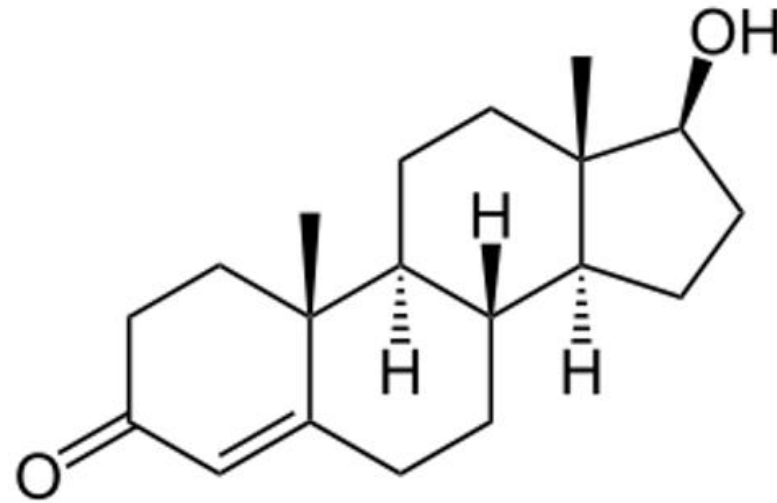
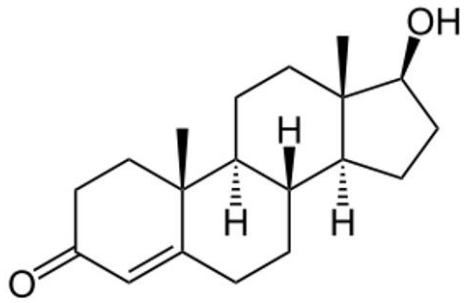
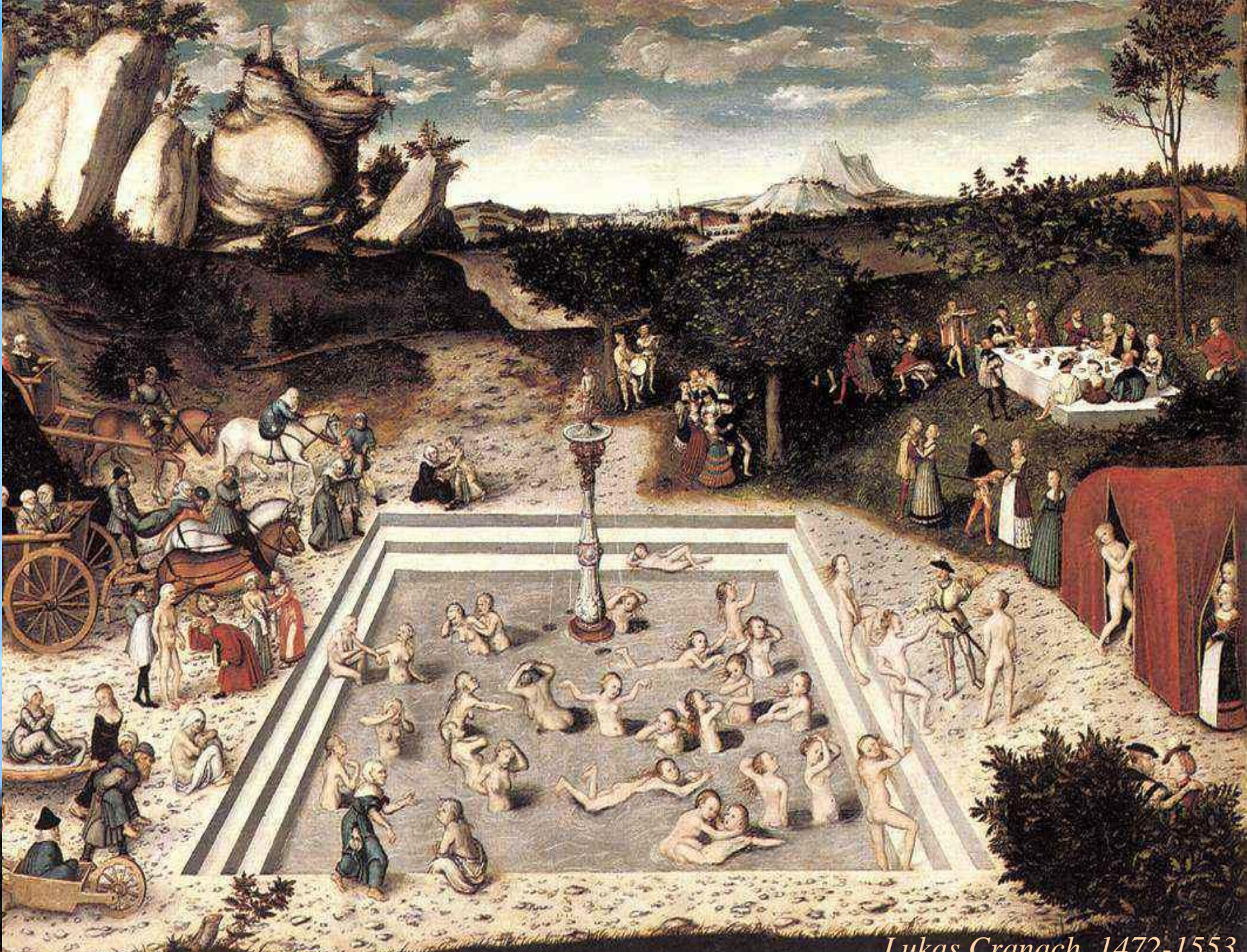
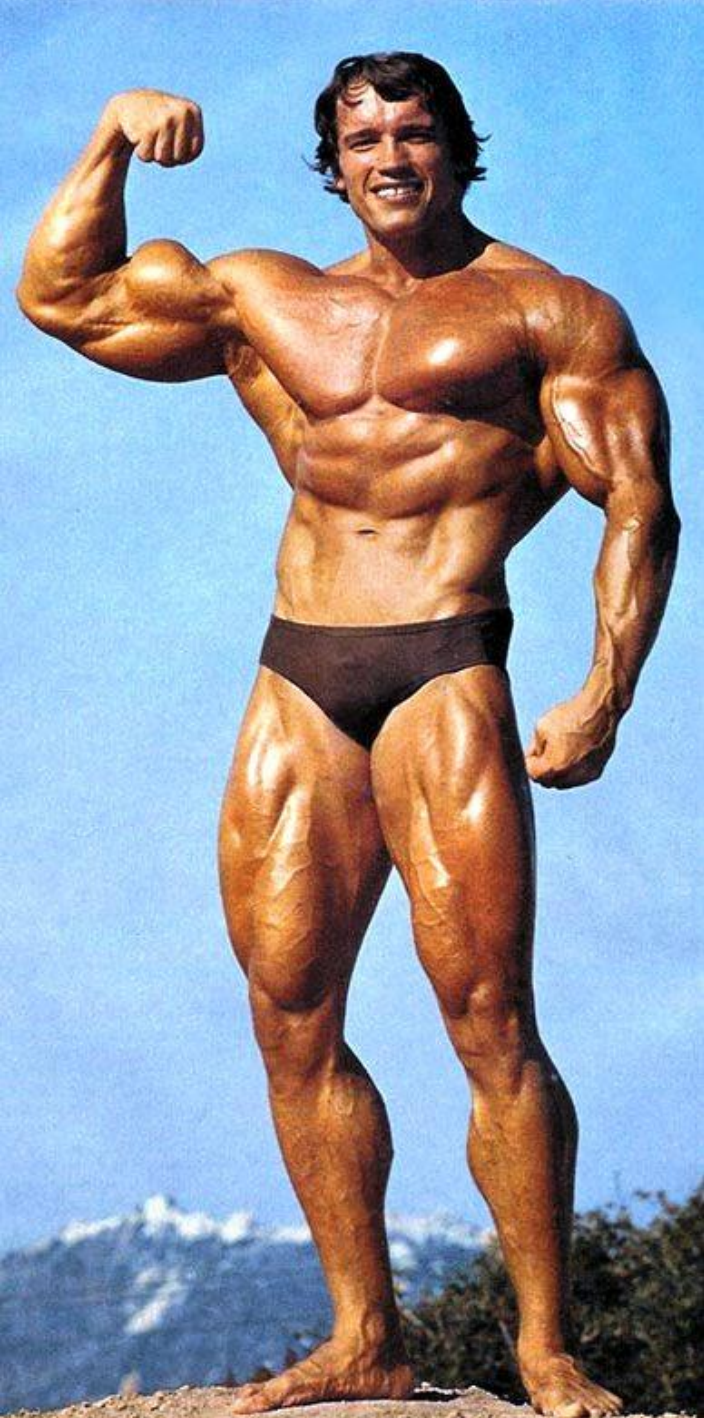


Testosteron – ein Hormon, viele Phänotypen

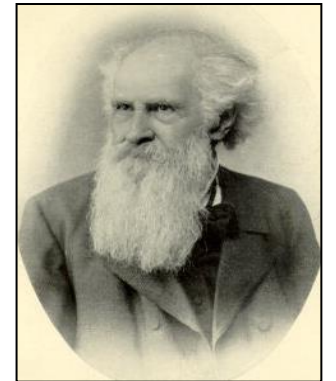
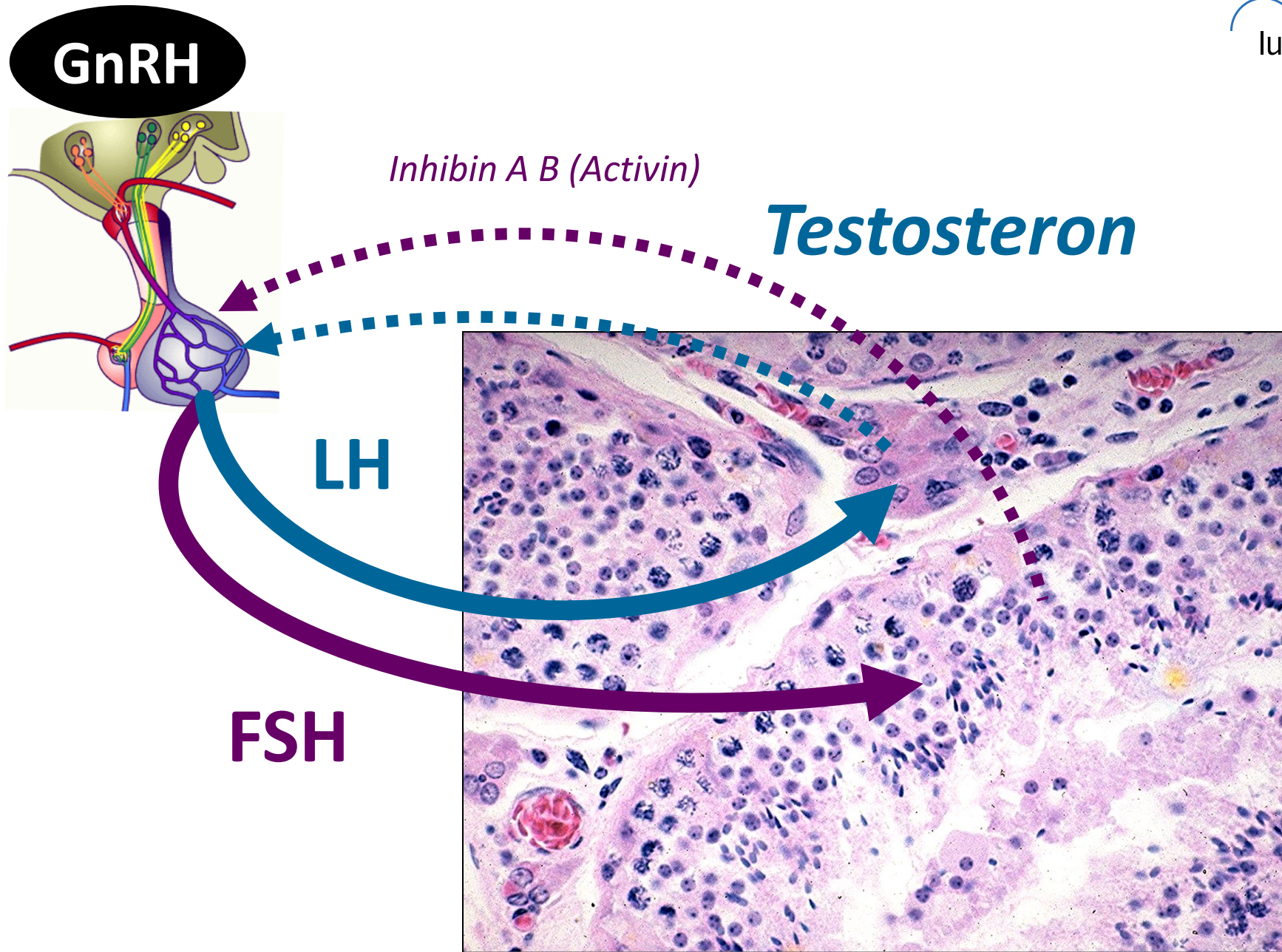




- 1. Physiologie der Gonadenachse**
2. Hypogonadismus beim Mann
3. Testosteron beim kranken Mann
4. Hyperandrogenismus/Hirsutismus bei der Frau
5. Transgender
6. Zusammenfassung

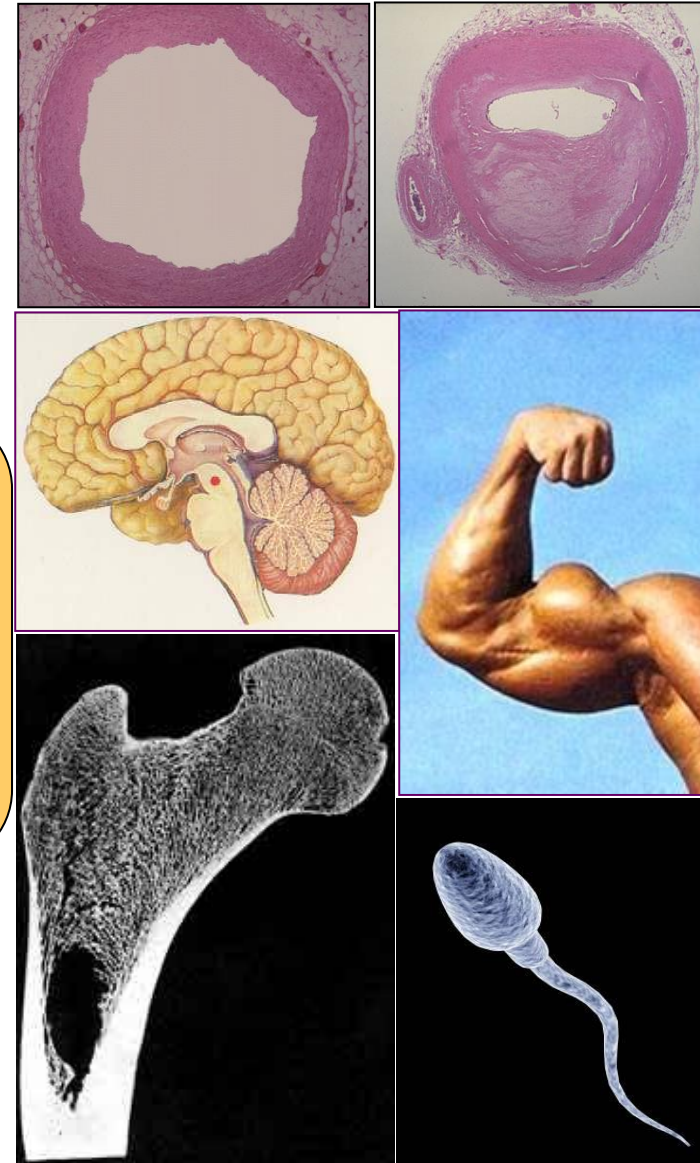
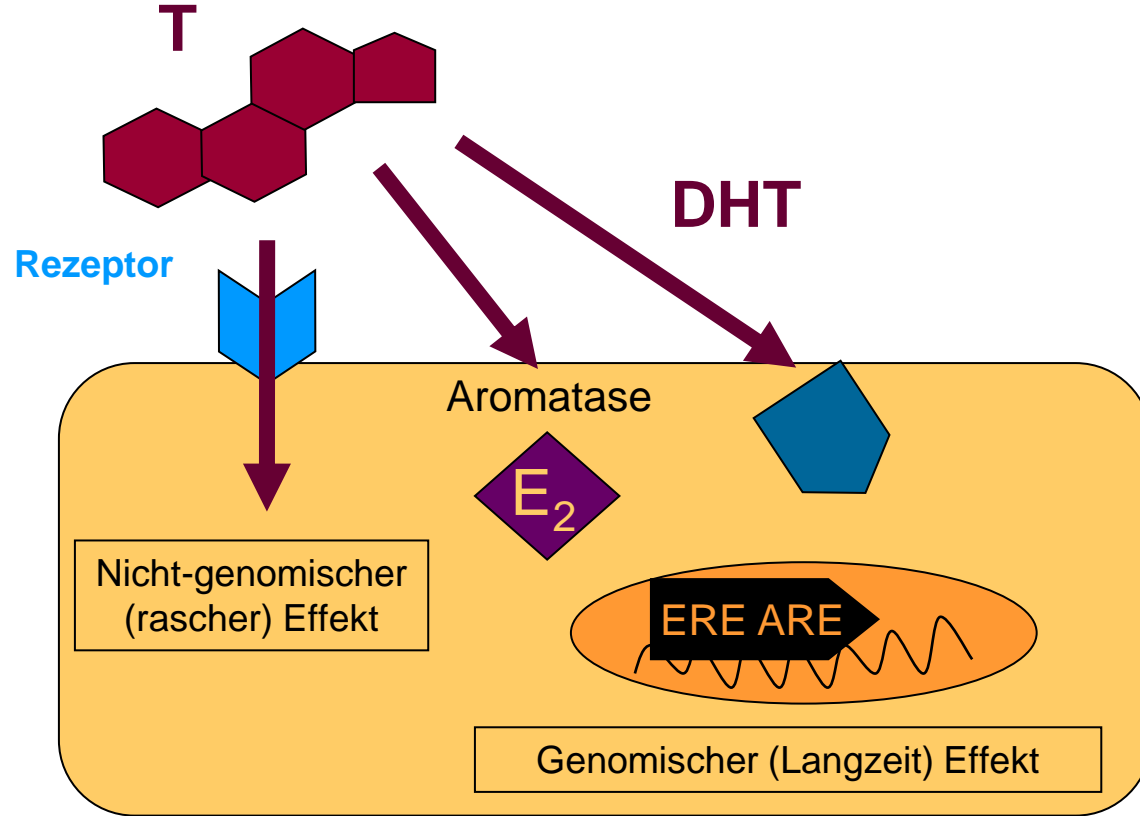
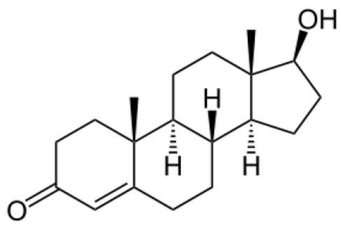


