GLOBAL
INTEGRATIVE MEDICINE ACADEMY

Key Blood Tests, Biomarkers and Longevity

James Meschino DC, MS, ROHP

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Purpose of this Subject:

1. Many MD's don't do a complete work up in many cases or miss things of importance on blood tests (i.e. high ferritin)

2. Early harbingers of escalating risk for premature death and common morbidity issues are often ignored by medical practitioners – more reactive and less proactive (health optimization perspective is often lacking). Ideal value for longevity and healthy life expectancy sometime different than medically accepted range

3. Looking at patient's blood work and providing intelligent, evidence-based feedback earns patient/client respect with better compliance with recommendations

4. This is knowledge every holistic health practitioner should be aware of, if optimizing health and longevity potential for all patients/clients is one of your core objectives.

5. Most patients over 40 years of age are on the downward spiral towards premature morbidity and mortality and you are the most qualified person (or soon will be) to identify it and help correct it

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Topics Covered

A. CVD Risk Assessment

B. Blood Work Interpretation:

1. Red Blood Cells, Anemia And Related Disorders
2. White Blood Cells, Infection, Inflammation And Related Disorders
3. Common Liver Function Tests
4. Inflammatory Markers And Related Diagnostic Blood Tests
5. Kidney Function Tests And Associated Conditions
6. Other Standard Blood Tests and Review Of Some Already Mentioned
7. Vitamins and Minerals – ideal blood levels
8. Hormone And Endocrine Assessment – blood levels

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A Few Initial Considerations To Explain The Mysteries Of Longevity:

A. Good Genes Mean Good DNA Repair Enzymes

B. Good Genes Mean Good LDL-Receptor Function

C. Good Genes and Good Luck also involve Functional Tumor Suppressor Genes (and preservation of proto-oncogenes)

Let's Look At Some Examples:

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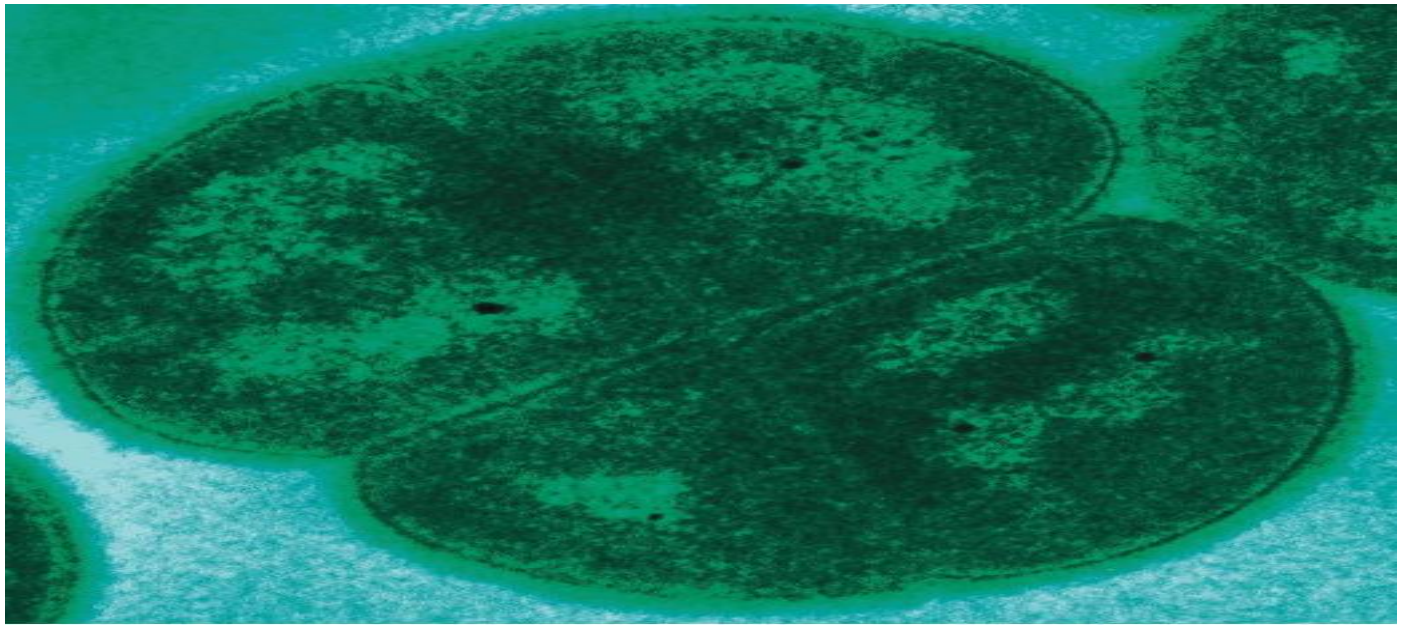
Deinococcus radiodurans - can survive cold, radiation, dehydration, vacuum, and acid, and is therefore known as a polyextremophile and has been named the world's toughest bacterium



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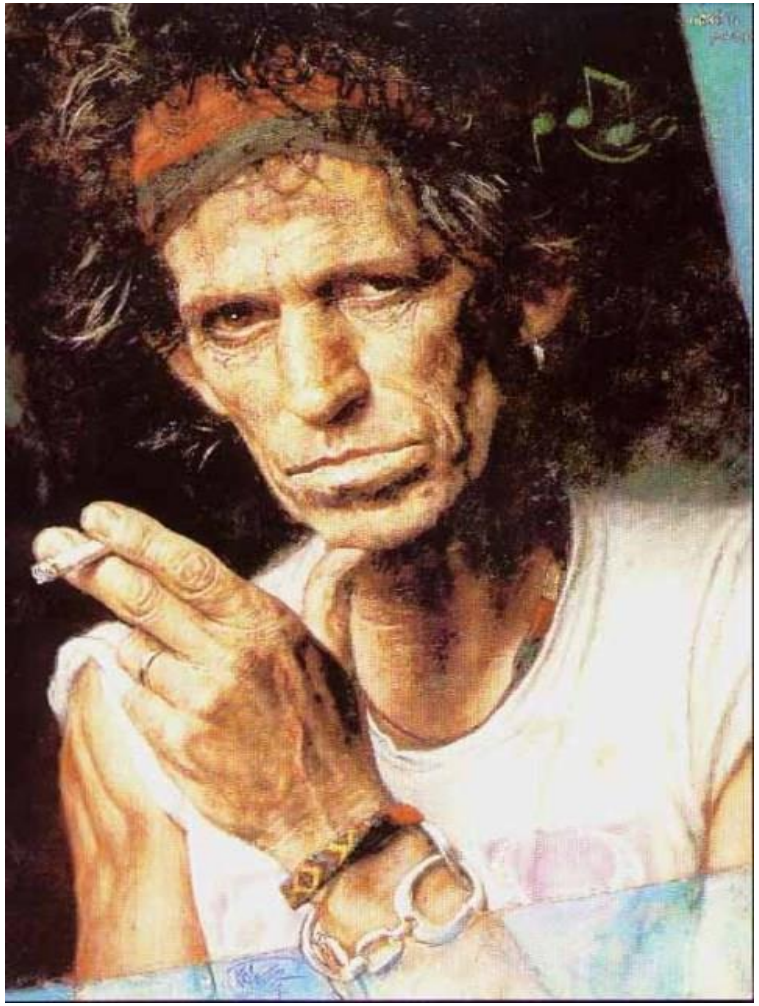
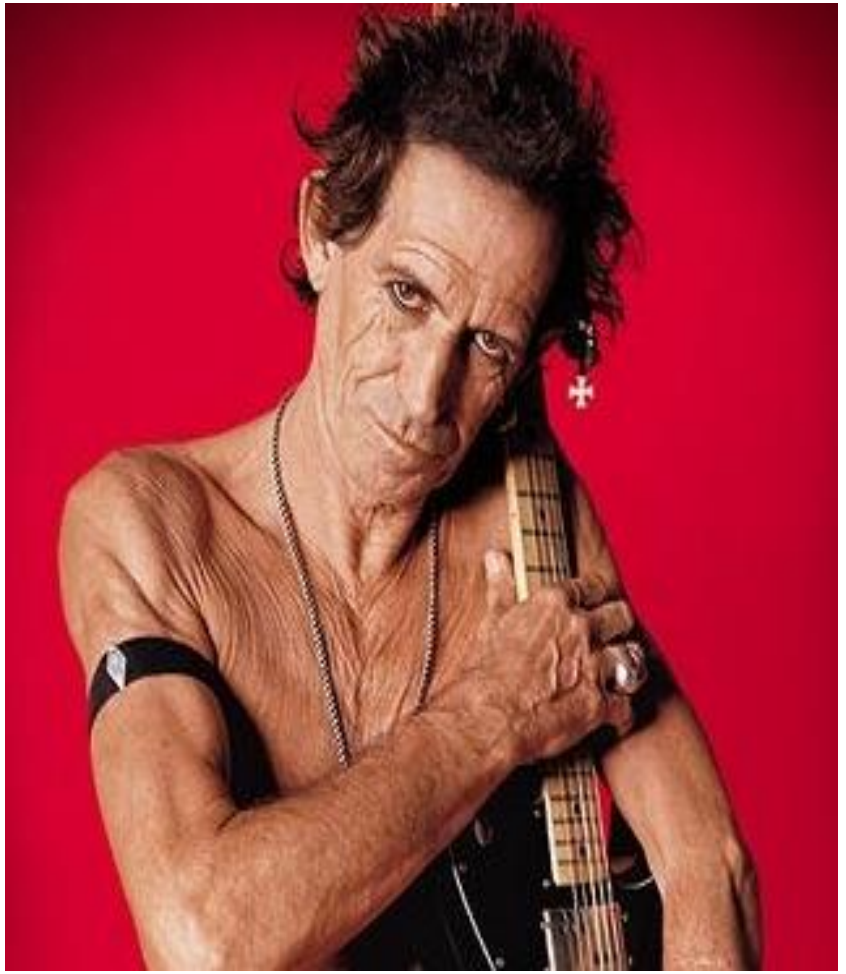
Example Of A Human Polyextremophile – 74 yrs. old in 2018





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Functional Longevity In Humans

Common Traits:

1 Very skinny (certainly not obese) – George Burns, Keith and Mick etc.

2. Practice systemic under-eating – less metabolic stress (different than exercising more so you can eat more without gaining weight)

3. Have great DNA repair enzymes

4. Have functional Tumor Suppressor Genes

4. Fabulous LDL-Receptor mechanisms

5. Are not depressed

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Blood Work And Other Biomarkers Of Longevity and Disease Risk:

Looking at blood work provides objective assessment of disease risk, disease presence, disease monitoring, and helps fine tune lifestyle recommendations

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Part A: Review of Cardiovascular Risk Analysis

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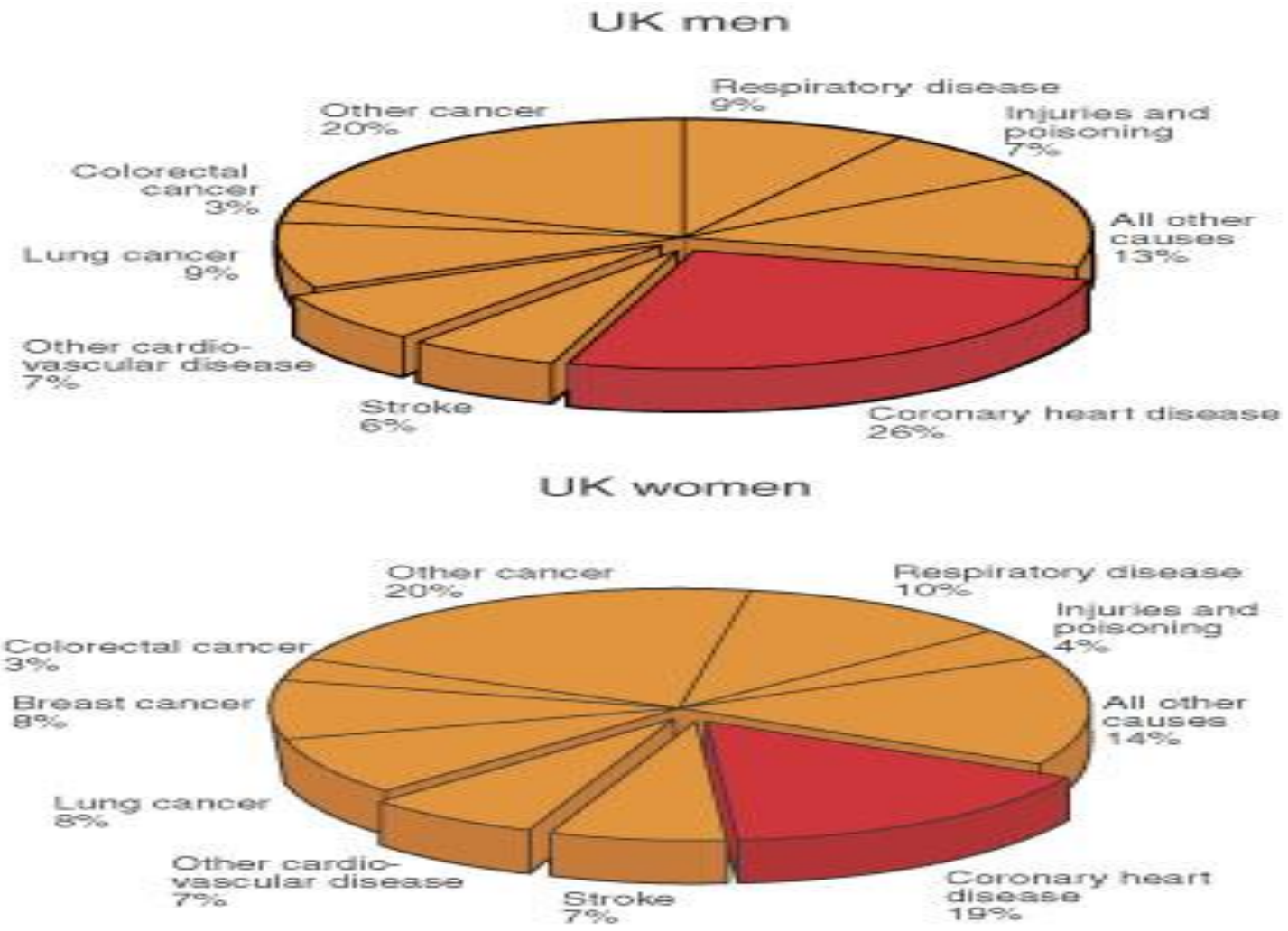
CVD Leading Cause Of Death



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Practitioner Cardiovascular Disease Screening Form (James Meschino DC, MS, ROHP)

- **Patient's Name** _____
- **Assessment Date**_____
- **Gender** _____**Age**_____ **Systolic BP**_____ **Diastolic BP**_____ **Resting Pulse**_____ per/min
- **Diabetes:** Yes___ No____ comment:_____
- **Smoking:** Yes____ No____comment _____
- **Total Cholesterol** _____(to convert cholesterol from mmol/L to mg/dL divide by 0.026) (at or below 3.9 mmol/L)
- **LDL-Cholesterol**_____ Below 1.8 – 2.0 mmol/L (72-80 mg/dL)
- **HDL-Cholesterol**_____Men: above 1.17 mmol/L (45 mg/dL) Women: above 1.42 mmol/L (55 mg/dL)
- **TC:HDL Ratio**_____3:1 or lower

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- **Fasting Glucose** _____ (ideal is under 90 mg/dl or 5 mmol/L – conversion factor is .055)

- **Fasting Triglycerides**_____(ideal is 132 mg/dl or 1.5mmol/L – conversion factor is 88.57)

- **C-Reactive Protein** _____ (less than 0.2 mg/dL or 2.0 mg/L) – conversion factor is 10

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- **Fibrinogen** _____ (less than 300 mg/dL or 0.88 umol/L - conversion factor is 0.0294)

- **INR** _____ (0.8 – 1.3)

- **Body Mass Index or BMI** (wt/ht squared) – wt is kg and ht is in metes-squared)
  Multiply weight in pounds by .45 to get weight in kg
  Multiply height in inches by .025 to get height in meters (then multiply height in meters by itself to get height in meters squared)
  (BMI of 27 or higher increases risk of high BP, Diabetes,
  Dyslipidemia and some cancers) BMI = _____

- **Waist Circumferenc**e: _____inches (under 36 for men and 33 for women)

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- **Personal History** of Heart Disease, Stroke, Deep Vein Thrombosis, Chronic Renal Disease or any vascular problems or vascular procedures (angioplasty, by-pass surgery, coronary stent) Yes___ No___ Comment:
  _____
  _____

- **Exercise Program**
  _____
  _____
  _____
  _____
  _____

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- **GFR** (eGFR < 60 mL/min is a concern) _____

- **Blood Creatinine** _____Normal is 0.6 to 1.2 mg/dl 60-110 µmol/L) in adult males and 0.5 to 1.1 mg/dl (45-90 µmol/L) in adult females

- **Uric Acid** _____Men: 140 – 440 umol/L (2.4 – 7.4 mg/dL) Women: 80 – 350 umol/L (1.4 – 5.8 mg/dL)

- **Albumin:Creatinine Ratio** - URINE TEST (An elevated albumin/creatinine ratio (men: > 2.0 mg/mmol, women: > 2.8 mg/mmol) is associated with an increased risk of heart disease, stroke, all cause mortality and progression of kidney disease_____.

