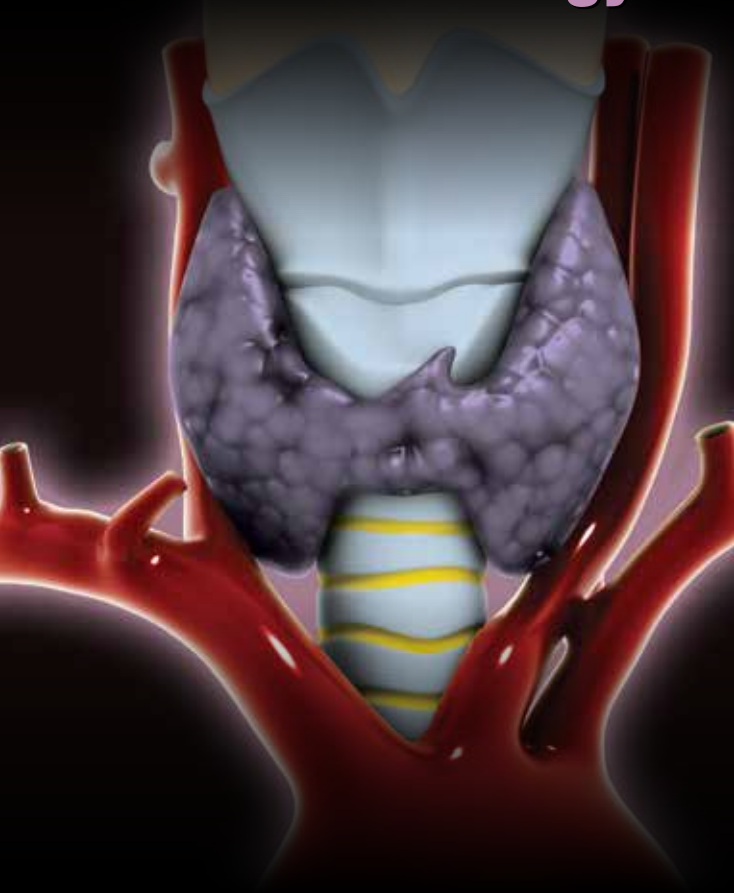


The A to Z of Endocrinology



Dr A. L. Neill

BSc MSc MBBS PhD FACBS

The A to Z of Endocrinology

Introduction

While writing the A to Z of the Reproductive and Sexual Organs it became apparent that a full discussion of the interactions of these organs was needed, along with the inclusion of the Thyroid gland, for which there had been many requests. Due to the complexity of hormonal interactions and their overlapping effects, flow charts, tables and abbreviations are used extensively in this book. "New" hormones are being discovered all the time, or "old" ones are being renamed, hence there is extensive cross referencing of hormone names.

The immune system and its detailed interactions needs an A to Z book of its own, so although discussed in this book, this subject will be dealt with extensively in *The A To Z of the Immune System*, in which the spectrum of autoimmune diseases, the detailed role of the thymus and the lymphatic system will also be closely examined.

The A to Zs may be viewed on 2 sites –

www.amandasatoz.com and

<http://www.aspenpharma.com.au/atlas/student.htm>

Feedback may be left at

anatomy.update@gmail.com / medicalamanda@gmail.com

and it is always appreciated.

Acknowledgement

Thank you Aspenpharmacare Australia particularly Greg Lan, Rob Koster, Richard Clement and Peter Penn, for your support and assistance. This is the 10th year of the A to Zs which continue to expand and now consist of 15 books, and other associated projects. They fill a need in the medical and health community, and cover the basic anatomical concepts in the normal and increasingly in the abnormal. And they continue to grow - thank you.

Dedication

To one of my dearest friends and colleagues Rob Koster. Thank you.

How to use this book

The format of this A to Z book has been maintained. The **Common Terms of Endocrinology section** contains brief summaries of terms & concepts necessary for the understanding of the influences & formation of this system. **The Hormone & Other Substances section** contains the **Hormone Table A to Z** which lists all the major hormones of the endocrine system. This section also includes other important influential substances e.g. the precursors of Hormones, the structures and basic chemistry of their components, the Amino acids & Cholesterol. It also includes the Vitamins.

The Organs & Tissues of Endocrinology section contains the **Endocrine Organs and their Hormones Table** which lists all the major Organs and the hormones they secrete. Additional information relating to these tables can be found in their respective sections in the A to Z format.

The section on **Pathways & Processes** summarizes the major hormone pathways and interactions

So as usual **think of it and then find it** is the motto of **the A to Zs** and continues to be the structure behind the books.

Thank you

A. L. Neill

BSc MSc MBBS PhD FACBS



TABLE OF CONTENTS

Introduction.....	1
Acknowledgement	1
Dedication	1
How to use this Book	1
Table of Contents	3
Abbreviations	6
Common Terms of Endocrinology	21

HORMONES & OTHER SUBSTANCES

Amino acids (AAs)	58
Adrenaline <i>see Adrenal Gland, Catecholamines</i>	
Aldosterone <i>see Kidney nephrons, Salt & Water balance</i>	
Antidiuretic Hormone (ADH) <i>see Kidney nephrons</i>	
Atrial Naturetic Hormone <i>see Fluid Balance</i>	
Calcium <i>see also Parathyroid & PTH</i>	84
hypercalcaemia	85
Catecholamines	86
Cholesterol	90
esterification for transport	90
functions	
precursor for steroid H	92
structure - properties	98
synthesis	100
transport <i>see Lipoproteins</i>	
Dopamine AKA Prolactin Inhibiting Factor (PIF) <i>see Catecholamines</i>	
Erythropoietin (EPO)	102
Fats AKA Fatty Acids (FAs) & Triglycerides (TGs)	106
Glucagon <i>see Glucose homeostasis</i>	

HORMONE TABLE - A TO Z

Hormones	110
Changes with Aging	132
Changes with Puberty	133
Steroid Hs	134

Insulin <i>see Glucose Homeostasis, Glucose Insulin release mechanism</i>	
Lipoproteins	142
Melatonin	146
Naturetic Hormones (Peptides) <i>see Fluid balance</i>	
Noradrenaline <i>see Catecholamines</i>	
Parathyroid H (PTH)	150
Progesterones <i>see Oestrogens</i>	
Proteins	156
formation	156
folding	158
filler structures	160
Renin <i>see Salt & Water Balance</i>	
Testosterone <i>see Catecholamines Cholesterol</i>	
Vitamins	162

ORGANS & TISSUES OF ENDOCRINOLOGY

ENDOCRINE ORGANS AND THEIR HORMONES	196
Adipose tissue	200
Adrenal glands <i>see Cholesterol</i>	
Breasts <i>see also Hormone changes with Puberty</i>	206
Corpus Luteum <i>see Menstruation</i>	
Hypothalamus	208
Hypophysis <i>see Pituitary</i>	
Grave's Ophthalmopathy <i>see Thyroid</i>	
Kidney <i>see also Erythropoietin</i>	214
Liver <i>see Erythropoietin</i>	
Ovary <i>see Cholesterol, Gonad differentiation & development</i>	
Pancreas	216
Parathyroid gland <i>see also Thyroid</i>	218
Pineal gland	222
Pituitary gland	224
Placenta	234
Prostate & Seminal vesicles	236

Testes	238
Thyroid <i>see also Parathyroid</i>	240
Grave's Ophthalmopathy AKA Thyroid eye disease	250
Pregnancy	252
Uterus	254
Vagina	256
Womb <i>see Uterus</i>	
Yellow body AKA Corpus Luteum <i>see Menstruation</i>	

PATHWAYS & PROCESSES

Fluid balance	258
Genitalia	260
differentiation & development	260
Glucose Homeostasis - regulation	262
Glucose - Insulin release mechanism	266
Gonads	268
differentiation & development	268
Menarche	272
Menopause	
Hormone changes	274
Bone changes	278
Organ pathophysiology	280
Menstruation AKA Menstrual cycle	282
Ovulation <i>see also Menstruation</i>	290
Salt & water balance - renin angiotensin aldosterone path <i>see also Kidney nephron</i>	294
Stress responses - hypothalamic-pituitary-adrenal axis	296