Lukas Cranach, 1472-1553



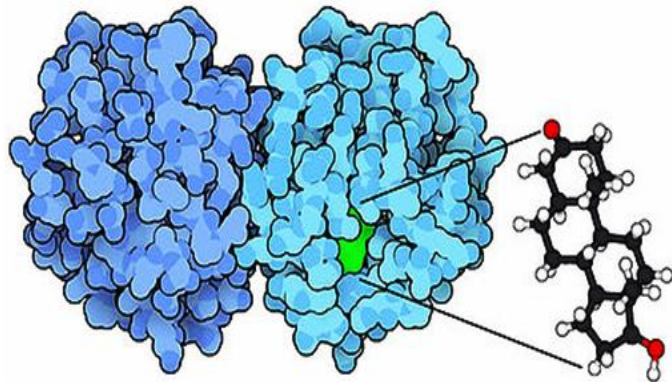
1821-1908

Zellulärer Effekt der Androgene

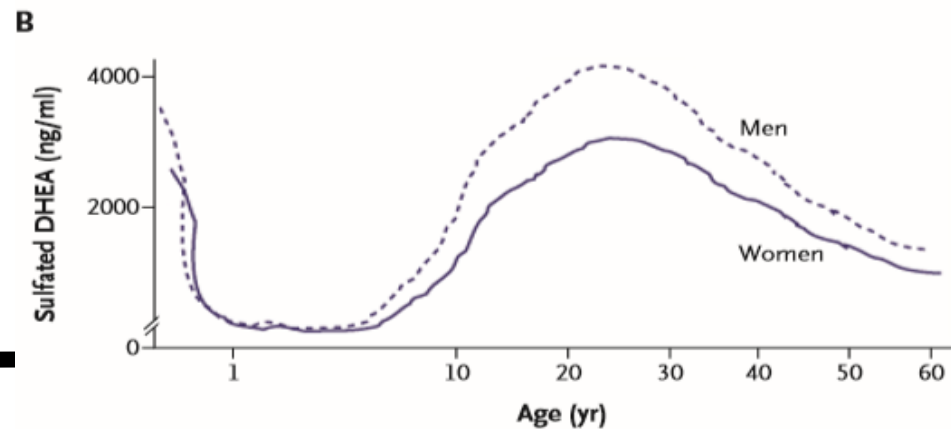
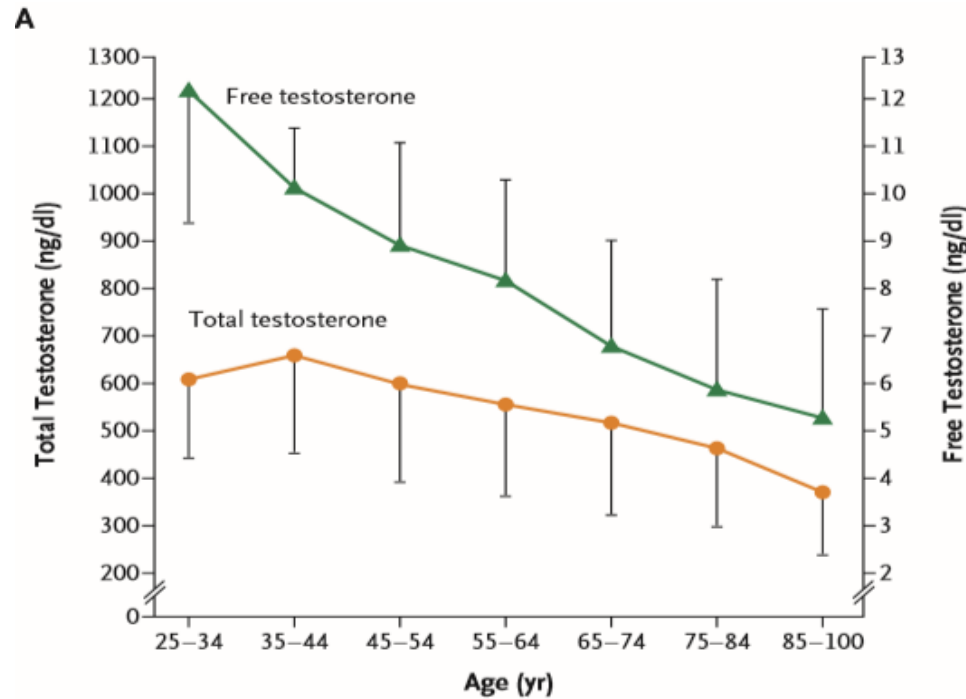


Produktion von Testosteron und SHBG

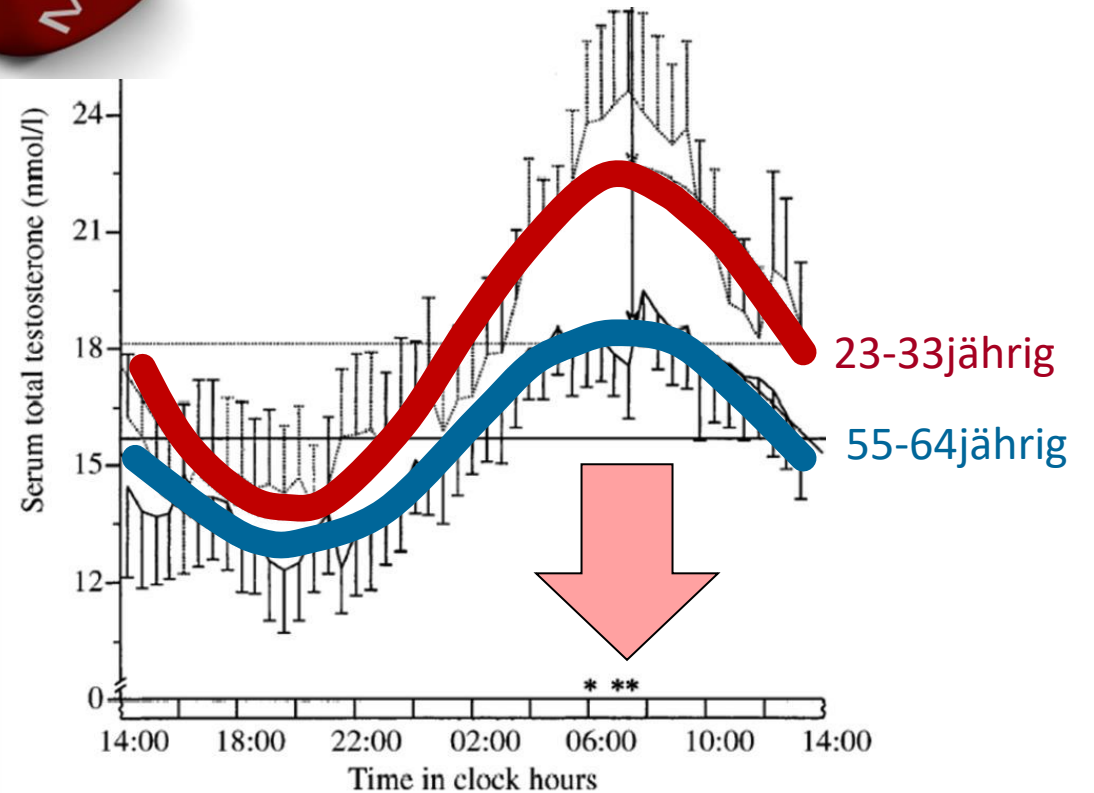
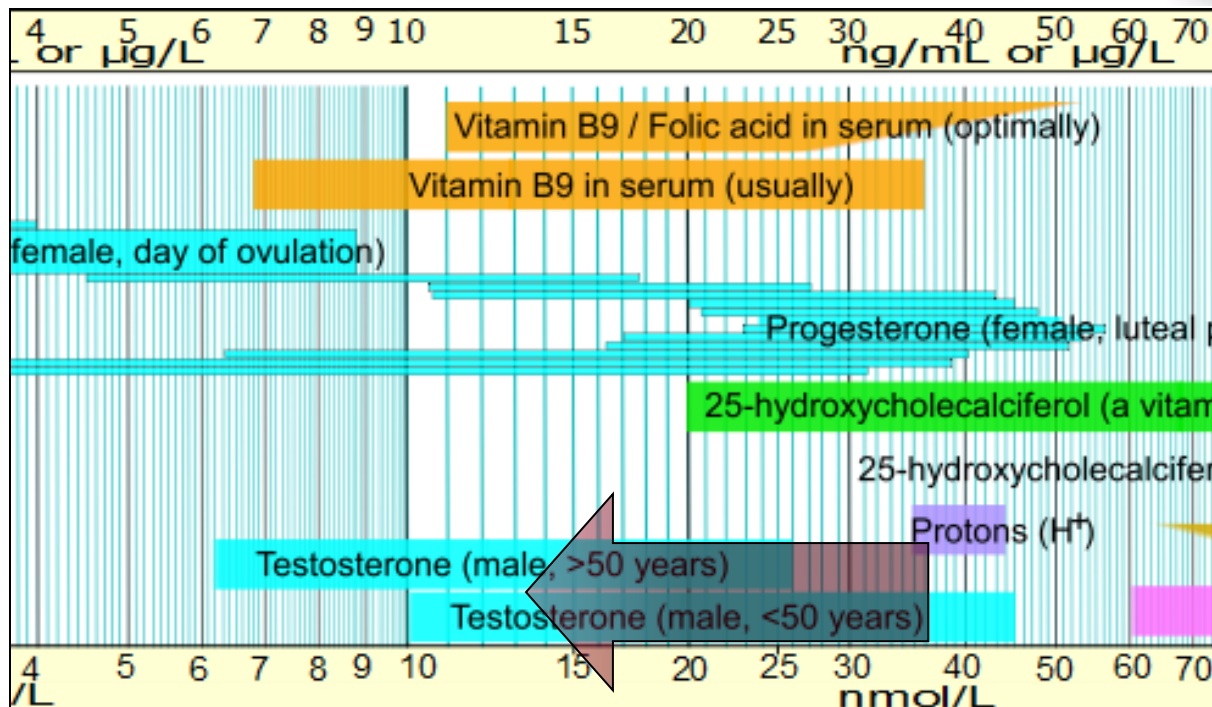
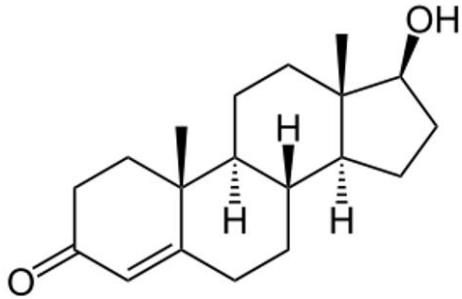
Sex-hormone
binding globuline
SHBG



Testosteron 5 – 7 mg/d
(minus 0.5–1.6%/J)



Laborbestimmung des Testosteron

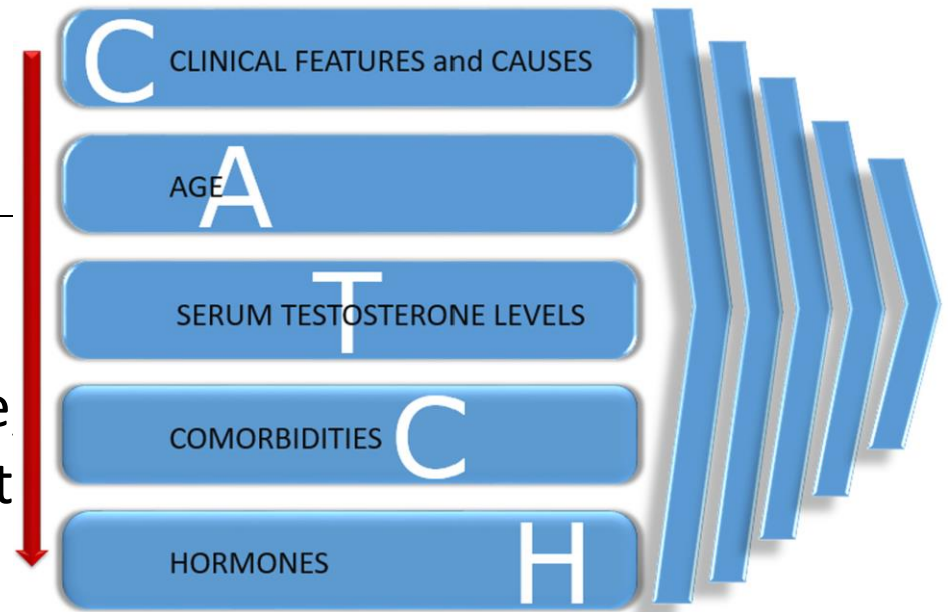


Hypogonadismus =

Symptome + erniedrigte Testosteronspiegel

Symptome:

Libidoverlust und Erektile Dysfunktion, Gynäkomastie
Verlust der Sekundärbehaarung Adynamie, vermehrt
Ermüdbarkeit, Verlust des „well-being“, Depression,
Verminderung kognitiver Funktion Verminderte
Muskelmasse und -kraft, Osteoporose, Anämie...