- **Homocysteine -** _____Ideal is 6.3 umol/L or lower (0.85 mg/L)

- **Fructosamine** -_____ normal range 205-285 umol/L

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Effective Date: March 15, 2008 Clinical Practice Guidelines and Protocols in British Columbia

Metabolic syndrome: Metabolic syndrome includes three or more of the following criteria:

- Abdominal obesity - waist circumference: men > 102 cm (40 inches), women > 88 cm (35.2 inches)
- Triglycerides ≥ 1.7 mmol/L
- HDL (men < 1.0 mmol/L, women < 1.3 mmol/L)
- BP > 130/85 mm Hg
- Fasting glucose 5.7-6.9 mmol/L
- Precursor to diabetes and a cardiovascular risk in and of itself

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- 10 Year Heart Disease Risk Score (based on LDL reference form)_____% - completed in office
- 10 Year Heart Disease Risk Score (based on Total Cholesterol reference form_____% - completed in office

- (See Accompanying Framingham Forms)

- Current CVD Medications (cholesterol, triglyceride, blood pressure, other):
  _____
  _____
  _____
  _____
  _____

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Are They A Candidate For Other CV Tests:

1. Chest Pain (stress test)
2. Chest Pain upon exertion (stress test)
3. Shortness of Breath
4. Light-headedness or dizziness
5. Over Age 60 and not accustomed to exercise (stress test)
6. Family History Of CVD before age 60
7. Pectus Excavatum
8. Previous CVD episode (MI, stroke, TIA, angina, DVT etc)

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Other Tests: have they had, or should they discuss with MD

Resting ECG_____

Stress Test ECG_____

Echocardiogram (valves)_____

Thallium Uptake_____

Angiography_____

Other_____

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Coronary Disease Risk Prediction Score Sheet for Men Based on LDL Cholesterol Level

Step 1

Age	
Years	Points
30-34	-1
35-39	0
40-44	1
45-49	2
50-54	3
55-59	4
60-64	5
65-69	6
70-74	7

Step 2

LDL - Cholesterol		
(mg/dl)	(mmol/L)	Points
<100	<2.59	-3
100-129	2.60-3.36	0
130-159	3.37-4.14	0
160-189	4.16-4.91	1
≥190	≥4.92	2

Key	
Color	Risk
green	Very low
white	Low
yellow	Moderate
rose	High
red	Very high

Step 3

HDL - Cholesterol		
(mg/dl)	(mmol/L)	Points
<35	<0.90	2
35-44	0.91-1.16	1
45-49	1.17-1.29	0
50-59	1.30-1.55	0
≥60	≥1.56	-1

Step 4

Blood Pressure					
Systolic (mmHg)	Diastolic (mmHg)				
	<80	80-84	85-89	90-99	≥100
<120	0				
120-129		0 pts			
130-139			1		
140-159				2	
≥160					3 pts

Note: When systolic and diastolic pressures provide different estimates for point scores, use the higher number

Step 6

Diabetes	
	Points
No	0
Yes	2

Step 6

Smoker	
	Points
No	0
Yes	2

Risk estimates were derived from the experience of the NHLBI's Framingham Heart Study, a predominantly Caucasian population in Massachusetts, USA

Step 7 (sum from steps 1-6)

Adding up the points	
Age	_____
LDL Cholesterol	_____
HDL Cholesterol	_____
Blood Pressure	_____
Diabetes	_____
Smoker	_____
Point Total	_____

Step 8 (determine CHD risk from point total)

CHD Risk	
Point Total	10 Yr CHD Risk
≤-3	1%
-2	2%
-1	2%
0	3%
1	4%
2	4%
3	6%
4	7%
5	9%
6	11%
7	14%
8	18%
9	22%
10	27%
11	33%
12	40%
13	47%
≥14	>56%

Step 9 (compare to man of the same age)

Comparative Risk		
Age (years)	Average 10 Yr CHD Risk	Low* 10 Yr CHD Risk
30-34	3%	2%
35-39	5%	3%
40-44	7%	4%
45-49	11%	4%
50-54	14%	6%
55-59	16%	7%
60-64	21%	9%
65-69	25%	11%
70-74	30%	14%

*Low risk was calculated for a man the same age, normal blood pressure, LDL cholesterol 100-129 mg/dL, HDL cholesterol 45 mg/dL, non-smoker, no diabetes

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Coronary Disease Risk Prediction Score Sheet for Men Based on Total Cholesterol Level

Step 1

Age	
Years	Points
30-34	-1
35-39	0
40-44	1
45-49	2
50-54	3
55-59	4
60-64	5
65-69	6
70-74	7

Step 2

Total Cholesterol		
(mg/dl)	(mmol/L)	Points
<160	≤4.14	-3
160-199	4.16-5.17	0
200-239	5.18-6.21	1
240-279	6.22-7.24	2
≥280	≥7.25	3

Key	
Color	Risk
green	Very low
white	Low
yellow	Moderate
rose	High
red	Very high

Step 3

HDL - Cholesterol		
(mg/dl)	(mmol/L)	Points
<35	<0.90	2
35-44	0.91-1.16	1
45-49	1.17-1.29	0
50-59	1.30-1.55	0
≥60	≥1.56	-2

Step 4

Blood Pressure					
Systolic (mmHg)	Diastolic (mmHg) <80	80-84	85-89	90-99	≥100
<120	0				
120-129		0 pts			
130-139			1		
140-159				2	
≥160					3 pts

Note: When systolic and diastolic pressures provide different estimates for point scores, use the higher number

Step 5

Diabetes	
	Points
No	0
Yes	2

Step 6

Smoker	
	Points
No	0
Yes	2

Risk estimates were derived from the experience of the NHLBI's Framingham Heart Study, a predominantly Caucasian population in Massachusetts, USA

Step 7 (sum from steps 1-6)

Adding up the points	
Age	_____
Total Cholesterol	_____
HDL Cholesterol	_____
Blood Pressure	_____
Diabetes	_____
Smoker	_____
Point Total	_____

Step 8 (determine CHD risk from point total)

CHD Risk	
Point Total	10 Yr CHD Risk
≤-1	2%
0	3%
1	3%
2	4%
3	5%
4	7%
5	8%
6	10%
7	13%
8	16%
9	20%
10	25%
11	31%
12	37%
13	45%
≥14	≥53%

Step 9 (compare to man of the same age)

Comparative Risk		
Age (years)	Average 10 Yr CHD Risk	Low* 10 Yr CHD Risk
30-34	3%	2%
35-39	5%	3%
40-44	7%	4%
45-49	11%	4%
50-54	14%	6%
55-59	16%	7%
60-64	21%	9%
65-69	25%	11%
70-74	30%	14%

*Low risk was calculated for a man the same age, normal blood pressure, total cholesterol 160-199 mg/dL, HDL cholesterol 45 mg/dL, non-smoker, no diabetes

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Coronary Disease Risk Prediction Score Sheet for Women Based on LDL Cholesterol Level

Step 1

Age	
Years	Points
30-34	-9
35-39	-4
40-44	0
45-49	3
50-54	6
55-59	7
60-64	8
65-69	8
70-74	8

Step 2

LDL - Cholesterol		
(mg/dl)	(mmol/L)	Points
<100	≤2.59	-2
100-129	2.60-3.36	0
130-159	3.37-4.14	0
160-189	4.16-4.91	2
≥190	≥4.92	2

Key	
Color	Risk
green	Very low
white	Low
yellow	Moderate
rose	High
red	Very High

Step 3

HDL - Cholesterol		
(mg/dl)	(mmol/L)	Points
<35	<0.90	5
35-44	0.91-1.16	2
45-49	1.17-1.29	1
50-59	1.30-1.55	0
≥60	≥1.56	-2

Step 4

Blood Pressure					
Systolic (mmHg)	Diastolic (mmHg)				
	<80	80-84	85-89	90-99	≥100
<120	-3 pts				
120-129		0 pts			
130-139			0 pts		
140-159				2 pts	
≥160					3 pts

Note: When systolic and diastolic pressures provide different estimates for point scores, use the higher number

Step 6

Diabetes	
	Points
No	0
Yes	4

Step 8

Smoker	
	Points
No	0
Yes	2

Risk estimates were derived from the experience of the NHLBI's Framingham Heart Study, a predominantly Caucasian population in Massachusetts, USA

Step 7 (sum from steps 1-6)

Adding up the points	
Age	_____
LDL Cholesterol	_____
HDL Cholesterol	_____
Blood Pressure	_____
Diabetes	_____
Smoker	_____
Point Total	_____

Step 8 (determine CHD risk from point total)

CHD Risk	
Point Total	10 Yr CHD Risk
<-2	1%
-1	2%
0	2%
1	2%
2	3%
3	3%
4	4%
5	5%
6	6%
7	7%
8	8%
9	9%
10	11%
11	13%
12	15%
13	17%
14	20%
15	24%
16	27%
≥17	≥32%

Step 9 (compare to women of the same age)

Comparative Risk		
Age (years)	Average 10 Yr CHD Risk	Low* 10 Yr CHD Risk
30-34	<1%	<1%
35-39	1%	<1%
40-44	2%	2%
45-49	5%	3%
50-54	8%	5%
55-59	12%	7%
60-64	12%	8%
65-69	13%	8%
70-74	14%	8%

*Low risk was calculated for a woman the same age, normal blood pressure, LDL cholesterol 100-129 mg/dL, HDL cholesterol 55 mg/dL, non-smoker, no diabetes

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Coronary Disease Risk Prediction Score Sheet for Women Based on Total Cholesterol Level

Step 1

Age	
Years	Points
30-34	-9
35-39	-4
40-44	0
45-49	3
50-54	6
55-59	7
60-64	8
65-69	8
70-74	8

Step 2

Total Cholesterol		
(mg/dl)	(mmol/L)	Points
<160	≤4.14	-2
160-199	4.15-5.17	0
200-239	5.18-6.21	1
240-279	6.22-7.24	1
≥280	≥7.25	3

Key	
Color	Risk
green	Very low
white	Low
yellow	Moderate
rose	High
red	Very high

Step 3

HDL - Cholesterol		
(mg/dl)	(mmol/L)	Points
<35	<0.90	5
35-44	0.91-1.16	2
45-49	1.17-1.29	1
50-59	1.30-1.55	0
≥60	≥1.56	-3

Step 4

Blood Pressure					
Systolic	Diastolic (mmHg)				
(mmHg)	<80	80-84	85-89	90-99	≥100
<120	-3 pts				
120-129		0 pts			
130-139			0 pts		
140-159				2 pts	
≥160					3 pts

Note: When systolic and diastolic pressures provide different estimates for point scores, use the higher number

Step 5

Diabetes	
	Points
No	0
Yes	4

Step 6

Smoker	
	Points
No	0
Yes	2

Risk estimates were derived from the experience of the NHLBI's Framingham Heart Study, a predominantly Caucasian population in Massachusetts, USA

Step 7 (sum from steps 1-6)

Adding up the points	
Age	_____
Total Cholesterol	_____
HDL Cholesterol	_____
Blood Pressure	_____
Diabetes	_____
Smoker	_____
Point Total	_____

Step 8 (determine CHD risk from point total)

CHD Risk	
Point Total	10 Yr CHD Risk
<-2	1%
-1	2%
0	2%
1	2%
2	3%
3	3%
4	4%
5	4%
6	5%
7	6%
8	7%
9	8%
10	10%
11	11%
12	13%
13	15%
14	18%
15	20%
16	24%
≥17	≥27%

Step 9 (compare to women of the same age)

Comparative Risk		
Age (years)	Average 10 Yr CHD Risk	Low* 10 Yr CHD Risk
30-34	<1%	<1%
35-39	1%	<1%
40-44	2%	2%
45-49	5%	3%
50-54	6%	5%
55-59	12%	7%
60-64	12%	8%
65-69	13%	8%
70-74	14%	8%

*Low risk was calculated for a woman the same age, normal blood pressure, total cholesterol 160-199 mg/dL, HDL cholesterol 55 mg/dL, non-smoker, no diabetes

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Nutrition and Lifestyle Interventions

Hypercholesterolemia:

- Low saturated fat and cholesterol diet (also transfats and deep fried and pan fried foods)
- Soluble dietary fiber
- Aerobic Exercise and Weight Reduction
- Gum Guggul and Artichoke Leaf Extract

Hypertriglyceridemia:

- Weight Reduction
- Lower Glycemic Foods
- Low saturated fat and cholesterol diet (also transfats and deep fried and pan fried foods)
- Aerobic Exercise
- Soluble dietary fiber to slow glucose absorption
- Gum Guggul and Artichoke Leaf Extract

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Hyperglycemia and/or Diabetes:

- Weight Reduction
- Lower Glycemic Foods
- Low saturated fat and cholesterol diet (also transfats and deep fried and pan fried foods)
- Aerobic Exercise
- Soluble dietary fiber to slow glucose absorption
- Chromium, Hydroxycitric Acid and Catechins
- Adaptogens - to suppress cortisol release if stress is a factor (Adrenal Support Formula), as cortisol produces insulin resistance and elevated blood glucose levels.

Elevated C-Reactive Protein:

- Reduce pro-inflammatory food (arachidonic acid)
- Reduce Smoking
- Aerobic Exercise
- Antioxidant Supplementation Essential Fatty Acids (e.g. Adeeva Nature's Essential Oils)
- Anti-Inflammatory Herbs
- Quercetin – 1000 mg per day

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Low INR:

- Reduce animal fats (arachidonic acid) – thromboxane effect
- Essential fatty acids Natural COX Inhibitors
- Endurance Exercise

Over weight:

- Low fat and lower glycemic diet
- Aerobic Exercise
- Increase Dietary Fiber
- Reduce alcohol
- Chromium, Hydroxycitric acid and Catechins
- Possibly Thyro Support Formula and/or Adrenal Support Formula

High Homocysteine:

- B- complex
- Trimethylglycine (betaine)

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Impaired Renal Function: Management Overview:

- Low saturated fat and cholesterol diet (also transfats and deep fried and pan fried foods)
- Protein Restriction
- Sodium Restriction
- Magnesium, Potassium & Phosphate Restriction Mandatory
- Water and Fluid intake must be controlled (hyponatremia concern)
- Calcium & Vitamin D Supplementation usually required
- Phosphate-binding antacids prevent hyperphosphatemia (not magnesium containing)
- Alpha-lipoic acid and glutathione precursors – slow/reverse kidney damage

Registered Dietician and/or Nephrologist Must Be In Charge Of Diet and Supplements

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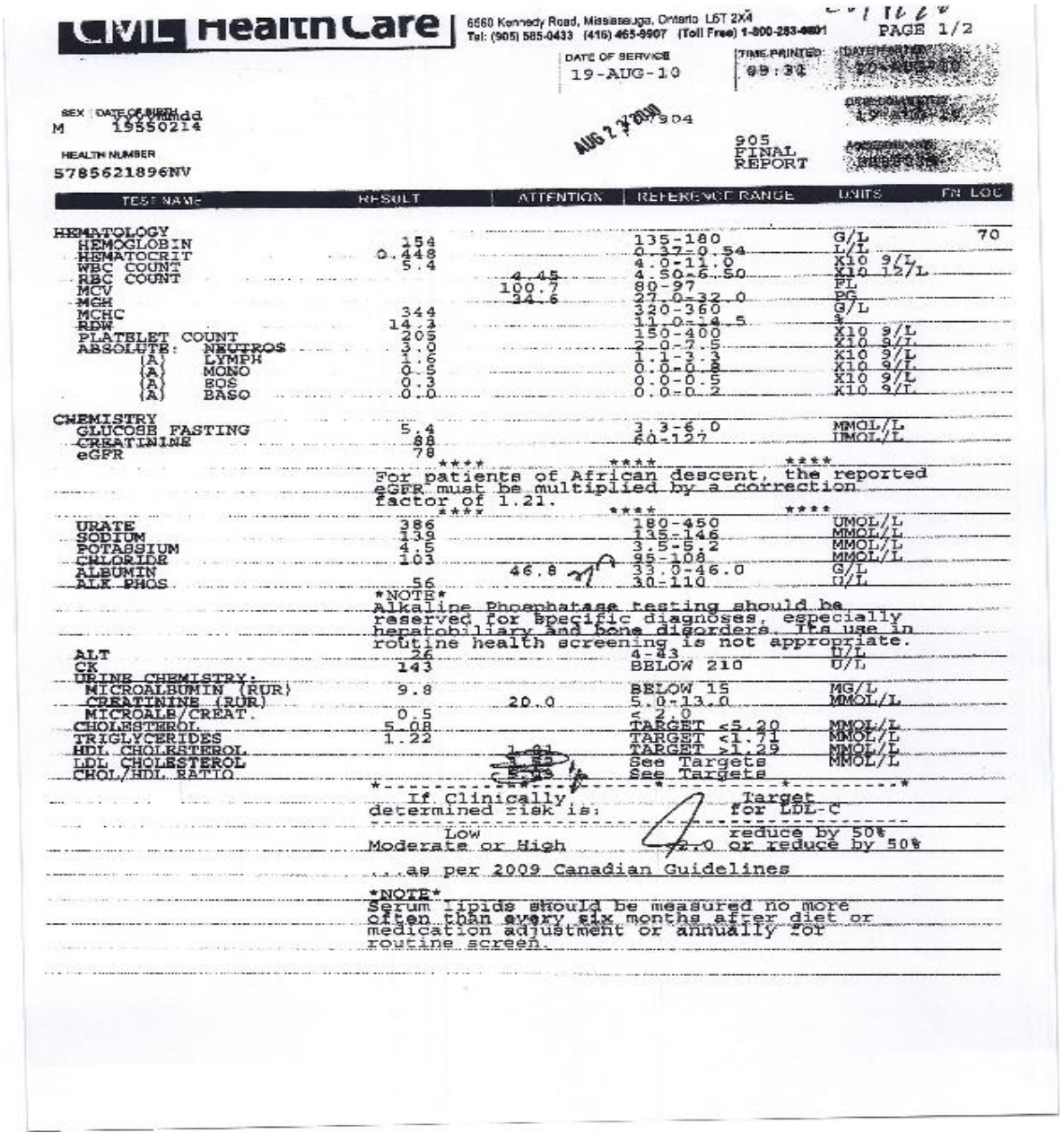
Note: Glucose: 5.4, TC: 5.08, LDL: 3.52 HDL:1.01
TC:HDL Ratio: 5.03:1



CML Health Care
6660 Kennedy Road, Mississauga, Ontario L5T 2X4
Tel: (905) 565-0433 (416) 465-9907 (Toll Free) 1-800-263-4601
PAGE 1/2

DATE OF SERVICE: 19-AUG-10
TIME PRINTED: 09:31

SEX / DATE OF BIRTH: M 19550214
HEALTH NUMBER: 5785621896NV

905 FINAL REPORT

TEST NAME	RESULT	ATTENTION	REFERENCE RANGE	UNITS	FN LOC
HEMATOLOGY					
HEMOGLOBIN	154		135-180	G/L	70
HEMATOCRIT	0.448		0.37-0.54	L/L	
WBC COUNT	5.4		4.0-11.0	X10 9/L	
RBC COUNT		4.45	4.50-6.50	X10 12/L	
MCV		100.7	80-97	FL	
MCH		34.6	27.0-32.0	PG	
MCHC	344		320-360	G/L	
RDW	14.3		11.0-14.5	%	
PLATELET COUNT	205		150-400	X10 9/L	
ABSOLUTE: NEUTROS	3.0		2.0-7.5	X10 9/L	
(A) LYMPH	1.6		1.1-3.3	X10 9/L	
(A) MONO	0.5		0.0-0.8	X10 9/L	
(A) EOS	0.3		0.0-0.5	X10 9/L	
(A) BASO	0.0		0.0-0.2	X10 9/L	
CHEMISTRY					
GLUCOSE FASTING	5.4		3.3-6.0	MMOL/L	
CREATININE	88		60-127	UMOL/L	
eGFR	78				
	****	****	****		
	For patients of African descent, the reported eGFR must be multiplied by a correction factor of 1.21.				
	****	****	****		
URATE	386		180-450	UMOL/L	
SODIUM	139		135-146	MMOL/L	
POTASSIUM	4.5		3.5-5.2	MMOL/L	
CHLORIDE	103		95-108	MMOL/L	
ALBUMIN		46.8	33.0-46.0	G/L	
ALK PHOS	56		30-110	U/L	
	NOTE Alkaline Phosphatase testing should be reserved for specific diagnoses, especially hepatobiliary and bone disorders. Its use in routine health screening is not appropriate.				
ALT	26		4-43	U/L	
CK	143		BELOW 210	U/L	
URINE CHEMISTRY:					
MICROALBUMIN (RUR)	9.8		BELOW 15	MG/L	
CREATININE (RUR)		20.0	5.0-13.0	MMOL/L	
MICROALB/CREAT.	0.5		< 2.0		
CHOLESTEROL	5.08		TARGET <5.20	MMOL/L	
TRIGLYCERIDES	1.22		TARGET <1.71	MMOL/L	
HDL CHOLESTEROL		1.01	TARGET >1.29	MMOL/L	
LDL CHOLESTEROL		3.52	See Targets	MMOL/L	
CHOL/HDL RATIO		5.03	See Targets		

If Clinically determined risk is:	Target for LDL-C
Low	reduce by 50%
Moderate or High	2.0 or reduce by 50%

...as per 2009 Canadian Guidelines

NOTE
Serum lipids should be measured no more often than every six months after diet or medication adjustment or annually for routine screen.

