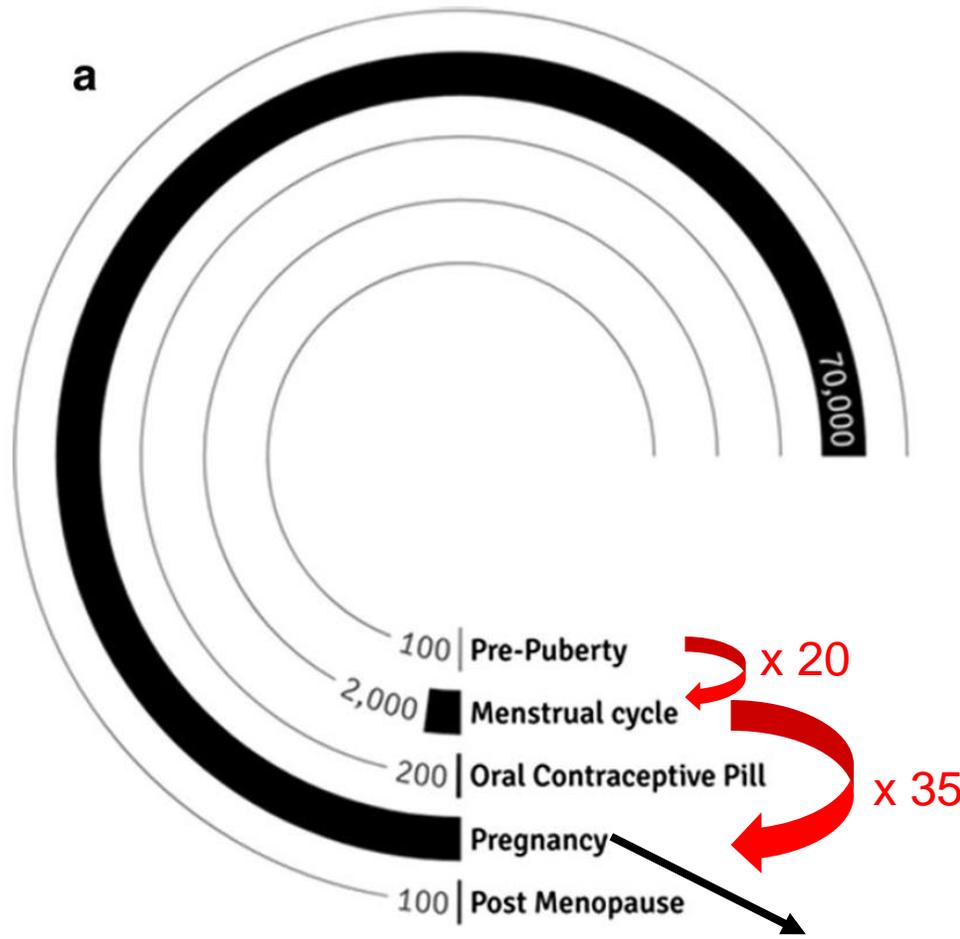


E2: 5-fache Konz.änderung  
P4: 50-fache Konz.änderung

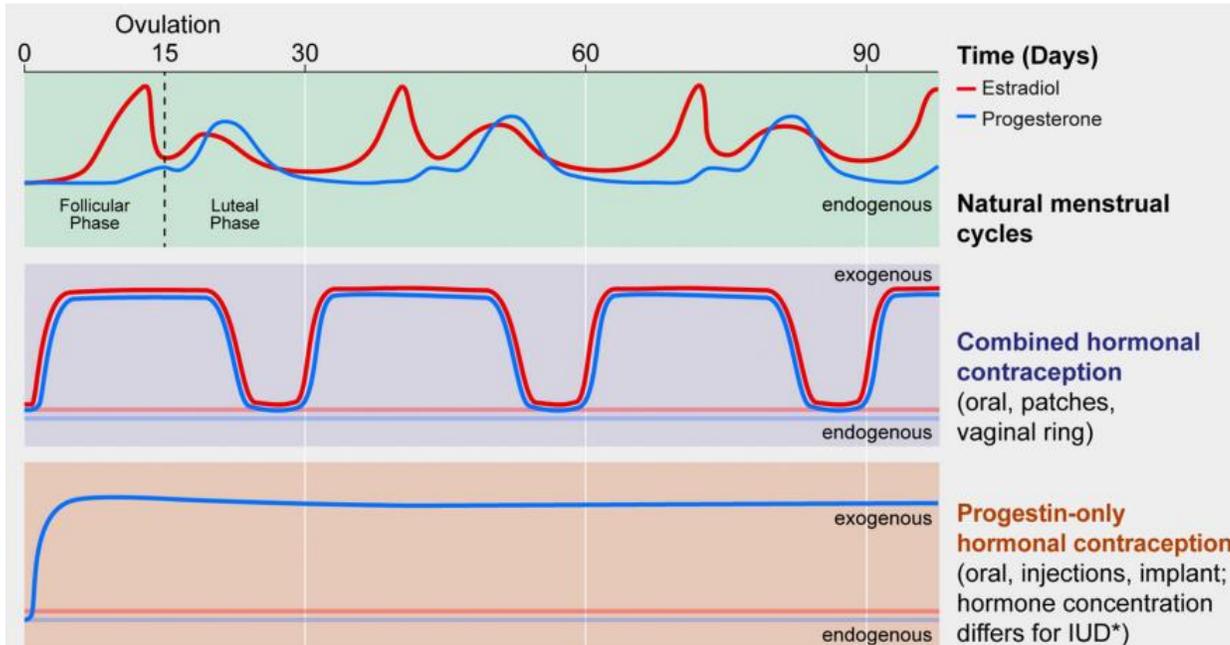


# Östrogene

# Gestagene

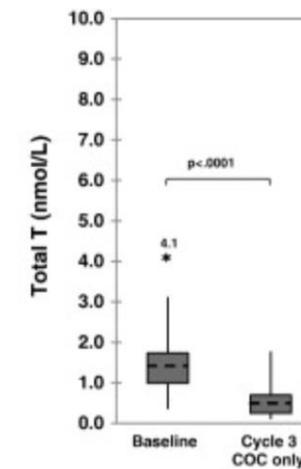
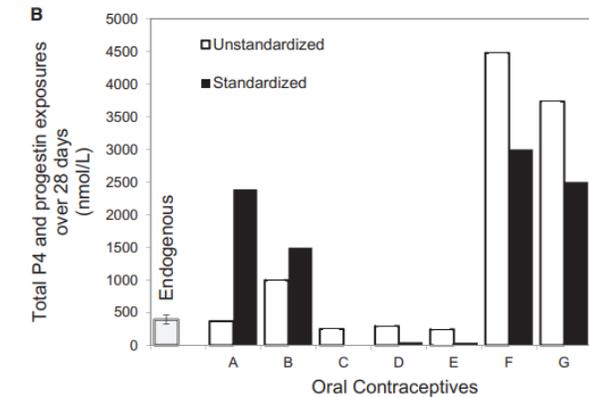
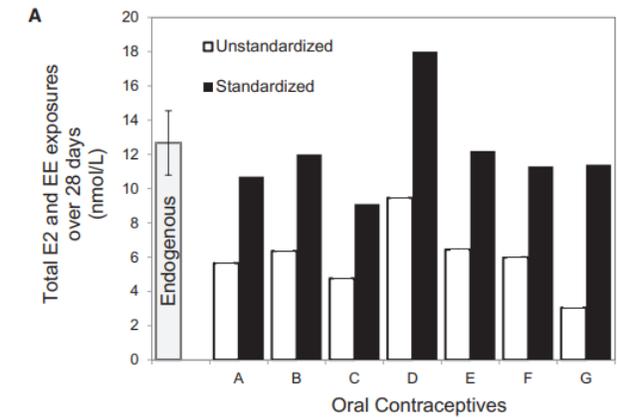