Abbreviations of the terms used in Endocrinology

5HT 5-hydroxytryptamine, serotonin

A

a	artery
aa	anastomosis (ses)
AA	amino acid
AAAH	aromatic amino-acid hydroxylase
AADC	aromatic L-amino acid decarboxylase
Ab	antibody
AB	antibiotic
ABC	ATP-binding cassette family of proteins
ABP	androgen binding protein
ACAT	acetyl-CoA: cholesterol acetyltransferase - permitting acetyl-CoA into the mitochondria
ACAT1	acetyl-CoA acetyltransferase 1; acetoacetyl-CoA thiolase , mitochondrial; involved in ketone body synthesis
ACAT2	acetyl-CoA acetyltransferase 2; acetoacetyl-CoA thiolase , cytoplasmic; involved in cholesterol biosynthesis
ACC2	acetyl-CoA carboxylase , expressed in heart, liver, skeletal muscle, mitochondrial targeting motif, found associated with CPT I
ACE	angiotensin converting enzyme
ACh	acetylcholine
AChR	acetylcholine receptor
ACOX1,2,3	peroxisomal fatty acyl-CoA oxidase 1, 2, & 3
ACP	acyl-carrier protein
ACTH	adrenocorticotrophic hormone / adrenal cortical H
ACS	acyl-CoA synthetase
ADH	antidiuretic hormone
ADP	adenosine diphosphate
Ag	antigen
AGL	glycogen debranching enzyme, GDE
AgRP	agouti-related peptide, hypothalamic neuropeptide antagonizes α -MSH
AI	adequate intake - referring to vitamins etc
AI	autoimmune
AID	autoimmune diseases / disorder
AIS	androgen insensitivity syndrome
AITD	autoimmune thyroid disease

AKA	also known as
alt	alternative
ALT	alanine transaminase AKA serum glutamate pyruvate transaminase
ALXR	lipoxin receptor
AMP	adenosine monophosphate
AMPK	AMP-activated protein kinase
ANP	atrial natriuretic peptide AKA atrial natriuretic factor ANF
ANS	autonomic nervous system
ant.	anterior
anti-If	anti-inflammatory
AP	action potential
APC	activated protein C
AR	androgen receptor
ARC	arcuate nucleus, region of the hypothalamus involved in feeding behaviour
art.	artery
AS	alternative spelling
ASP	acylation stimulating protein
AT	adipose tissue
ATGL	adipose triglyceride lipase
ATL	aspirin-triggered lipoxin
ATP	adenosine triphosphate, major biological E source

B

b	bone
B	blood
BAT	brown adipose tissue
BBB	blood brain barrier
bc	because
BCAA	branched-chain amino acid
BCKD	branched-chain α-ketoacid dehydrogenase
BF	blood flow
BGLAP	osteocalcin AKA bone- γ -carboxyglutamic-acid-containing-protein
BM	basement membrane / bone marrow
b/n	between
BMP	bone morphogenetic protein
BMR	basal metabolic rate
BNP	brain natriuretic peptide
BP	blood pressure

The A to Z of Endocrinology

BS	blood supply
BUN	blood urea nitrogen
BV	blood vessel

C

C	carbon
Ca / Ca ²⁺	calcium / calcium ion
CaCM	calcium calmodulin
CAH	congenital adrenal hyperplasia
cAMP	cyclic AMP
CAR	constitutive androstane receptor
CART	cocaine & amphetamine-regulated transcript; hypothalamic neuropeptide involved in feeding behaviour
CC	cerebral cortex
CCF	congestive cardiac failure / congestive heart failure
CCK	cholecystekinin
cdc	cell division cycle
CD	collecting ducts of the Ky
CDK	cyclin-dependent kinase
CEN	centromere
c.f.	as in / as demonstrated here
cGMP	cyclic GMP
CGRP	calcitonin gene related peptide
ChE	cholinesterase
CHO	carbohydrate
CK	creatine kinase
CL	corpus luteum
CLA	conjugated linoleic acid - ω -3 FA, purported to be helpful against obesity & DM2
cm	cell membrane
CNS	central nervous system
COC	combined oral contraceptives (i.e. oestrogens + progesterones)
COMT	catecholamine-O-methyltransferase
CORT	cortistatin
CoQ	coenzyme Q; ubiquinone
COX	cyclo oxygenase; COX1 & COX2
CP	creatinine phosphate
CPK or CK	creatine phopshokinase: creatine kinase
CRBP	cellular retinol binding protein
CREB	cAMP response element-binding protein
CRF	corticotropin-releasing factor (hormone)

CSF	colony stimulating factor / cerebrospinal fluid
CT	connective tissue
CVA	cerebrovascular accident AKA stroke
CVD	cardiovascular disease
CVS	cardiovascular system
CYP	nomenclature prefix for cytochrome P450 class of enzymes
CYP7A1	cholesterol 7-hydroxylase ; rate-limiting enzyme of classic pathway for bile acid synthesis
CYP8B1	sterol 12α-hydroxylase; bile acid synthesizing enzyme
CYP11A1	P450 side-chain cleavage enzyme, AKA desmolase AKA cholesterol desmolase, 20,22 desmolase ; involved in steroid H synthesis
CYP11B1	11β-hydroxylase, AKA P450c11 ; involved in steroid H synthesis
CYP11B2	aldosterone synthase, AKA 18α-hydroxylase or P450c18 ; involved in adrenal steroid hormone synthesis
CYP17A1	has 2 activities: 17α-hydroxylase & 17,20-lyase, AKA P450c17 ; involved in steroid H synthesis
CYP19A1	aromatase, AKA oestrogen synthetase ; involved in steroid H synthesis
CYP21A2	21-hydroxylase ; involved in steroid H synthesis; AKA CYP21 & CYP21B

D

DCT	distal convoluted tubules (of the Ky)
DDx	differential diagnosis
DG	diglycerides
DHA	docosahexaenoic acid; important ω -3 FA
DHAP	dihydroxyacetone phosphate
DHEA	dehydroepiandrosterone AKA androstenolone AKA prasterone
DHEA-S	dehydroepiandrosterone sulphate
DHT	dihydrotestosterone
DKA	diabetic ketoacidosis
DLMO	dim light melatonin onset
DM	diabetes mellitus
DM1	Diabetes mellitus type 1 – insulin dependant
DM2	Diabetes mellitus type 2 – non –insulin dependant
DMG	dimethylglycine
DMN	dorsomedial hypothalamic nucleus; involved in stimulating GIT activity
DNP	dinitrophenol; compound that uncouples e flow from ATP production
DOC	deoxy-corticosterone

The A to Z of Endocrinology

Dol	dolichol
DOPA	3,4-dihydrophenylalanine
DSI	depolarization-induced suppression of inhibition; a term relating to neurochemical transmission in the CNS
DT	digestive tract

E

e	electron
E	energy
EC	extracellular
ECF	extracellular fluid
ECM	extracellular matrix
ECT	extracellular T
EFA	essential fatty acids
EGF	epidermal growth factor
eNOS	endothelial nitric oxide synthase
EOM	extra ocular muscles
EPA	eicosapentaenoic acid; important ω -3 FA, precursor for PGs & PGIs
EPI	extrinsic pathway inhibitor
EPO	erythropoietin
ER	endoplasmic reticulum

F

F6P	fructose -6-phosphate
FA	fatty acids
FAAH	fatty acid amide hydrolase
FABP _c	cytosolic FA-binding protein
FAP α	fibroblast activation protein alpha
FAS	fatty acid synthase
FATP	fatty acid transport protein; six family members FATP1 – FATP6
FFA	free fatty acid
FGF	fibroblast growth factor
FGFR	fibroblast growth factor receptor
FH	familial hypercholesterolemia
FIZZ	found in inflammatory zone: a family of proteins that includes resistin AKA FIZZ3
FPG	fasting plasma glucose
FPP	farnesyl pyrophosphate
FSH	follicle-stimulating hormone