GLOBAL
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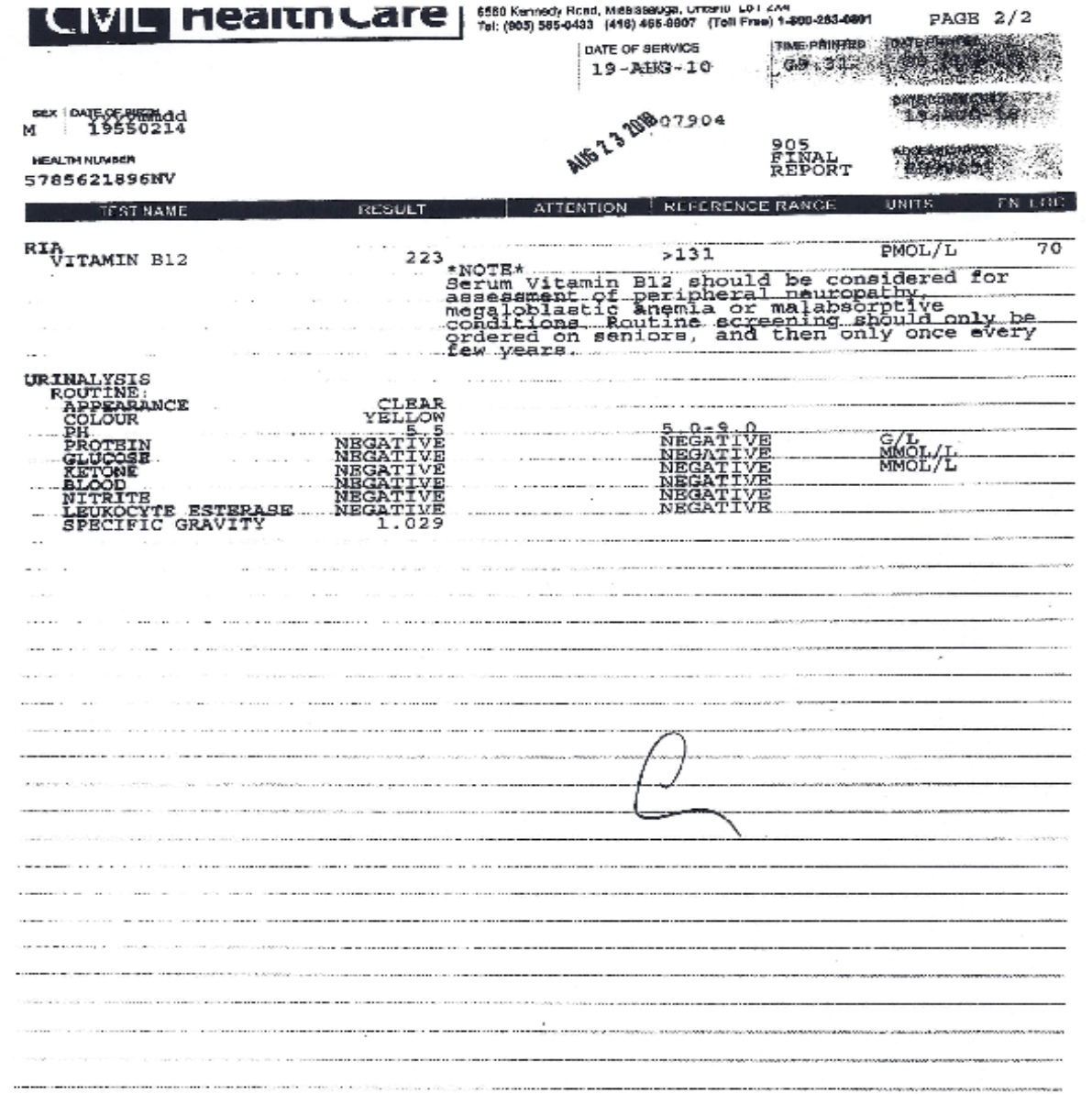
Normal Urinalysis and Serum B12



LifeLabs Health Care
6560 Kennedy Road, Mississauga, Ontario L5T 2X4
Tel: (905) 565-0433 (416) 466-8907 (Toll Free) 1-800-263-4991

PAGE 2/2

DATE OF SERVICE
19-AUG-10

TIME PRINTED
09:31

SEX | DATE OF BIRTH
M | 19550214

AUG 23 2010

07904

HEALTH NUMBER
5785621896NV

905
FINAL
REPORT

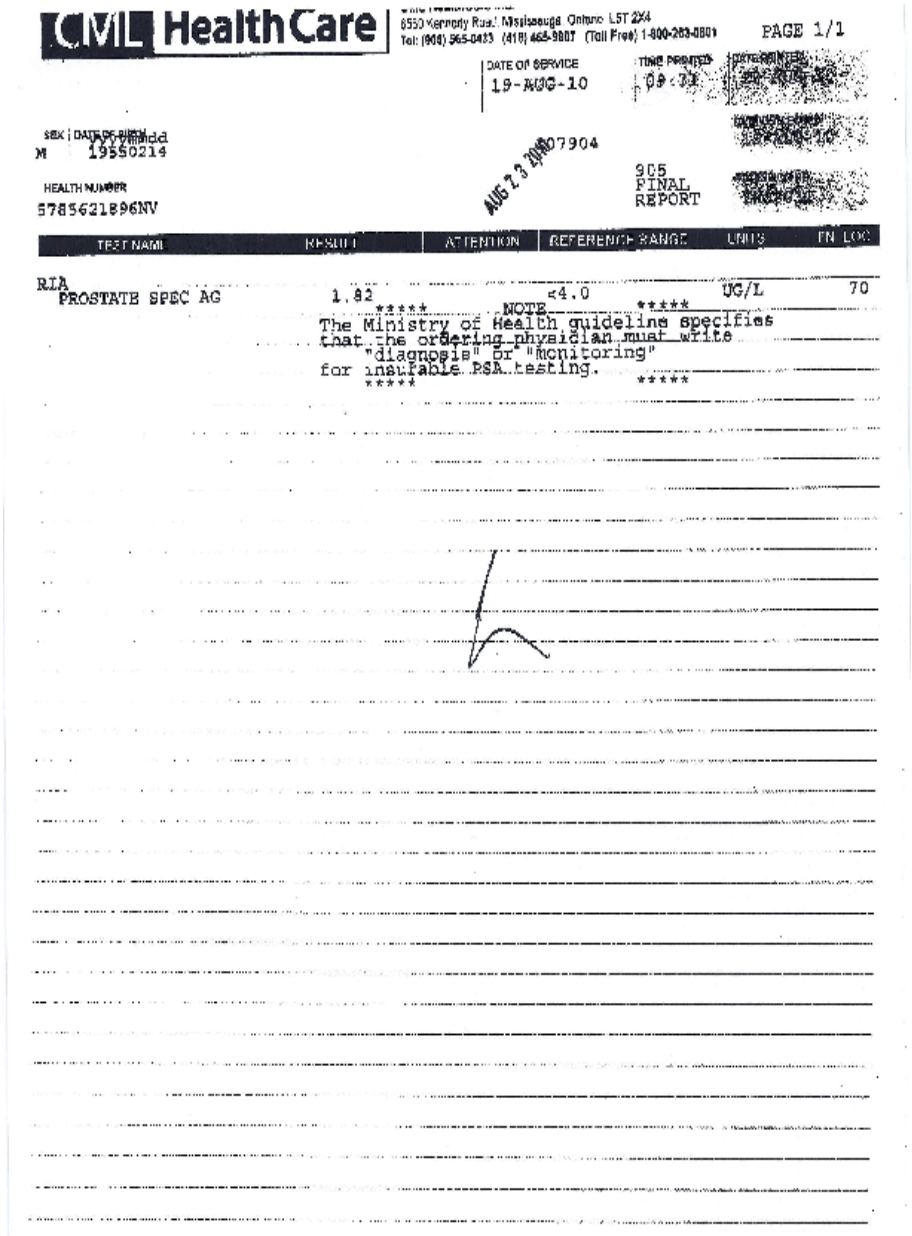
TEST NAME	RESULT	ATTENTION	REFERENCE RANGE	UNITS	FN LOC
RIA VITAMIN B12	223		>131	PMOL/L	70

NOTE
Serum Vitamin B12 should be considered for assessment of peripheral neuropathy, megaloblastic anemia or malabsorptive conditions. Routine screening should only be ordered on seniors, and then only once every few years.

URINALYSIS ROUTINE:				
APPEARANCE	CLEAR			
COLOUR	YELLOW			
PH	5.5		5.0-9.0	
PROTEIN	NEGATIVE		NEGATIVE	G/L
GLUCOSE	NEGATIVE		NEGATIVE	MMOL/L
KETONE	NEGATIVE		NEGATIVE	MMOL/L
BLOOD	NEGATIVE		NEGATIVE	
NITRITE	NEGATIVE		NEGATIVE	
LEUKOCYTE ESTERASE	NEGATIVE		NEGATIVE	
SPECIFIC GRAVITY	1.029			

GLOBAL
INTEGRATIVE MEDICINE ACADEMY

PSA: 1.82 (at 2.5 concern begins) Previous Yr.: 1.79



CML Health Care

6550 Kennedy Road, Mississauga Ontario L5T 2X4
Tel: (905) 565-0433 (416) 465-9807 (Toll Free) 1-800-263-0801

PAGE 1/1

DATE OF SERVICE: 19-AUG-10

TIME PRINTED: 09:03

SEX | DATE OF BIRTH: M 19550214

AUG 23 2010 07904

HEALTH NUMBER: 5785621896NV

905 FINAL REPORT

TEST NAME	RESULT	ATTENTION	REFERENCE RANGE	UNITS	FN LOC
RLA PROSTATE SPEC AG	1.82		<4.0	UG/L	70

***** NOTE *****

The Ministry of Health guideline specifies that the ordering physician must write "diagnosis" or "monitoring" for insurable PSA testing.

*****

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Red Blood Cells, Anemia And Related Disorders

GLOBAL
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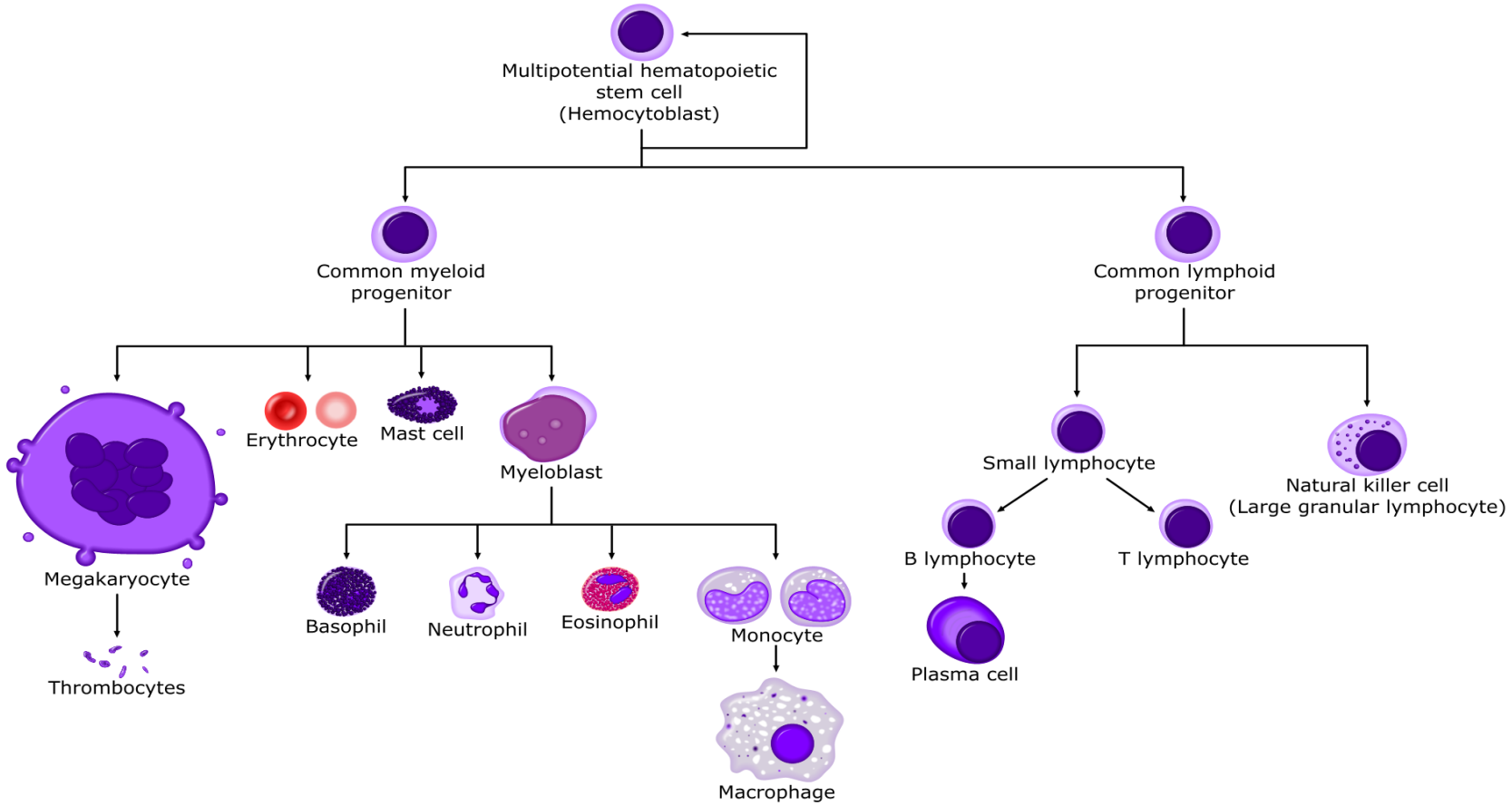
Hematopoietic Cells



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Red Blood Cell Count (RBC)

- 4.2 – 5.6 X 10 to the power of 12 /L

- Red blood cells carry oxygen from lungs to tissues of body.

- Low red blood cell counts occur in **anemia, hemorrhage** and various **blood cell disorders**.

Abnormally high RBC count suggests an underlying genetic blood cell disorder problem (Polycythemia vera) genetic damage (cancerous changes) to progenitor cells giving rise to increased erythrocytes

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Hemoglobin

- Men: 136 –175 g/L (13.6 – 17.5 g/dL)
- Women: 120 – 155 g/L (12.0 – 15.5 g/dL)

- Hemoglobin is the protein within red blood cells that binds to and carries oxygen from the lungs to the tissues of the body.

- A low hemoglobin level occurs in **anemia** and **hemorrhage.** May occur in cancer from chemo, radiation or disease process (may need transfusion or iron injections)

- Anemia can be nutritional, genetic, lysis, destruction or blood loss

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Hematocrit

- Men: 0.39 – 0.49 (39 – 49%)
- Women: 0.35 – 0.49 (35 –45%)

- Hematocrit refers to the percentage of blood comprised of red blood cells.

- A low hematocrit occurs in **anemia** and **hemorrhage.** Also in cancer from chemo, radiation or disease process (may need transfusion or iron injections)

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MCH (Mean Corpuscular Hemoglobin) - is the average mass of hemoglobin per red blood cell in a sample of blood.

- MCH are between 26 and 33 picograms (pg) of hemoglobin per RBC.

- The most common reason **for High MCH is Macrocytic anemia**, where red blood cells that are produced are larger than usual, each carrying more hemoglobin than normal-sized cells would. This condition can be caused by deficient levels of vitamin B-12 or folic acid in the body

- Common causes of Low MCH results include blood loss, iron deficiency and microcytic anemia, which is a condition in which red blood cells are abnormally small, carrying less hemoglobin.

- Other potential causes of a low MCH test include hemoglobinopathy, which is a group of disorders that cause changes in the structure of hemoglobin, and iron-deficiency anemia.

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MCHC (Mean Corpuscular Hemoglobin Concentration) - a measure of the average concentration of hemoglobin inside a single red blood cell.

- When the **MCHC is high**, the cells are referred to as being **hyperchromic**. **High MCHC means** more hemoglobin than normal for a person's age and gender, which -- counterintuitively -- **can indicate** a particular type of anemia.

- Two possible causes of High MCHC are **autoimmune hemolytic anemia** (in which the immune system attacks its own blood cells) and **hereditary spherocytosis** (a genetic disorder characterized by anemia and gallstones).

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RDW (Red Cell Distribution Width) - is a measurement of the amount that red blood cells vary in size.

The RDW test is used to help diagnose types of anemia and other medical conditions including:

- Thalassemias, which are inherited blood disorders that can cause severe anemia
- Diabetes mellitus
- Heart disease
- Liver disease
- Cancer

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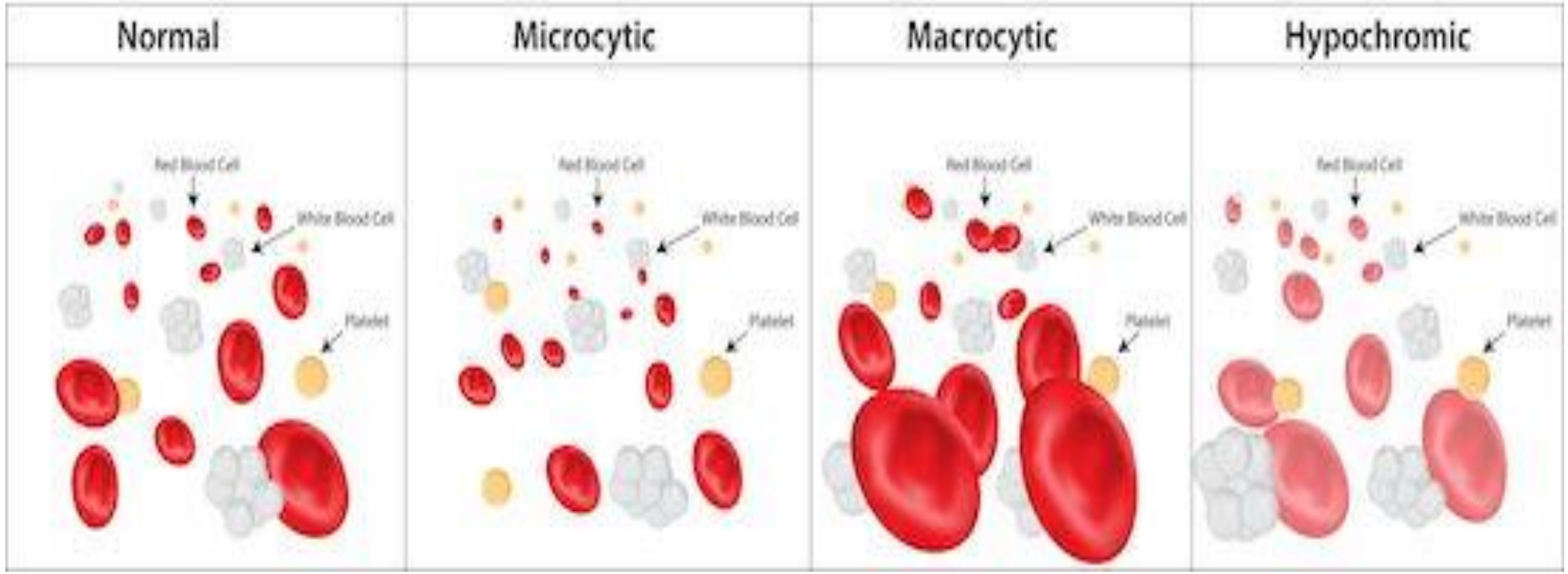
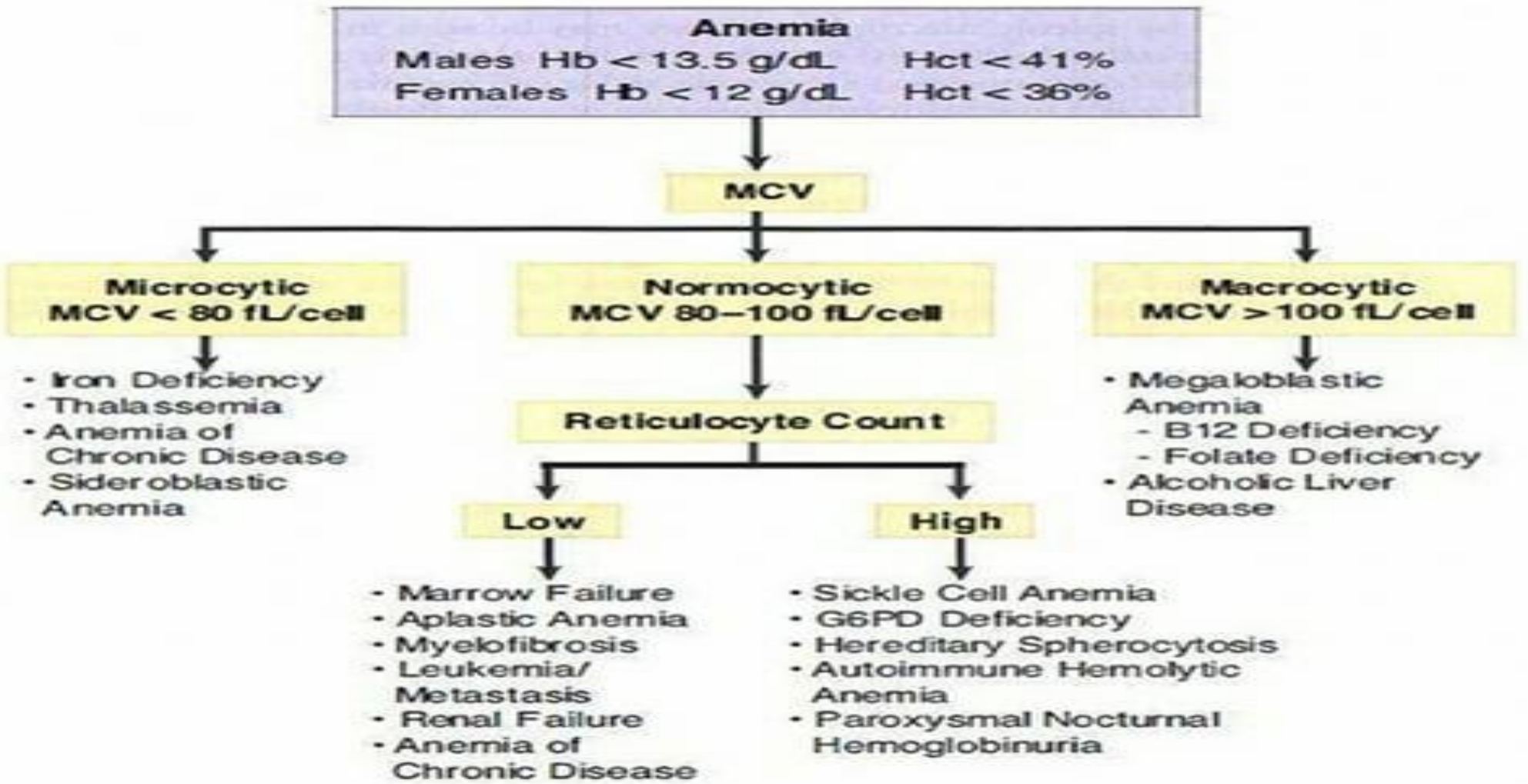
Anemia