*Andrology 2018;6:665-679,
doi: 10.1111/andr.12506*

Hypogonadismus-Symptome
und
Totales Testosteron niedrig
(2x morgens bestimmt)

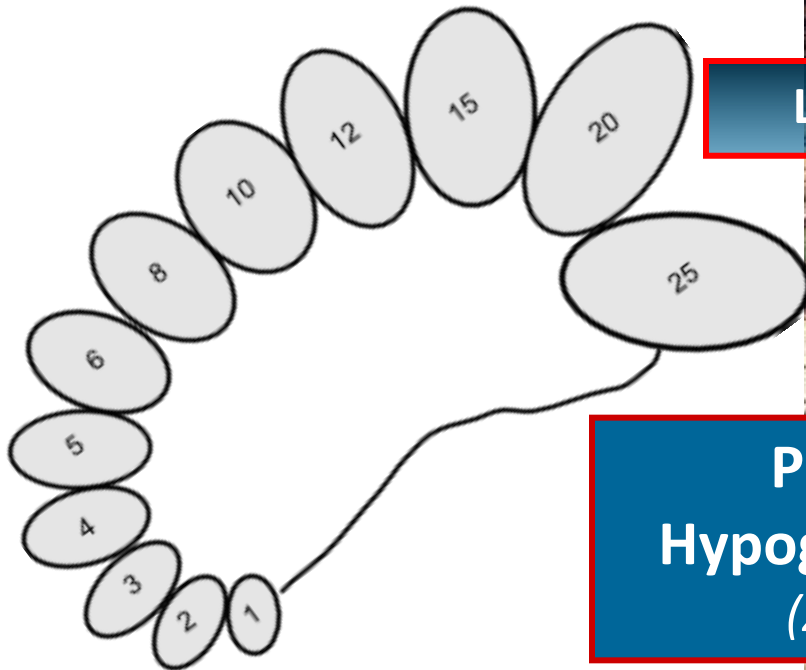
LH

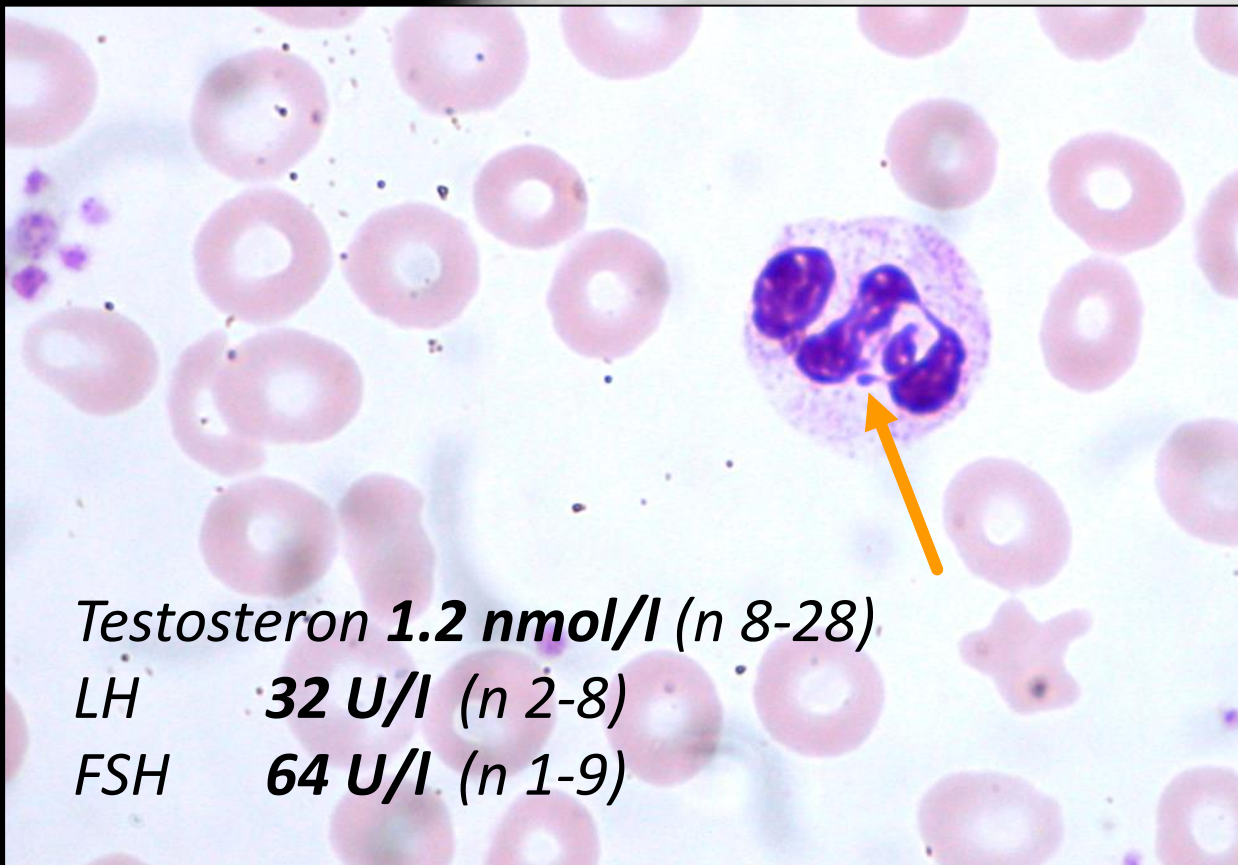
LH hoch

LH niedrig-

Primärer
Hypogonadismus
(z.B. XXY)

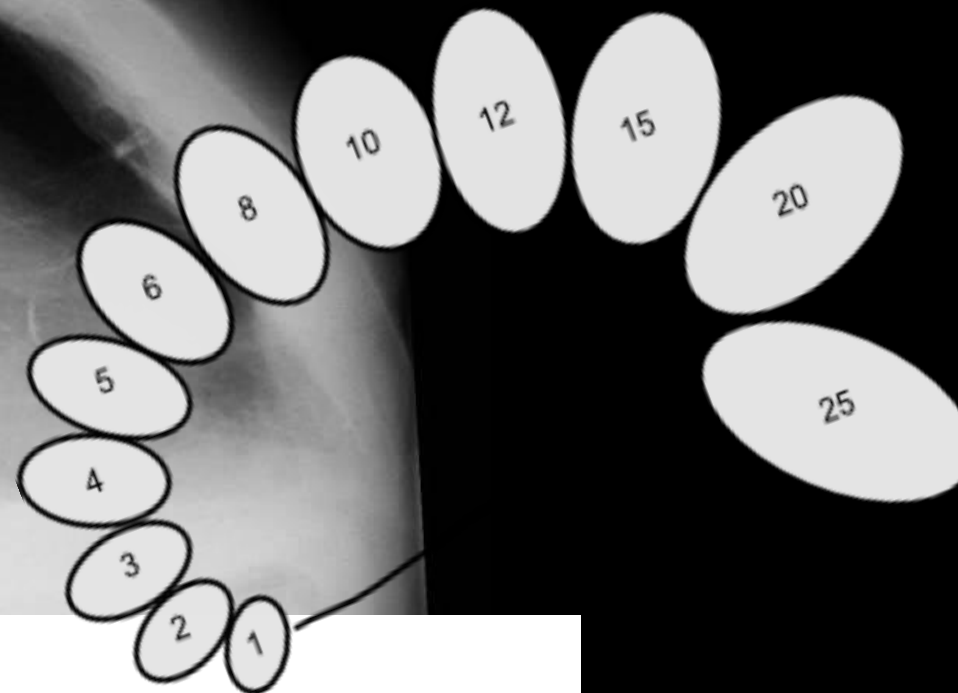
Sekundärer
Hypogonadismus
(z.B. Hypophysenadenom)





Herr B. A., 1940

L



JL „Pflegetotfall“

PA St.n. SHF 1999, Myokardinfarkt 2009, Pneumonie 2015

ST BD 134/76, P 88/min, 167cm (-8cm), 75 kg, keine
 Sekundärbehaarung, Gynäkomastie +/+, Testesvolumen < 3ml

Herr K.J., 1954

GCS 9, Temp 41°

Adynamie

Akute Bronchitis

BD 70/40 mmHg

Meningismus (+)

Hemianopsie

TSH 0.4 mU/l (0.2 - 4.2)

LH 1.9 IU/l (1.7 - 8.6)

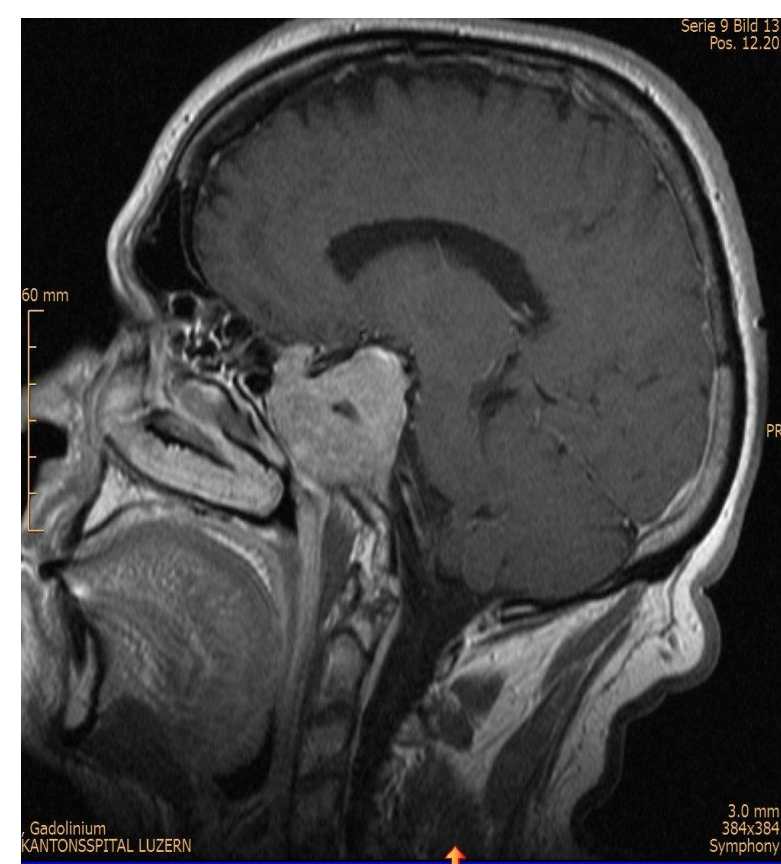
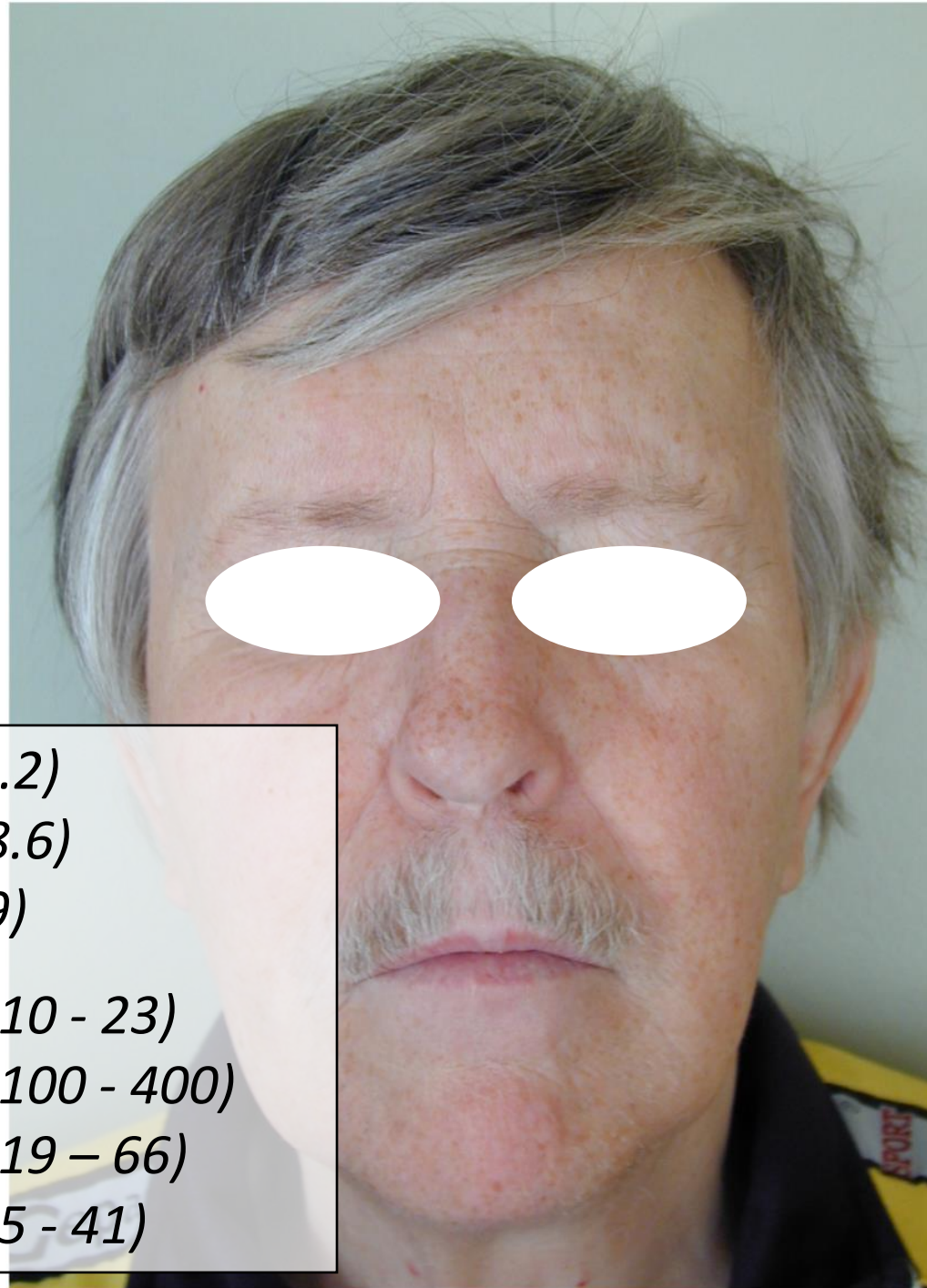
FSH 0.9 IU/l (0.8 - 9)

fT4 7.1 pmol/l (10 - 23)

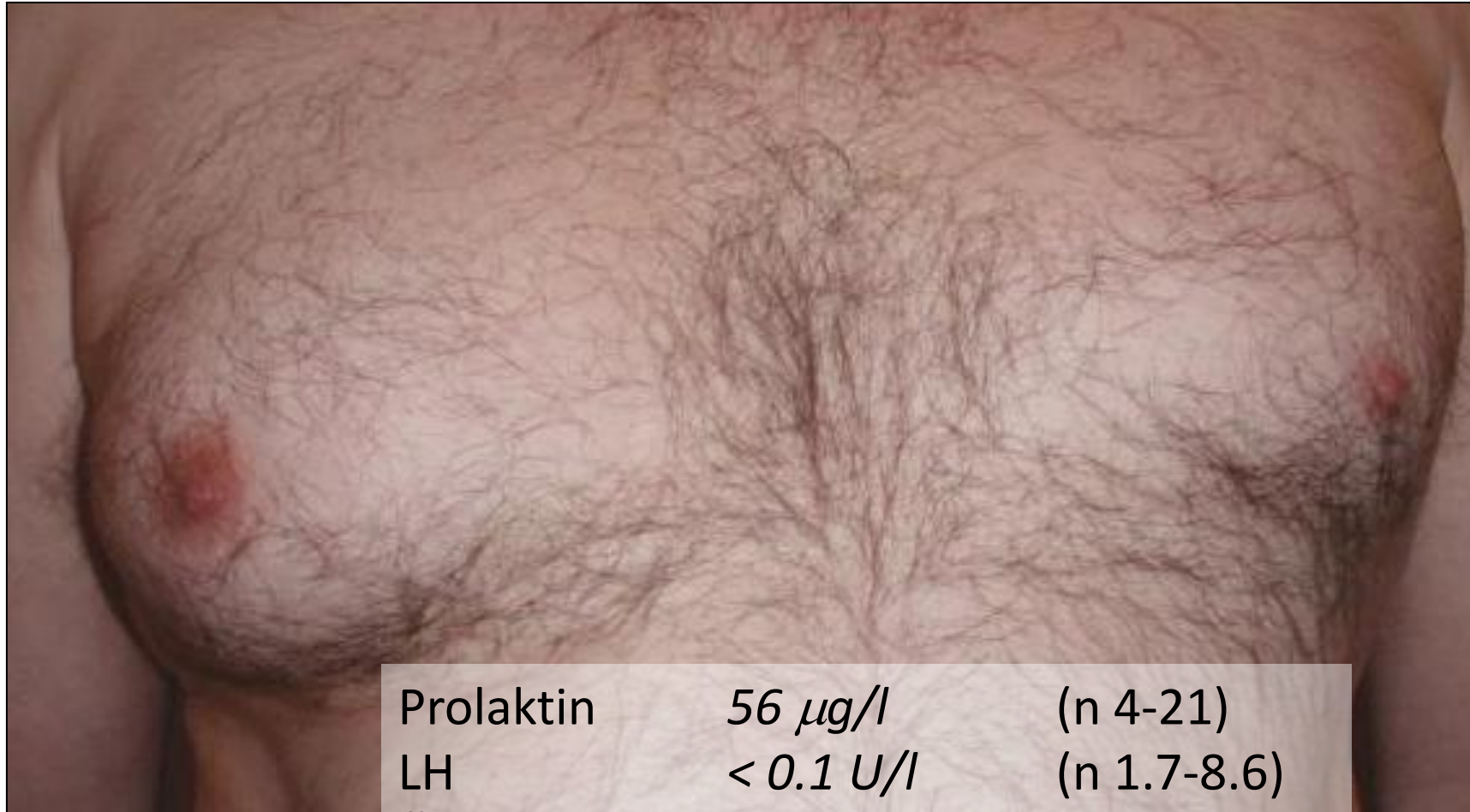
Cortisol 29 nmol/l (100 - 400)

fTesto < 0.1 pmol/l (19 - 66)