G

GA	golgi apparatus
GOS2	G ₀ /G ₁ switch protein 2; peptide inhibitor of adipose TG lipase (ATGL) expressed by mononuclear cells
G1P	glucose-1-phosphate
G6P	glucose 6-phosphate
GABA	γ-amino butyric acid
GAD	glutamic acid decarboxylase
GAG	glycosaminoglycan
GAL	galanin
GALT	gut associated lymphoid tissue
GAP	GTPase activating protein
GB	gall bladder
Gb3	globotriaosylceramide; predominant glycolipid accumulating in Fabry disease, a lysosomal storage disease
GBD	glycogen-binding domain
GCC	glycine cleavage complex
GCG	glucogen
G-CSF	granulocyte colony stimulating factor
GD	Grave's disease
GDE	glycogen debranching enzyme AKA amylo-1,6-glucosidase, AGL
GEF	guanine nucleotide exchange factor
GF	growth factor
GFAT	glutamine:fructose-6-phosphate aminotransferase 1
GFR	glomerular filtration rate
GH	growth hormone AKA somatotropin
GIF	growth hormone-inhibiting factor AKA somatostatin AKA GIH growth hormone-inhibiting hormone (GHIH)
GIP	glucose-dependent insulinotropic peptide AKA gastric inhibitory peptide
GIT	gastrointestinal tract (stomach → LI)
GlcNAc	<i>N</i> -acetylglucosamine
gld	gland
GLP-1, -2	glucagon-like peptide 1, -2
GLUT	glucose transporter (< 14 members) commonest GLUT1 → GLUT5
GM	grey matter
GM-CSF	granulocyte-macrophage colony stimulating factor
GnRF	gonadotropin-releasing factor (hormone)
GPAT	glycerol-3-phosphate acyltransferase
GPCR	G-protein coupled receptor

The A to Z of Endocrinology

GR	glucocorticoid receptor
GRACILE	growth retardation, aminoaciduria, cholestasis, iron overload, lactic acidosis, early death
GRF	growth hormone releasing factor AKA growth hormone releasing hormone (GRH) (also -GHRH / GHRF)
GS	glycogen synthase AKA synthetase
GSD	glycogen storage disease
GSH	glutathione
GSK	glycogen synthase kinase

H

H	hormone / hydrogen
HADH	hydroxyacyl-CoA dehydrogenase/3-ketoacyl-CoA thiolase/enoyl-CoA hydratase , subunit of the mito. trifunctional protein (MTP) that catalyses the last 3 steps of mito. FA β -oxidation
hCG	human chorionic gonadotropin / trophin
HDL	high density lipoprotein
HF	hair follicle
HFCS	high fructose corn syrup
HGF	hepatocyte growth factor
HIOMT	hydroxyindolo-O-methyltransferase
HIV	human immunodeficiency virus
HMGR	HMG-CoA reductase, 3-hydroxy-3-methylglutaryl-CoA reductase
hPL	human placental lactogen
HR	heart rate
HRE	hormone response element
HRT	hormone replacement therapy
HSL	hormone-sensitive lipase
HT	hormone therapy
HTGL	hepatic triglyceride lipase

I

IAA	insulin auto-antibodies: anti-insulin antibodies
IAPP	amylin AKA islet amyloid polypeptide
IBABP	intestinal bile acid binding protein AKA FA-binding protein 6: FABP6
ic	intracellular
ICAM-1	intercellular cell adhesion molecule-1
ICCA	islet cell cytoplasmic antibodies
ICSA	islet cell surface antigen

IDDM	insulin-dependent diabetes mellitus AKA DM1
If	inflammation / inflammatory
IF	inhibiting factors
IFG	impaired fasting glucose
IFR	inflammatory response
IGF-1 -2	insulin-like growth factor 1 -2
IGFBP	insulin-like growth factor binding protein
IL	interleukin
IMR	immune response
In	infection
INF or IF	interferon: α -IFs are leukocyte-derived, β -IFs are fibroblast-derived, γ -IFs are lymphocyte derived
INS	insulin
IoL	islets of Langerhans
IR	insulin resistance
IU	international units
Iy	injury

J

JGA	juxtaglomerular apparatus of the kidney
-----	-----------------------------------------

K

KB	ketone body / ketones
Ky	kidney

L

L	left
LACI	lipoprotein-associated coagulation inhibitor
LAD	leukocyte adhesion deficiency
LAL	lysosomal acid lipase ; important lysosomal enzyme involved in lipid metabolism; deficiency in LAL results in Wolman disease
LBP	L-bifunctional protein; involved in peroxisomal fatty acid β -oxidation
LCAD	long chain acylCoA dehydrogenase
LCAT	lecithin cholesterol acyltransferase
LCFA	long-chain fatty acid
LDL	low density lipoprotein
LDLR	low density lipoprotein receptor
LH	luteinizing hormone

The A to Z of Endocrinology

LHRF	luteinizing hormone releasing factor
LI	large intestine
LN	lymph node
LNS	Lesch-Nyhan syndrome
LoH	loop of Henle (in the Ky)
LOX	lipoxygenase; 3 members of enzyme family: LOX-5, LOX-12 & LOX-15
LP	lamina propria
LPH	lipotrophin AKA lipotropin
L-PK	liver isoform of pyruvate kinase
LPL	lipoprotein lipase
LPL	lysophospholipid
LT	lymphoid tissue
LT	leukotriene
LX	lipoxin

M

MAO	monoamine oxidase
MCAD	medium-chain acyl-CoA dehydrogenase
MCD	malonyl-CoA decarboxylase
MCH	melanin concentrating hormone
MCP	monocyte chemotactic protein
M-CSF	macrophage colony stimulating factor
MD	macula densa cells of the kidney - distal part of the ascending limb of the LoH closely associated with the JGA
mem	membrane
MFS	Marfan syndrome
mØ	macrophage
MGL	monoacylglyceride lipase
MIP	mØ inhibitory protein
mm	mucous membranes
MMP	matrix metalloproteinase
mRNA	messenger ribonucleic acid
MPS	mucopolysaccharidosis; lysosomal storage diseases
MRT	metabolic rate
MR	mineralocorticoid receptor
mRNA	messenger RNA
MSH	melanocyte-stimulating hormone
MSUD	maple syrup urine disease
MTP	mitochondrial trifunctional protein; carries out the last three reactions of mitochondrial fatty acid β -oxidation
mu	muscle

N

N	nerve cell , neuron, nerve
NAD	normal / no abnormality
NADH	nicotinamide adenine dinucleotide
NADPH	nicotinamide adenine dinucleotide phosphate
NAT	serotonin-N-acteyl-transferase
N-CAM	neural cell adhesion molecule
NE	niacin equivalents
NEFA	non-esterified fatty acid
NGF	nerve growth factor
NGFR	nerve growth factor receptor
NHE	sodium hydrogen exchanger
NIDDM	non-insulin-dependent diabetes mellitus AKA DM2
nm	nuclear membrane
NO	nitric oxide
NOS	nitric oxide synthase : 3 types: nNOS (neuronal NOS, NOS-1) iNOS (inducible NOS, NOS-2) , eNOS (endothelial NOS, NOS-3)
NPY	neuropeptide tyrosine
NS	nervous system / nerve supply
NSAID	non-steroidal anti-inflammatory drug
NT	neural tissue / nerve tissue
NTS	nucleus of the solitary tract (NTS for Lt. term <i>nucleus tractus solitarii</i>), specialized cells w/n the medulla responsible for sensations of taste & visceral sensations of stretch

O

OAA	oxaloacetic acid
OC	oral contraceptives
OD	overdose
OGTT	oral glucose tolerance test
OI	osteogenesis imperfecta
OP	osteoporosis
OPG	osteoprotegerin AKA osteoclastogenesis inhibitory factor
OPN	osteopontin
OSCP	oligomycin sensitivity-conferring protein; a protein that connect the F1 & F0 proteins of ATP synthase in the mitochondria
OTC	ornithine transcarbamoylase

P

P	phosphate
P450	cytochrome P450 AKA CYP
P450c11	proper nomenclature is CYP11B1; 11β-hydroxylase
P450c17	has 2 activities: 17α-hydroxylase & 17,20-lyase ; properly called CYP17A1
P450c18	proper nomenclature is CYP11B2: aldosterone synthase , AKA 18α-hydroxylase
P450c21	proper nomenclature is CYP21A2: 21-hydroxylase ; AKA CYP21 or CYP21B
P450ssc	proper nomenclature is CYP11A1: P450 side-chain cleavage enzyme , AKA desmolase, cholesterol desmolase, & 20,22 desmolase
PABA	4-aminobenzoic acid AKA para-aminobenzoic acid
PAF	platelet activating factor
PAI	plasminogen activator inhibitor; PAI-1, PAI-2
PaP	pancreatic polypeptide
PCOS	polycystic ovarian syndrome
PCR	polymerase chain reaction
PCT	proximal convoluted tubules (of the Ky)
PDGF	platelet-derived growth factor
PEP	phosphoenolpyruvate
PEX	designation for peroxisomal proteins
PG	prostaglandin
PGD	prostaglandin D major prostaglandin produced by mast cells involved in asthma & other allergies
PGI	prostacyclin
PGK	phosphoglycerate kinase
PGS	prostaglandin synthase; prostaglandin endoperoxide synthetase
pI	isoelectric point
PIF	prolactin-release inhibiting factor (hormone)
PIH	prolactin inhibiting hormone AKA Dopamine
pit.	pituitary
PK	pyruvate kinase
PKA	cAMP-dependent protein kinase
PKC	Ca²⁺-phospholipid-dependent protein kinase
PKD	DNA-dependent protein kinase
PKG	cGMP-dependent protein kinase
PKU	phenylketonuria
pl	plural
PLA ₂	phospholipase A₂