# Hormonelle Kontrazeption

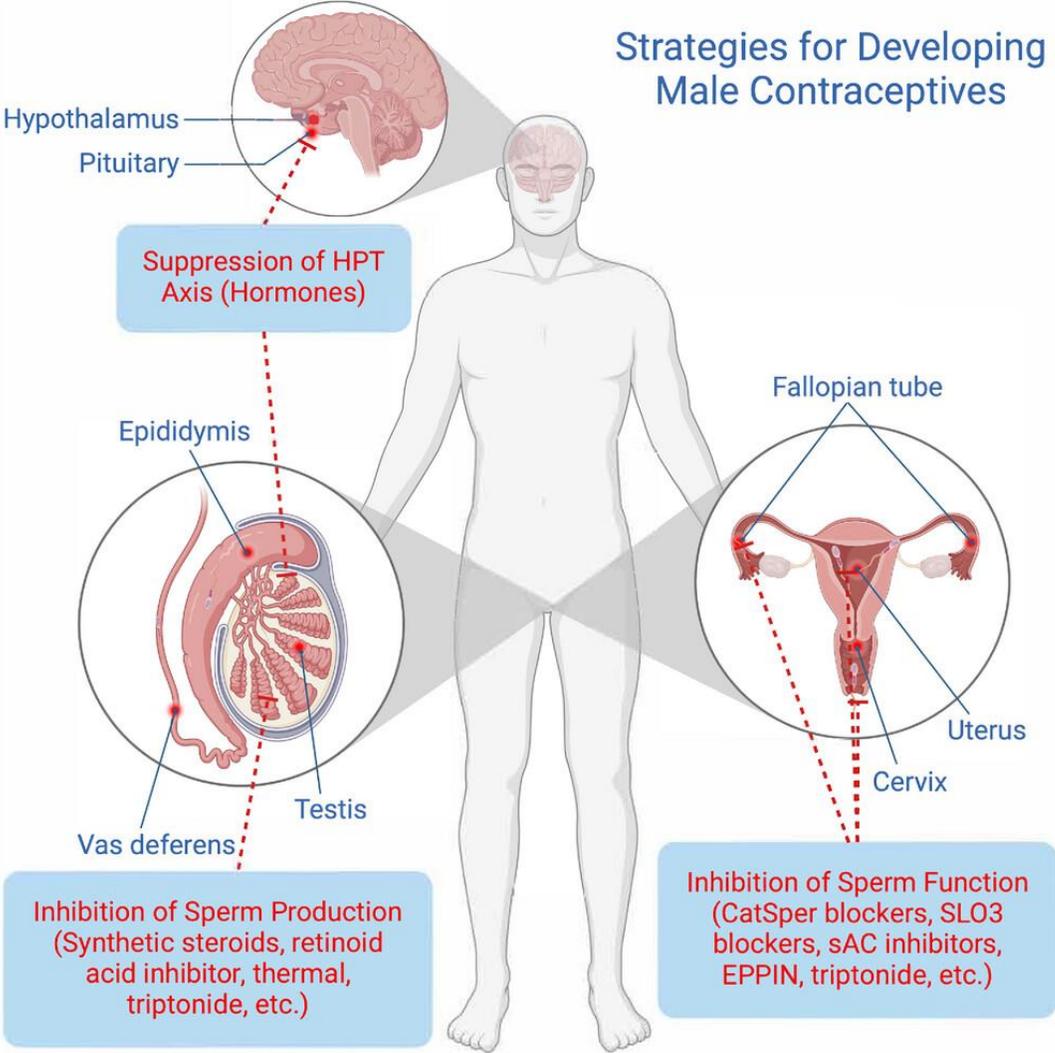


- Unterschiedliche Kinetik
- Unterschiedliche Gesamtexposition
- Tiefere Androgenexposition

Lewis CA et al, Curr Psych Reports 2019; Lovett JL et al, Evolution, Medicine, and Publ Health 2017; Zimmermann Y et al, Contraception 20015