Anemia
Males Hb < 13.5 g/dL Hct < 41%
Females Hb < 12 g/dL Hct < 36%
MCV
Microcytic
MCV < 80 fL/cell
Normocytic
MCV 80–100 fL/cell
Macrocytic
MCV >100 fL/cell
- Iron Deficiency
- Thalassemia
- Anemia of Chronic Disease
- Sideroblastic Anemia
Reticulocyte Count
- Megaloblastic Anemia
- B12 Deficiency
- Folate Deficiency
- Alcoholic Liver Disease
Low
High
- Marrow Failure
- Aplastic Anemia
- Myelofibrosis
- Leukemia/ Metastasis
- Renal Failure
- Anemia of Chronic Disease
- Sickle Cell Anemia
- G6PD Deficiency
- Hereditary Spherocytosis
- Autoimmune Hemolytic Anemia
- Paroxysmal Nocturnal Hemoglobinuria

Type of anaemia	Causes
Microcytic (low MCV)	**Iron deficiency anaemia** Thalassaemia Sideroblastic anaemia
Normocytic (normal MCV)	**Anaemia of chronic disease** **Acute blood loss** Haemolytic anaemia Renal failure (chronic)
Macrocytic (high MCV)	**B_{12}*/folate deficiency ('megaloblastic anaemia')** **Excess alcohol** **Liver disease (including nonalcoholic causes)** Hypothyroidism Haematological diseases beginning with 'M': myeloproliferative, myelodysplastic, multiple myeloma

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Platelet Count (thrombocytes)

- 150-450 X 10 to the power of 9 (150 – 450 X 10 to the power of 3 u/L)
- Platelet cells play a crucial role in the blood's clotting capacity. Platelet count is increased in leukemia and certain other blood disorders, and is decreased in certain anemias, acute leukemias, some chronic leukemias and some other conditions (idiopathic thrombocytopenia).
- Platelets often low in cancer from chemo, radiation or disease process.
- Idiopathic thrombocytopenia is autoimmune disease whereby antibodies attack platelets leading to increased purpura (looks like bruising under the skin).

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Serum Ferritin

Men: 20 - 300 ng/mL (44.94 - 674 pmol/L)
Women: 20 - 150 ng/mL (44.94 - 337 pmol/L)

- Ferritin is a protein which stores iron in your cells for your body to use later. Measuring ferritin levels gives us a good indication of the amount of iron stored in your body.

- Low levels of ferritin can indicate anaemia which can be caused by excessive or chronic bleeding, poor absorption of iron or too little iron in the diet.

- Raised ferritin levels can indicate iron overload syndrome (haemochromatosis) or any kind of liver damage. It is also a marker of infection and inflammation.

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- A low reading is associated with weakness, fatigue, lowered immune function and eventually anemia, if levels fall excessively low. This can occur from inadequate intake, the presence of chronic infection, cirrhosis, autoimmune diseases, and cancer

- High levels of iron occur in iron storage diseases (hemochromatosis), from iron overload (requiring more than 35-40 mg of iron per day from a supplement), in hemolytic anemias, liver disease, and sometimes in response to the use of oral contraceptives.

- Acute infections can also cause a spike in serum ferritin levels (acute phase reactant protein) – robbing bacteria of the iron they need for their replication

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Other Iron Status Blood Tests

Total Iron Binding Capacity (TIBC) is a measure of the amount of iron that can be carried through the blood. A raised TIBC result usually indicates iron deficiency whereas low TIBC can occur with iron overload syndrome (haemochromatosis).

Transferrin - is made in the liver and is the major protein in the blood which binds to iron and transports it through the body. Low levels of transferrin indicate iron deficiency while high levels indicate iron overload.

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Acute Phase Proteins Released From Liver

- In response to injury or acute infection, local inflammatory cells (neutrophils, other granulocytes and macrophages) secrete a number of cytokines into the bloodstream, most notable of which are the interleukins IL-1, IL-6 and IL-8, and TNF-alpha. Some of these stimulate release of acute phase proteins from the liver.

- Positive acute-phase proteins serve different physiological functions for the immune system. Some act to destroy or inhibit growth of microbes, e.g., C-reactive protein, Mannose-binding protein, complement factors, ferritin, ceruloplasmin, Serum amyloid A and haptoglobin.

- Others give negative feedback on the inflammatory response, e.g. serpins.

- Alpha 2-macroglobulin and coagulation factors affect coagulation, mainly stimulating it. This pro-coagulant effect may limit infection by trapping pathogens in local blood clots.

- Also, some products of the coagulation system can contribute to the innate immune system by their ability to increase vascular permeability and act as chemotactic agents for phagocytic cells.

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Low Iron States Without Frank Anemia (usually 12- 20ng/ml) – Stage One Iron Deficiency

Consider: Supplemental Iron – with Chelated Iron and Heme factors:

Each Vegetable Capsule Contains:

1. Ferrochel (Ferrous Bisglycinate Chelate) – 225 mg yielding 45 mg of Iron
2. Ascorbic Acid – 50 mg
3. Methylcobalamin – 20 mcg
4. Folic acid – 50 mcg
5. Vitamin B6 – 10 mg

Dosage: 1-3 capsules per day until serum ferritin above 20 ng/ml

* Optimal iron absorption and non-constipating

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Nutritional Anemias

Reference:

Clinical Nutrition 2nd edition (S. Halpern):235-248 (Lippincott Publisher)

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RBC synthesis requires following nutrient:

Iron

Vitamin B12

Folic Acid

Vitamin B6

Vitamin C

Vitamin E

And some minor elements and some protein

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Anemia = decrease in total red blood cell mass due to fewer RBC **or smaller RBC** (microcytic) that contain less hemoglobin (Hb) (hypochromic)

Anemia results from either decrease RBC production or increased loss or destruction of RBC

RBC Lifespan – 120 days (average)

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Freshly released RBC from bone marrow still contain fragments of mitochondria, polyribosomes, and other organelles that can be stained appearing as wavy reticular forms – **and thus called reticulocytes**

The Reticulocyte count (RC) is an index of bone marrow activity and essential aspect of blood exam of anemic patients

RC is reported as percentage of RBC count and is usually 0.8% - 1.0% of total RBC's in blood

RBC synthesis prompted by **erythropoietin** (produced in kidney in response to low oxygen levels in blood).

This is why anemia develops in CRF (decreased erythropoietin secretion)

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1. Iron-Deficiency Anemia – iron is part of Hb that binds oxygen in lungs

Most common iron-deficiency due to chronic blood loss (usually GI):

- Aspirin-induced GI bleeds
- Peptic ulcer
- Hiatus Hernia
- Chronic enteritis
- Hookworm infestation
- Neoplasm
- Hemorrhoids

- Also, uterine blood loss, epistaxis, frequent pregnancies)

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Decreased iron results in decreased Hb synthesis with:

1. Microcytic/hypochromic anemia

2. Mean corpuscular volume (MCV) and Mean corpuscular Hb (MCH) reduced

3. RC subnormal

4. Serum Ferritin below 50 ng/ml

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Other Causes: decreased iron intake relative to loss (e.g. vegetarian, anorexic)

1. Menstruating Women – lose 2 mg iron per day
2. Men – lose 1 mg per day

Good recovery of iron from GI after exfoliation of intestinal mucosal cells

10-20% of dietary iron is absorbed from NA diet (avg. diet provides 10-20 mg/d)

- Pregnant women require 3 mg net daily accretion (for fetal needs plus accounting for iron loss from their body)

- Infants, Teenagers and Women in Childbearing Years – most susceptible to iron deficiency

- Dietary iron is usually ferrous iron (divalent), which must be converted to ferric iron (trivalent form) for absorption in gut. Vitamin C and gut acidity aid this process. Thus, proton pump inhibitor drugs and other antacids can decrease iron absorption and increase risk of iron deficiency

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Apoferritin in intestinal mucosal cell guards against iron toxicity and also facilitates iron absorption

(thus 6-12 mg of iron from multiple vitamin supplement does not cause excess serum iron)

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Treatment of Iron Deficiency:

Must use supplementation as food alone can not bring levels up to normal

Ferrous sulfate; Ferrrous gluconate; Ferrous fumerate – 300 mg. 3x daily will increase RC and Hb in 7-10 days

Recall that Subclinical Iron Deficiency can occur without anemia and usually manifests as low serum ferritin below (12 -20) ng/mL, with fatigue, frequent infections and decreased physical performance (in absence of microcytic, hypochromic RBC changes and RC) – this is extremely common in women (stage 1 iron def)

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Megaloblastic Anemias – abnormal large oval RBC – the Macrocyte

Often caused by Vit B12 and/or folic acid deficiency, which are required for methlyation reactions to form DNA bases (thymidine synthesis) – resulting in **impaired mitosis**

Folic acid is also required to **join together shorter strands of purines and pyrimidine bases to form double-helix configuration**. If strands can't be joined then nuclear chromatin in stained cells show a **megaloblastic** appearance.

Macrocytes are prone to **hemolysis** and have a shorter life span

Folic acid – the native form (heptoglutamate) must be deconjugated to shorter forms for absorption in gut to occur.

Within mucosal cell vitamin C helps to convert FA to Tetrahydrofolate form, which is then absorbed into bloodstream and is the form from which all ensuing forms of FA are made by the body

Body requires 25-50 mcg of FA daily to prevent megaloblastic anemia. The body stores only 5 mg. Daily intake of only 5 mcg/d results in megaloblastic anemia within 3-4 months.

Serum Folate below 4 ng/100 ml (normal = 5 - 15) requires 1000 mcg, 3x per week to correct deficiency state

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Common Causes of Poor FA Absorption:

- Lack of vitamin C
- Folate antagonists (methotrexate)
- Alcohol (interferes with FA metabolism and absorption) – very important cause in NA

Recall – pregnant women have increased need for FA (800 mcg per day) –

decreased risk of spinal tube defects

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Vitamin B12 – recall that FA donates its methyl group to Vit B12, which then passes it along to methylation reactions, including DNA synthesis

Lack of B12 then causes megaloblastic anemia, even if FA status is normal

Serum Vitamin B12 below 100 pg/100 ml is suggestive of deficiency (normal = 150-400)

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Lack of vit B12 – see increased methylmalonic acid appear in urine, as B12 also required to convert methlymalonate CoA to succinate in myelin synthesis.

Decreased myelin synthesis results in Pernicious Anemia:

- Dorsolateral sclerosis of spinal cord caused by methylmalonate toxicity
- Ataxia
- Parasthesia
- Decreased vibratory sensation
- Decreased position sense

Daily Requirement of Vit B12 to prevent anemia : 2-3 mcg (avg NA diet provides 5-30 mcg/d)

Liver stores – 2000-5000 mcg, and thus several years (3-6) yrs are required to produce frank vit B12 def.

Recall- intrinsic factor (glycoprotein made by stomach parietal cells) required for absorption in terminal ileum, unless 1000 mcg/weekly is being ingested (passive diffusion does occur)

- Decreased gastric acidity (especially with age) – results in decreased intrinsic factor secretion and frequently encountered sub-optimal Vit B12 blood levels in elderly

  (with depression and personality changes in absence of megaloblastic anemia)

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INTEGRATIVE MEDICINE ACADEMY

Common Causes of Vit B12 Deficiency

1. Vegetarianism
2. Intestinal Infections and Diseases (malabsorption)
3. Lack of Intrinsic Factor (usually B12 injections are used) – Schillings Test – patient given radioactive Vit B12 with urine recovery of less than 8-10% over 24-hr collection period indicated Vit B12 deficiency from lack of B12 absorption.
4. Vit B12 parasites (fish tapeworm)
5. Chronic Pancreatitis
6. Decreased Gastric Acidity (aging, antacids, proton pump inhibitors, women produce less stomach acid)

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Vitamin B12 Treatment:

1. 100 mcg injection intramuscularly, 2x/wk until normal blood levels occur
2. Then, 100 mcg, 1x month for maintenance

Oral Route:

1000 mcg, 1x per week, (30 ml vial of 1000 mcg/ml of vitamin B12 (cyanocobalamin)

diluted with with 120 ml of preservative containing water will contain 200 mcg of B12/ml,

roughly 1000 mcg per tsp)

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INTEGRATIVE MEDICINE ACADEMY

Other Nutritional Considerations In Anemia:

1. Pyridoxine – required for **Heme synthesis.**
B6 def results in decreased hemoglobin synthesis with elevated blood iron and ring sideroblasts in bone marrow

Hypochromic, Microcytic Anemia results (but is macrocytic in 1/6 of cases)

This anemia is refractory to FA and Vit B12 until Vit B6 is added to treatment (50-200 mg/d)

Can be from genetic cause involving breakdown in pyridoxine utilization, but is overcome with supplementation

2. Vitamin C

Required for iron absorption in gut (ferrous)

Stabilizes FA reductase for conversion of native FA into absorbable THF

Thus, lack of vitamin C can exacerbate iron def anemia and/or megaloblastic anemia in marginal def states of either nutrient

3. **Vitamin E** – required to defend RBC membrane against free radicals and hemolytic anemia. Vitamin C also plays role

This appears to be helpful in cases of:

- Sickle cell anemia
- Glucose -6 phosphate dehydrogenase def
- Liver Disease with hemolytic anemia

4. **Riboflavin Def** – results in Normocytic anemia with hypoplastic bone marrow

B2 required for RBC glutathione reductase with some hemolytic anemias being due to B2 def (glutathione protects RBC from free radical damage and lysis – high iron and oxygen content creates oxidative environment)

5. **Niacin, Thiamine, Pantothenic Acid, Biotin Deficiencies** – all produce anemias in animals, but few if any cases reported in humans

6. **Elevated aluminum** can cause refractory hypochromic microcytic anemia (chronic dialysis patients- whose anemia reverses with chelation with desferoxamine). Aluminum shown to inhibit RBC synthesis in vitro

7. **Alcohol** – damages intestinal cells, leads to iron loss from GI erosion, decreases serum FA, inhibits heme synthesis and inhibits RBC synthesis in vitro – alcohol very common cause of anemia

(1/4 to 1/3 of hospitalized alcoholics show impaired heme synthesis)

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White Blood Cells, Infection, Inflammation And Related Disorders

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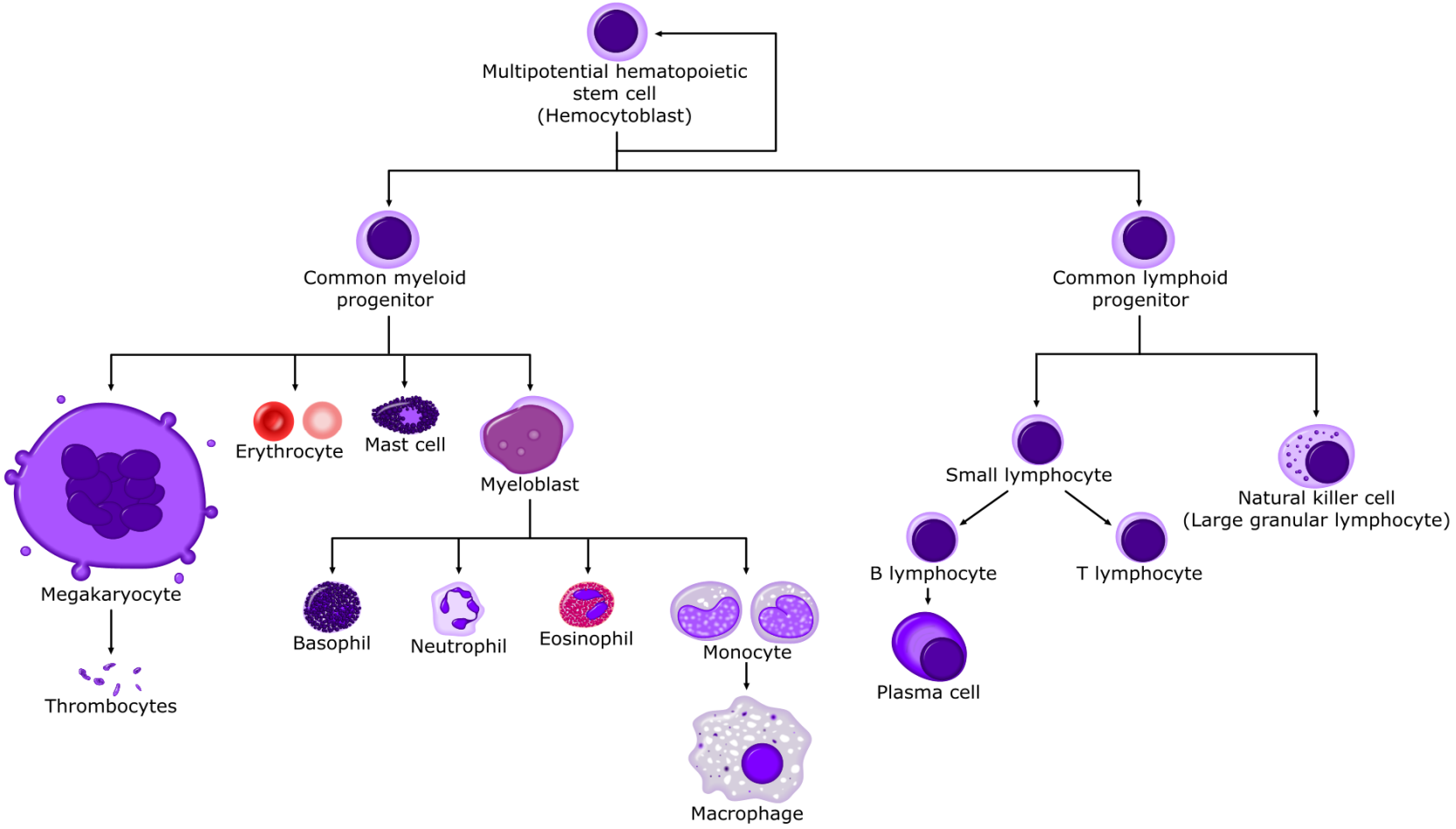
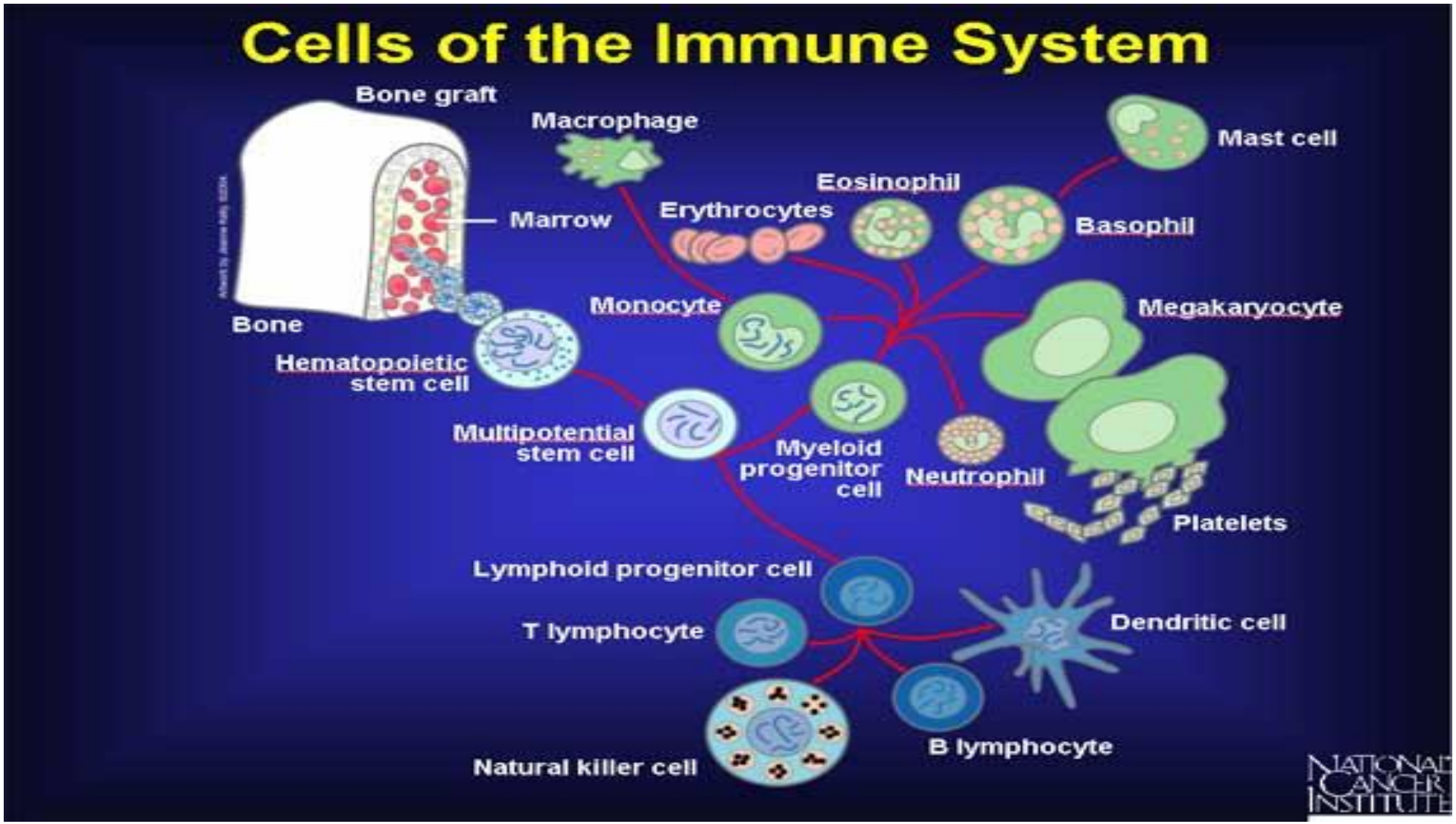
Hematopoietic Cells