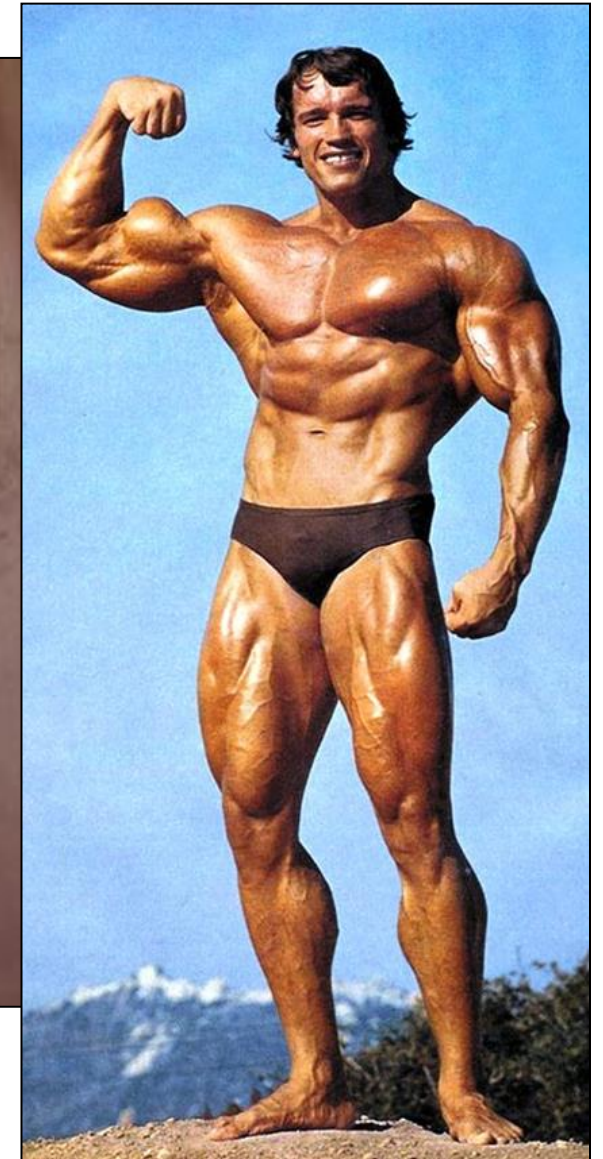
IGF-1 1.1 pmol/l (5 - 41)



26jähriger Mann mit schmerzhafter Gynäkomastie rechtsbetont seit 5 Wochen und Polyglobulie (Hb 188 g/l)

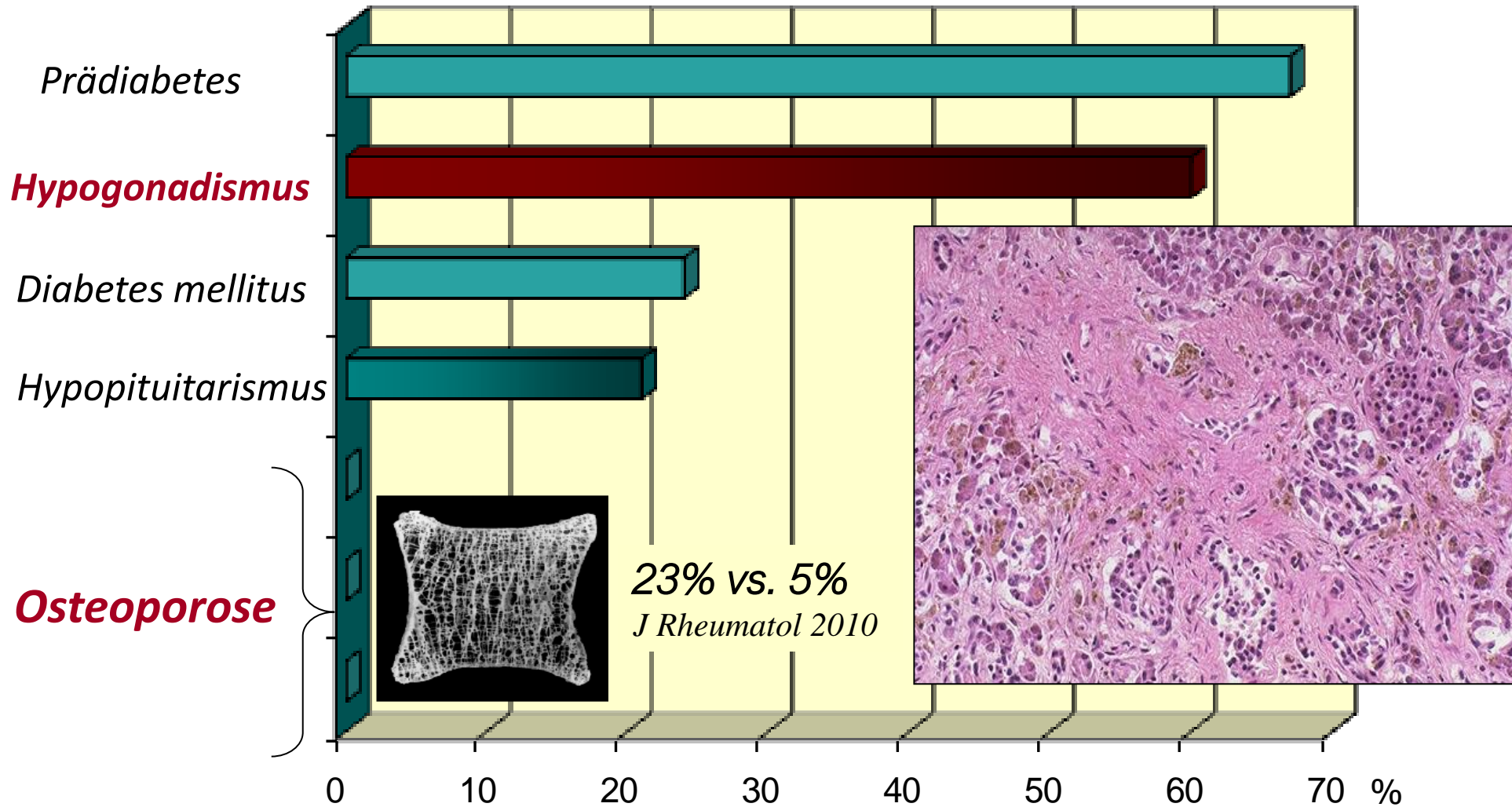


Prolaktin	56 $\mu\text{g/l}$	(n 4-21)
LH	< 0.1 U/l	(n 1.7-8.6)
Östradiol	34 pmol/l	(n 28-156)
Testosteron	87 nmol/l	(n 9-29)
SHBG	12 nmol/l	(n 18-54)



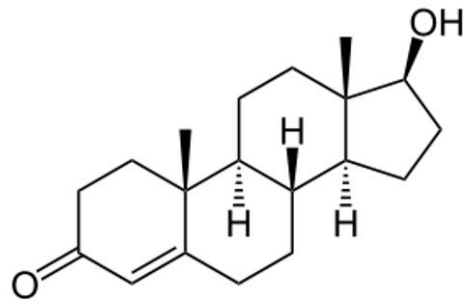
Hämochromatose und endokrine Erkrankungen

J Endocr Invest 1999, Acta Clin 1999, Osteop Int 1996, JCEM 1993, Ann Int Med 1989. Mayo Clin Proc 2002



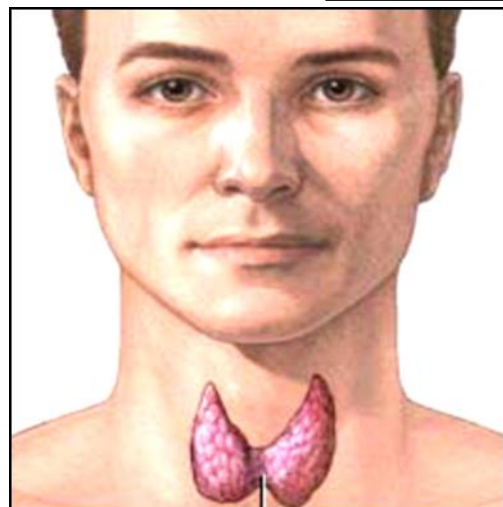
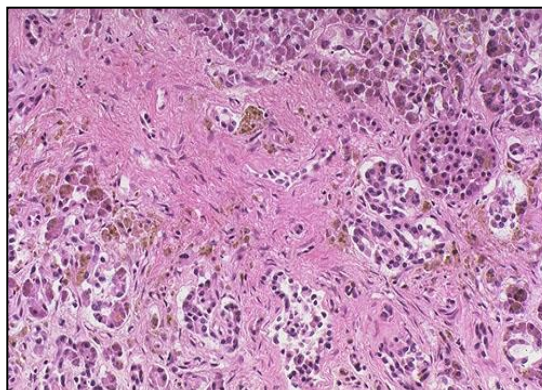
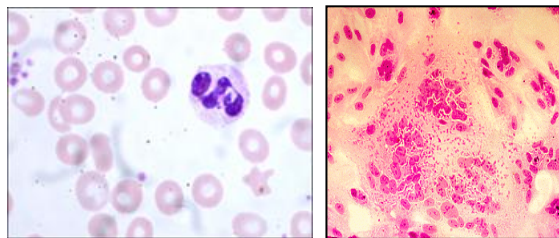
Zusammenfassung

1. Testosteronspiegel sind variabel (zirkadianer Rhythmus – Alter)
2. Androgene werden in den Testes und in den Nebennierenrinden produziert
3. Gonadenachse: LH / FSH und Testosteron
4. Hypogonadismus = erniedrigtes Testosteron und Symptome
5. Drei typische Beispiele: Klinefelter / Hypophysen-Makroadenom / Hämochromatose
6. Häufiges klinisches Korrelat = männliche Osteoporose



1. Physiologie der Gonadenachse
- 2. Hypogonadismus beim Mann**
3. Testosteron beim kranken Mann
4. Hyperandrogenismus/Hirsutismus bei der Frau
5. Transgender
6. Zusammenfassung

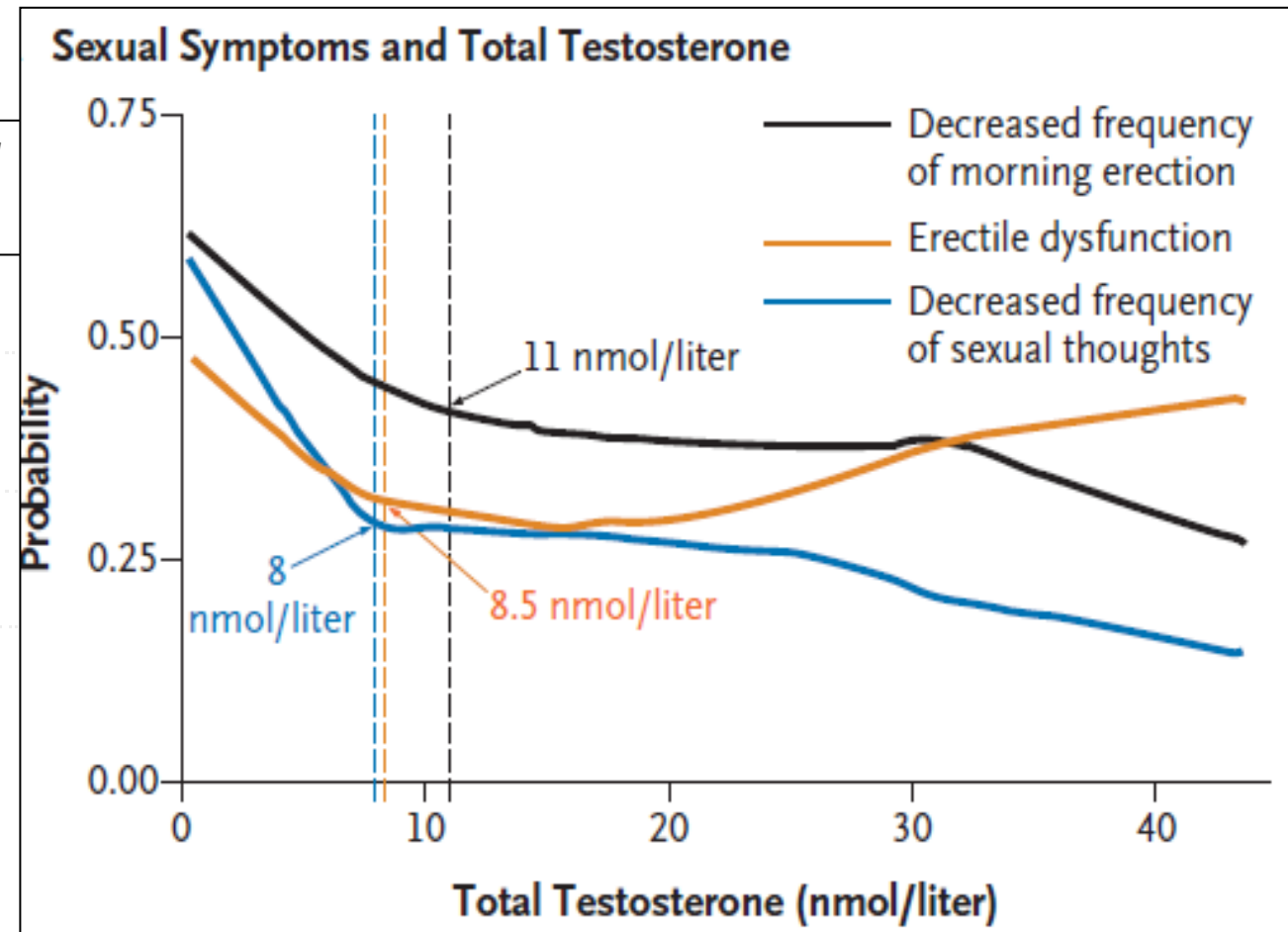
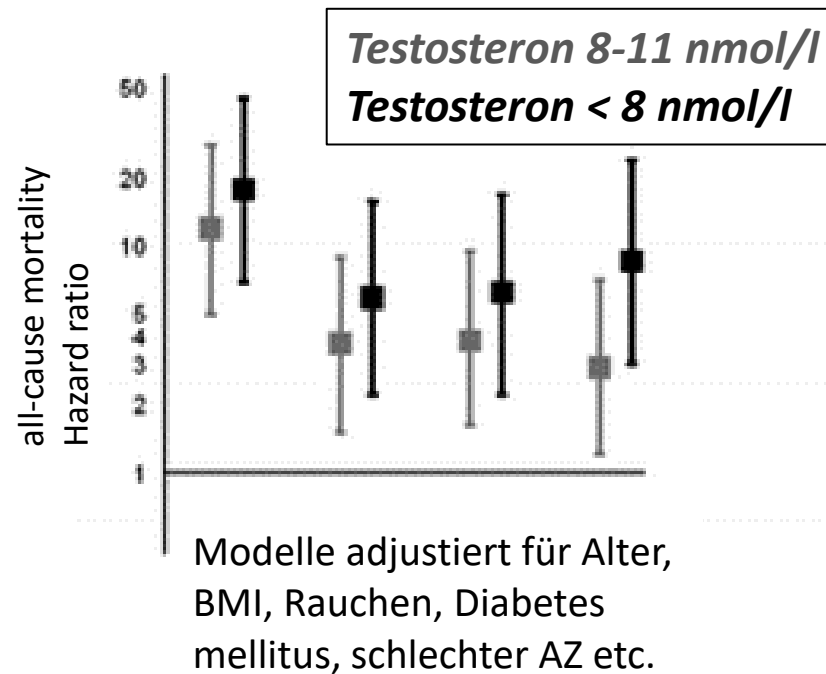
Ursachen des Hypogonadismus



Late-onset Hypogonadismus und Mortalität in «aging men»