PLP	pyridoxal phosphate
PMN	polymorphonuclear leukocyte
PMT	premenstrual tension
PN	peripheral nerve
PNS	peripheral nervous system
PO	phosphate
post.	posterior
PP	polypeptide
PP	protein phosphatase
PPI	protein phosphatase inhibitor
PPP	pentose phosphate pathway
PGR	progesterone receptor
PPT	postpartum thyroiditis
PRF	prolactin-releasing factor
pro-If	pro-inflammatory
pro-IF	
prot.	protein
PRL	prolactin
PTH	parathyroid hormone
PTK	protein tyrosine kinase
PTP	protein tyrosine phosphatase
PUFA	polyunsaturated fatty acid
PVN	paraventricular nucleus, hypothalamic region involved in Oxytocin & ADH release
PVR	peripheral vascular resistance
PWS	Prader-Willi syndrome
PYY	peptide tyrosine tyrosine

R

R	right / amino acid side chain
R5P	ribose-5-phosphate
RANK	osteoclast surface receptor - binds to RANKL
RAAS	renin-angiotensin-aldosterone-system
RANKL	receptor activator of nuclear factor-kappaB ligand
RAR	retinoic acid receptor
RBC	red blood cell
RBM	red bone marrow / haemopoietic (blood forming) bone marrow
RBP	retinol binding protein
RDS	respiratory distress syndrome
RDA	recommended dietary intake AKA recommended daily allowance
RER	rough endoplasmic reticulum

The A to Z of Endocrinology

RF	releasing factors / releasing hormone
RIA	radioimmunoassay
RLN	relaxin
RNA	ribonucleic acid
ROS	reactive oxidative species AKA free radicals
rRNA	ribosomal RNA
RT	reverse transcription, reverse transcriptase
RTK	receptor tyrosine kinase
RXR	retinoid X receptor

S

SAA	serum amyloid A
SA	sexual activity
SCAD	short chain acylCoA dehydrogenase
SCN	suprachiasmatic nuclei
SE	side effects
SER	smooth endoplasmic reticulum
SGLT2	sodium-glucose co-transporter: target for treatment of hyperglycaemia in diabetes
SGOT	serum glutamate oxalate transaminase
SGPT	serum glutamate pyruvate transaminase
SHBG	sex hormone binding globulin
SI	small intestine
SIF	somatostatin, = GIF
sing	singular
SKM	skeletal muscle / striated muscle
SLE	systemic lupus erythematosus
SM	smooth muscle
SMRT	silencing mediator of retinoid & thyroid H receptor
SNS	sympathetic nervous system
SR	sarcoplasmic reticulum
SREBP	sterol-regulatory element binding protein
SRSA	slow-reacting substance of anaphylaxis
SS	signs & symptoms
SSBG	sex steroid binding globulin (AKA SHBG)
SSRI	selective serotonin reuptake inhibitor
StAR	steroidogenic acute regulatory protein; rate-limiting enzyme of steroidogenesis
STAT	signal transducers activators of transcription
subcut	subcutaneous
supf	superficial
SV	seminal vesicles

SymNS sympathetic nervous system

T

T	tissue
T3	triiodothyronine
T4	thyroxine
TAG	triacylglyceride, triacylglycerol
TAK1	transforming growth factor-β-activated kinase 1
TAT	tyrosine aminotransferase
TGA	therapeutic goods administration
TBG	thyroid binding globulin (binds TH in the B)
TCR	T-cell antigen receptor
TED	thyroid eye disease AKA Grave's ophthalmopathy
TEL	telomere
TFII	transcription factors that regulate the activity of RNA polymerase II
TFM	testicular feminization syndrome
TFPI	tissue factor pathway inhibitor
TGA/TG	triglyceride
TGF	transforming growth factor
TH	non specific thyroid H made up of T ₃ & T ₄
THF	tetrahydrofolate
THP	tryptophan hydroxylase
TNF	tumor necrosis factor, α & β
TNF- α	tumor necrosis factor- α
TNF- β	tumor necrosis factor- β
tPA	tissue plasmogen activator
TPP	thiamine pyrophosphate
TPO	thyroid peroxidase
TR	thyroid hormone receptor
TRF	thyrotropin-releasing factor AKA thyroid hormone releasing hormone (TRH)
tRNA	transfer RNA / transport RNA
TSAb	thyroid stimulating autoantibodies; bind to TSH receptor mimicking TSH action, leads to hyperthyroidism of Graves disease
TSH	thyroid-stimulating hormone
TSI	thyroid stimulating immunoglobulins
Tx	treatment
TX	thromboxane
TZD	thiazolidinedione

U

UCD	urea cycle disorder
UCP1	uncoupling protein 1, AKA thermogenin

V

V	veins
v	very
VCAM	vascular cell adhesion molecule
VDR	vitamin D receptor
VEGF	vascular endothelial growth factor
VHL	von-Hippel-Lindau syndrome
VIP	vasoactive intestinal peptide
Vita	vitamin
VLCFA	very long-chain fatty acid
VLCS	very long-chain acyl-CoA synthetase ; AKA FA transport protein
VLDL	very low density lipoprotein
VMN	ventromedial nucleus; hypothalamic region involved in satiety (sensation of being full)
VSGP	vertical supranuclear gaze palsy
vWF	von Willebrand factor

W

WAT	white adipose tissue
w/n	within
w/o	without
wrt	with respect to

X

XP	xeroderma pigmentosum
----	-----------------------

V

ZF	zona fasciculata
ZG	zona glomerulosa
ZR	zona reticularis
&	and
ω	omega

Cholesterol

Pathway of synthesis from acetyl CoA

Biosynthesis - Acetyl CoA formed from the oxidation of FAs or pyruvate in the mitochondria, OR from acetate or ethanol in the cytoplasm & it is the precursor of cholesterol.

The rate limiting irreversible step of cholesterol synthesis is when **HMG-CoA-reductase** converts (acetyl CoA) X3 → 3 hydroxy-3-methylglutaryl-CoA (HMG-CoA). (**site of action of most statin drugs*)

The process of cholesterol synthesis has five major steps:

- 1. Acetyl-CoAs X3 are converted to 3-hydroxy-3-methylglutaryl-CoA (HMG-CoA)**
- 2. HMG-CoA is converted to mevalonate**
- 3. Mevalonate is converted to the isoprene based molecule, isopentenyl pyrophosphate (IPP), losing CO₂**
- 4. IPP is converted to squalene**
- 5. Squalene is converted to cholesterol**

Regulation of cholesterol synthesis

The cellular supply of cholesterol is maintained at a steady level by 3 distinct mechanisms:

- 1. Regulation of HMG-CoA activity & levels**
- 2. Regulation of excess ic free cholesterol through **ACAT****
- 3. Regulation of plasma[cholesterol] levels via LDL receptor-mediated uptake & HDL-mediated reverse transport.**

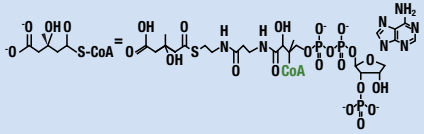
The LDL receptor scavenges circulating LDL from the BS, whereas **HMG-CoA reductase** leads to an ↑ of endogenous production of cholesterol.