Cells of the Immune System
Bone graft
Macrophage
Mast cell
Eosinophil
Erythrocytes
Marrow
Basophil
Monocyte
Megakaryocyte
Bone
Hematopoietic stem cell
Multipotential stem cell
Myeloid progenitor cell
Neutrophil
Platelets
Lymphoid progenitor cell
T lymphocyte
Dendritic cell
Natural killer cell
B lymphocyte

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Major Histocompatability Complex = Antigen (protein) MHC I – on all cells; MHC II - only on some specialized cells. On WBC's MHC called HLA (e.g. HLA B27)

- Any infectious agent (e.g. virus, bacteria, fungus etc.) that enters your body will eventually be taken up in your lymphatic system. Foreign agents (e.g. virus) have proteins on cell surface (MHC) that act as antigens

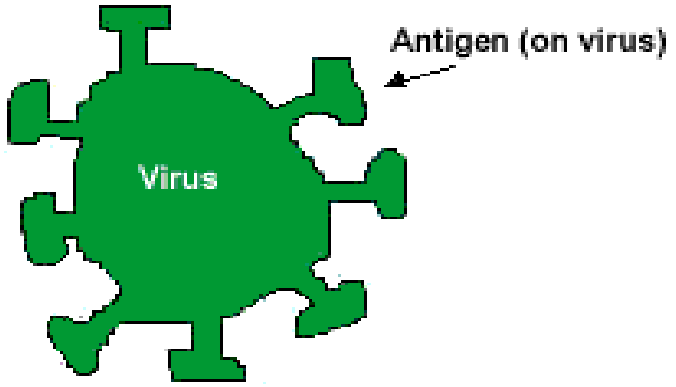

Figure 1

- This may happen very soon after infection, or it may not happen until the invader has found a niche and begun to replicate. In one of your lymph nodes, the infectious agent will bump into a macrophage. The macrophage will ingest the invader. Neutrophils and dendritic cells also ingest invaders upon contact as part of innate immunity.

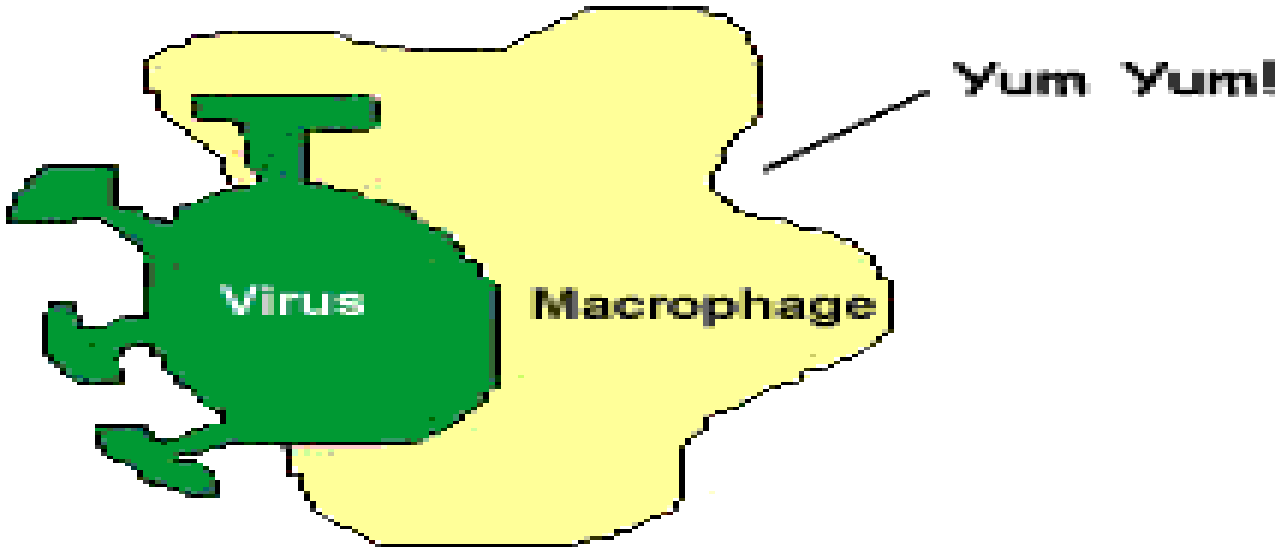

Figure 2
Macrophage surrounds/"eats" the virus

- Then the macrophage and dendritic cells take the invader apart and displays the viral **antigens** on its surface for other immune cells to read

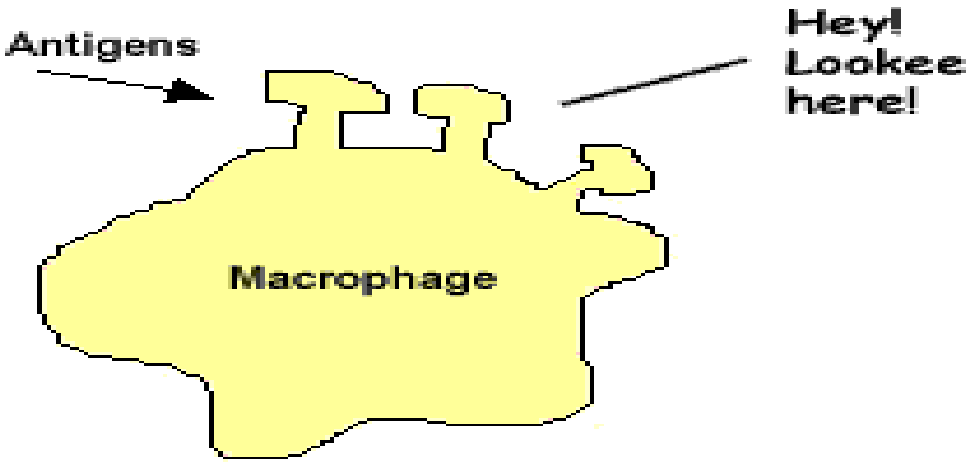

Figure 3
Macrophage displays the antigens of the virus on its surface to alert and activate the other cells.

- The antigens act as an identity card that allows our immune system to recognize invaders
- After displaying the agent's antigens, the macrophage and dendritic cells will send out a message (cytokines) to a T-helper cell to read and recognize the antigens.

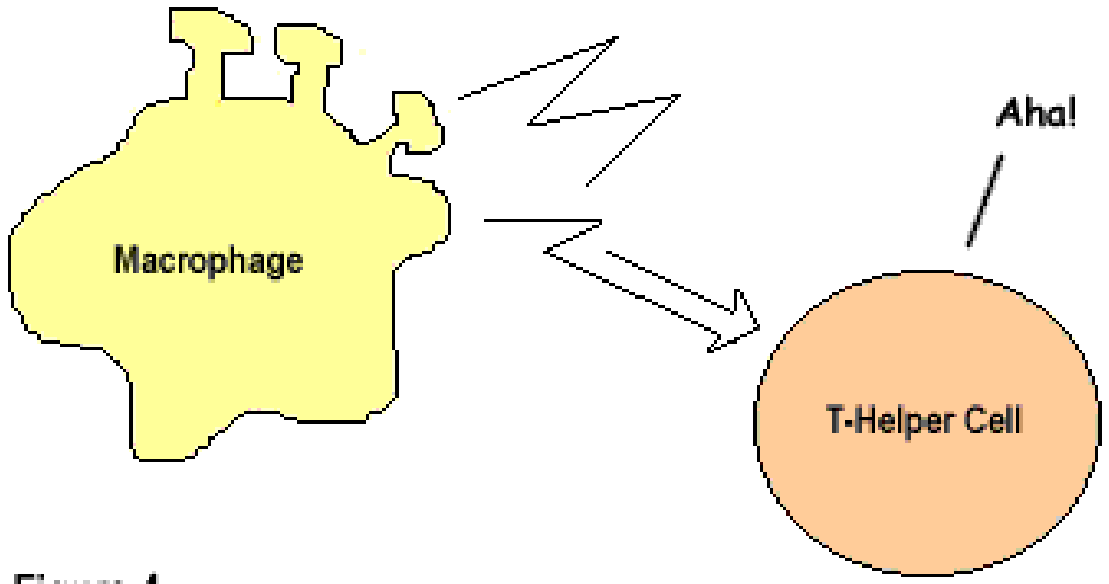

Figure 4
T-helper cell reads and recognizes the antigens

- This message activates T-helper cells and triggers the immune response. Once the T cell has read the antigens, it will send out messages to activate B cells (lymphocytes), which will in turn come and read the antigens from the macrophage's surface

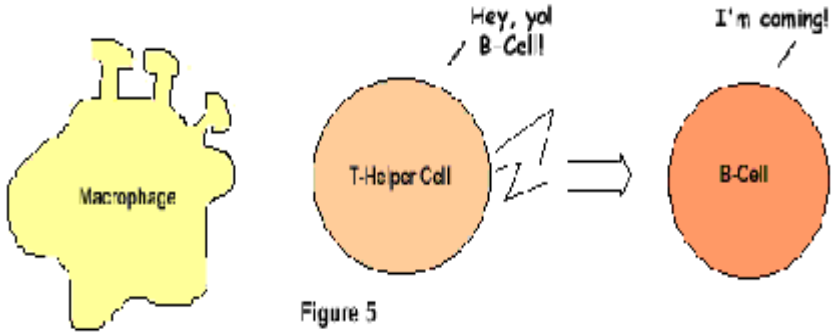

Figure 5
T-helper cell is activated and triggers the immune response, sending out messages to activate the B-cells.

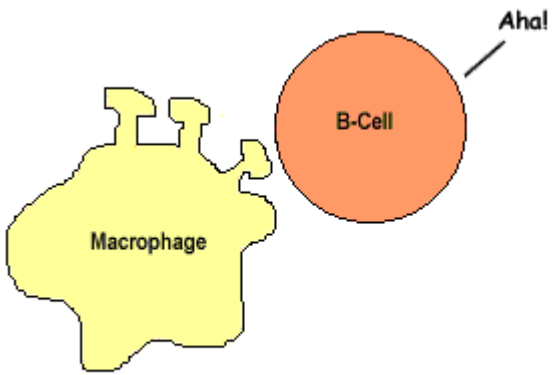

Figure 6
B-cells, in turn, come and read the antigens on the macrophage

- The activated B cells morph into **plasma B cells** and produce millions of **antibodies**. The antibody is a protein that will bind to an antigen. Each antibody is unique and specific; for example, a measles antibody will only bind to a measles virus. We produce antibodies because, given the high concentration of infectious agent that is needed to cause disease, our macrophages could not go after the invaders alone. However, antibodies can outnumber the invaders and help us get rid of them. Some activated B cells morph into **memory B cells**, which store the antigen data in case the invader presents itself in the future (acquired immunity and vaccination premise).

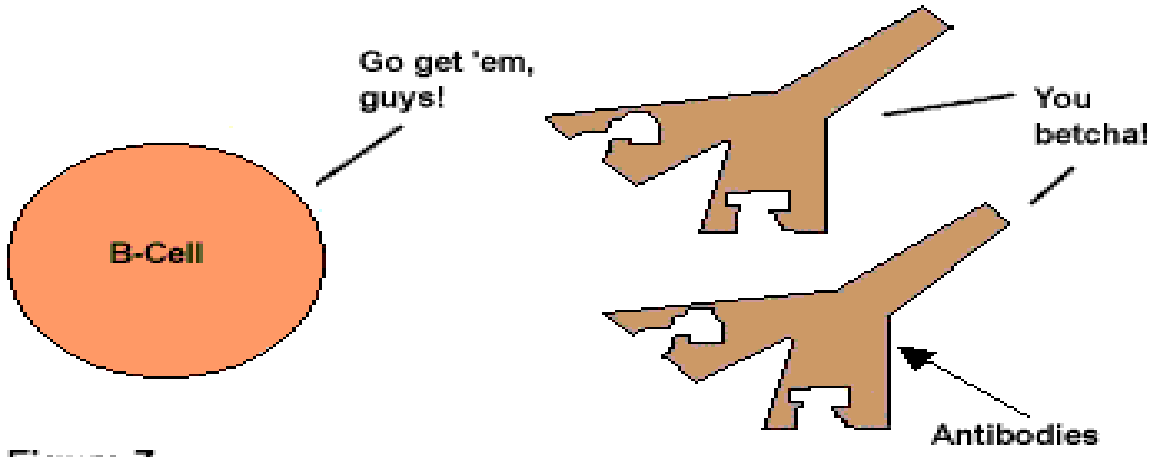

Figure 7

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- Once an antibody has "coated" an invader, it will broadcast a signal that says "eat me and whatever I have captured". A macrophage will in turn get the message and will devour the antibody-antigen complex and rid the body of the infectious agent

See Next Slide For Illustration

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Macrophage Ingests antigen-antibody complex

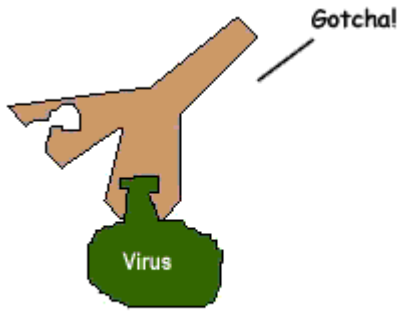

Figure 8

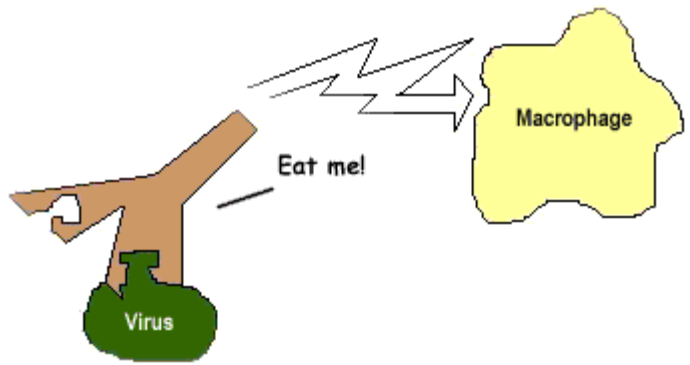

Figure 9

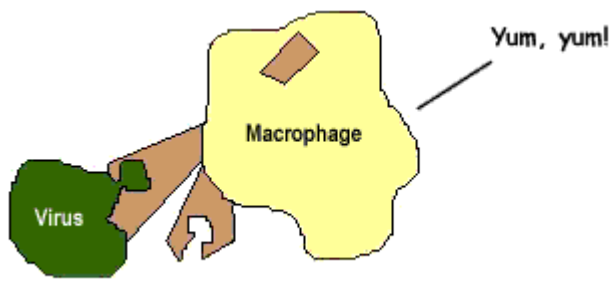

Figure 10

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Ending The Battle

- Eventually, as this process continues, the number of infectious agents will decrease and the body will need to stop the battle. However, all the cells are still activated and the immune system needs to put them to rest. Another kind of T cell, the T-suppressor cell (T8 or CD8 cell), will send out cytokines to other cells and "de-activate" them. Without the T-suppressor cells, the body would continue trying to fight off a disease that no longer exists (and eventually would end up fighting its own cells – as in autoimmune diseases)

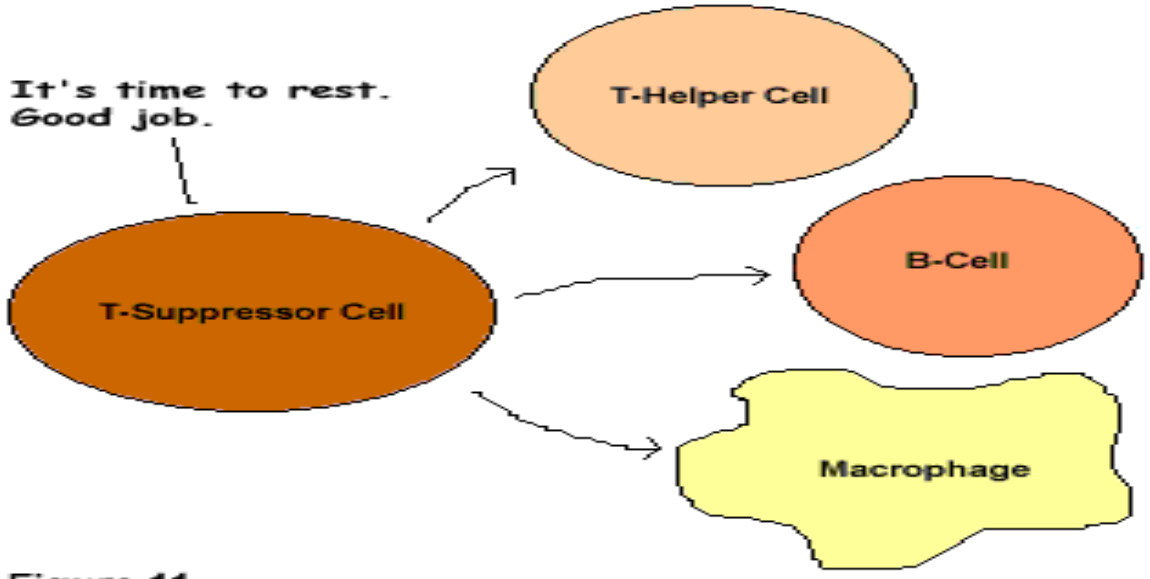

Figure 11

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CD4 and CD8 T-Lymphocytes

- **T-Cells --** T lymphocytes are usually divided into two major subsets that are functionally and phenotypically (identifiably) different.