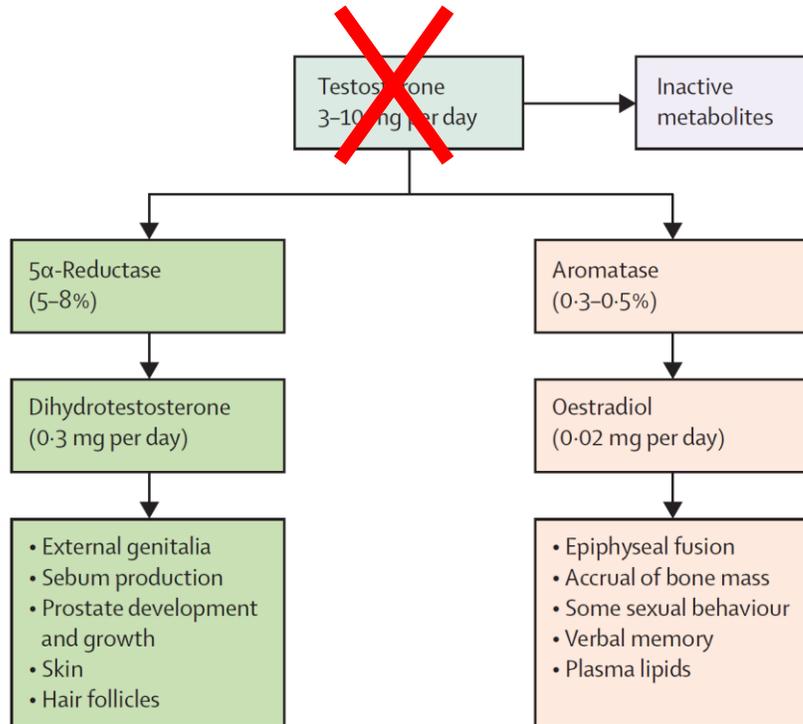


# Strategien für die Kontrazeption beim Mann



# Biologische Funktion?

## Männlicher Hypogonadismus



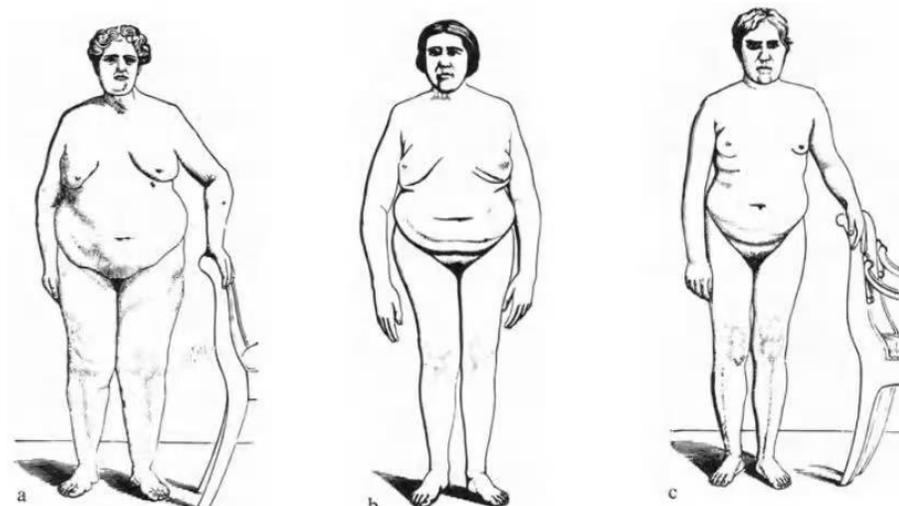
### Panel 1: Clinical manifestations of male hypogonadism

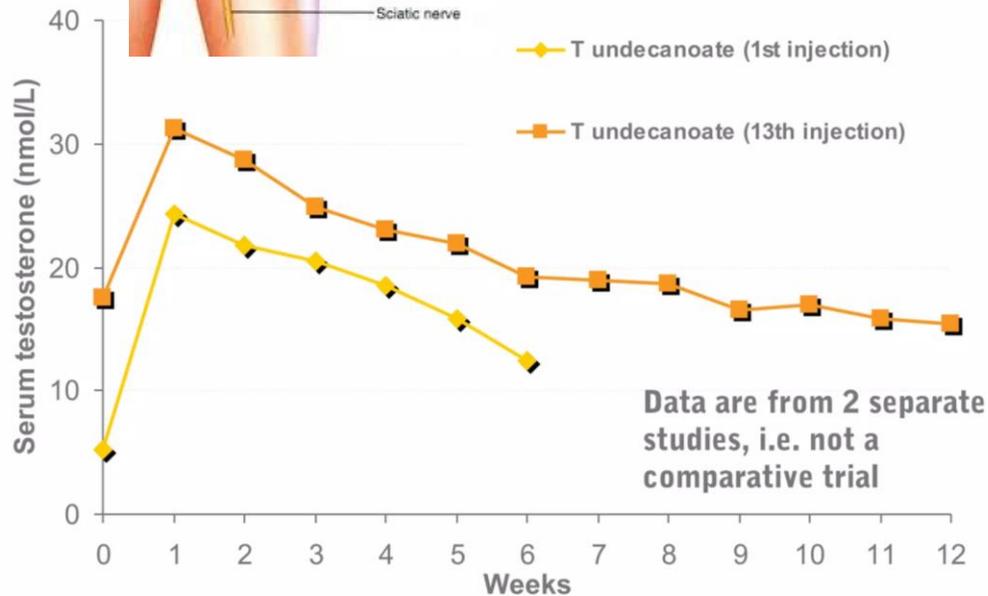
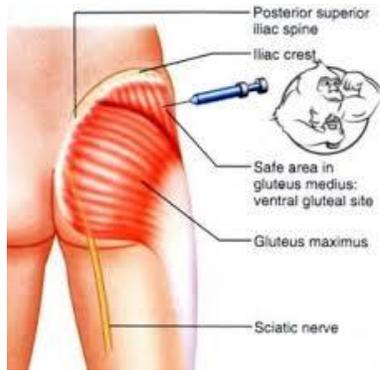
#### Prepubertal onset

- Testes volume <5 cm<sup>3</sup>
- Micropenis
- Cryptorchidism
- Anosmia (Kallmann's syndrome)
- Hypopigmented scrotum
- Lack of scrotal rugae
- Gynaecomastia
- Eunuchoidal proportions
- Decreased body hair
- High-pitched voice
- Low hair line
- Decreased libido
- Decreased bone mass
- Decreased muscle mass
- Visual-field defects (pituitary lesion)
- Small prostate

#### Postpubertal onset\*

- Decreased libido
- Decreased spontaneous erections
- Decrease in testicular volume
- Gynaecomastia
- Hot flashes
- Decreased bone mass
- Height loss or minimum-trauma fracture
- Decreased pubic and axillary hair
- Decreased frequency of shaving
- Galactorrhoea (prolactinoma; rare)
- Visual-field defects (pituitary lesion)
- Decreased muscle mass
- Decreased energy and motivation





1. Von Eckardstein S et al. *J Androl* 2002; 23(3):419-425.  
 2. Behre HM et al. *Eur J Endocrinol* 1999;140:414-419.

Monitoring plan	
General health	Assess for efficacy and adverse effects at 3 and 6 months after the start of treatment and annually thereafter if stable; check for formulation-specific adverse effects
Testosterone concentration	Adjust dose to maintain testosterone concentrations in serum in the mid-normal range (according to local laboratory reference)
Digital rectal examination	No data available about benefits in healthy men younger than 40 years Perform at baseline in men aged 40–49 years who are African American, have first-degree relatives of men with prostate cancer, or who have baseline PSA concentrations >0.6 µg/L Perform at baseline in all men older than 50 years Repeat 3–6 months after the start of therapy and annually thereafter; discontinue therapy if nodules or induration are detected
PSA concentration	Check at baseline in all men older than 40 years Check at 3–6 months after the start of therapy and annually thereafter; discontinue therapy and assess further if PSA concentration increases by >1.4 µg/L in a 1-year period or PSA velocity is >0.4 µg/L per year (applicable if >2 years of data are available, with the 6-month value taken as reference)
Lower-urinary-tract symptoms	Discontinue therapy and assess if the patient complains of severe symptoms or if the international prostate symptom score is >19
Haematocrit	Check at baseline to exclude sleep apnoea, hypoxaemia, and haematological disorders Check at 3–6 months after the start of therapy and annually thereafter; discontinue therapy if haematocrit >54%; if the value reverts to normal, treatment can be restarted at a lower dose
Sleep apnoea	Assess symptoms of sleep apnoea (snoring, daytime somnolence, etc)
Bone density	Measure baseline bone-mineral density if indicated (minimum-trauma fracture, osteoporosis, height loss, etc) and repeat every 1–2 years

# Androgen-Exzess

## Adverse effects and complications of androgenic steroids



### Cardiovascular

- Coronary heart disease
- Cardiomyopathy
- Erythrocytosis
- Hemostasis/coagulation abnormalities
- Dyslipidemia
- Hypertension

### Infection

- HIV, hepatitis B and C, MRSA
  - Unsafe needle practices
  - Contaminated products