Cholesterol synthesis is halted when ATP levels are low, &/or exogenous cholesterol levels are high.

acetyl CoA +
acetoacetyl CoA

HMG CoA
synthase

HMGCoA



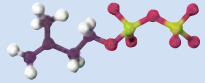
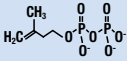
*

HMG CoA
reductase

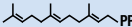
mevalonate



IPP



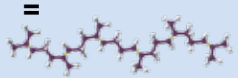
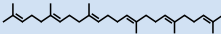
farnesyl PP



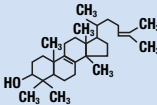
→ structural proteins

C₃₀

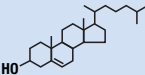
squalene



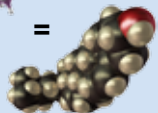
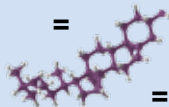
lanosterol



cholesterol



→ steroid Hs
vitamin D
bile acids



Erythropoietin (EPO) AKA haematopoietin AKA haemopoietin

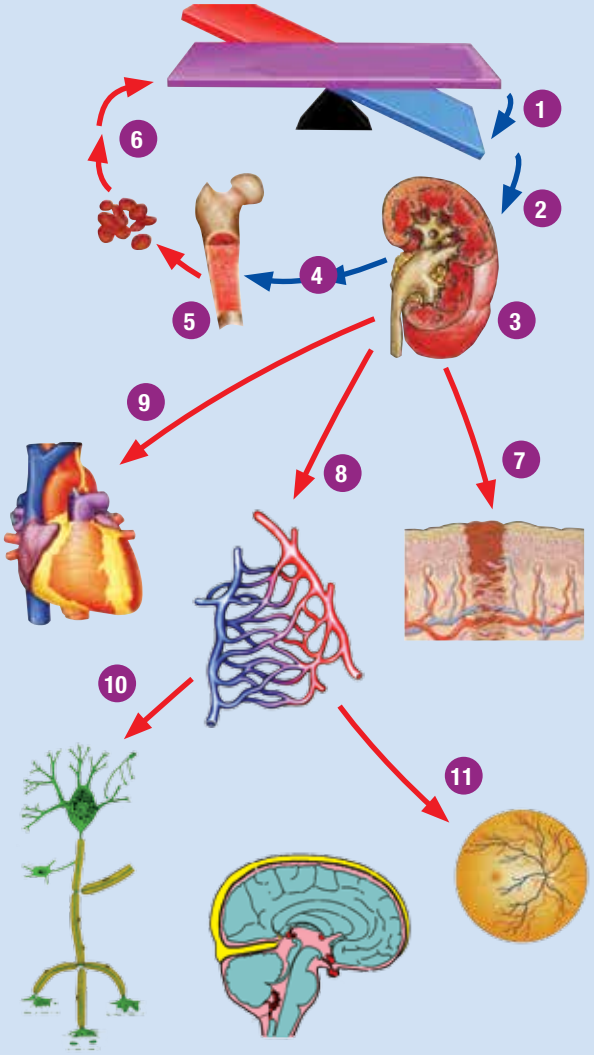
Schema EPO regulating erythropoiesis

Non haematopoietic roles of EPO

EPO's major function is to control erythropoiesis, or RBC production. In the presence of hypoxia levels may increase 1000X & signal the RBM to produce more precursors of RBC e.g. pro-erythroblasts, while also protecting RBCs from programmed cell death - apoptosis, in the RBM, liver & spleen.

EPO has other functions. It helps prevent the formation of foam cells from monocytes, by ↓ their ability to take up LDLs, & its anti-IF effects protects damaged neurological & cardiovascular T, particularly in AI diseases.

- 1 ↓ levels of O₂ in the B...
- 2 are detected by the kidneys (JGA & MD cells)
- 3 which stimulate renal peritubular & glomerular mesangial cells to produce EPO
- 4 ↑ circulating EPO ...
- 5 activates RBM to ...
- 6 ↑ RBC production, ↑ O₂ carrying capacity in the B
- 7 EPO also ↑ rate of wound healing due to its
- 8 stimulation of angiogenesis, which protects
- 9 cardiovascular T
- 10 neural T including the Brain &
- 11 the retina



Erythropoietin (EPO) 2

AKA haematopoietin AKA haemopoietin

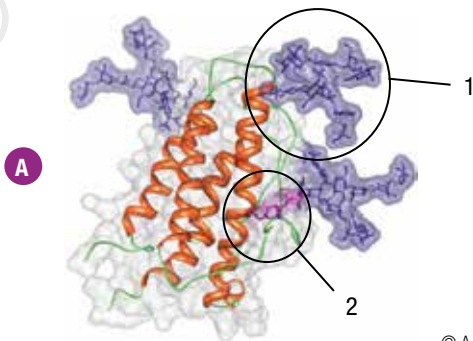
A Structure of EPO - glycosylated

B Major sites of synthesis of EPO - Kidney

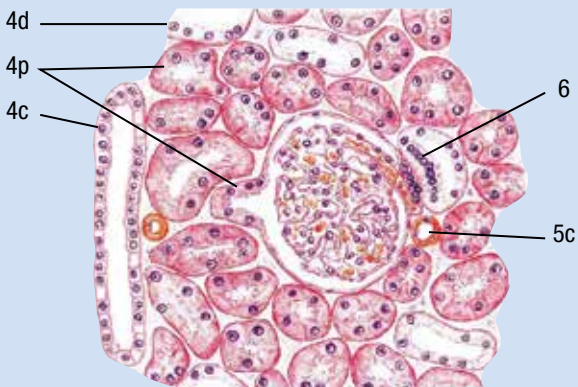
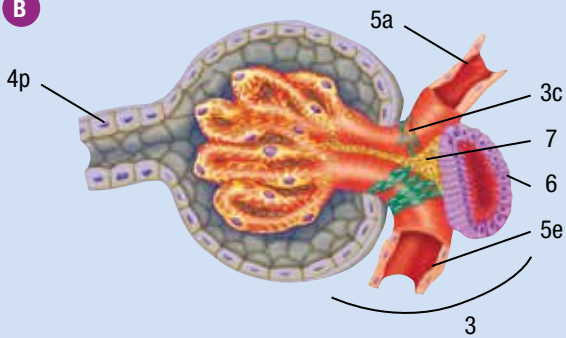
C Supplementary site of EPO synthesis - Liver

EPO is at least 40% glycosylated in circulation with the number and types of sugars ie its various glycoforms modulating its effects. It is produced by the interstitial fibroblasts in the kidney, mesangial cells (7) in close association with peritubular capillaries & tubular epithelium (4), & it has quite diverse effects on different Ts, possibly because of these different forms. It is also produced in peri-sinusoidal cells of the liver.

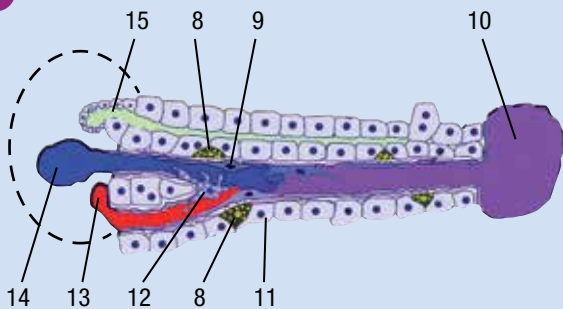
- | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>1 high mannose oligosaccharide, bonded to the EPO in this glycoform, via N bonds</p> <p>2 single glycan - O-linked</p> <p>3 JGA / c = periarteriolar cells of the JGA</p> <p>4 tubular cells / d = DCT / p = PCT / c = collecting ducts</p> <p>5 arterioles / a = afferent / e = efferent / c = peritubular capillaries</p> | <p>6 MD</p> <p>7 mesangial cells</p> <p>8 perisinusoidal cells AKA stellate cells AKA Ito cells</p> <p>9 endothelial cells + space of Disse</p> <p>10 central vein</p> <p>11 hepatocyte</p> <p>12 Kupfer cell</p> <p>13 hepatic arteriole</p> <p>14 portal vein</p> <p>15 bile duct</p> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



B



C



Fatty Acids (FAs) & Triglycerides (TGs)

representations of FAs

FAs are carboxylic acids with a long aliphatic chain (straight hydrocarbon chain). If the bonds b/n the C & H are all single then the FA is *saturated* & each C in the chain has 4 covalent bonds. If there are any 2X bonds b/n the C atoms then the FA is *unsaturated* & has the potential to covalently bind to further atoms.