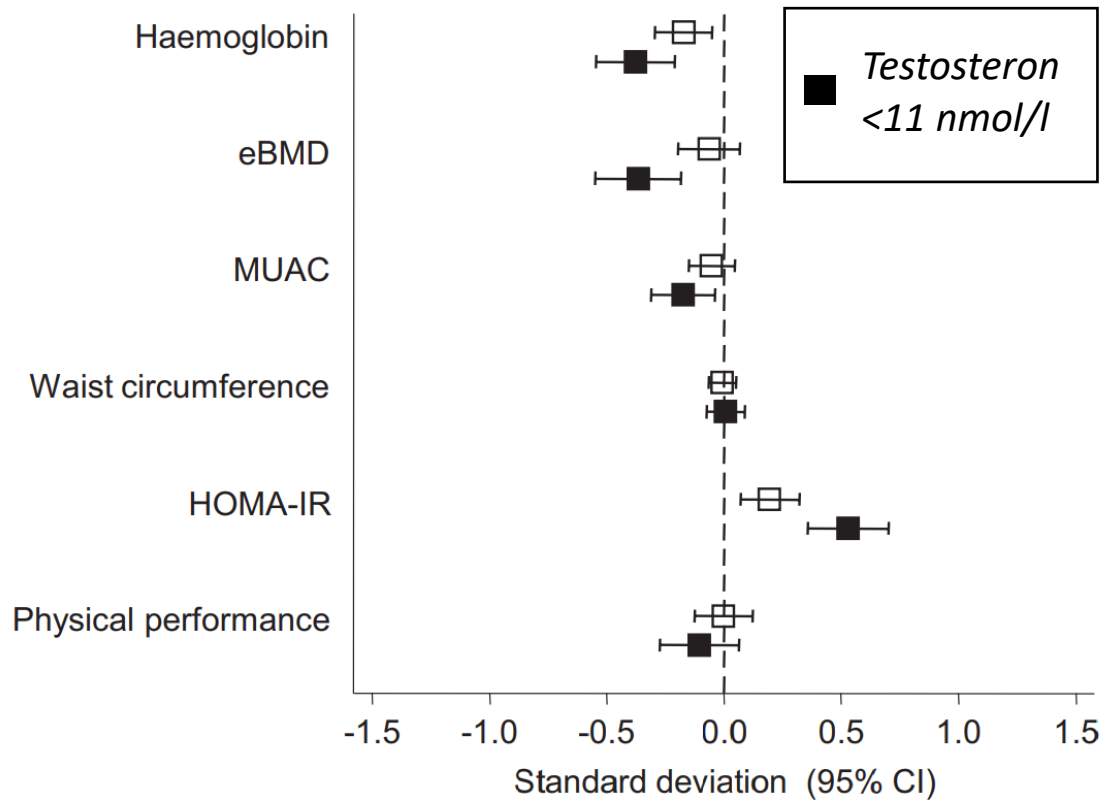
EMAS study group JCEM 2014;99:1357-; N Engl J Med 2010; 363:123-

Prospektive Studie: 2599 Männer, 40-79jährig, Follow-up 4.3 Jahre
LOH bei 55 Männern (2.1%)



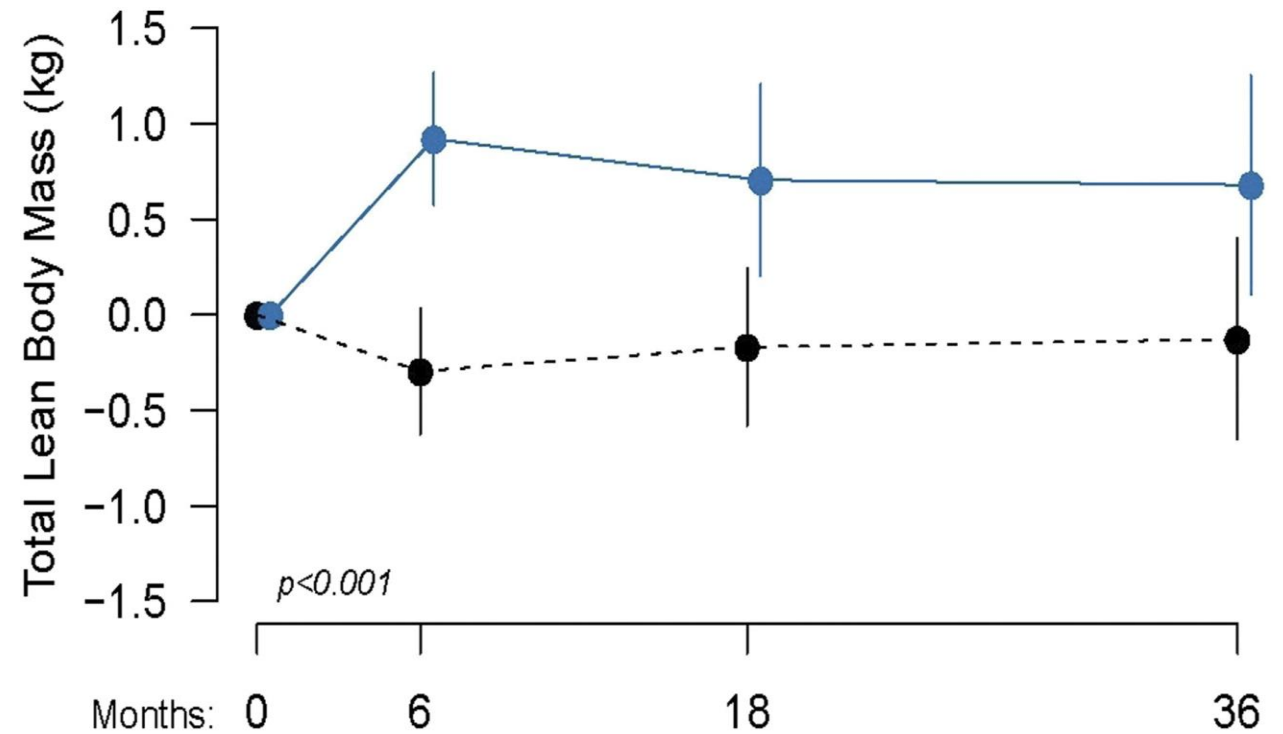
Hypogonadismus : Metabolische Auswirkungen ?

2966 Männer, 40-79jährig:
Evidenz für «Endorgan» Effekte von LOH?



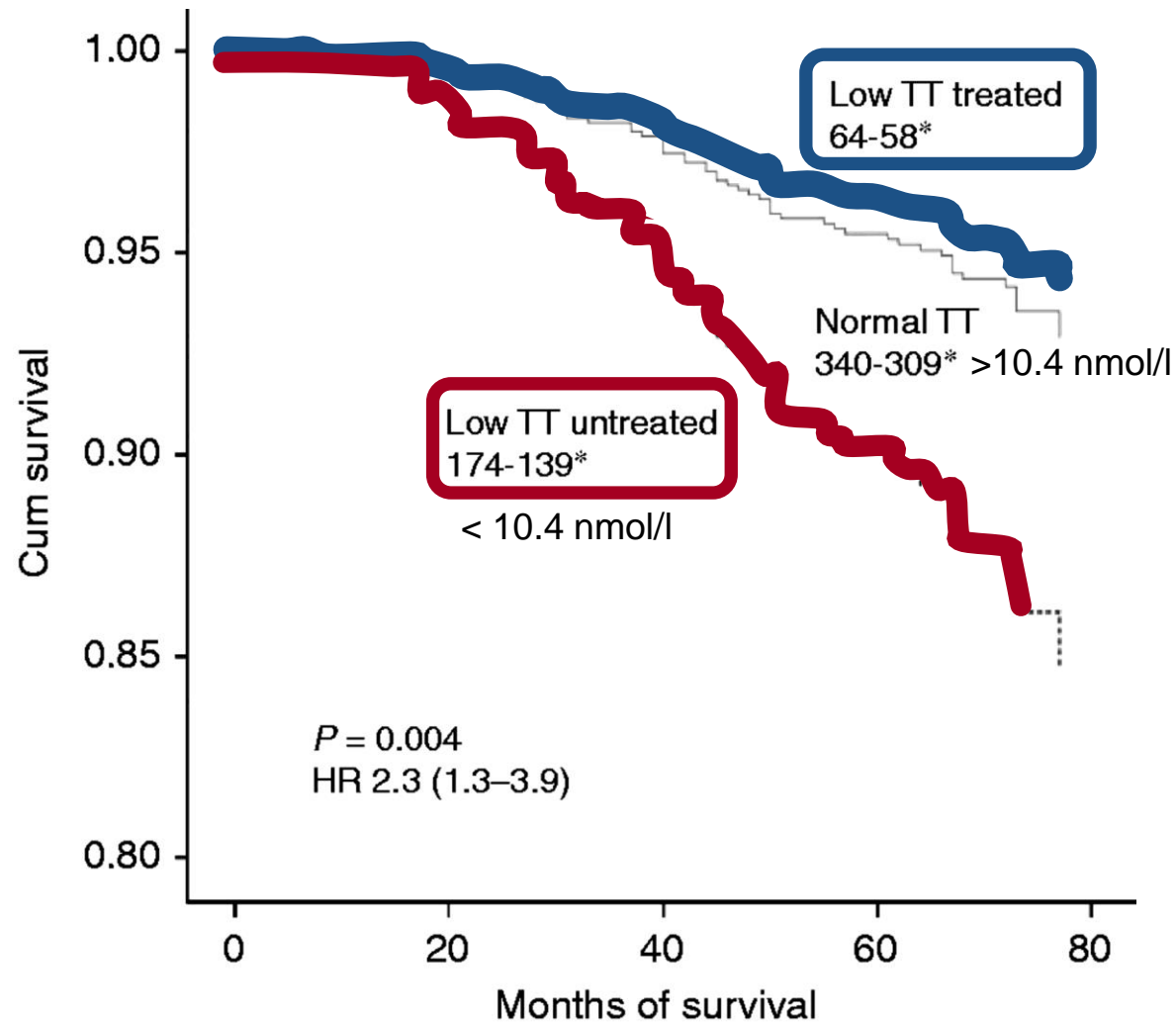
JCEM 2012;97:1508- (EMAS)

Effects of Testosterone Supplementation for 3 Years on
Muscle Performance and Physical Function in Older Men



JCEM 2017;102:583-

Testosteron-Substitution und Mortalität



581 Typ 2 Diabetiker

Alter 59 Jahre

HbA1c 7.3%

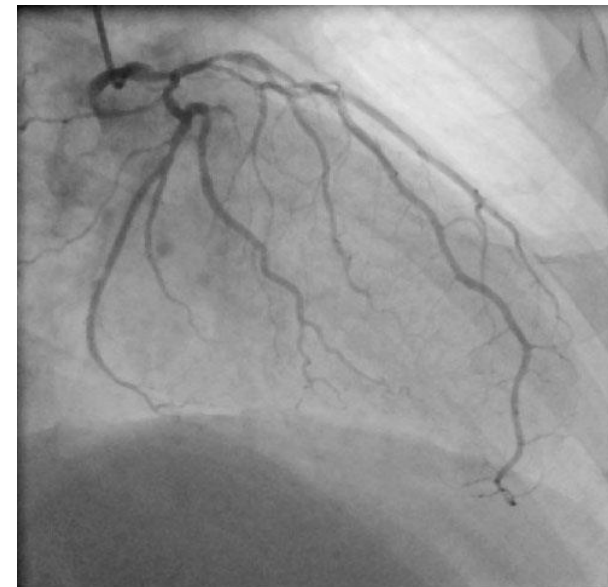
BMI 32.4

Raucher 18%

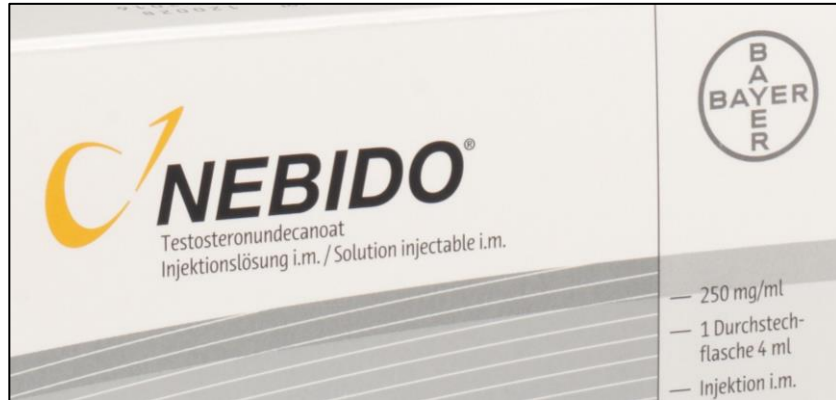
Statine 48%

ACE-I 48%

KHK 39%

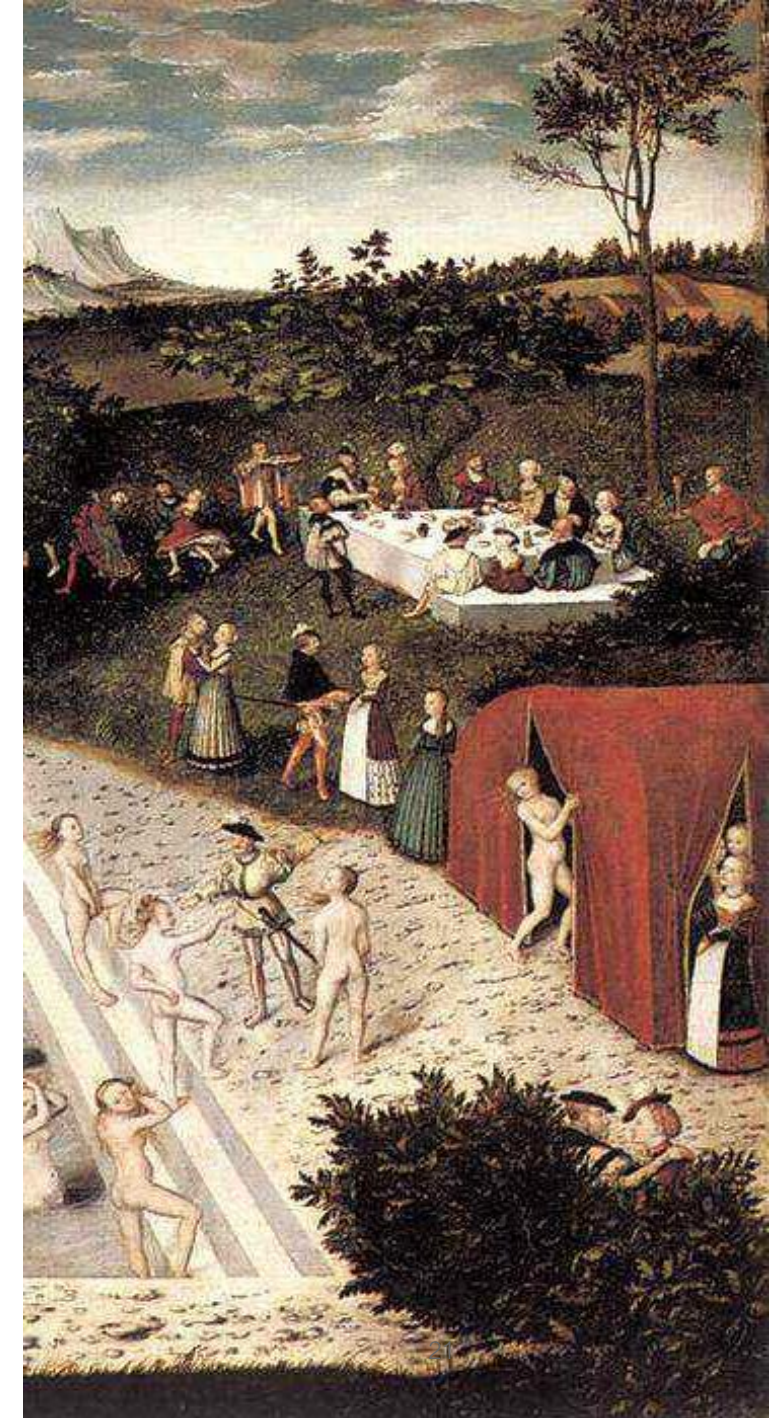


Testosteron-Ersatztherapie



1000 mg (=4 ml) intramuskulär alle 12 Wochen,
ergibt ein gleichmässiges Testosteronprofil,
ist kassenpflichtig (*Tageskosten Fr. 1.25 bzw. 0.50*)

Nebenwirkungen: Schwitzen, Wasseransammlung, Akne,
Haarausfall, Brustspannen, Schmerzen bei Injektion,
Schlafapnoe, Prostataveränderungen, Erektionen,
Schwindel, Atemnot...