### Musculoskeletal

- Tendon rupture

### Neuropsychiatric

- Major mood disorders
- Aggression, violence
- Dependence

### Males (reproductive)

- Hypogonadism (following withdrawal)
- Gynecomastia
- Acne
- Premature epiphyseal closure (when taken before completion of puberty)
- Prostate (potential increased risk for cancer)

### Females (reproductive)

- Acne
- Virilization (hirsutism, deepening of voice, clitoromegaly)
- Irregular menses

### Hepatic (only with oral 17-alpha-alkylated androgens)

- Cholestasis
- Peliosis hepatis
- Hepatic neoplasms



# Menopause: steiler Östradiol-Abfall

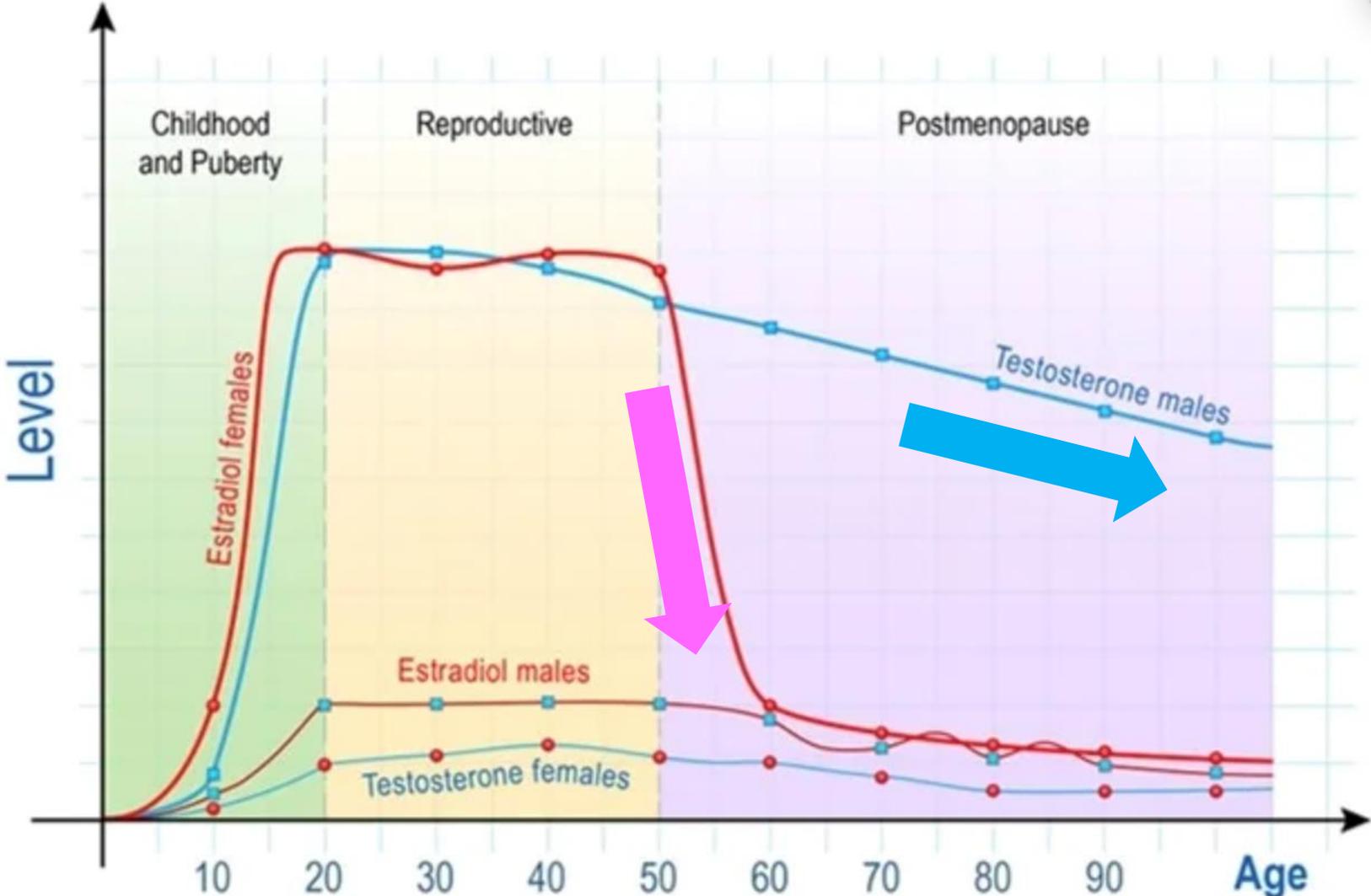
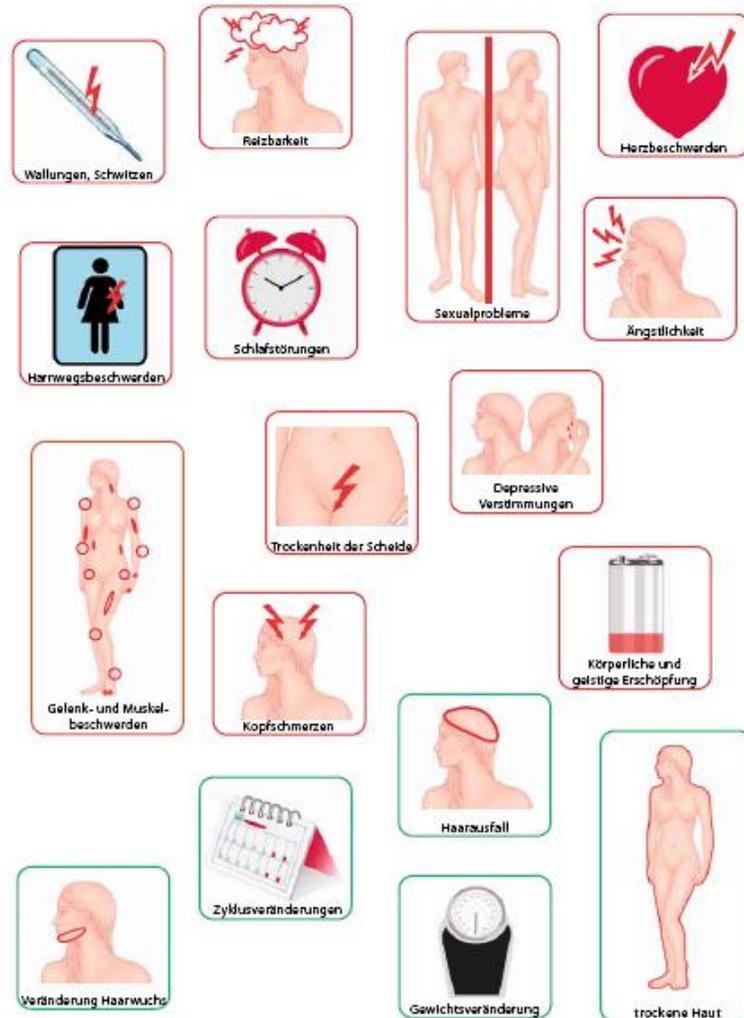
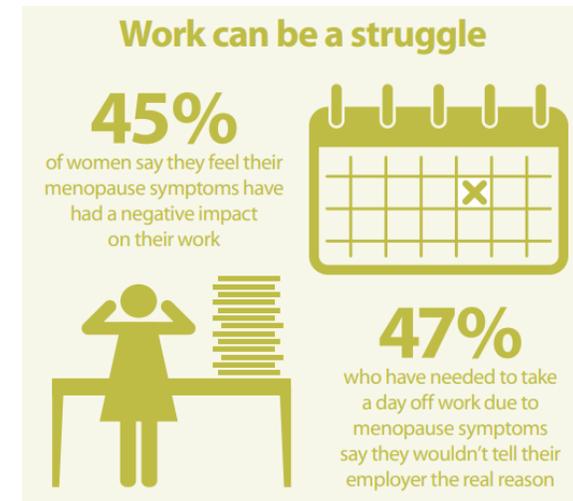