- The T helper subset, also called the **CD4+** T cell, is a pertinent coordinator of immune regulation. The main function of the T helper cell is to augment or potentiate immune responses by the secretion of specialized factors that activate other white blood cells to fight off infection.

  Another important type of T cell is called the T killer/suppressor subset or **CD8+** T cell. These cells are important in **directly killing certain tumor cells, viral-infected cells and sometimes parasites.**

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- The CD8+ T cells are also important in down-regulation of immune responses once the invading organism is under control.

- A subset of CD8+ cells **are Natural Killer Cells**, which also kill cancer cells, virally-infected cells (most notably herpes and cytomegalovirus-infected cells) without need of any prompting from CD4+ cells (using perforin and granzyme B). However, CD4+ prompting improves their killing efficiency. (Hence Melatonin Consideration)

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CD4 (Th1 and Th2 cytokines)

- The helper T-cells produce enormous amounts of two types of cytokines: Th1 and Th2.

- The Th1 cytokines produce **a pro-inflammatory** response
- The Th2 cytokines produce an **anti-inflammatory** response, **but promote allergic responses.**

Th1 Cytokines:

- produce inflammation to kill intracellular parasites (viruses and certain bacteria).
- perpetuate any form of autoimmune response
- can cause cell-mediated allergies.
- Th1-type lymphokines are involved in the development of organ-specific autoimmune diseases, such as autoimmune uveitis, allergic encephalomyelitis, or insulin-dependent diabetes mellitus.

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Th2 Cytokines:

- counteract effects of the Th1 cytokines – they have an anti-inflammatory action.

- they also help kill extracellular pathogens (which live outside the body's cells and are exposed to antibodies in blood and other body fluids).

- **induce a pronounced allergic response.** If you suffer from IgE-mediated allergies, or asthma, you are likely to be over-producing Th2-types of cytokines, and have a Th2-weighted imbalance.

- Th2-cell predominance is found in patients with chronic graft-versus host disease, progressive systemic sclerosis, systemic lupus erythematosus, and allergic diseases

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Th-1 and Th-2 Bioregulation

- In autoimmune disease and chronic inflammation the goal is to suppress Th-1 and increase Th-2

- In cancer the goal is to increase Th-1 response

Nutrients and Drugs That Provide Bioregulation:

- Mushrooms (reishi, shitake, maitake, cordyceps)
- Astragalus
- Plant Sterols and Sterolins (e.g. Beta-sitosterol)
- Zadaxin – synthetic thymus hormone

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Cancer and Immuno-Therapy – evidence that cancer involves immune failure of:

- Dendritic Cells
- T- Killer Cells (CD8+)
- T- Helper Cells (CD4+)
- Natural Killer Cells
- B-lymphocytes and plasma cells
- Macrophages – TNF-alpha – apoptosis, and antigen presenting cell
- Neutrophils – respiratory burst insufficiency – especially after age 60.

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White Blood Cells

Granulocytes:

Neutrophils can increase in response to bacterial infection or inflammatory disease. Severe elevations in neutrophils may be caused by various bone marrow disorders, such as chronic myelogenous leukemia.

- Decreased neutrophil levels may be the result of severe infection or other conditions, such as responses to various medications, particularly chemotherapy (Neutropenia common in cancer treatment). Also decreased neutrophils in ANCA Vasculitis, an autoimmune disease where antibodies attack neutrophils

  Neutrophils create respiratory bursts of Hydrogen Peroxide to destroy pathogens and cancer cells. After age 60 neutrophils show decreased respiratatory burst capacity. Allogenic neutrophil administration from younger donors shown to help fight cancer (Dr Maharhaj)

  Neutrophils are also known as granulocytes (grans), polys, PMNs, or segs.

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Eosinophils can increase in response to **allergic disorders,** inflammation of the skin, and **parasitic infections.** They can also increase in response to some infections or to various bone marrow disorders. Decreased levels of eosinophils can occur as a result of infection.

Basophils can increase in cases of leukemia, chronic inflammation, the presence of a **hypersensitivity reaction to food,** or radiation therapy.

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Agranulocytes

- ***Lymphocytes (B cells and T cells)*** - can increase in cases of viral infection, leukemia, cancer of the bone marrow, or radiation therapy.

- Decreased lymphocyte levels can indicate diseases that affect the immune system, such as lupus, and the later stages of HIV infection and later stages of cancer

- ***Monocyte*** levels can increase in response to infection of all kinds as well as to inflammatory disorders. Monocyte counts are also increased in certain malignant disorders, including leukemia. Decreased monocyte levels can indicate bone marrow injury or failure and some forms of leukemia.

- Remember that monocytes morph into macrophages and osteoclasts and dendritic cells.

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General Scheme To Keep In Mind

- Neutrophils - the most common white blood cells, are infection-fighters that increase during bacterial or fungal infections.
- Lymphocytes - responsible for the immune response and regulation of antibody (immunoglobulin) production. They are increased in some leukemias.
- Monocytes - phagocytes that ingests foreign cells. These may increase in some leukemias
- Eosinophils - phagocyte that increases during allergic attacks and some parasitic infestations.
- Basophils - control inflammation and damage to the body. They increase in some blood diseases and poisoning.

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Normal WBC Blood Test Results

Two measurements of white blood cells are commonly done in a CBC:

1. The total number of white blood cells in a microliter (1x10-9 liters) of blood, reported as an **absolute number** of "X" thousands of white blood cells, and

2. The percentage of each of the five types of white blood cells. This test is known as a **differential** or "diff" and is reported in percentages.

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Normal values for total WBC and differential in Adults:

- Total WBC: 4,500 - 10,000

- Bands or stabs: 3 - 5 %

- **Granulocytes** (or polymorphonuclears)
  - **Neutrophils** (or segs)**: 50 - 70% relative value** (2500-7000 absolute value)
  - **Eosinophils: 1 - 3% relative value** (100-300 absolute value)
  - **Basophils: 0.4% - 1% relative value** (40-100 absolute value)

- **Agranulocytes** (or mononuclears)
  - **Lymphocytes: 25 - 35% relative value** (1700-3500 absolute value)
  - **Moncytes: 4 - 6% relative value** (200-600 absolute value)

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Handy Reference Of Abnormal Values And Associated Diseases

An increased percentage of neutrophils may be due to:

- Acute infection
- Eclampsia
- Gout
- Myelocytic leukemia
- Rheumatoid arthritis
- Rheumatic fever
- Acute stress
- Thyroiditis
- Trauma

A decreased percentage of neutrophils may be due to:

- Aplastic anemia
- Chemotherapy, Radiation therapy or Radiation exposure
- Influenza
- Widespread bacterial infection
- ANCA Vasculitis

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An increased percentage of lymphocytes may be due to:

- Chronic bacterial infection
- Infectious hepatitis
- Infectious mononucleosis
- Lymphocytic leukemia
- Multiple myeloma
- Viral infection (such as infectious mononucleosis, mumps, measles)
- Recovery from a bacterial infection

A decreased percentage of lymphocytes may be due to:

- Chemotherapy, Radiation therapy or Radiation exposure
- HIV infection
- Leukemia
- Sepsis

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An increased percentage of monocytes may be due to:

- Chronic inflammatory disease
- Parasitic infection
- Tuberculosis
- Viral infection (for example, infectious mononucleosis, mumps, measles)

An increased percentage of eosinophils may be due to:

- Allergic reaction
- Cancer
- Parasitic infection
- Hodgkin's disease

A decreased percentage of basophils may be due to:

- Acute allergic reaction

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CRP – Non Specific, But Good Monitoring Marker

- CRP is not specific. A high level serves as a general indication of acute inflammation or infection. In cases of inflammatory rheumatic diseases, such as rheumatoid arthritis and lupus, doctors can utilize the CRP test to assess the effectiveness of a specific arthritis treatment and monitor periods of disease flareup. It's value is as a general indicator, not specific. (Good monitoring tool)

- CRP can be normal in patients with active RA and lupus, however.

- Although a result above 1 mg/dL is usually considered high for CRP, most infections and inflammations result in CRP levels above 10 mg/dL".

- High levels are also associated with increased risk of CVD.

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ESR (erythrocyte sedimentation rate - SED Rate)

- Men: less than 10 mm/hr
- Women: less than 15 mm/hr

- The ESR refers to the rate at which red blood cells settle in non-coagulated blood.

The ESR is increased in rheumatoid inflammatory conditions, other inflammatory and infectious conditions, some cancers and several other conditions.

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Liver Function Tests

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Alanine transaminase (ALT) – Most Common General Screening Test For Liver Function Included In A CBC

- Reference range - 9 to 60 IU/L
- Alanine transaminase (ALT), also called Serum Glutamic Pyruvate Transaminase (SGPT) or Alanine aminotransferase (ALAT), is an enzyme present in hepatocytes.
- When liver cells are damaged, they leak this enzyme into the blood
- ALT rises dramatically in acute liver damage, such as viral hepatitis or paracetamol (acetaminophen) overdose.

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Aspartate transaminase (AST)

Reference range - 10 to 40 IU/L

- Aspartate transaminase (AST) also called Serum Glutamic Oxaloacetic Transaminase (SGOT) or aspartate aminotransferase (ASAT), is similar to ALT in that it is another enzyme associated with liver parenchymal cells.

- It is raised in acute liver damage, but is also present in **red blood cells, and cardiac and skeletal muscle** and is therefore not specific to the liver.

- The ratio of AST to ALT is sometimes useful in differentiating between causes of liver damage.

- Elevated AST levels are not specific for liver damage, and AST has also been used as a cardiac marker (heart attack)

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Alkaline phosphatase (ALP)

- Reference range - 30 to 120 IU/L

- Alkaline phosphatase (ALP) is an enzyme **in the cells lining the biliary ducts of the liver.**

- ALP levels in plasma will rise with **large bile duct obstruction**, **intrahepatic cholestasis** or **infiltrative diseases of the liver.**

- ALP is also present in **bone** and **placental tissue**, so it is higher in growing children (as their bones are being remodeled) and elderly patients with Paget's disease, and in osteoblastic bone tumors. In osteolytic tumors see rise in acid phosphatase enzyme.

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Gamma glutamyl transpeptidase (GGT)

- Reference range - 0 to 42 IU/L

- Although reasonably specific to the liver and a more sensitive marker for **cholestatic damage** than ALP, GGT may be elevated with even **minor, sub-clinical levels of liver dysfunction –** sensitive marker and thus, good screening test.

- It can also be helpful in identifying the cause of an isolated elevation in ALP.

- GGT is raised in chronic alcohol toxicity – if all other tests normal and see elevated GGT, usually due to chronic alcohol consumption (functional alcoholic).

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Albumin (Alb)

- Reference range - 34 – 47 g/L (3.4 – 4.7 g/dL)

- Albumin is a protein made specifically by the liver. It is the main constituent of total protein; the remaining fraction is called globulin (including the immunoglobulins).

- Albumin makes up the largest percentage of total blood proteins. A **reduction** in blood albumin usually reflects chronic liver disease such as cirrhosis. Other causes include advanced malignancy, protein mal-absorption, starvation, advanced kidney disease, congestive heart failure, eclampsia of pregnancy.

- An increase in albumin occurs in dehydration (a relative increase due reduced blood volume)

- Poor nutrition or states of protein catabolism may also lead to hypoalbuminaemia. The half-life of albumin is approximately 20 days. Albumin is not considered to be an especially useful marker of liver synthetic function; coagulation factors are much more sensitive

- At end-stage disease in cancer, often see albumin and prealbumin levels decline.

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Total bilirubin (TBIL)

- Reference range - 0.2–1.2 mg/dL

- Bilirubin is a breakdown product of heme (a part of hemoglobin in red blood cells).

- The liver is responsible for clearing the blood of bilirubin. It does this by the following mechanism:
  - bilirubin is taken up into hepatocytes, *conjugated* (modified to make it water-soluble), and secreted into the bile, which is excreted into the intestine.

- Increased total bilirubin causes jaundice, and can signal a number of problems

Direct bilirubin (Conjugated Bilirubin)

- Reference range - 0–0.3 mg/dL

- The diagnosis is narrowed down further by looking at the levels of direct bilirubin.

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Creatine Kinase (CK)

- Reference Range – below 210 U/L (units per liter)

- Elevation of CK is an indication of **damage to muscle.** It is therefore indicative of injury, rhabdomyolysis, myocardial infarction, muscular dystrophy, myositis, myocarditis, malignant hyperthermia, and neuroleptic malignant syndrome

- Creatine Kinase-MB (myoglobin) distinguished heart muscle involvement (heart attack) from peripheral muscle damge.

  CK elevation also seen in McLeod syndrome and hypothyroidism.

  The use of statin medications appear to elevate CPK level in about 1% of the patients – muscle damage

- **Lowered CK** can be an indication of **alcoholic liver disease** and rheumatoid arthritis.

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Total Protein

- 60.0 - 82.0 g/L (6.0 –8.0 g/dL)

- Like albumin, a reduction in total blood protein usually reflects chronic liver disease. Other causes include advanced malignancy, protein malabsorption, starvation, advanced kidney disease, congestive heart failure, eclampsia of pregnancy.

- An increase in total protein occurs in dehydration (a relative increase due reduced blood volume)

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Globulin

- 14 - 45 g/L (1.4 – 4.5 g/dL)

- Globulin proteins are another type of protein found in the blood. Globulin proteins are often elevated in liver disease whereas a decrease signifies serious **depletion of the body's immune defense mechanisms** – **very low levels as cancer progresses.**

- **Alpha globulins are often elevated in hepatitis, collagen diseases, advanced malignancies, chronic leukemia and lymphomas.**

- The **Bence-Jones globulin** protein (an abnormal one) is frequently elevated in multiple myeloma. It also spills into the urine in approximately 50% of multiple myeloma cases.

- Bisphosphanate drug administered as IV often help block osteoclastic activity in bones of patients with multiple myeloma

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A/G Ratio (albumin to globulin ratio)

- 1.30 – 2.60

- The A/G ratio is a useful evaluation to ensure that there is a healthy balance between albumin and globulin proteins in the blood.

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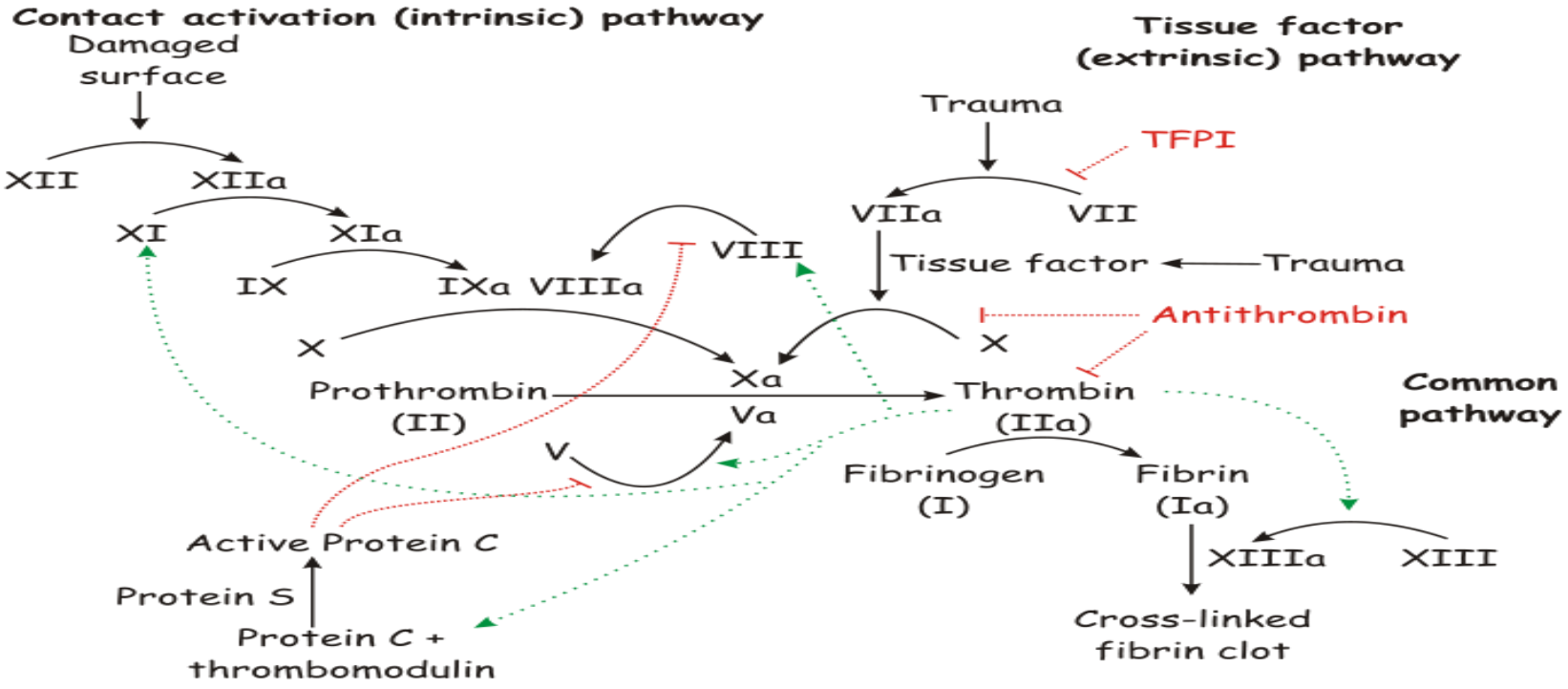
Prothrombin Time and INR