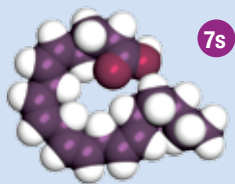
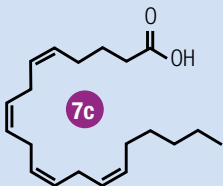
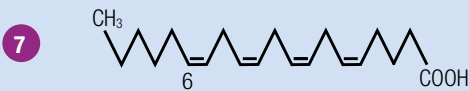
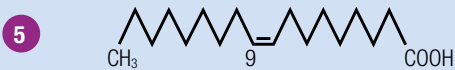
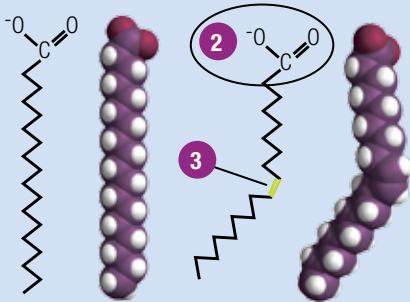
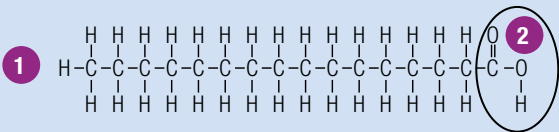
With the *unsaturated* FAs they may be a "straight" line & hence they are *trans* FAs or "curved" then *cis* FAs. Trans FAs rarely occur in natural oils or fats.

The type of FA is determined by the site of the first unsaturated bond. Counting from the methyl end - if it is on the 3rd C atom then it is an omega 3 FA.

Polyunsaturated bonds cause curving of the molecule.

Free Fatty Acids (FFAs) are those FAs which are not bound to glycerol or other carrier substance. Most FAs are bound to glycerol in the body forming TGs.

- 1 **saturated FA showing C-H individual bonds**
 - 2 **carboxyl group representations**
 - 3 **unsaturated bond - causing bend - i.e. unsaturated cis FA**
 - 4 **Palmitic FA**
 - 5 **Oleic FA - monounsaturated FA**
 - 6 **Linolenic FA**
 - 7 **Arachidonic FA**
- c = curved representation**
s = 3D representation



Fatty Acids (FAs) & Triglycerides (TGs)

A representations of TGs

B analysis of the TG structure and component FAs

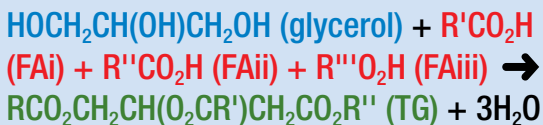
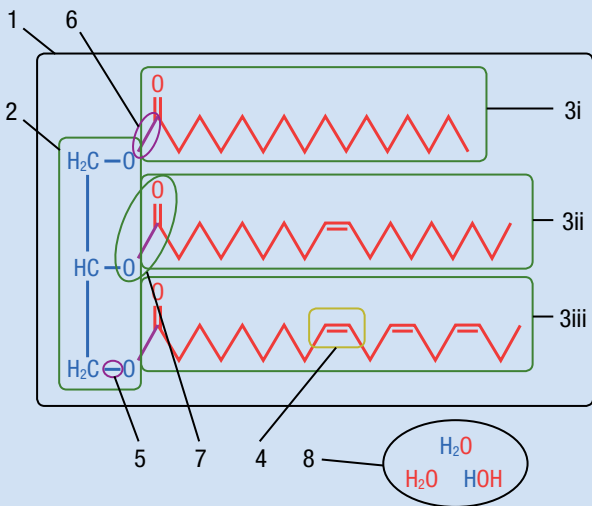
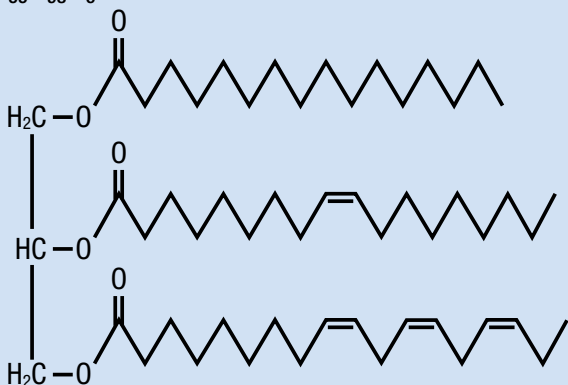
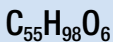
Triglycerides (TGs) AKA Triacylglycerols, or Triacylglycerides

are made when glycerol & 3 FAs combine forming ester bonds & liberating water.

The TGs **(1)** have a glycerol back bone **(2)** & 3 FA arms **(3)** which vary with the person's diet. In this case palmitic acid **(3i)** a fully saturated FA more common in plant fats; oleic acid **(3ii)** with a single 2X bond **(4)** & α -linolenic acid **(3iii)** a poly unsaturated FA, commoner in animal fats. The arms of the TG may "swing around" changing shape & allow the molecule to take many shapes particularly with the longer FA chains.

The 3 hydroxy (-OH) grps **(5)** form ester bonds **(6)** with the carboxyl grps (-COOH) **(7)** of the FAs cleaving off the hydrogen & oxygen radicals which combine to form 1 water molecule for each bond **(8)**. Because of their structure TGs can circulate freely in the B moving through most cm w/o specific transport systems, allowing for the bidirectional flow of fat & glucose b/n the liver & B.

- 1 glycerol backbone**
- 2 3 FA arms**
- 3 FAs**
 - i = Palmitic acid**
 - ii = Oleic acid**
 - iii = Linolenic acid**
- 4 unsaturated C to C bond**
- 5 hydroxyl grps**
- 6 ester bonds**
- 7 carboxyl grps**
- 8 water = H₂O**



HORMONE LIST A to Z

Adipose T (AT) - adipocytes

Adrenal cortex - ZF, ZG, ZR

Corpus luteum (CL)

Ovary - granulosa cells

Placenta - trophoblasts

Prostate gland

Sex Organs

Testes – Leydig cells,
sertoli cells

Uterus - decidua, myometrium

Bones - osteoblasts,
osteoclasts

Parathyroid Gland (PT) -
parafollicular cells, chief cells

Adrenal medulla

Brain - cerebral cortex (CC)

Central nervous system (CNS)

Hypothalamus / neurosecretory
Ns / Inhibitory Ns

Pineal gland

Ant. Pituitary gland (Ant. Pit.)
- gonadotrophs, lactotrophs,
melanotrophs, pars intermedia
somatotrophs

Duodenum (Duo)

Gastrointestinal tract (GIT) -
mucosa

Small intestine (SI) - K cells

Stomach

Endothelium - vascular

Hair follicle (HF)

Platelets

Skin

Thymus

White blood cells (WBCs)

Heart - atrial cells,
cardiomyocytes

Kidney (Ky)

DCT, JGA, macula densa, PCT

Pancreas

Salivary gland

Liver - perisinusoidal cells

Post. Pituitary (Post. Pit.)
neurosecretory Ns

Skeletal muscle (SKM)

Smooth Muscle (SM)

Thyroid gland - thyrotrophs,
parafollicular cells, C cells

NOTES ON THIS TABLE

- 1 The terms, peptide & H are sometimes used interchangeably, for small Hormones. As far as possible the more familiar term is used with the other listed.
- 2 **Trophic** (Brit.) (**TROH-fik**) & **tropic** (US) (**TROH-pik**) both meaning *stimulating the activity of another endocrine gland* are interchangeable suffixes; for clarity only trophic is used here; hence gonadotrophs = gonadotropes = cells causing growth of the gonads.
- 3 Many Hs act on other Hs before there is a bodily / cellular response, 2° Hs. These are referred to as releasing or inhibiting factors, RFs or IFs wherever possible.