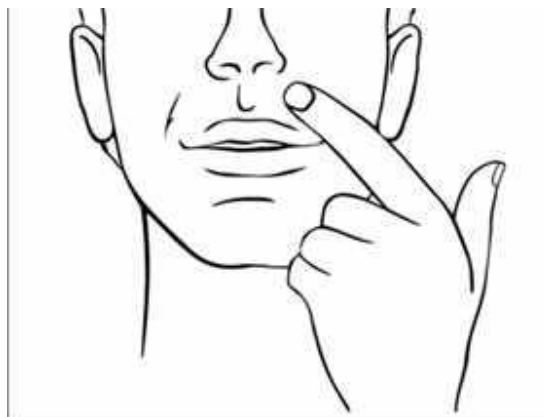




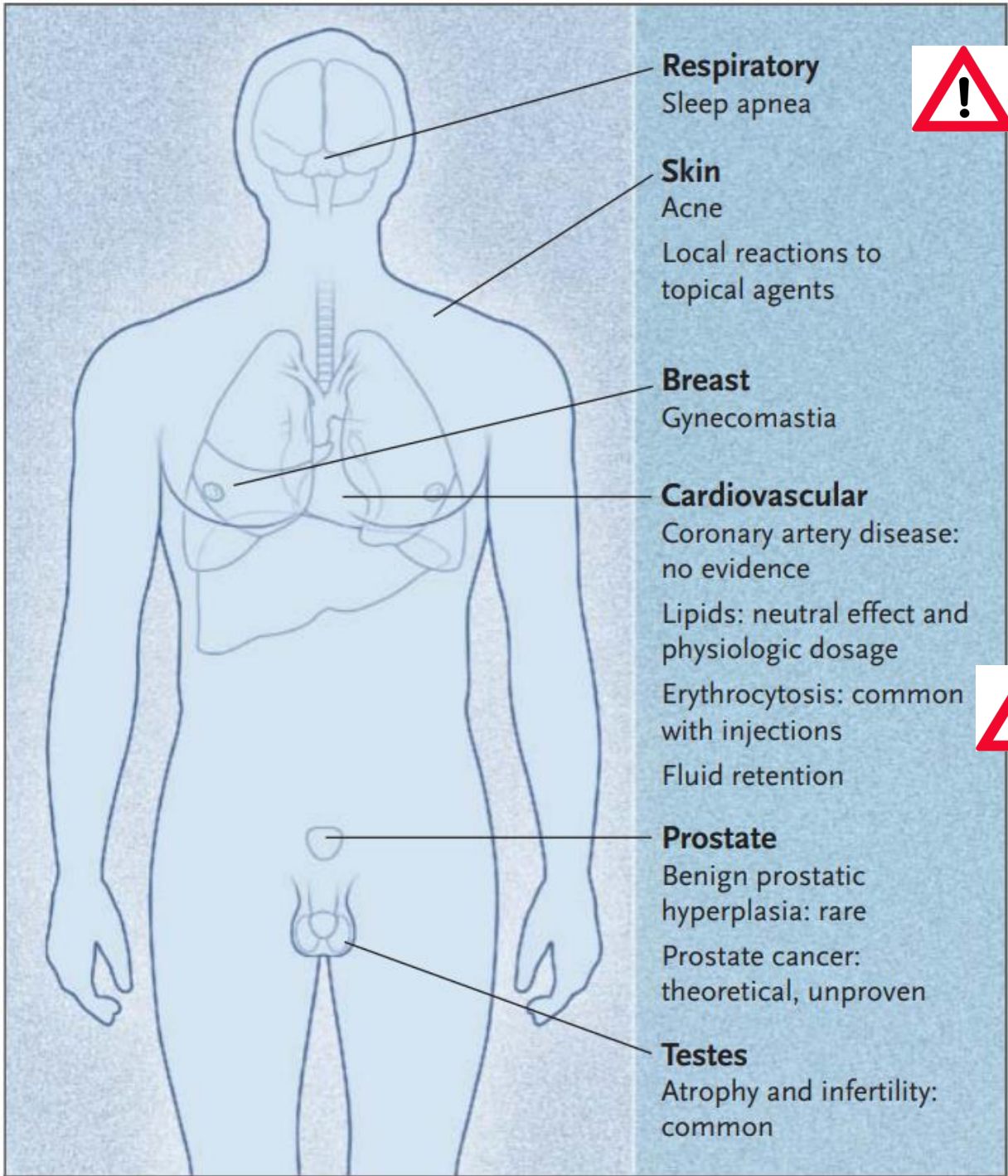
Testogel® 50 mg

Nicht kassenpflichtig
Tagesdosis Fr. 2.70

 **STRIANT®**
(testosterone buccal system) 
mucoadhesive 30 mg

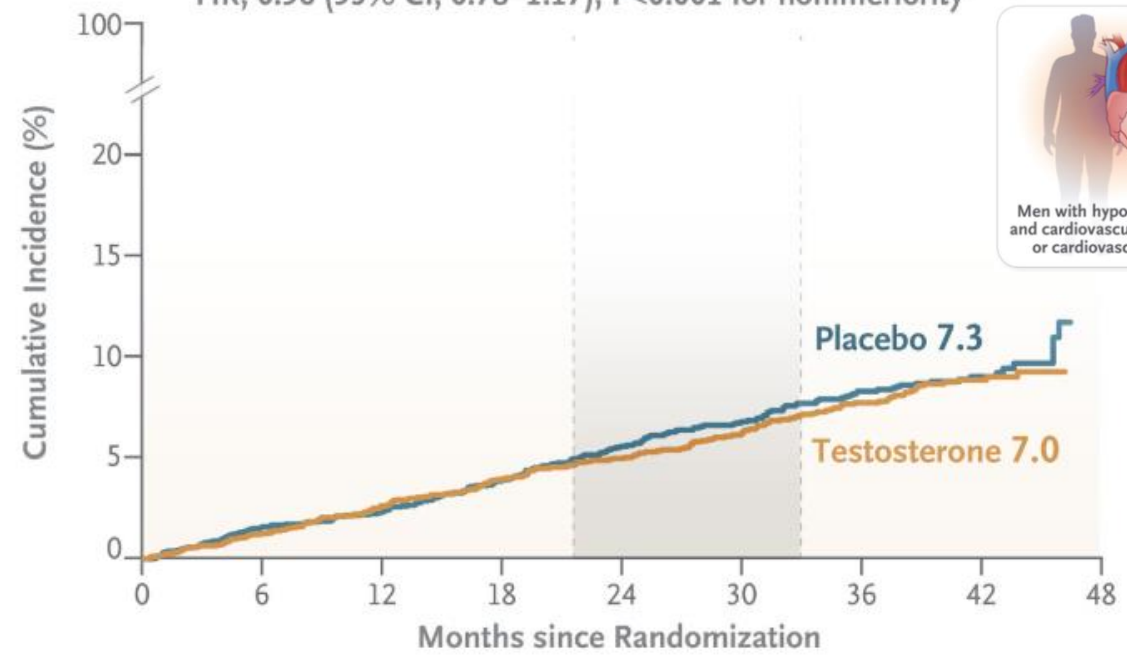


Testosteron
Pellets



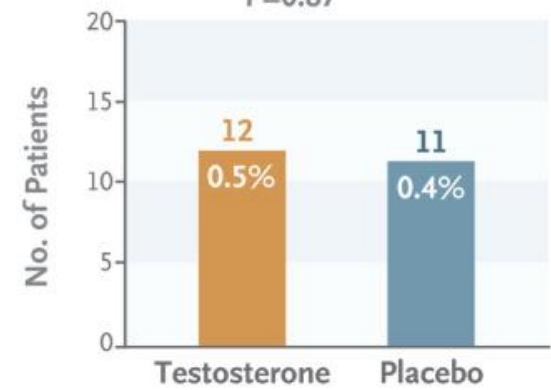
Death from Cardiovascular Causes, Nonfatal MI, or Nonfatal Stroke