Chart of Sex hormone production in humans. Image Credit: Designua / Shutterstock

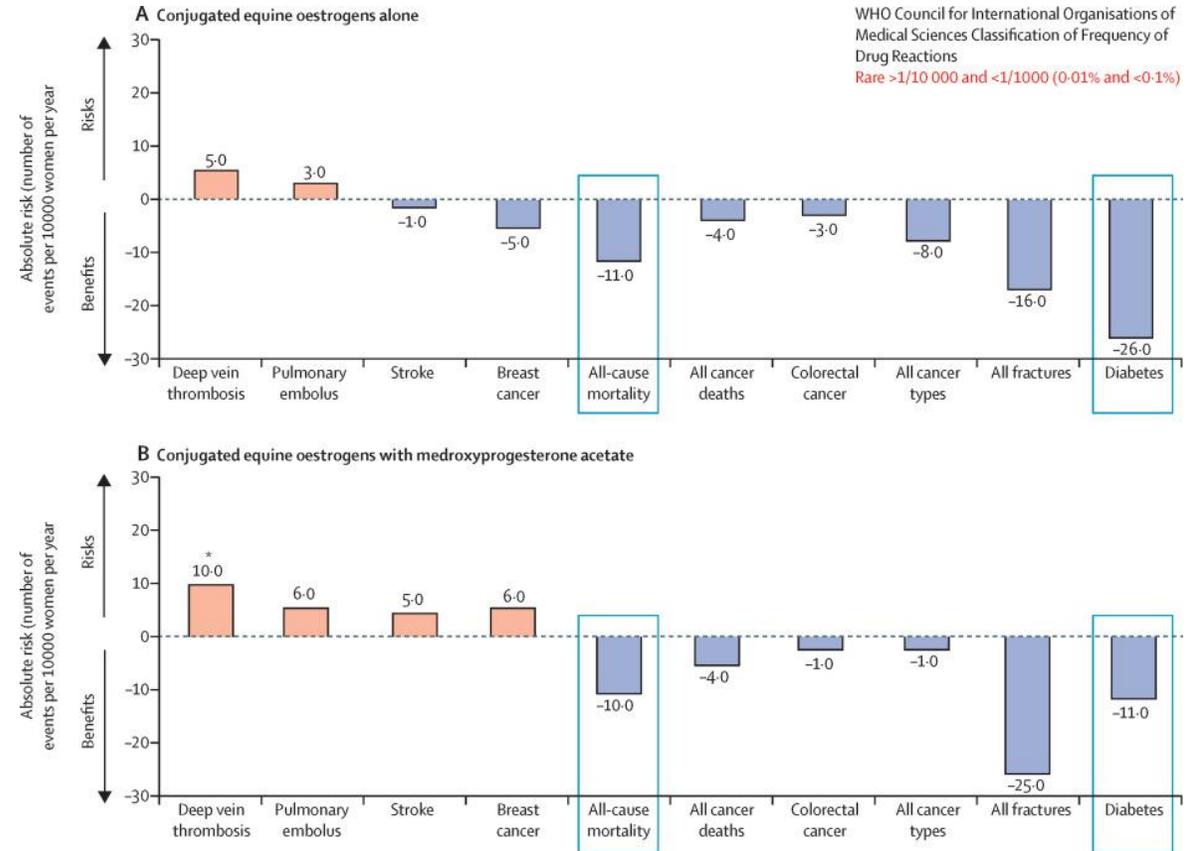
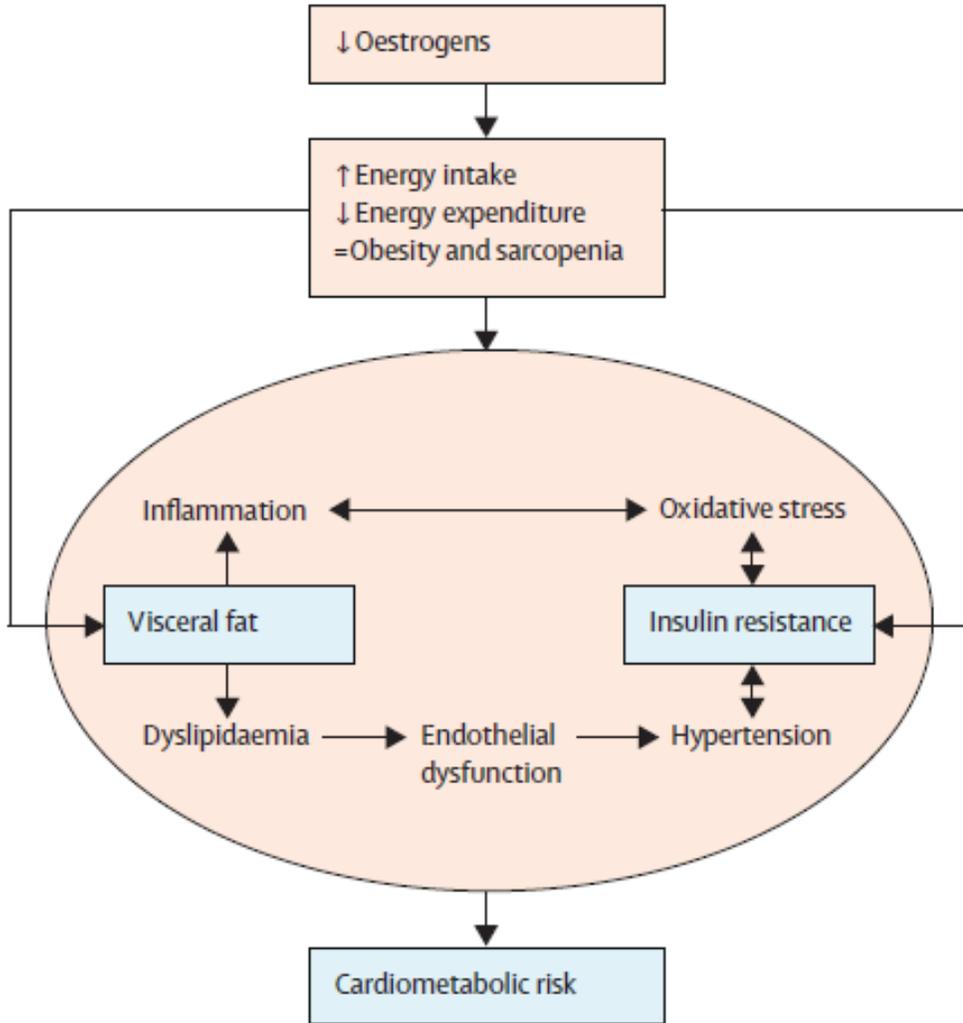
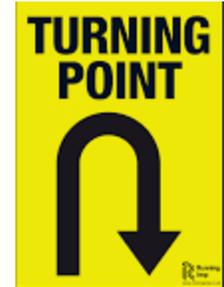
# Klimakterisches Syndrom