A

Hormone (Abbreviation)	Structure CLASS/TYPE	Principal Source	Main effects (Target Ts)
5-hydroxytryptamine AKA Serotonin (5HT)			
ADIPOKINES ADIPOCYTOKINES	group of AT derived Hs	AT - fat cells	see indiv. members of this grp pro-IF Hs
Adiponectin AKA Adipocyte complement factor 1q (ACRP) AKA AdipoQ	protein (117 AAs) 244 AAs with 4 functional domains	AT - fat cells	↓ IR ↑ FFA oxidation
Adrenalin AKA Adrenaline AKA Epinephrine <i>see also noreadrenalin</i>	Tyrosine derivative CATECHOLAMINE	Adrenal medulla	classic "fight-or-flight" response, glycogenolysis, lipid mobilization ↑ SM contraction ↑ HR, ↑ cardiac function binds to all catecholamine receptors (α - & β - adrenergic) throughout the body
Adrenocorticotrophic H (ACTH) AKA Corticotrophin	PP (39 AAs) melanocortin	Ant. Pituitary	↑ synthesis of corticosteroids (Adrenal cortex - adrenocortical cells)
Aldosterone	mineralocorticoid steroids	Adrenal cortex / ZG	↑ B volume, ↑ BP ↑ Na ⁺ absorption & ↑ K ⁺ & H ⁺ secretion (Ky)
Amylin AKA islet amyloid polypeptide (IAPP)	PP (37 AAs)	Pancreas β cells	↓ gastric emptying, ↓ digestive secretion, ↓ food intake ↓ GCG
Amphiregulin	PP (78 AAs)	Pancreas	released with INS complements its actions competes with EGF

Androgens (e.g., testosterone)	group of steroid derived Hs	Adrenal cortex Ovaries, Testes	see indiv members of this grp involved in maintenance of sex organs & characteristics
Androstenedione	androgen steroids	Adrenal cortex Sex organs	Substrate for Oestrogen
Angiotensinogen pro-H/inactive	protein (485 AAs)	Liver	present in the α_2 -globulin fraction of plasma cleaved by Renin to form Angiotensin I
Angiotensinogen -I pro-H/partially active	PP (10 AAs)	Kidney	the C-terminal 2 AAs are cleaved by Angiotensin- Converting Enzyme, ACE to form Angiotensin II
Angiotensinogen -II pre H Angiotensin (AGT)	PP (8 AAs)	Kidney	↑ vasoconstriction, ↑ BP essential hypertension ↑ release of Aldosterone
Anti-diuretic H AKA Vasopressin (ADH)	PP (9 AAs)	Hypothalamus synthesizes the H Post. Pit. releases the H	↑ cardiomyocyte contractility (Heart) ↑ glycogenolysis (Liver) ↑ water reabsorption (renal DCT) ↑ vasodilation / ↓ BP (arterioles) ↑ ACTH (Ant Pit).
Anti-Müllerian H AKA Müllerian inhibiting H (AMH) AKA Anti- Paramesonephric H	glycoprotein TRANSFORMING GFs	Ovaries / granulosa cells Testes / Sertoli cells	↓ TRH, ↓ prolactin suppresses formation of Müllerian ducts in ♂ embryo / maintains follicles throughout ♀ reproductive life
Atrial Natriuretic H (ANP) AKA atrial natriuretic peptide	pre-H 126 AAs PP (28, 32)	Heart - cardiomyocytes	↓ ↓ BP by: ↓ SM / ↓ PVR (arteries) ↓ Aldosterone

B

Hormone (Abbreviation)	Structure CLASS/TYPE	Principal Source	Main effects (Target Ts)
Betathrophin AKA β tropin	protein (193 AAs)	Liver	
Bone γ -carboxyglutamic acid-containing protein (BGLAP) AKA Osteocalcin			
Brain Natriuretic H AKA Brain Natriuretic peptide (BNP)	PP	Brain	\downarrow BP by: \downarrow PVR (less effective than ANP)

C

Hormone (Abbreviation)	Structure CLASS/TYPE	Principal Source	Main effects (Target Ts)
Calciferol AKA Vita D2 <i>see also Vita D</i>	steroid derivative (secosteroid - sterol)	Sunshine, Skin, Liver & Ky combined for synthesis	Ca & PO ₄ homeostasis less effective than Calcitriol
Calcitonin (CT)	PP (32 AAs)	Thyroid Gland parafollicular C cells	\uparrow bone synthesis \downarrow B[Ca] phosphate regulation tied to Ca
Calcitonin gene-related peptide (CGRP)	PP (37 AAs)	Thyroid Gland parafollicular C cells <i>alternative product to Calcitonin</i>	vasodilator not as active as Calcitonin
Calcitriol (Vita D3) <i>active</i> <i>Calcidiol - inactive form (Vita D3)</i>	C9-10 secosteroid derived from Cholesterol	Sunshine, Skin, Liver & Ky-PCT combined for synthesis	\uparrow Vita D ₃ - active form \uparrow absorption Ca / PO ₄ (GIT & Ky) \downarrow PTH \uparrow bone mineralization

CATECHOLAMINES	group of Tyrosine derived Hs	Adrenal Medulla	see indiv. members of this grp involved in Fight or Flight in conjunction with the SyMNS
Cholecystokinin (CCK)	PPs (8 - 33 AAs)	Duodenum Stomach	<ul style="list-style-type: none"> ↑ digestive enzymes (Pancreas - exocrine cells) ↑ bile flow (GB contractions) ↓ hunger (cerebral hunger centre)
Chorionic gonadotropin (HCG)		Placenta - syncytiotrophoblasts	similar to LH
Chorionic somatomammotropin AKA Placental lactogen (hPL)	protein (191 AAs)	Placenta - trophoblasts	similar to : Prolactin, GH only present in preg. peaks at term ↑ maternal BMR
Chromogranin A AKA Parathyroid secretory H	protein (439 AAs)	Adrenal medulla Pancreas / β cells	↑ synthesis of secretory vesicles in their own & nearby cells precursors of the agents which promote their release - functional peptides
Corticotropin AKA Adrenocorticotropin H (ACTH)			
Corticotropin-releasing factor (CRF)	PP (41 AAs)	Hypothalamus	<ul style="list-style-type: none"> ↑ ACTH / (Ant. Pituitary) ↑ lipotropin → ↑ endorphins (CC)
Cortisol	glucocorticoid steroids	Adrenal cortex - ZF / ZR	<ul style="list-style-type: none"> ↑ gluconeogenesis ↓ glucose uptake (SKM & WAT) ↑ B [AA] / ↑ FFAs - i.e. lipolysis (WAT) ↓ IFR & IMR anti-inflammatory
Cortistatin (CORT) <i>similar to somatostatin (SIF)</i>	neuropeptide PP (105 AAs) similar to SRIF	CC - inhibitory Ns	<ul style="list-style-type: none"> ↓ N activity; ↑ slow-wave sleep; (CC amygdala, hippocampus) ↓ locomotor activity

D

Hormone (Abbreviation)	Structure CLASS/TYPE	Principal Source	Main effects (Target Ts)
Dehydroepiandrosterone (DHEA) AKA Didehydroepiandrosterone AKA Androstenedione AKA Prasterone (INN)	androgen steroids / neurosteroid <i>most abundant steroid in the BS</i>	Adrenal cortex Brain Ovary / theca cells Testes / Leydig cells	↑ virilization ↑ anabolic grth
Dihydrotestosterone (DHT) AKA 5-DHT AKA Androstanolone AKA 5- α -dihydrotestosterone 1° androgen in the adult	androgen steroids <i>(metabolite of Testosterone) (in the ♂ it cannot be converted to oestradiol so remains higher longer- hence male pattern baldness)</i>	Adrenal cortex Hair follicles (HFs) Prostate Testes	↑ cell grth / maturation ↑ cell mitosis (bulbourethral gland, penis, prostate gland, scrotum, seminal vesicles). Testosterone → 5-DHT w/n the target cell bc it needs high conc. to work high levels cause male pattern baldness ↑ prostate size/ low levels maintain HFs Essential role in formation of ♂ embryo 's external genitals, & maintenance in the adult
Dopamine AKA Prolactin inhibiting factor (PIF)	CATECHOLAMINE neurotransmitter as well as H	Adrenal Medulla Brain Hypothalamus	↑ movement, SKM contractility ↓ lactation involved in pleasure & reward - drugs of abuse either

E

Hormone (Abbreviation)	Structure CLASS/TYPe	Principal Source	Main effects (Target Ts)
Enkephalin	protein	Brain	regulate pain
Endorphins	PP - from lipotropins	Ant. Pit.	↑ mood
Endothelin	PP (21 AAs)	Endothelium - vascular	↑ contraction of medium sized BVs ↑ contractions in the stomach (SM)
Enteroglucagon AKA Glucagon-like peptide (GLP-1)			
Enterostatin	derived from pancreatic colipase (PP 5 AAs)	AT / Fat cells GIT	↓ high fat diet (but not a low fat diet)
Epinephrine AKA Adrenaline			
Epithelial growth factor (EGF)	PP (55 AAs)	Salivary glands	↑ epithelial lining repairs (GIT, skin) regulated by inorganic iodine ↓ gastric & protease secretions
Erythropoietin (EPO) AKA Haemopoietin AKA Haematopoietin	glycoprotein (166 AAs)	Bones Ky - peritubular cells Liver / peri-sinusoidal cells	↑ RBC production (RBM) ↑ wound healing (skin), neuroprotection from hypoxia (Brain)
Estrogen AKA Oestrogen			