HR, 0.96 (95% CI, 0.78–1.17); P<0.001 for noninferiority



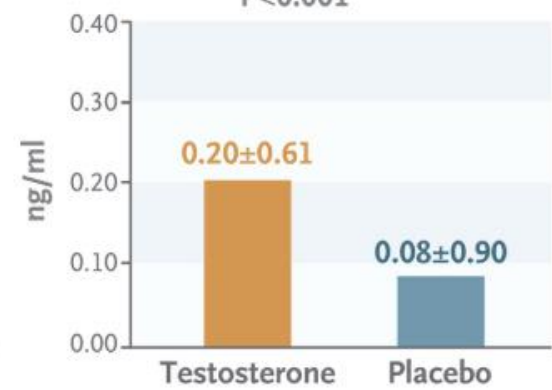
Incidence of Prostate Cancer

P=0.87

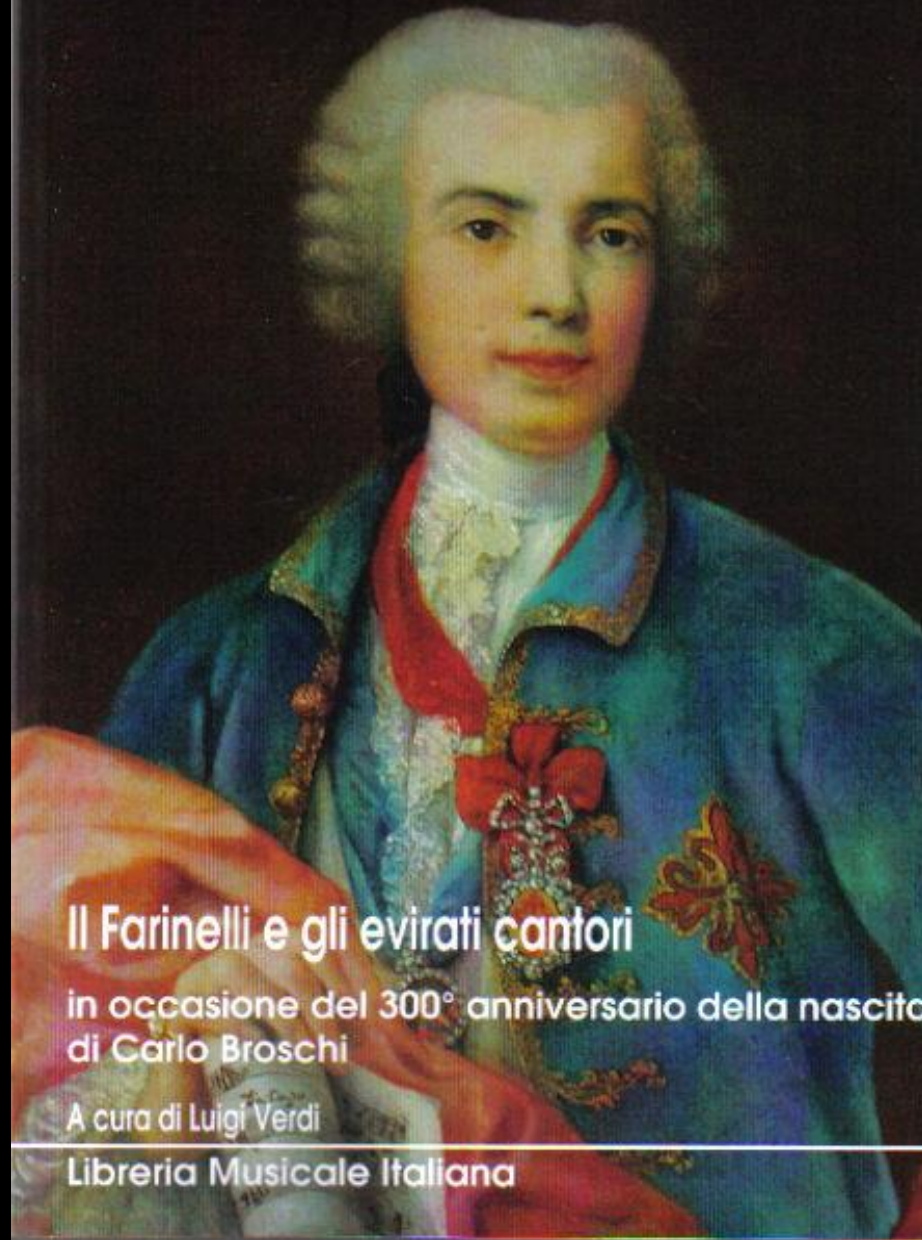


Increase in PSA Levels

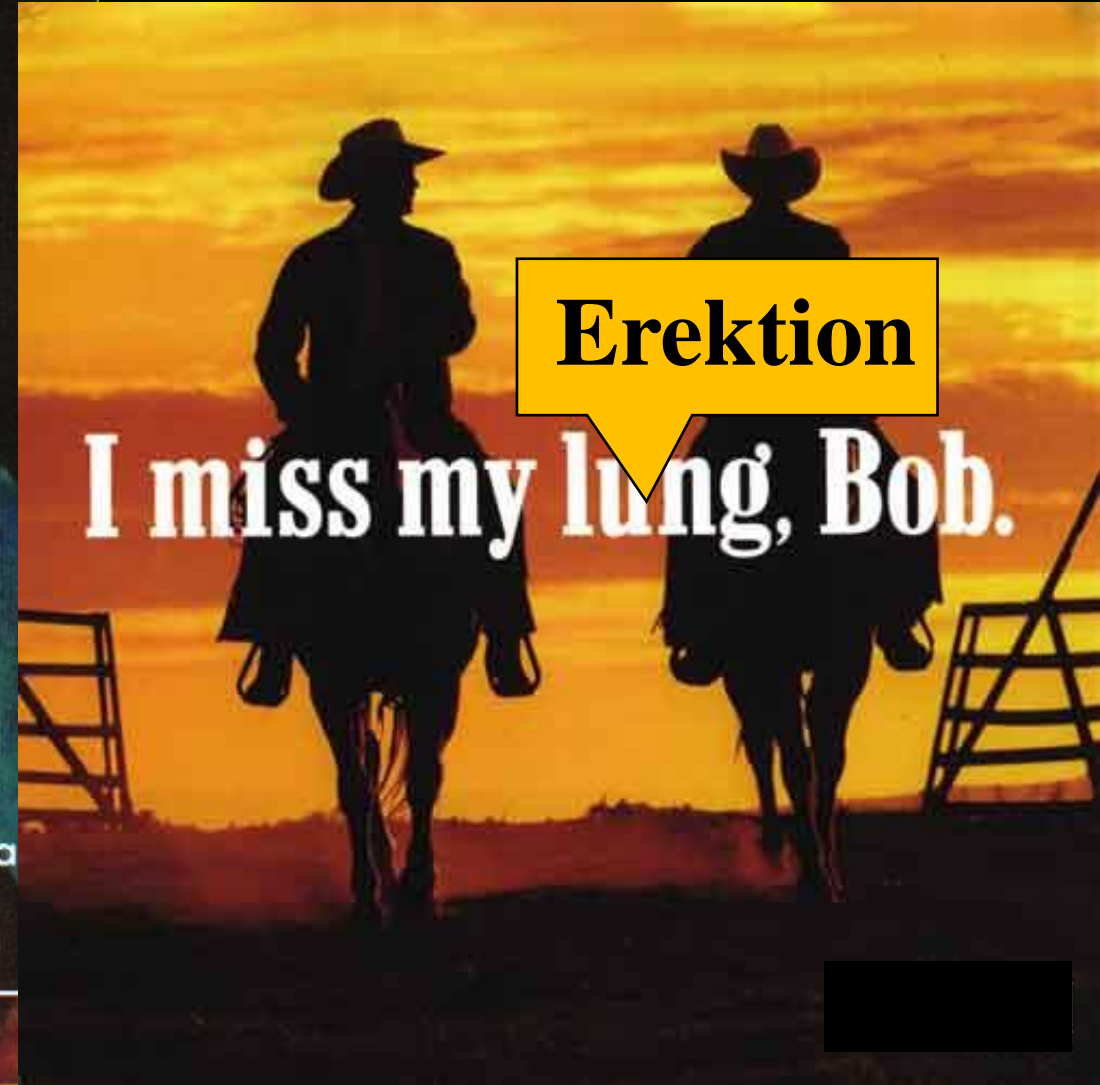
P<0.001



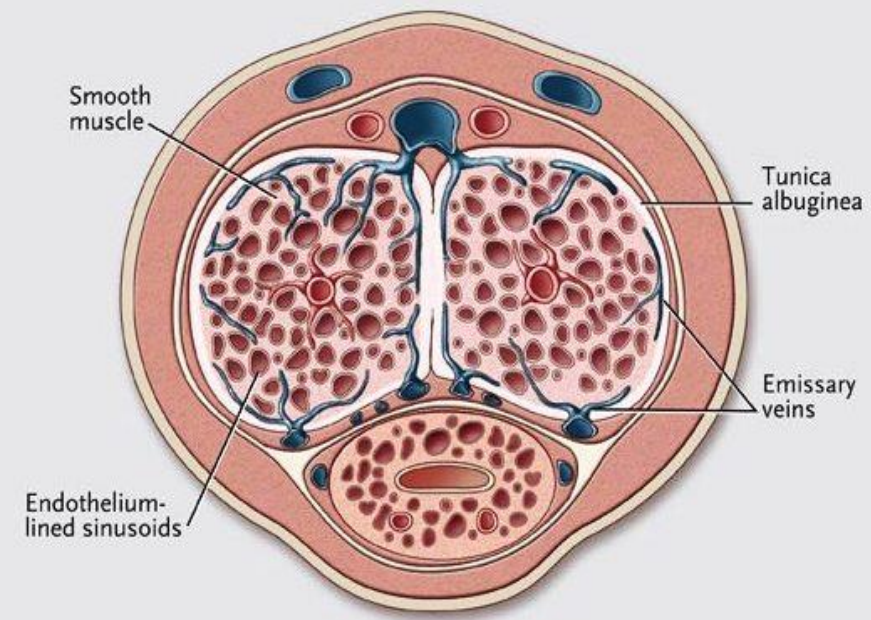
Libido = Testosteron



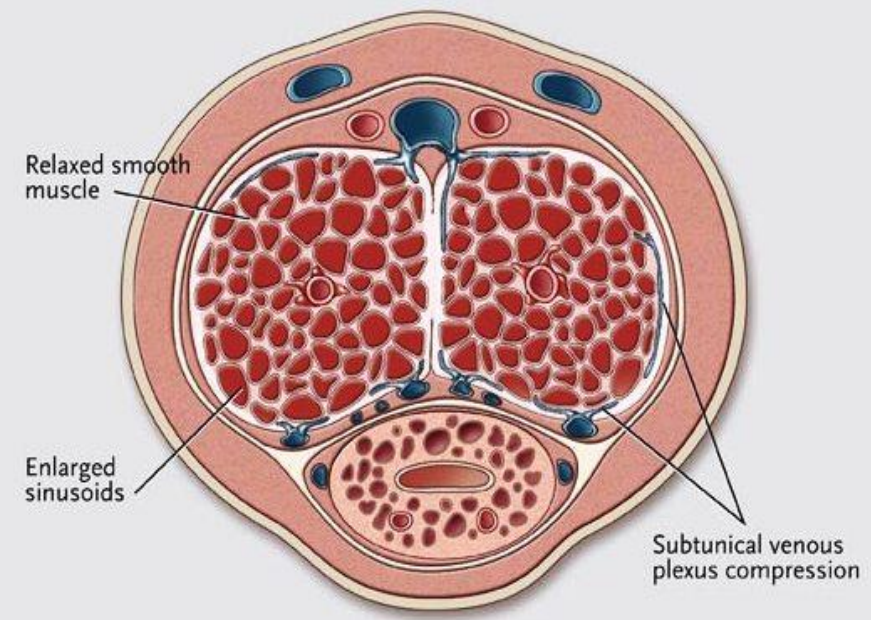
**Erektile Funktion =
neurovaskulär**



A Normal flaccid penile anatomy



B Normal erect penile anatomy



Erektile Dysfunktion

Pathophysiologie

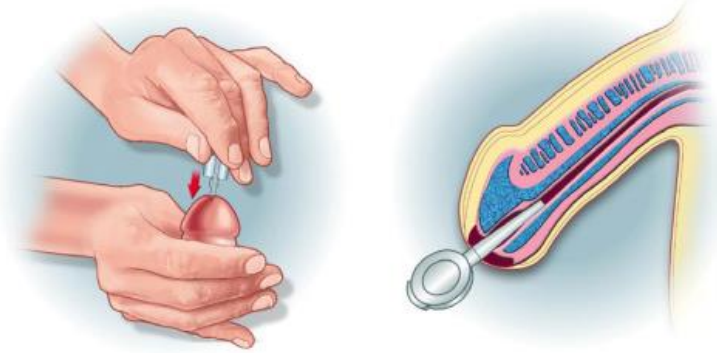
Risikofaktoren

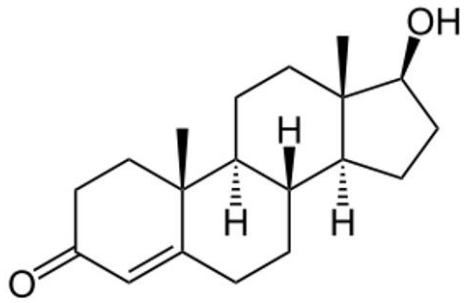


Phosphodiesterase-Hemmer

Caverject®

Muse®





1. Physiologie der Gonadenachse
2. Hypogonadismus beim Mann
- 3. Testosteron beim kranken Mann**
4. Hyperandrogenismus/Hirsutismus bei der Frau
5. Transgender
6. Zusammenfassung

COPD / Osteosarkopenie

Int J Chron Obstruct Pulmon Dis 2017; 12: 669–675.
Beverly SM. N Engl J Med 2003;348:2597-

Eur Respir J 2014;44:1504-

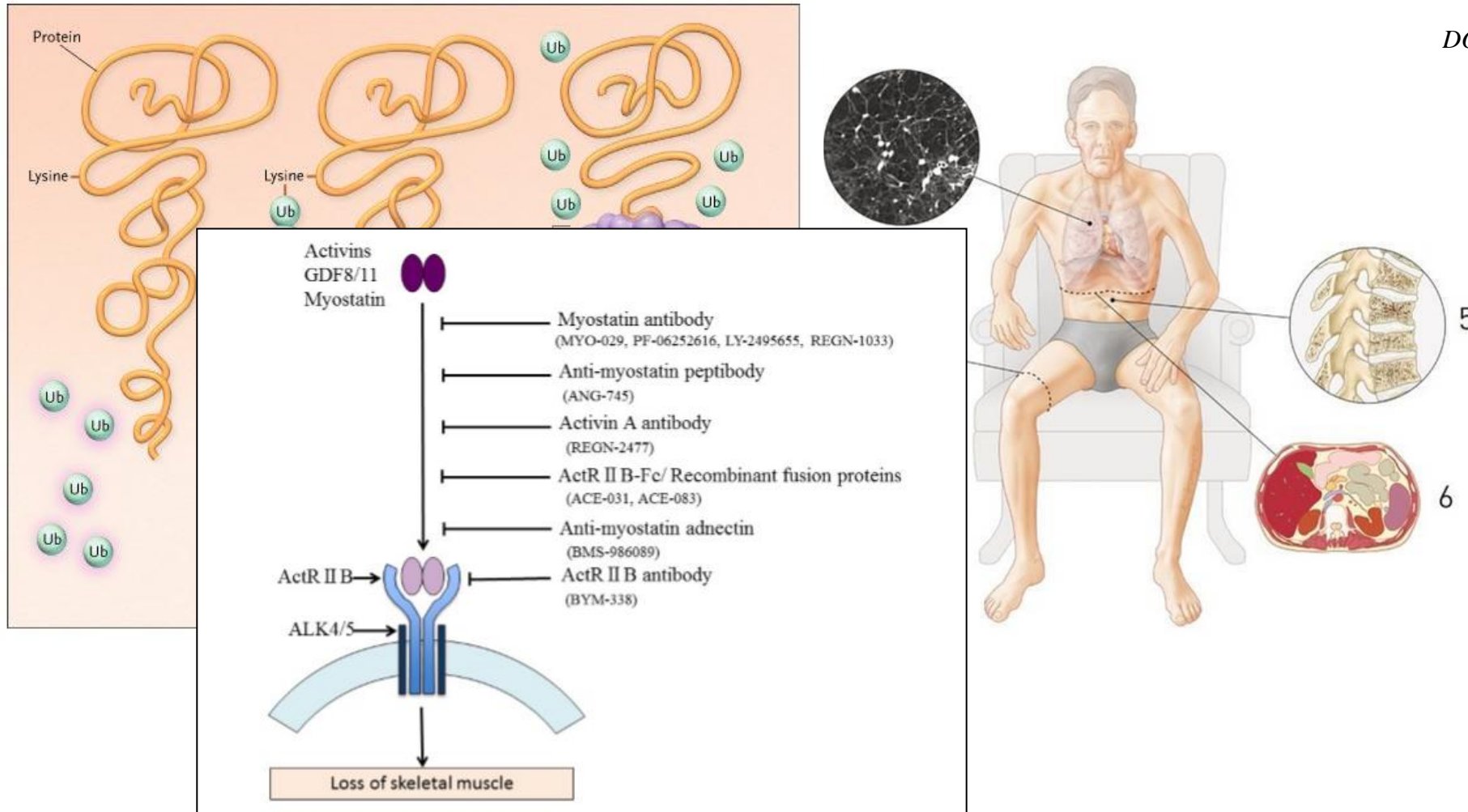
Mayo Clin Proc 2017;1:57-

European Respiratory Review 2019;28:190049

DOI: <https://doi.org/10.1183/16000617.0049-2019>

JCL 2021; 131:e148372

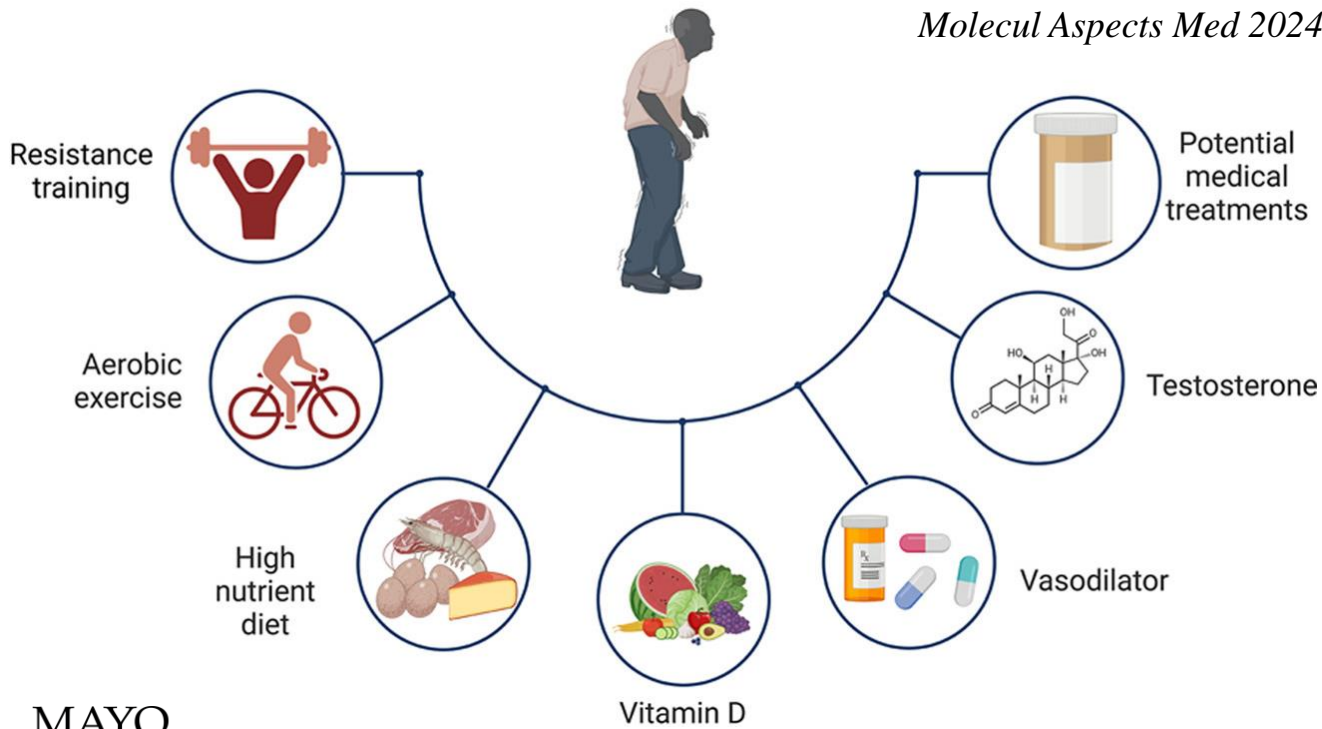
J Gerontol A Biol Sci Med 2023;78:32-



Saitoh M et al. JCSM 2017;2:1-10

Testosteron
SARMs
DHEA
IGF-1 / HGH
Vitamin D

...



BMJ Open
Respiratory
Research

Circulating testosterone levels and health outcomes in chronic obstructive pulmonary disease: results from ECLIPSE and ERICA

Outcome	Model adjustment	OR (95% CI)*	P value
ACM	Unadjusted	0.236	0.003
	Adjusted†	0.248	0.007
H-AECOPD	Unadjusted	0.665	0.314
	Adjusted†	0.610	0.255

BMJ Open Res 2023;10(1):e0011601

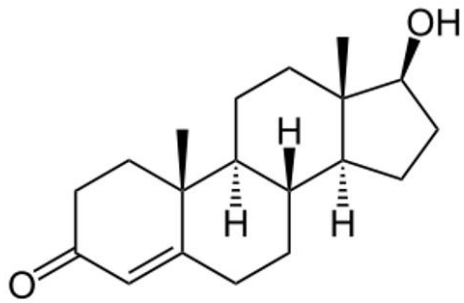


Mayo Clinics Proceedings 2017;1:57-66

	All-cause mortality			Myocardial infarction			Stroke		
	HR	95% CI	P	HR	95% CI	P	HR	95% CI	P
Univariate N=8137 vs 4418	0.495	0.448-0.547	<.001	0.622	0.455-0.852	.003	1.000	0.466-2.147	1.00
Propensity-matched (stabilized IPTW) N=8137 vs 4418	0.526	0.477-0.581	<.001	0.717	0.522-0.986	.04	1.069	0.652-1.754	.79

Zusammenfassung

1. Libidoverlust = Testosteronmangel (Eunuche)
2. Erektile Dysfunktion = neurovaskulär (Marlboro man)
3. Testosteron-Substitution des Hypogonadismus ist sicher,
(CAVE Schlafapnoe-Syndrom / chronischer Nikotinkonsum)
4. Therapie der Erektile Dysfunktion ebenfalls.
(CAVE Nitropräparate und MAO-Hemmer)
5. Testosteron und Osteosarkopenie bzw. Prognose bei COPD...