- Vasomotorische Symptome
- Schlafstörungen
- Stimmungsschwankungen
- Leistungsminderung
- Vaginale Atrophie
- Harnwegbeschwerden
- Sexuelle Beschwerden

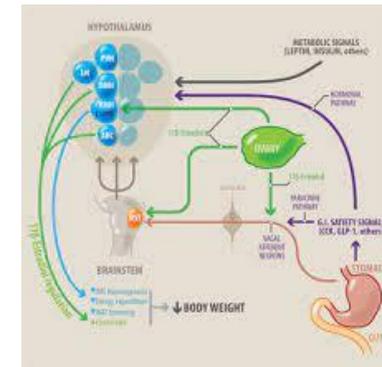
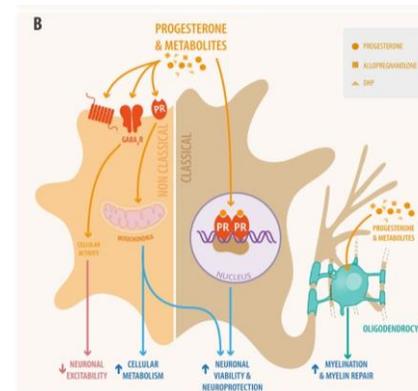
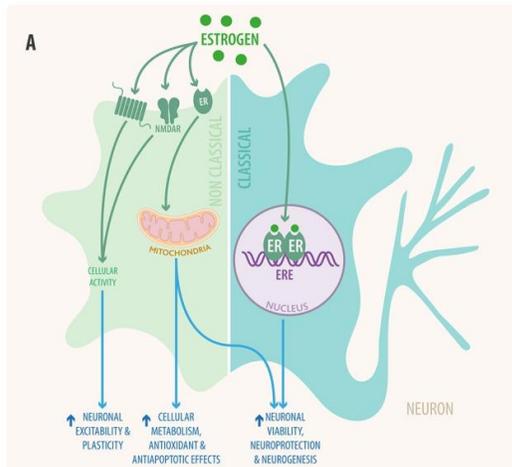
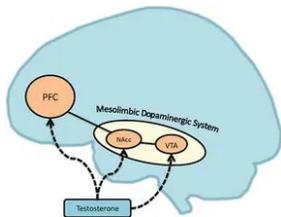
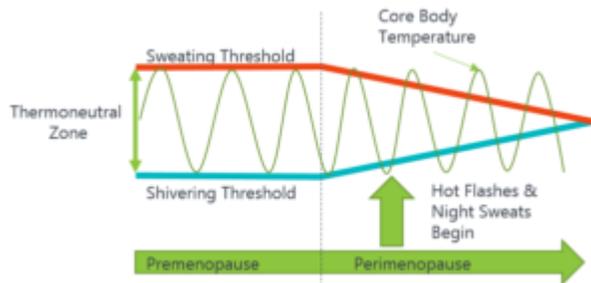
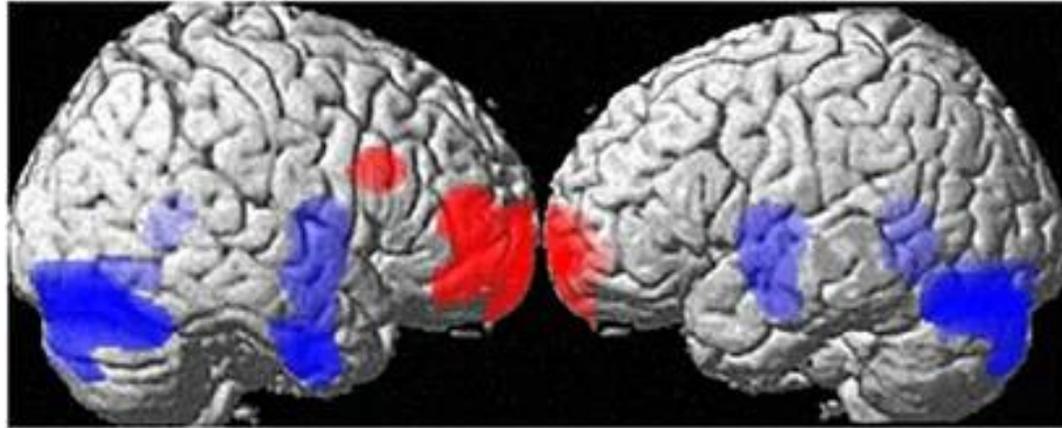


# Menopause – ein metabolischer “Wendepunkt”



Absolute risks of conjugated equine oestrogens (A) alone or (B) in combination with medroxyprogesterone acetate from the Women's Health Initiative clinical trials in women under 60 years

# Geschlechtshormone und das Gehirn



## Male

### In utero

- Testosterone and its aromatization to estrogen cause masculinization of the fetal brain

### Adolescence

- More between-network connectivity
- Larger grey matter volume
- Lower grey matter density

### Adulthood

- More total brain volume
- More grey matter volume
- More white matter volume
- More cerebrospinal fluid volume
- Higher proportion of white matter
- Larger volume of the central subdivision of the bed nucleus stria terminalis
- Better visuospatial and mathematical ability
- Weaker right-hand preference

## Female

### In utero

- Absence of androgen production and estrogen-binding activity of alpha-fetoprotein cause feminization of the fetal brain