F

Hormone (Abbreviation)	Structure CLASS/TYPE	Principal Source	Main effects (Target Ts)
Fibroblast Growth Factors 23 (FGF-23) AKA Phosphatonin	protein (251)	Bone	↑ synthesis of CT
Fibroblast Growth Factors 23 (FGF-23) AKA Phosphatonin	protein (216)	Ileum	synthesis of bile acids ↑ filling of the GB (relaxes the SM) ↑ glycogen formation
Follicle-stimulating H (FSH)	protein (204) α-FSH 96 AAs β-FSH 120 AAs	Ant. Pit.	♀: ↑ maturation of Graafian follicles (Ovary). ↑ oestrogen ♂: ↑ spermatogenesis ↑ production of androgen binding protein (Testes - Sertoli cells)

G

Hormone (Abbreviation)	Structure CLASS/TYPE	Principal Source	Main effects (Target Ts)
Galanin (GAL)	neuropeptide (29 AAs)	CNS GIT	modulation & ↓ AP in Ns neuromodulator
Gastric inhibitory polypeptide (GIP) AKA Glucose-dependent-insulinotropic PP (GIP)			
Gastrin	PP (17-34 AAs)	Stomach	↑ gastric acid, pepsin (Stomach - parietal cells AKA acid producing cells) ↑ pancreatic enzymes

Gastrin-releasing peptide (GRP)	neuropeptide PP (27 AAs)	postganglionic Ns of the Vagus N	↑ gastrin (stomach - G cells) ↑ CCK (SI neuroendocrine I cells)
Ghrelin antagonists Leptin Obestatin	PP (28 AAs)	GIT	↑ appetite, ↑ secretion of GH (Ant. Pit.) ↑ INS (Pancreas β cells) ↑ gastric emptying ↑ glomeniloptin
GLUCOCORTICOIDS (e.g. cortisol corticosterone)	steroids	Adrenal cortex	see individual members of this grp ↓ IFR, IMR ↓ protein synthesis
Glucagon (GCG) antagonist INS	PP (29 AAs)	Pancreas / α cells	↑ glycogenolysis & ↑ gluconeogenesis (Liver) ↑ lipolysis ↑ B [glucose] ↓ INS
Glucagon-like peptide (GLP-1) AKA Enteroglucagon	PP (30 & 31 AAs)	GIT	↑ INS, ↓ GCG, ↓ gastric emptying
Glucose-dependent-insulinotropic PP (GIP) AKA Gastric Inhibitory PP	PP (42 AAs)	Intestine / K cells	↓ gastric acid (stomach / G cells) ↑ INS (Pancreas / β cells)
Gonadotropin-releasing H (GnRH) AKA Luteinizing H releasing factor (LHRF)	PP (10 AAs)	Hypothalamus	↑ FSH, ↑ LH (Ant. Pit. / gonadotrophs)

Growth H (GH) AKA Somatotrophin	protein (191 AAs)	Ant. Pit.- somatotrophs	<ul style="list-style-type: none"> ↑ growth/anabolic ↑ cell mitosis (all cells in the body) ↑ sulphation of bone ↑ IGF-1 (Liver)
----------------------------------------	-------------------	--------------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------

H

Hormone (Abbreviation)	Structure CLASS/TYPE	Principal Source	Main effects (Target Ts)
Haemopoietin AKA Erythropoietin			
Hepcidin antagonist EPO	PP (25 AAs)	Liver	<ul style="list-style-type: none"> ↓ iron export from cells (all cells in the body)
Histamine		Stomach	<ul style="list-style-type: none"> ↑ vasoconstriction (BVs) ↑ contractions of SM (Stomach)
Human chorionic gonadotropin (hCG) placenta equiv of LH similar to TSH	protein (237 AAs)	Placenta - Trophoblast	<ul style="list-style-type: none"> ↑ maintenance of CL in early pregnancy ↓ IMR, towards the human embryo (immune Ts - LNs) ↑ TH (thyroid)
Human placental lactogen HPL	protein	Placenta	<ul style="list-style-type: none"> ↑ INS & IGF-1 ↑ IR & ↑ CHO intolerance

Hormone (Abbreviation)	Structure CLASS/TYPE	Principal Source	Main effects (Target Ts)
Incretins	PPs (31, 42)	Duodenum Stomach	potentiating effects of INS (all cells in the body) ↓ GCG (pancreas)
Inhibin A & B	A protein (134 AAs) B protein (115 AAs) TRANSFORMING GFs	Ovary / granulosa cells Placenta / foetal trophoblasts Testes / Sertoli cells	↓ FSH (Ant. Pit.)
Insulin (INS) antagonist GCG	PP - 2 subunits 2 α + 2 β (51 AAs = 21 + 30 PPs bonded)	Pancreas / β cells	↑ cellular uptake glucose, & lipids cells from the B (SKM) ↑ glycogenesis (Liver) ↑ glycolysis (Liver & SKM) ↑ lipids ↑ synthesis TGs from adipocytes ↑ anabolic processes (all cells)
Insulin-like growth factors-1 &2 (IGF-1) AKA Somatomedin	PP (70 AAs)	Liver / hepatocytes	same effects as INS, but much less potent regulate cell growth & development (all cells/organs)
Irisin	protein (112 AAs)	SKM (induced by PGs)	conversion WAT → BAT
Islet amyloid polypeptide (IAPP) AKA Amylin			

J

K

L

Hormone (Abbreviation)	Structure CLASS/TYPE	Principal Source	Main effects (Target Ts)
Leptin (LEP) antagonist - Ghrelin	protein (167 AAs) precursor to the active 146 AAs	Liver Fat cells (adipocytes) Hypothalamus GIT Placenta	↓ appetite (cerebral T) ↑ metabolism (all cells) ↑ IFR ↑ BP ↑ bone mass <i>may initiate puberty</i>
Leukotrienes	eicosanoids	WBCs	↑ vascular permeability (Endothelium - vascular)
LIPOTROPINS (LPH) eg β lipotropin	PPs β-PPs = 93AAs γ-PPs = 60 AAs	Ant. Pituitary - fragments of the long PP which also forms ACTH	↑ lipolysis ↑ FAs (AT) ↑ steroidogenesis, (adrenal cortex) ↑ melanin (melanocytes)
Luteinizing H (LH) <i>similar to hCG TSH</i>	protein (204 AAs) α-LH 96 AAs β-LH 120 AAs	Ant. Pit. - gonadotrophs	♀: ↑ ovulation / ↑ progesterone (Ovary - follicles) ♂: ↑ testosterone / (Testes - Leydig cells) ↑ interstitial cell dev <i>may initiate puberty</i>
Luteinizing H releasing factor (LHRF) AKA Gonadotropin releasing factor			

M

Hormone (Abbreviation)	Structure CLASS/TYPE	Principal Source	Main effects (Target Ts)
Melanin-concentrating H (MCH)	PP (19 AAs)	Hypothalamus	↑ appetite

Stress Response

Schema of hypothalamic adrenal axis for long & short term stress

A short term stress mediated by SymNS

B long term stress mediated by Anterior Pituitary

	SHORT TERM RESPONSE (s)	LONG TERMS RESPONSE (L)
1	Ns in the hypothalamus	neurosecretory cells in the hypothalamus secreting RFs
2	long post-ganglionic fibres of the Sym NS - transmitter noradrenaline	BV plexus from the hypothalamus carrying RFs to the ant pituitary which releases ACTH
3	secretions of noradrenaline	secretions of glucocorticoids switching from glucose to FAT & PROTEIN metabolism
4	secretions of adrenaline	secretions of mineralocorticoids NA & WATER RETENTION
5	from the adrenal medulla (10% of adrenal wgt - from the neuroectoderm)	from the adrenal cortex (90% of the adrenal wgt - from mesodermal mesoderm)
effects	↑ B[glucose], ↑ HR ↑ BP B directed to the SKM	↓ IfR & IR, ↑ BP