1. Physiologie der Gonadenachse
2. Hypogonadismus beim Mann
3. Testosteron beim kranken Mann
- 4. Hyperandrogenismus/Hirsutismus bei der Frau**
5. Transgender
6. Zusammenfassung



*Jusepe de Ribera (1591-1652)
La mujer barbuda*

Androgene bei der Frau

25%

Testosteron

25%

40%

Androstendion

60%

80%

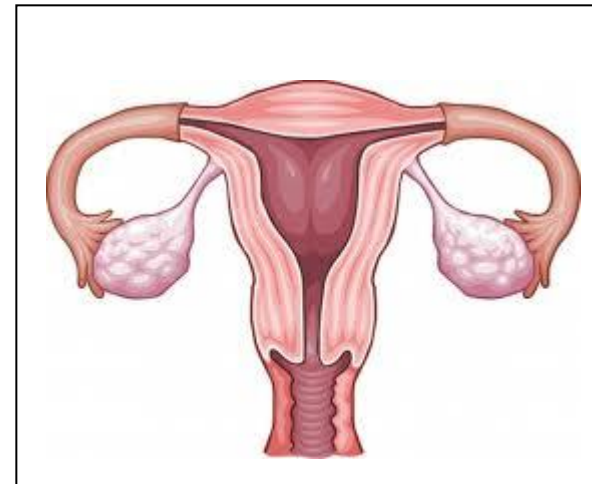
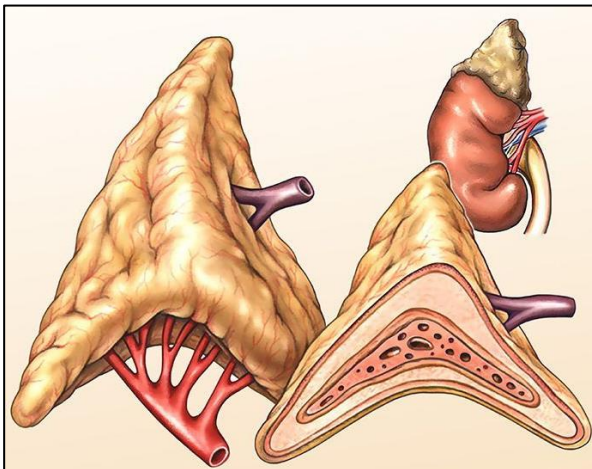
DHEA

20%

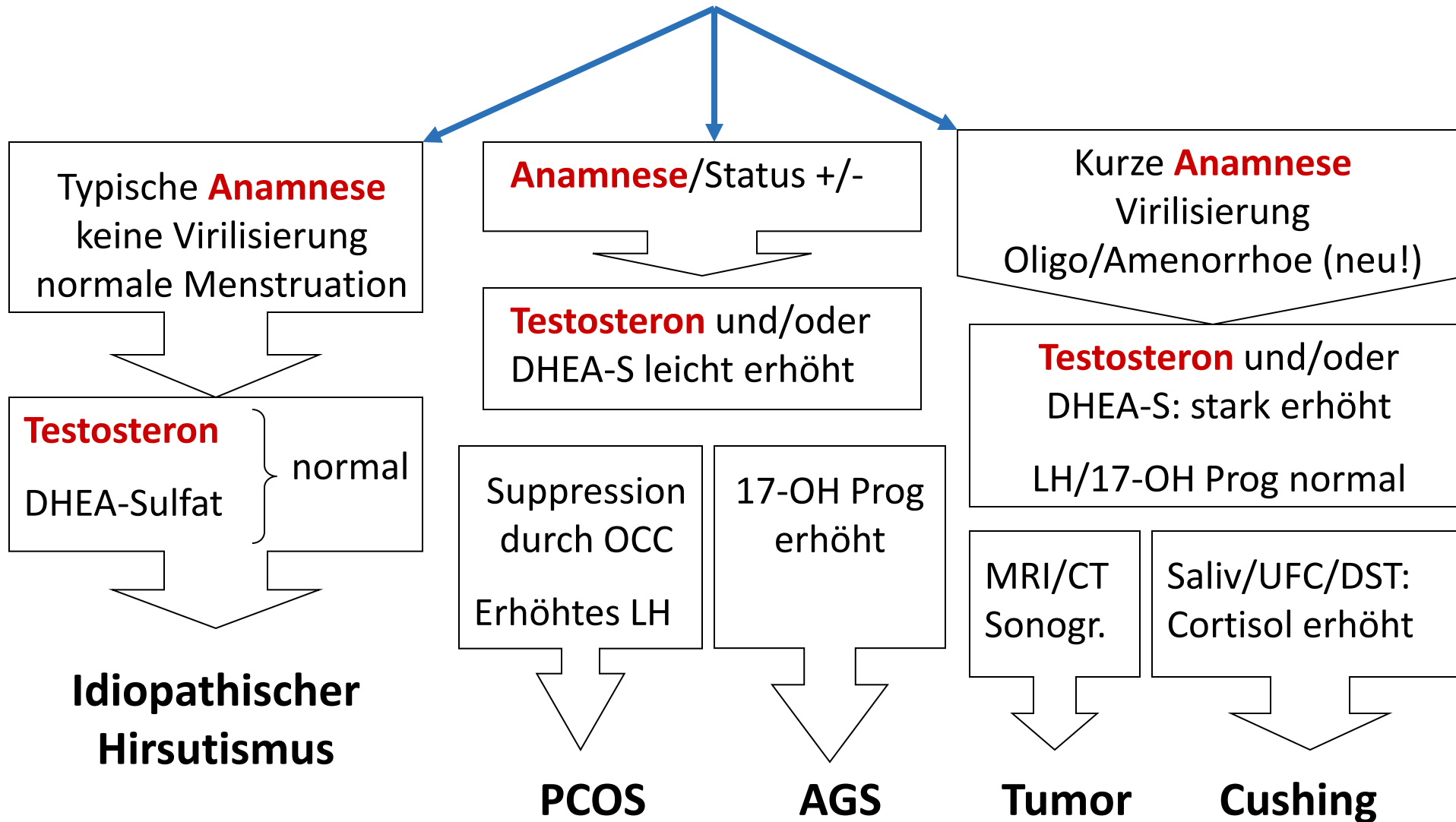
>95%

DHEA-Sulfat

<5%



Hirsutismus



Hirsutismus: Abklärung und Therapie

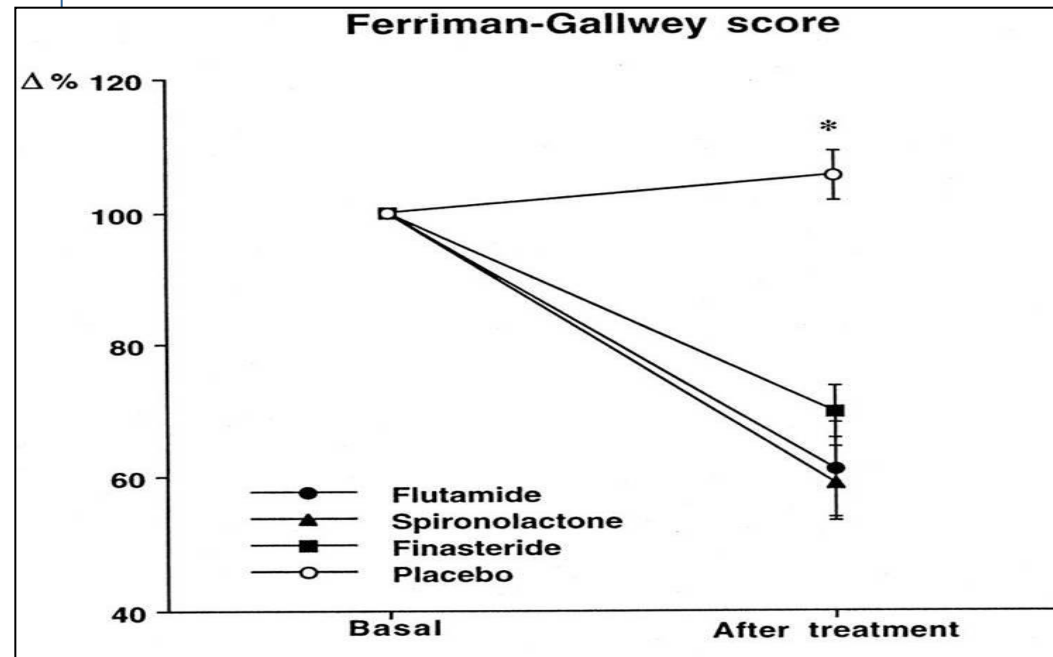
Typische Anamnese
keine Virilisierung
normale Menstruation

Testosteron } normal
DHEA-Sulfat }

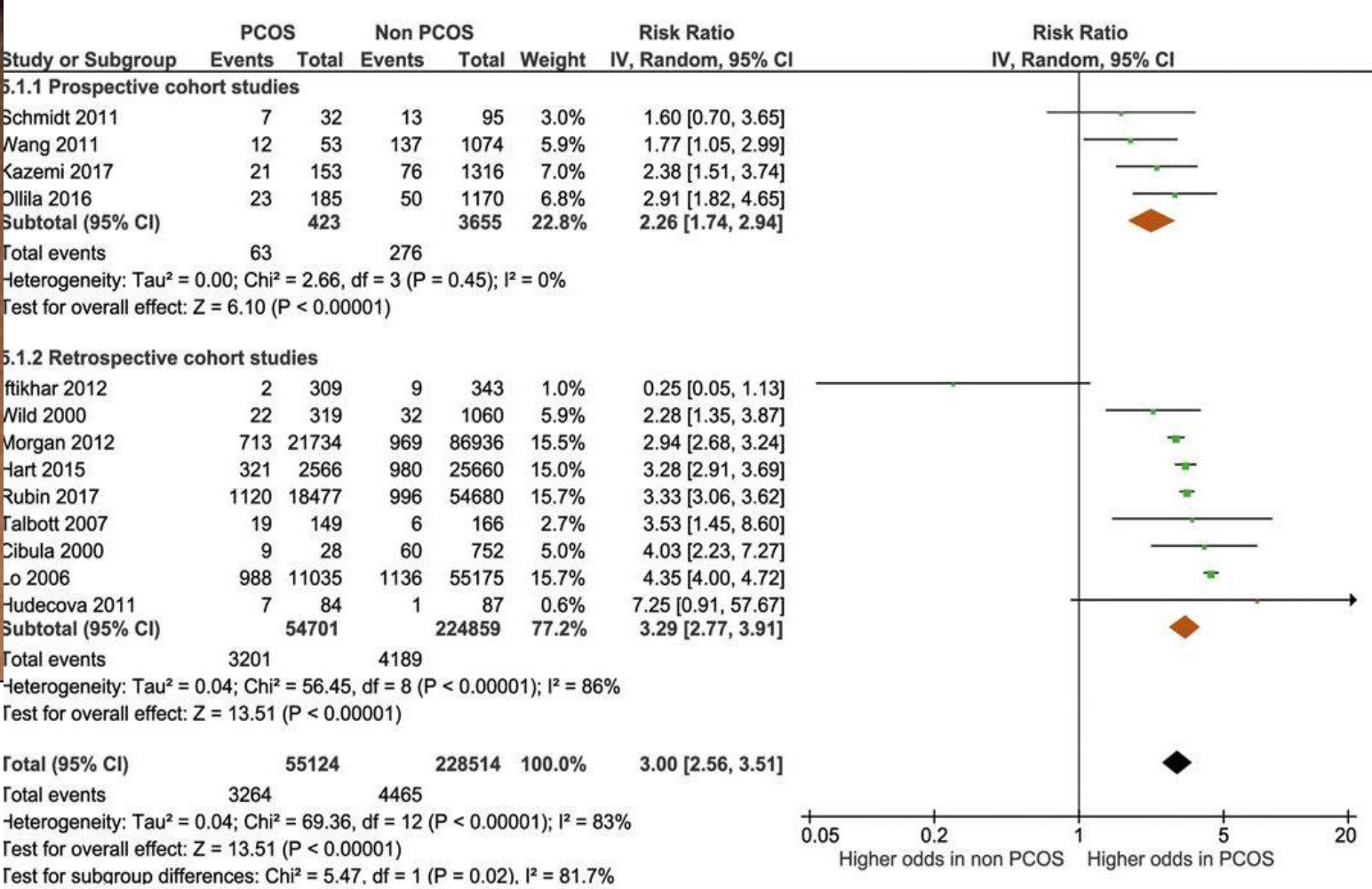
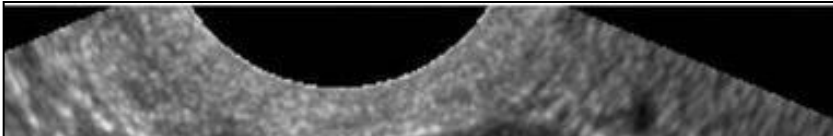
**Idiopathischer
Hirsutismus**

Therapie:

*Orale Antikonception (CPA Diane-35[®],
Elleacnelle[®], Minerva[®] etc.)
evtl. +Androcur[®] 25-50mg/10d*



Hirsutismus Abklärung und Therapie



Hirsutismus: Abklärung und Therapie

autosomal recessive

classical: 1:12'000

non-classical 1:1000

Ashkenazi 1:27

Yugoslavs 1:63

Italians 1:333

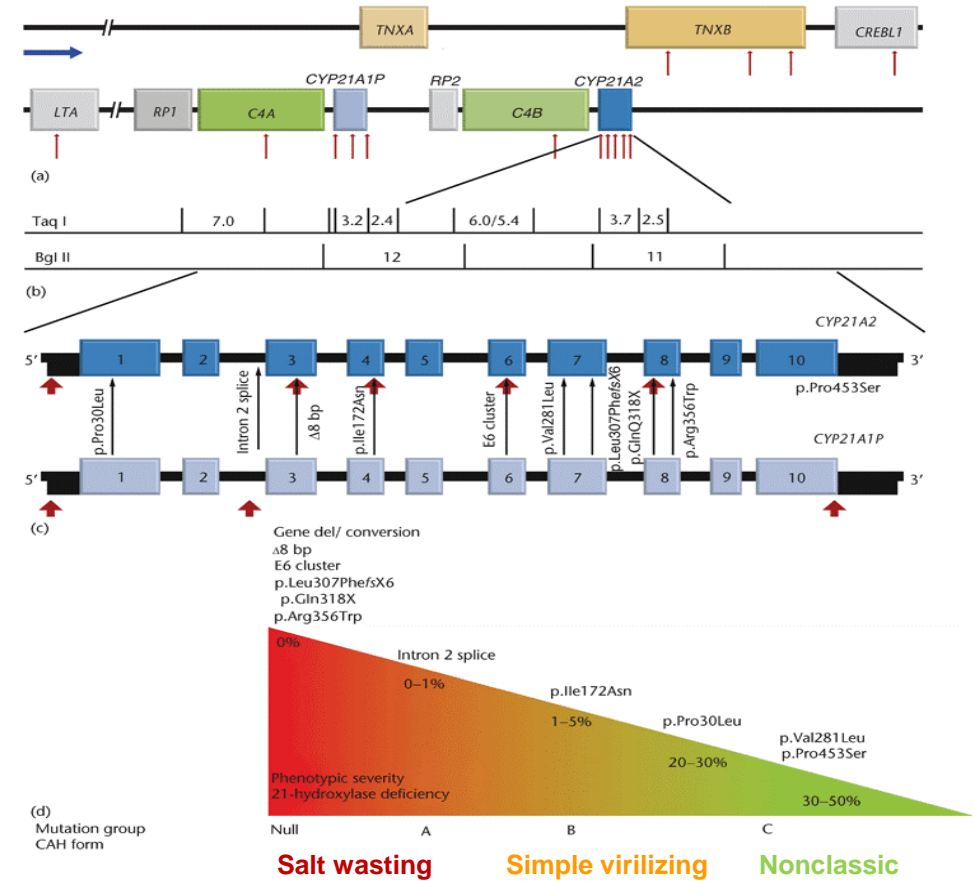
New M J, JCEM 2006;91:4205-

Typische Anamnese/
Status +/-

Testosteron und/oder
DHEA-S leicht erhöht

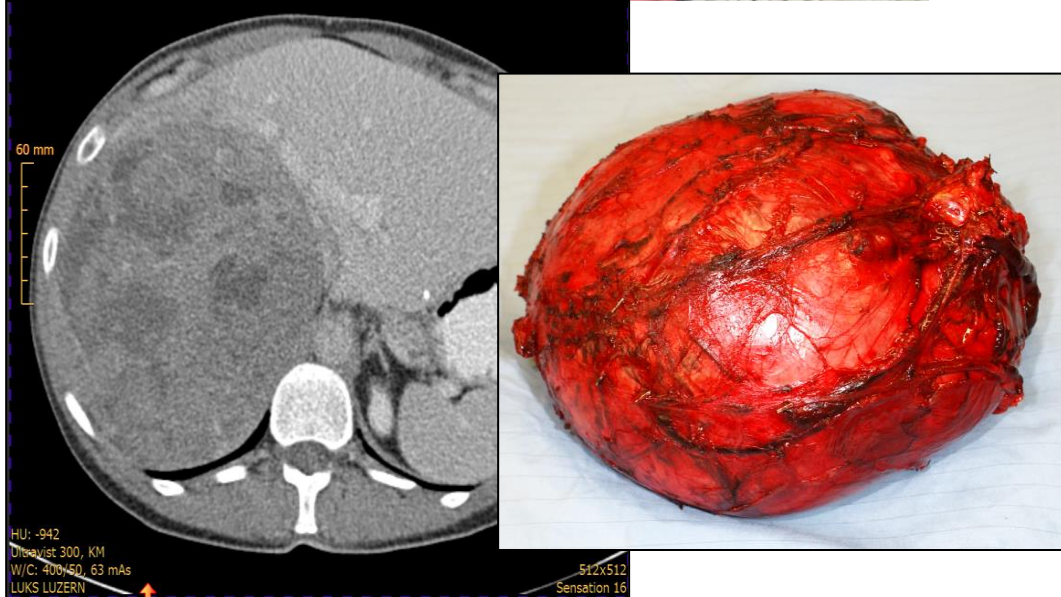
17-OH Prog
erhöht
(250 µg ACTH)

(Late-onset) Adrenogenitales Syndrom
AGS



Parajes S, Krone N; eLS 2012

Hirsutismus: Abklärung und Therapie



HU: -942
Ultraschall 300, KM
W/C: 400/150, 63 mAs
LUKS LUZERN

512x512
Sensation 16



Tumor

Cushing

Zusammenfassung

1. Androgene bei der Frau: Testosteron vs. DHEA-S
2. Häufigste Ursachen sind idiopathisch und PCOS
3. Hauptsymptom Hirsutismus (Ferriman-Gallwey)
4. CAVE Akne und Stimmbruch nach 30 Jahren!



Danke!

Lukas Cranach der Ältere
ca. 1530