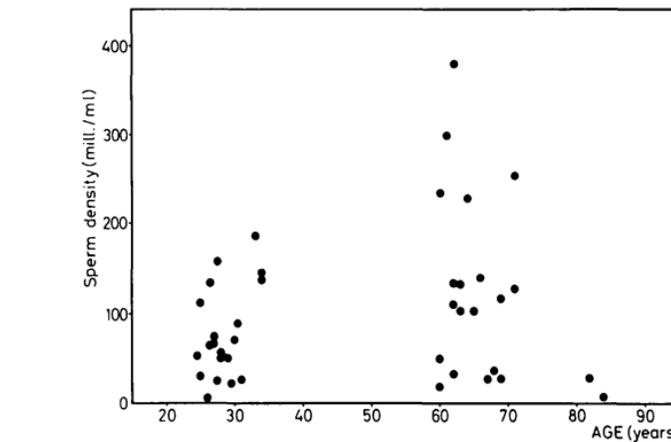
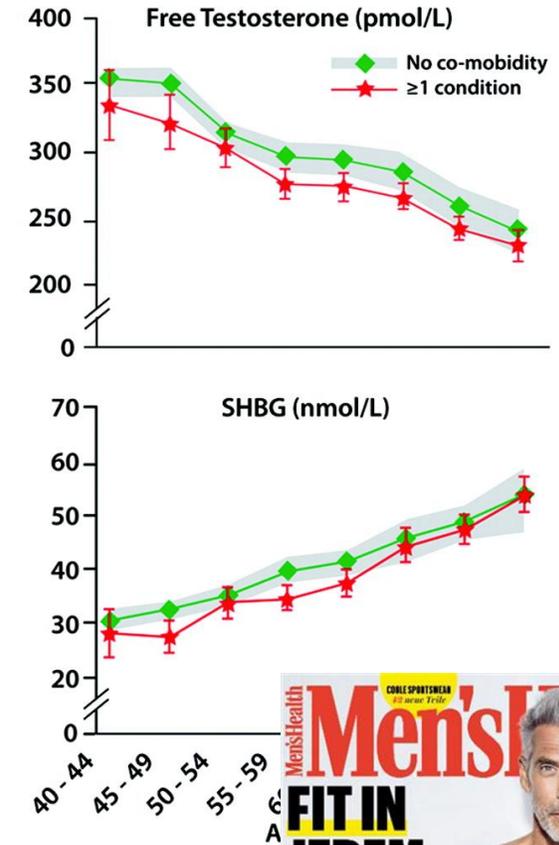
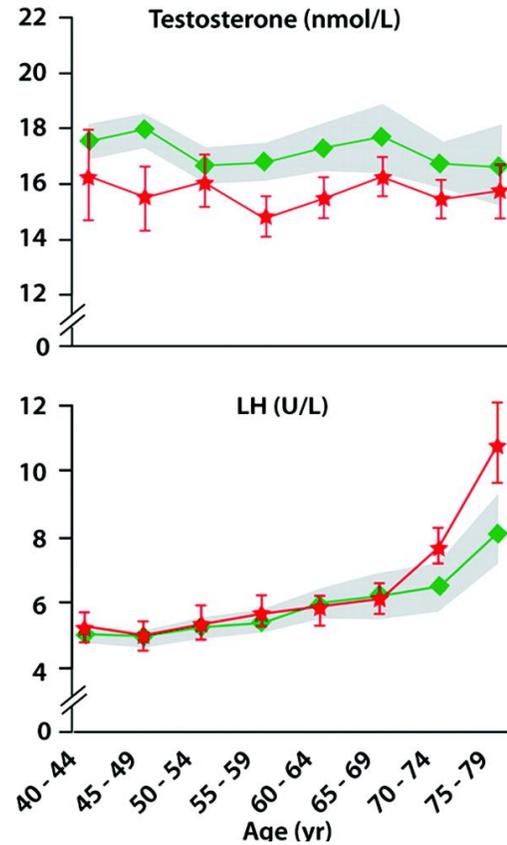
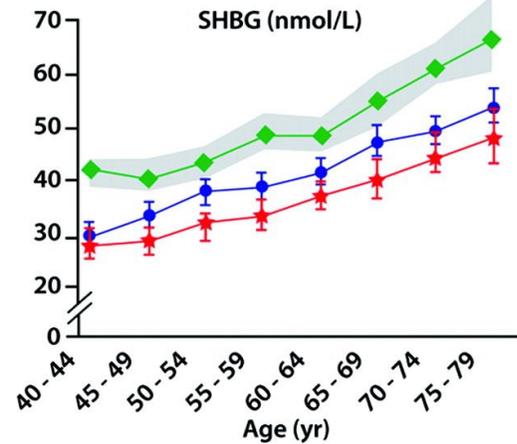
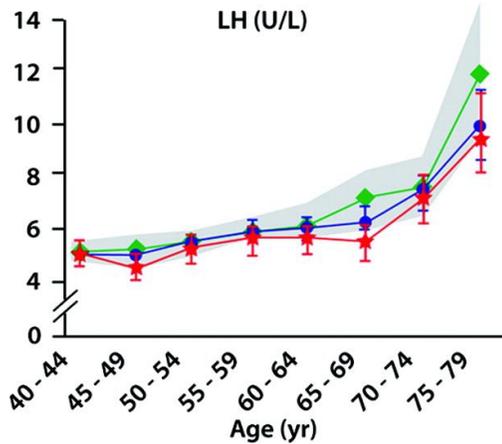
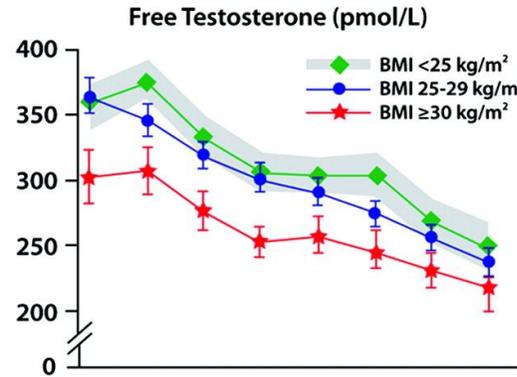
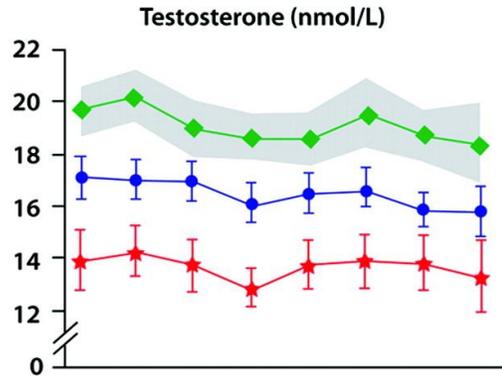
### Adolescence

- More within-network connectivity
- Less grey matter volume
- Higher grey matter density

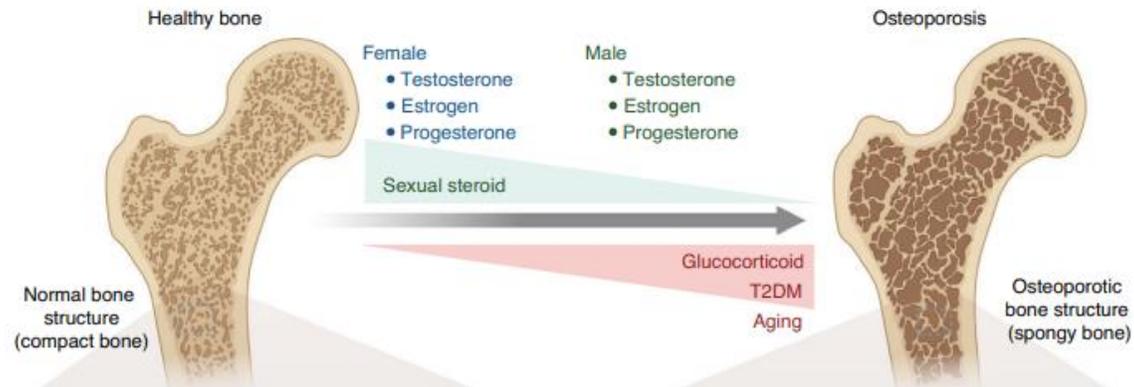
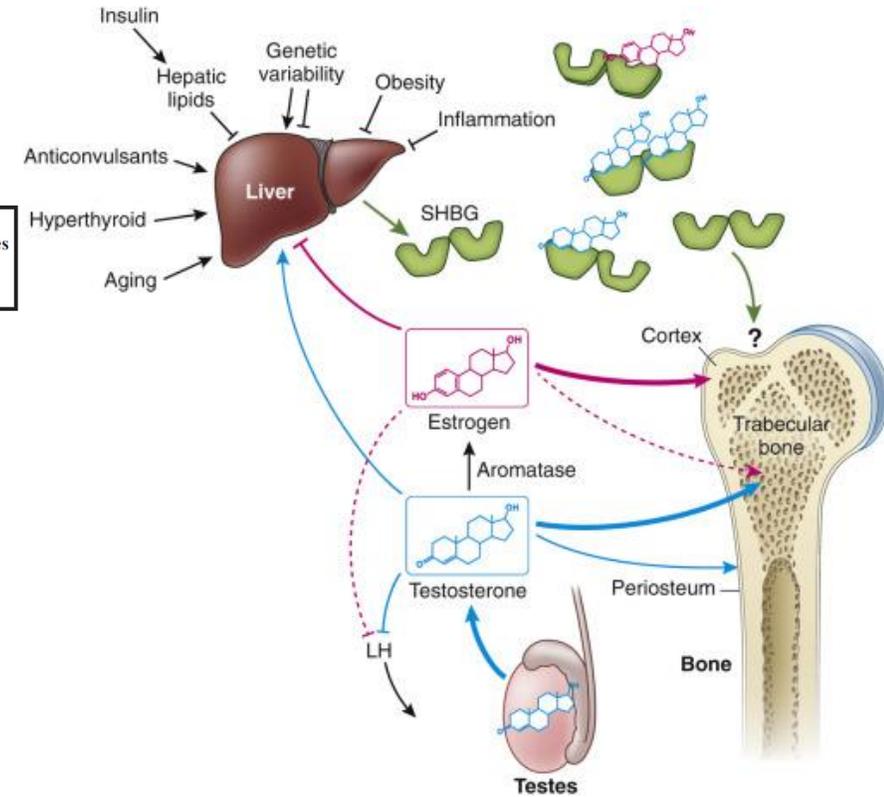
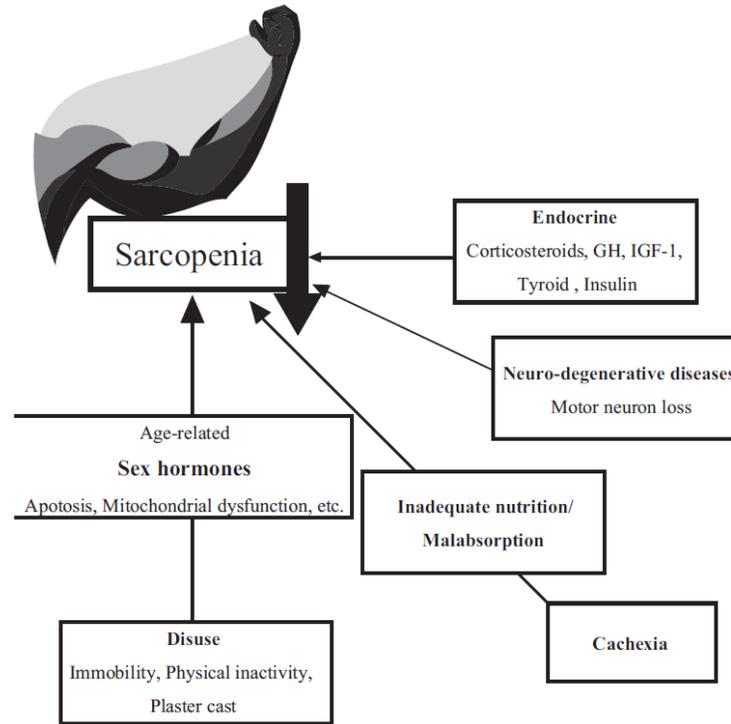
### Adulthood

- Less total brain volume
- Less grey matter volume
- Less white matter volume
- Less cerebrospinal fluid volume
- Higher proportion of grey matter
- Thicker cortex
- Higher global cerebral blood flow
- Better perceptual speed and fine manual dexterity
- Stronger right-hand preference

# Andropause ?

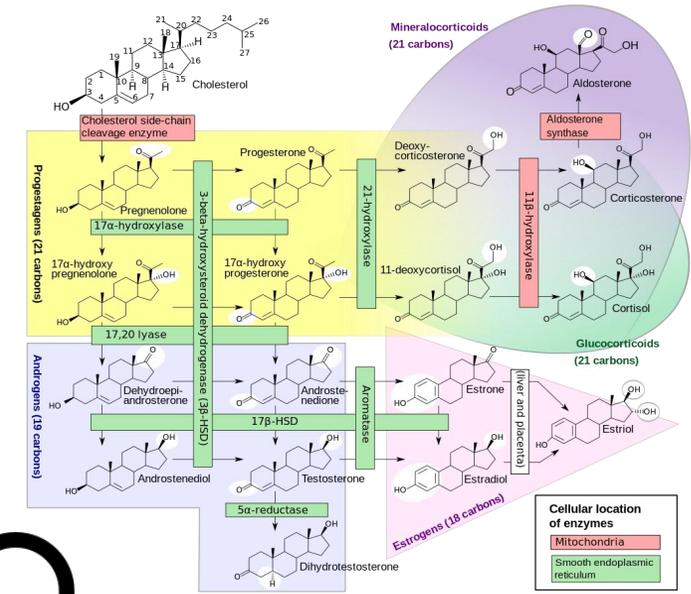


# Knochen und Muskel



# Geschlechtshormone in der medizinischen Behandlung

- Hormonelle Kontrazeption
- Hormonersatztherapie (organischer Hypogonadismus)
- Menopausale Hormontherapie (MHT)
- Pubertätsinduktion
- Antihormonelle Therapie bei Brustkrebs
- Antihormonelle Therapie bei Prostatakrebs
- Osteoporosebehandlung
- Libido-unterdrückende Behandlung
- Appetitstimulation
- Kinderwunschbehandlung
- Geschlechtsangleichende Hormontherapie



# Geschlechtshormone...

- prägen viele Geschlechtsunterschiede
- Beteiligt an Geschlechtsdifferenzierung, Reproduktion, viele weitere zentrale Körperfunktionen
- NICHT Geschlechts-spezifisch
- Frauen: durchleben starke Hormonschwankungen
- Menopause: wichtiger biopsychosozialer Wendepunkt
- Andropause?
- Besseres Verständnis als wichtige Voraussetzung für Geschlechts- und Gender-spezifische Medizin