Clotting Cascade: Note conversion of prothrombin to thrombin



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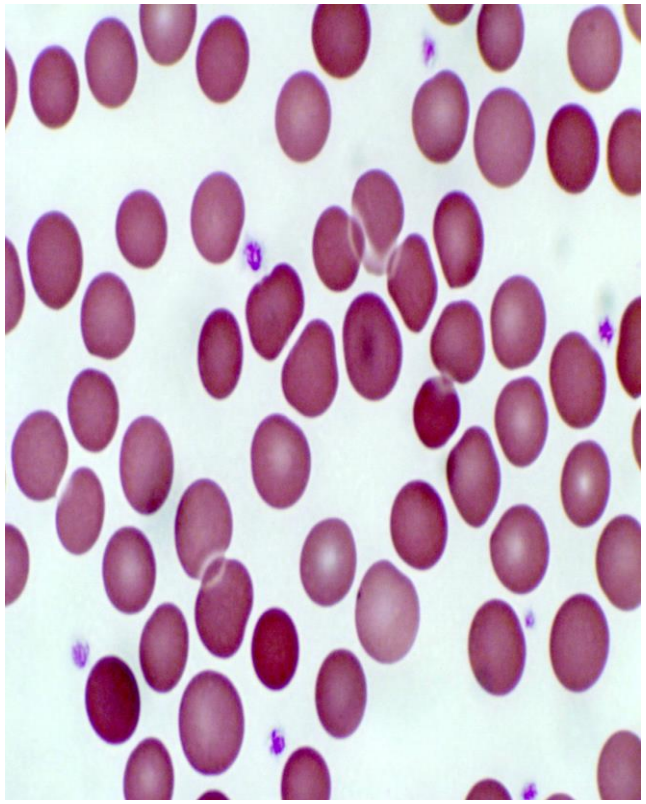
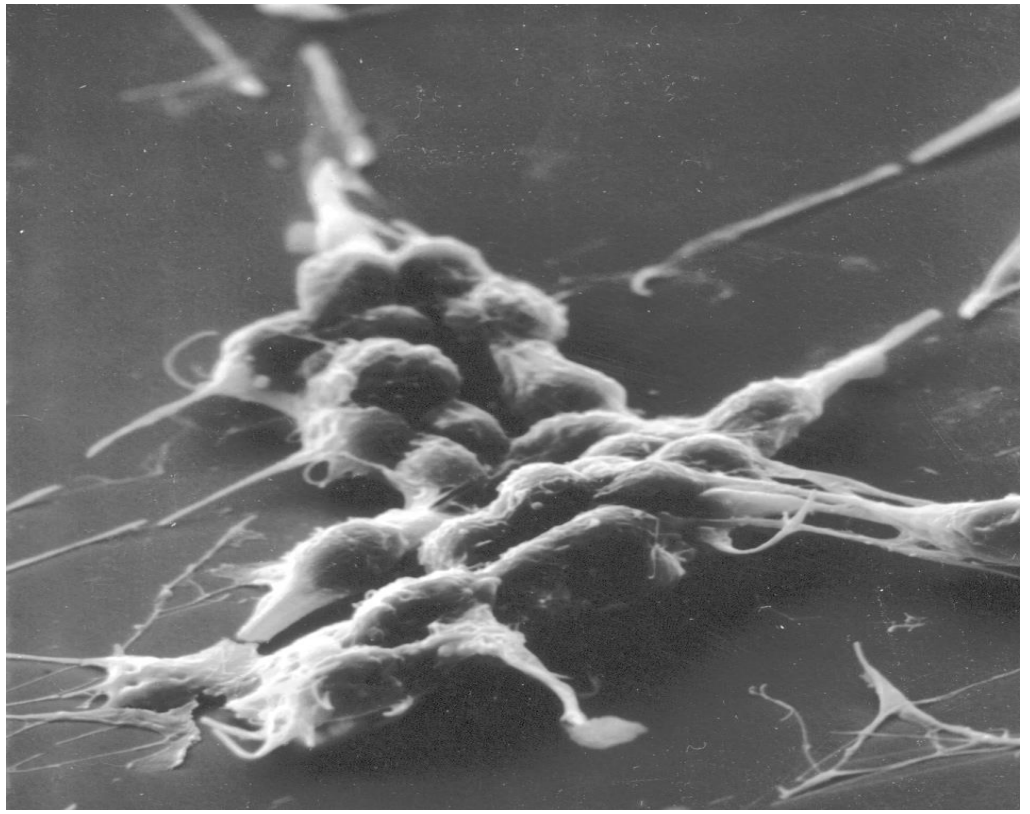
Scanning electron microscope on right shows group of platelets which have begun to initiate a clot. The stringy material covering them is fibrin.
The left side is inactivated platelets





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Prothrombin Time And INR

- The reference range for prothrombin time is usually around 12–15 seconds; the normal range for the INR is 0.9–1.3. (International Normal Ratio)

- A high INR level such as INR=5 indicates that there is a high chance of bleeding, whereas if the INR=0.5 then there is a high chance of having a clot.

- Normal range for a healthy person is 0.9–1.3, and for people on warfarin therapy, 2.0–3.0, although the target INR may be higher in particular situations, such as mechanical heart valves.

* **Major Adverse Side Effect** - Fatal or nonfatal hemorrhage from any tissue or organ.

Therefore, must be careful what supplements and dietary advice you give an individual on these medications.

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HIV 1 and 2

- No antibodies detected.

- This test is used to assess the presence of HIV infection.

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Kidney Function Tests

Creatinine

- 50 –100 umol/L (0.6 – 1.2 mg/dL)

- Creatinine is formed daily when old proteins are broken down by the liver. Blood creatinine levels are elevated in kidney disease.

- Blood creatinine is often used as an indicator of kidney function. An elevated value suggests poor kidney filtration ability.

- If the level rises too high then dialysis or kidney transplant is recommended

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BUN (blood urea nitrogen)

- 2.9-7.1 mmol/L (8 – 20 mg/dL)

- Urea is produced exclusively in the liver as an end product of protein metabolism.

- The most common cause of elevated BUN is kidney disease, however, it is also elevated in uncontrolled diabetes, starvation, intestinal bleeding, congestive heart failure and in febrile states – decreased kidney filtration

- A decrease in BUN occurs in advanced liver disease.

Previously saw:
eGFR

Albumin:Creatinine Ratio Urine Test

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Vitamins and Minerals

Vitamin E

- Above 27.5 umol/L (above 1.18 mg/dL)

- Observational studies suggest that blood levels in the optimal range are associated with decreased risk of heart attack and other vascular diseases.

Vitamin C

- Above 50 umol/L (above 0.88 mg/dL)

- Observational studies suggest that blood levels in the optimal range are associated with decreased risk of heart attack and other vascular diseases.

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Carotene (e.g. beta-carotene + alpha-carotene + lycopene, + lutein etc.)

- Above 0.4 umol/L (above 21.5 ug/dL)

- Observational studies suggest that blood levels in the optimal range are associated with decreased risk of heart attack and other vascular diseases.

Selenium

- Above 120 ug/L (colon cancer).

- Above 158 ug/L (prostate cancer), but requires at least 28 IU of vitamin E supplementation daily. Blood levels in the optimal range are associated with a significant decreased risk of colon cancer (Combs G, 2001) and prostate cancer (Peters U, 2007)

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Vitamin D (25-hydroxy cholecalciferol):

- 85 – 120 nmol/L (0.68 – 1.43 mg/dL)

- Vitamin D levels in the optimal range are associated with a decreased risk of osteoporosis, colon, breast and prostate cancers, and multiple sclerosis.

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Vitamin B12

- Above 300 pg/mL

- Low levels of vitamin B12 are associated with an increase risk of cancer. This may be especially true for breast cancer where a low level of vitamin B12 has been linked to a 2.5-4.0 times greater risk for breast cancer (Plant AS, Tisman G – Nutr and Cancer; 2006. 6,2:143-8)

Holotranscobalamin II

- Range: 70-130 pg/mL

- This is the most active form of vitamin B12 in the human body. Low levels are associated with an increase risk of cancer. (Plant AS, Tisman G – Nutr and Cancer; 56,2:143-8)

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Folic Acid

- Above 4 ng/mL (10 nmol/L)

- In conjunction with vitamin B12, folic acid, a B-vitamin, is required to make the DNA in our cells as our cells replace themselves from one generation to the next. A folic acid level below 4 ng/mL (10 nmol/L) is the level at which chromosomes break within our DNA allowing cancerous mutations to occur more easily. Low levels of folic acid are strongly associated with colon and cervical cancers, and likely other cancers as well (Ames B. 1995, JAMA, 273, 14: 1077-8)

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Coenzyme Q10

- At or above 2.0 mcg/ml

- Low blood levels of coenzyme Q10 are associated with an increased risk of congestive heart failure and a decline in immune function.

- Maintaining a minimum blood level of 2.0 mcg/ml is associated with reducing mild to moderate high blood pressure, and improving early stage congestive heart failure in studies when coenzyme Q10 has been administered via supplementation (120-350 mg per day).

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Hormone Assessment

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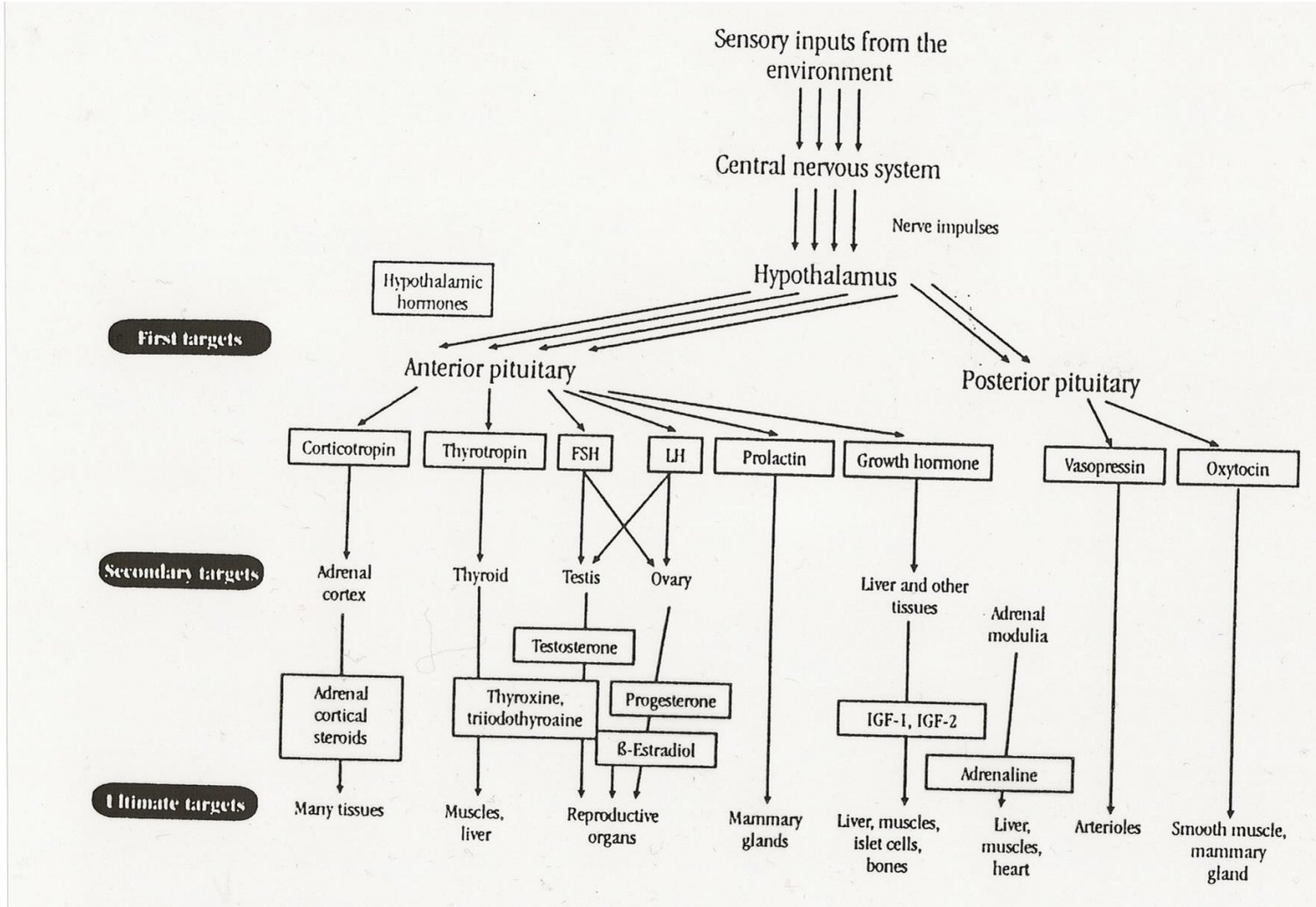
Neuro-Endocrine Signaling



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Thyroid Function

Conventional Thyroid Assessment (mU/L)

- Over 5.5 - Underactive Thyroid (Hypothyroidism)
- 0.2 – 5.5 Normal
- Less than 0.2 Overactive

Life Extension Foundation Assessment (mU/L)

- 4.0 - Increased risk of heart disease and future hypothyroidism – thyroid dysfunction
- 2.0 – 4.0 - Increased risk of future hypothyroidism – thyroid dysfunction
- 1.0 – 2.0 - Optimal Thyroid Function
- Less than 1.0 - Overactive Thyroid (Hyperthyroidism)

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What To Look For Clinically

Clinical Significance:

TSH above 4.0 is strongly associated with **increased risk of heart** disease and symptoms of under active thyroid:

- Physical and Mental Depression
- Low resistance to infection with slow recovery
- Difficulty losing weight with easier weight gain
- Fatigue
- Feeling cold
- Cloudy thinking – loss of cognitive edge
- Dry, flaky skin
- Constipation
- Prolonged menstrual bleeding not improved with estrogen and progesterone management

TSH between 2.0 – 4.0 – often see mix of symptoms associated with under active thyroid

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Thyroid Stimulating Hormone (TSH)

- 1.0 – 2.0 mU/L (1-2 uU/mL)
- TSH is a hormone released from the pituitary gland that instructs the thyroid gland to secrete more thyroid hormone into the blood stream.
- Thyroid hormone (T3 and T4) sets the metabolic rate for virtually all tissues of the body. High TSH levels indicate low thyroid function, whereas low TSH levels indicate an overactive thyroid.
- A TSH level between 2.0 – 4.0 indicates thyroid dysfunction, which often occurs as an aspect of the aging process (between age 40-50), usually responds to supplementation with thyroid support nutrients, whereas levels above 4.0 require a prescription of thyroid hormone.

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Treating Thyroid Dysfunction and Hypothyroidism

Treatment Options:

Thyroid Dysfunction (2.0 – 4.0) –Thyroid Support Formula and also consider Adrenal Support Formula, as high cortisol levels interfere with thyroid gland function and thyroid hormone function at the gene-receptor level within cells

Dessicated Thyroid (prescription only) - It provides both levothyroxine (T4) and L-triiodothyronine (T3):
Required by patients with TSH over 4.0, or in patients with TSH between 2.0 – 4.0 if unresponsive to Supplementation Support (mentioned above).

In patients requiring thyroid replacement (synthetic or dessicated thyroid) it can help to provide them with Thyroid Support Nutrients (and sometimes Adrenal Support Nutrients) to improve efficacy of thyroid hormone replacement therapy

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Dosage Equivalents

Synthetic Thyroid Tablets (Levothyroxine): Unithroid, Levoxyl, Levothroid, Synthroid	Armour Thryoid (dessicated thyroid)
• 25 mcg (.025 mg)	= 1/4 grain (15 mg)
• 50 mcg (.05 mg)	= 1/2 grain (30 mg)
• 100 mcg (0.1 mg)	= 1 grain (60 mg)
• 150 mcg (0.15 mg)	= 1 1/2 grains (90 mg)
• 200 mcg (0.2 mg)	= 2 grains (120 mg)
• 300 mcg (0.3 mg)	= 3 grains (180 mg)

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Alternative Dessicated Thyroid:

Canada ERFA - Tablets

30 mg

60 mg

125 mg

www.stopthethyroidmadness.com

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Free T4 (Thyroid hormone – Thyroxin)

- Ideal range - 1.2 – 1.4 ng/dL

- Normal Reference Range – 0.7 – 1.53 ng/dL

- Most of the thyroid hormone (thyroxine) made in the thyroid gland is in the form of T4 (4 atoms of iodine attached to each molecule of thyroxin).

- However, before thyroxin can be used by the tissues of the body it has to be converted to T3.

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Free T3 (Thyroid hormone – Thyroxin)

Ideal Range – 2.8 – 3.2 pg/mL

Normal Reference Range – 2.6 – 4.8 pg/mL

- T3 is the most active form of thyroxin hormone.
- Some individuals have a difficult time converting T4 into T3. In these cases supplementation with thyroid support nutrients can be beneficial. Remember that Armour Dessicated Thyroid contains T4 and T3, whereas synthetic thyroid contains only T4
- If Free T3 levels are below 2.6 pg/mL or the T4 level is below 0.70ng/dL, then thyroid hormone replacement therapy is likely required.

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Example of Thyroid Support Formula

One capsule contains:

1. Coleus Forskolin – 250 mg (std to 10% forskolin content)
2. Iodine – 150 mcg
3. Tyrosine – 250 mg
4. Gum Guggul – 150 mg (std to 2.5% Guggulsterones)

Dosage: Take 2 capsules per day in divided doses

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Function of Active Ingredients

- Tyrosine – the amino acid that is the essential building block from which thyroid hormone is made in the thyroid gland.
- Iodine – the essential mineral that is a critical component of thyroid hormone
- Coleus Forskolin – an herb shown to increase the release of thyroid hormone from the thyroid gland (experimental)
- Gum Guggul – an herb shown to increase conversion of T4 to T3, the most active form of thyroid hormone (experimental)

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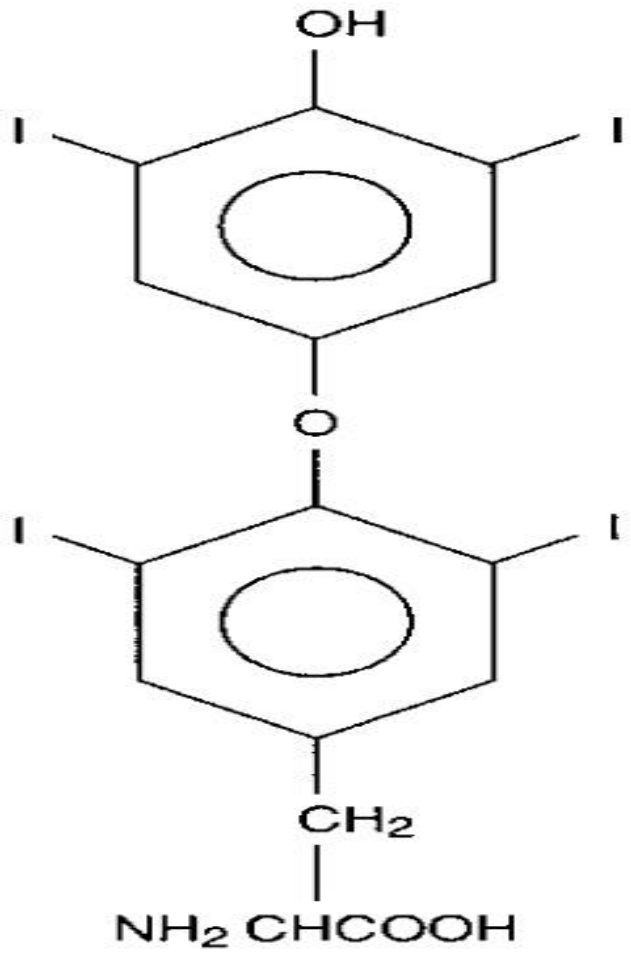
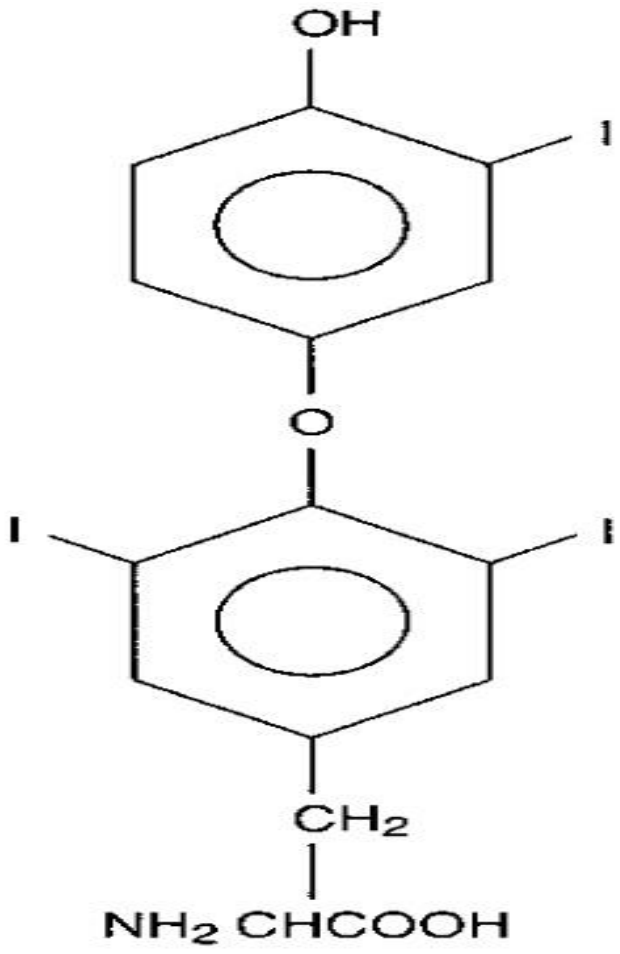
T4 and T3 Hormones: Note Tyrosine Backbone and Iodine



Thyroxine



Triiodothyronine

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Steroid Synthesis

Understand Steroid Synthesis:

- DHEA
- Cortisol, Aldosterone
- Growth Hormone and IGF-1
- Testosterone
- Estrogen
- Progesterone

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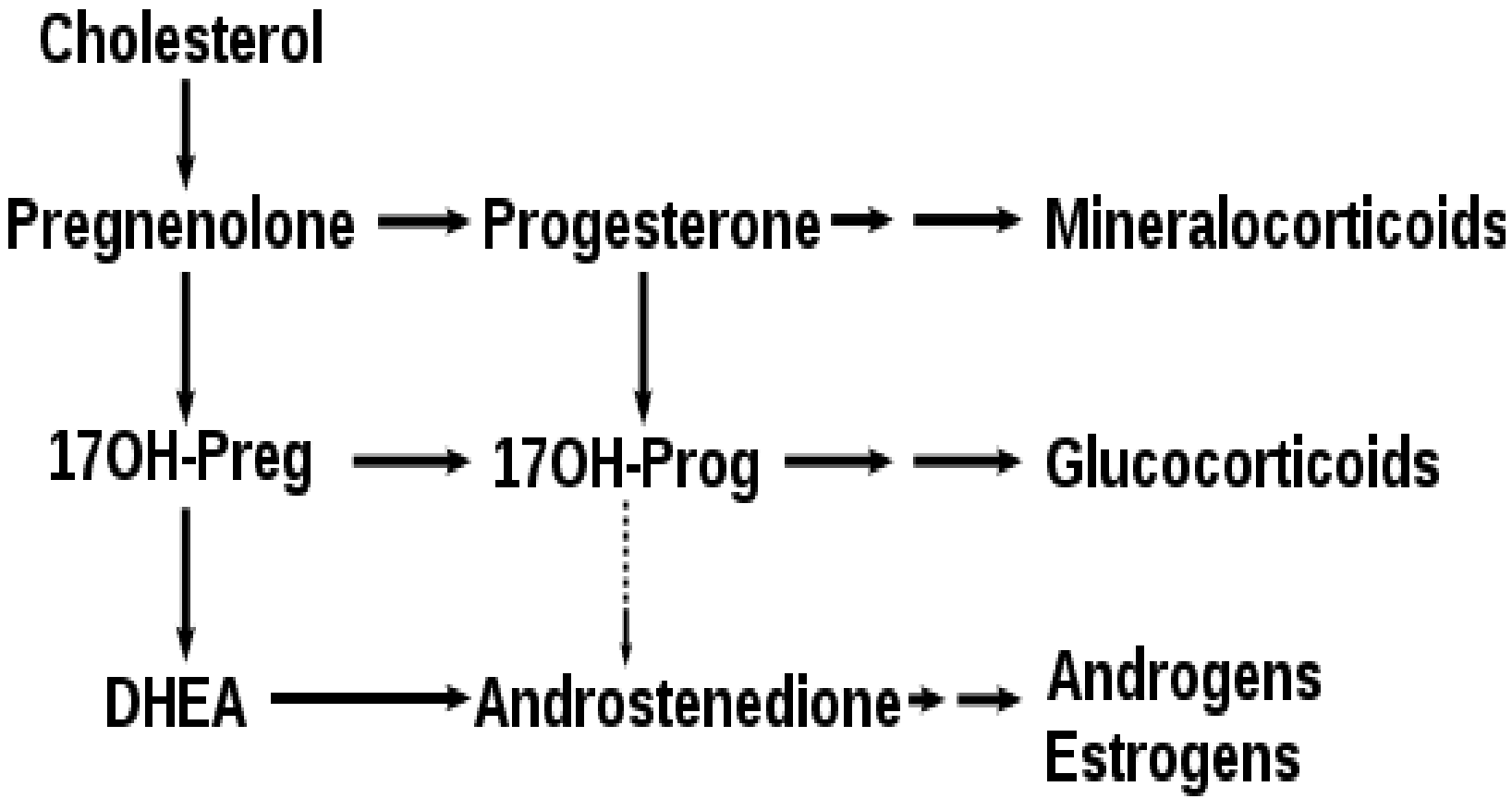
Overview of Steroidogenesis



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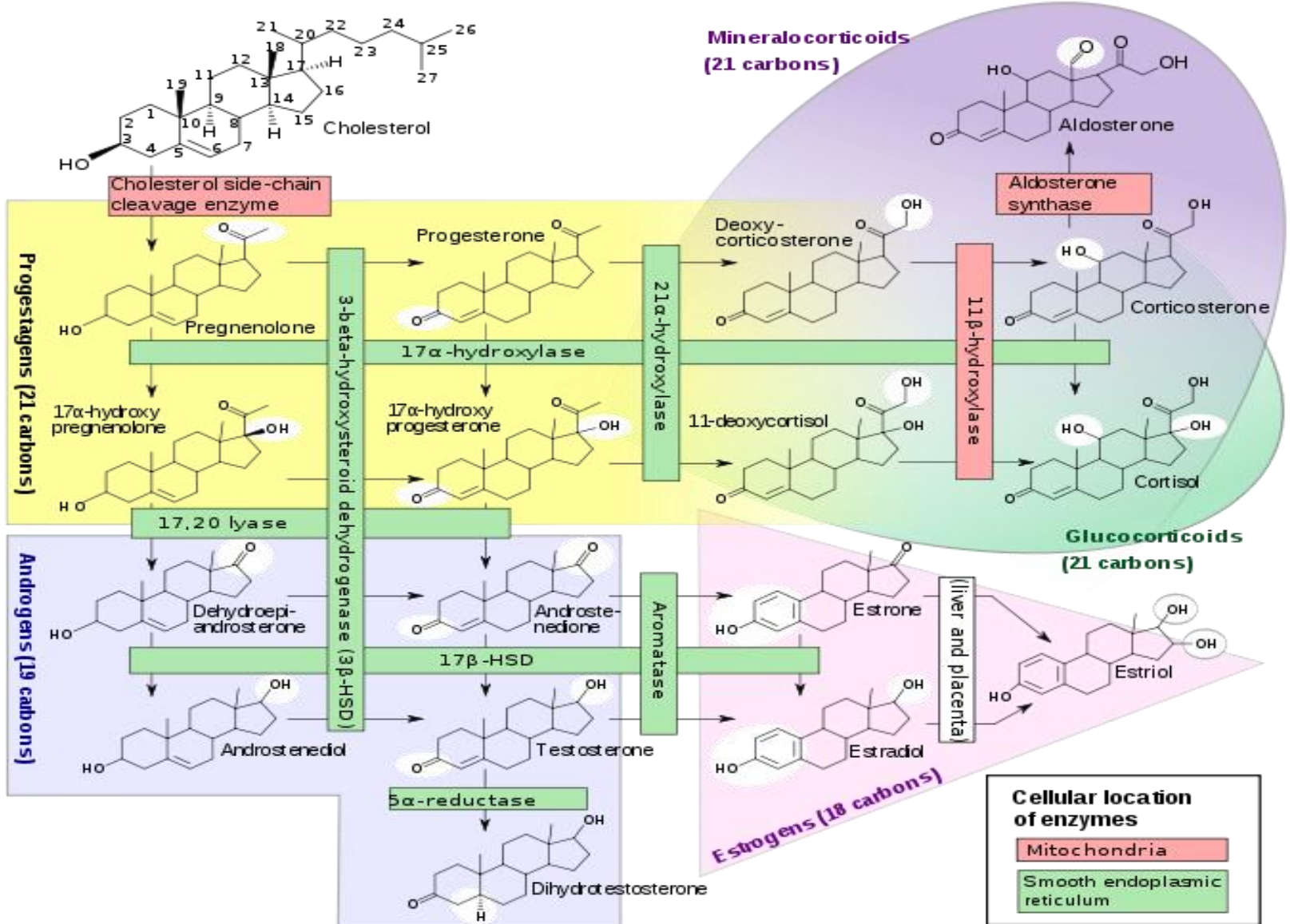
Detailed Steroidogenesis Pathways



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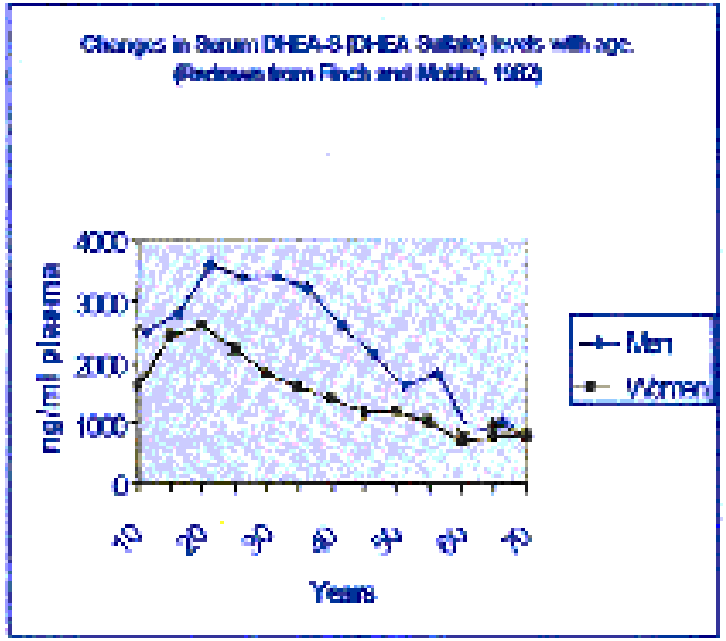
DHEA: Decline with Age



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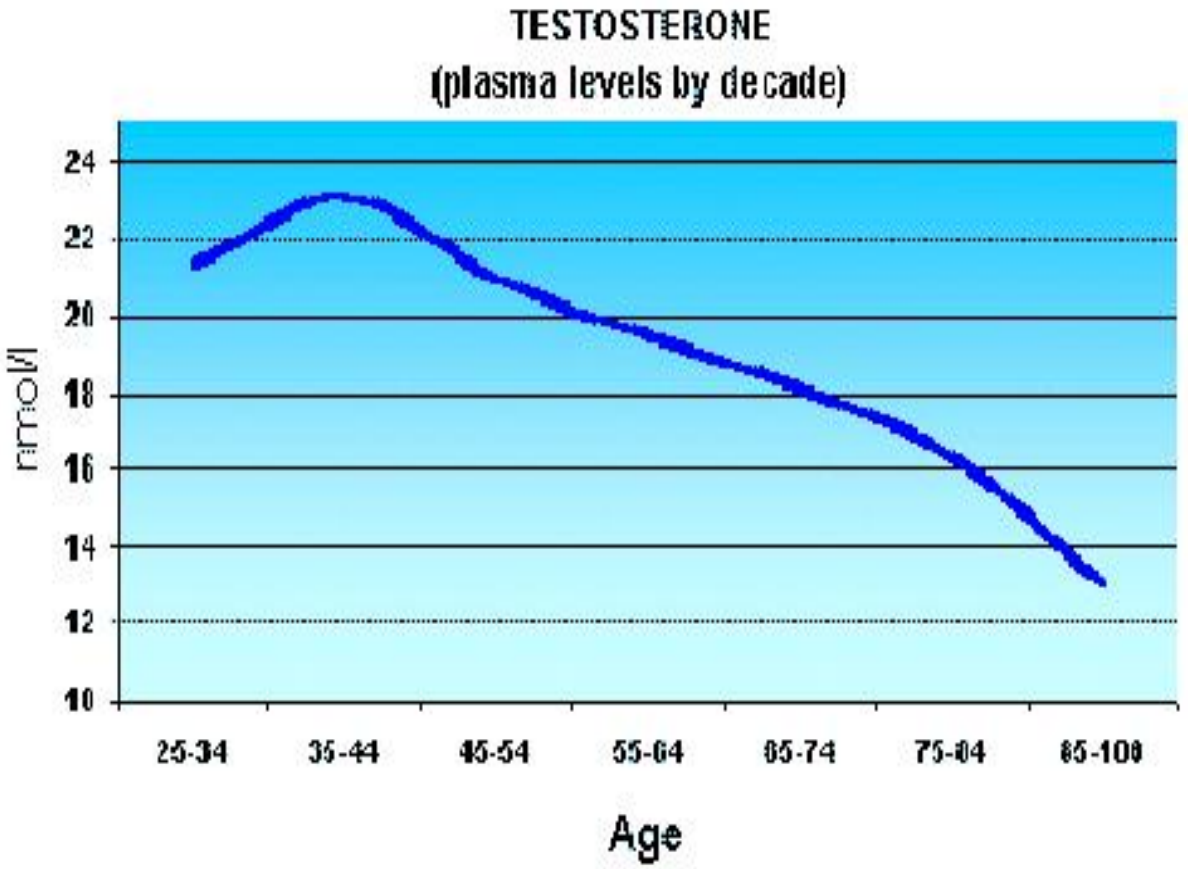
Age-Related Decline In Testosterone: 1% decline annually after 40



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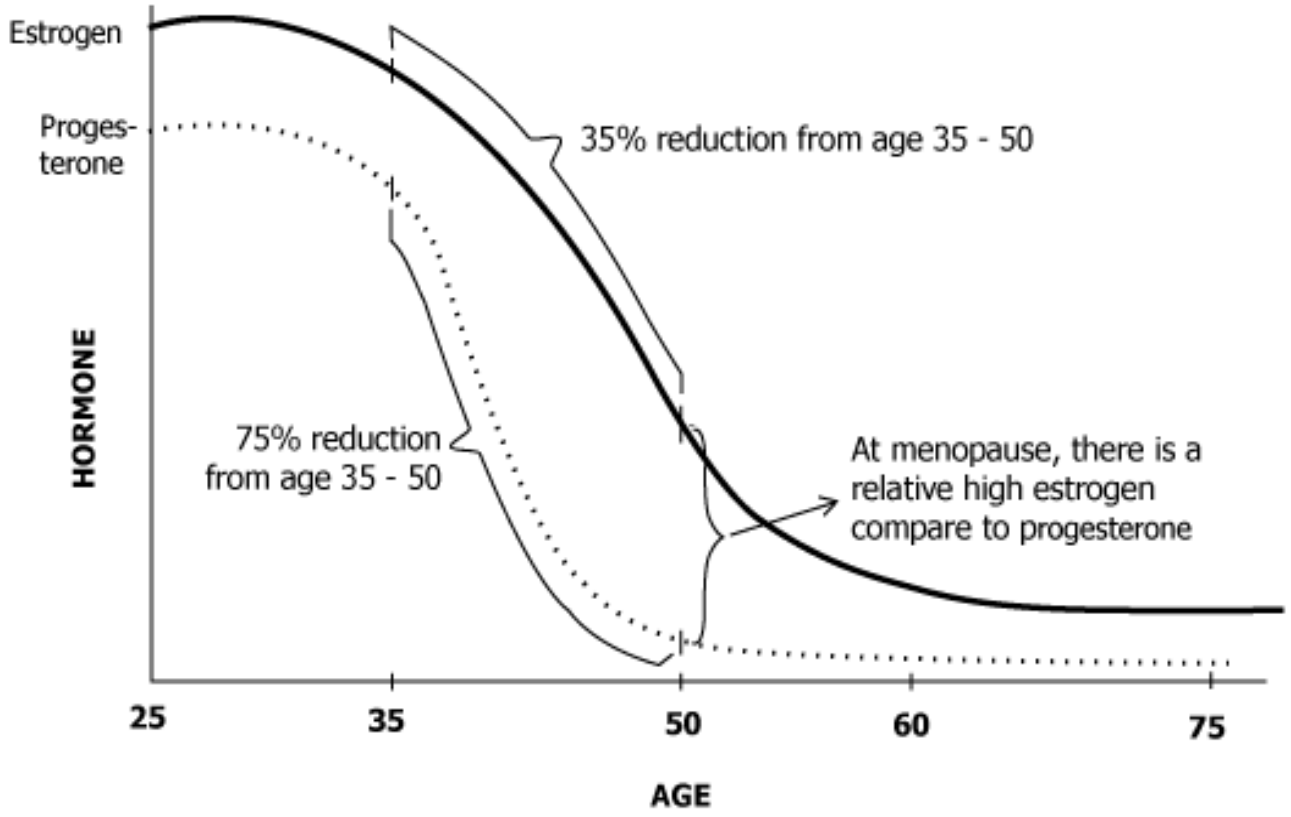
Age-Related Decline In Estrogen and Progesterone In Women



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DHEA

- Men: 250 – 450 mcg/dL (6.8 – 12.2 umol/L) Women: 150 – 350 mcg/dL (4 – 9.4 umol/L)

- Chronic stress tends to depress DHEA levels as more cholesterol is used to produce cortisol via pregnenolone pathway.

- Some experts suggest taking DHEA supplements if your DHEA blood levels are low or the DHEA/Cortisol ratio is not within the optimal range.

- DHEA on its own helps maintain bone density, slows skin aging by maintaining collagen levels, improves fat burning, enhances mood, sexual virility and responsiveness, boosts immune function, and helps to combat the undesirable effects of high cortisone levels (which accompany chronic or acute stress).

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- For men 25-50 mg per day is the typical dosage, and for women, they should start with 5-10 mg per day and slowly increase the dosage (up to maximum of 50 mg/day) if necessary until reaching optimal blood levels.

- Men with a history of prostate cancer and women with any previous reproductive cancer should not take DHEA supplements.

- DHEA may cause a latent cancer (breast, prostate) to start growing.

- DHEA supplementation requires semi-annual PSA blood testing in men.

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Cortisol

- 9 – 14 mcg/dL (250 – 385 nmolL)

- High levels of cortisol promote heart disease, diabetes and obesity by raising blood sugar and insulin, which increases and aggravates diabetic tendencies.

- This also leads to increased blood triglycerides, fat storage and weight gain – all of which increase heart disease risk.

- Elevated cortisol also weakens immune function (infections and cancer risk increase)

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- Chronic high cortisol decreases cognitive performance by the brain, adversely affecting memory, reaction time, problem solving etc.

- Supplementation with DHEA has been shown to combat many of the adverse affects of high cortisol levels (see DHEA/Cortisol ratio that follows) – however risk of cancer may increase with DHEA

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Cortisol:DHEA Ratio – ideally 5:1 or 6:1 (20:1 Ratio applies to **Cortisol:Testosterone Ratio-** higher ratio leads to muscle catabolism, decreased athletic performance, weakened immune system and often fatigue from over training)

- As we age the body makes more cortisol and less DHEA. The same is true in regards to chronic stress. As such, stress can speed up aging by creating an imbalance in the DHEA/Cortisol ratio.

- Some experts suggest taking DHEA supplements when the DHEA/Cortisol ratio is not within the optimal range, as a means to slow and/or reverse aging and reduce risk of certain chronic degenerative diseases.

- The preferred option is to lower cortisol levels via"

Adrenal Support Formula (Adaptogens)

Meditation, Deep Breathing, Yoga – Mind/Body Work

Endurance Exercise

In High Cortisol:Testosterone Ratio in Athletes – use periodization of training to allow recovery during unloading phase of training cycle.

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Saliva Cortisol and DHEA Testing

How Performed

The test involves simply spitting into a test tube. Cortisol is measured four times - in the morning (8 AM), noon, evening (4 PM) and night (best between 11 PM and midnight).

Other steroid hormones, such as estrogen, progesterone, DHEAS and testosterone can be measured along with cortisol in the 8 AM saliva sample, if desired.

Once the sample set is complete, you mail the tubes back to the lab for analysis in the mailing envelop that is included with the test kit. Both the patient and doctor receive copies of the results, usually within 2 weeks.

The National Institutes of Health (NIH) and the World Health Organization (WHO), recognize saliva cortisol testing as being very accurate

Rocky Mountain Labs: http://www.rmalab.com/index.php?id=14

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Interpretation Of Cortisol Saliva Testing

- The adrenal glands produce cortisol 24 hours per day with a regular diurnal variation.
- Cortisol output is highest within the first hour after waking, declines steadily through the day, and reaches a low during sleep.
- Adrenal exhaustion tends to result in a flattened cortisol profile with loss of the morning surge, while earlier stages of the General Adaptation Syndrome (heightened response) generally result in one or more elevated cortisol points.

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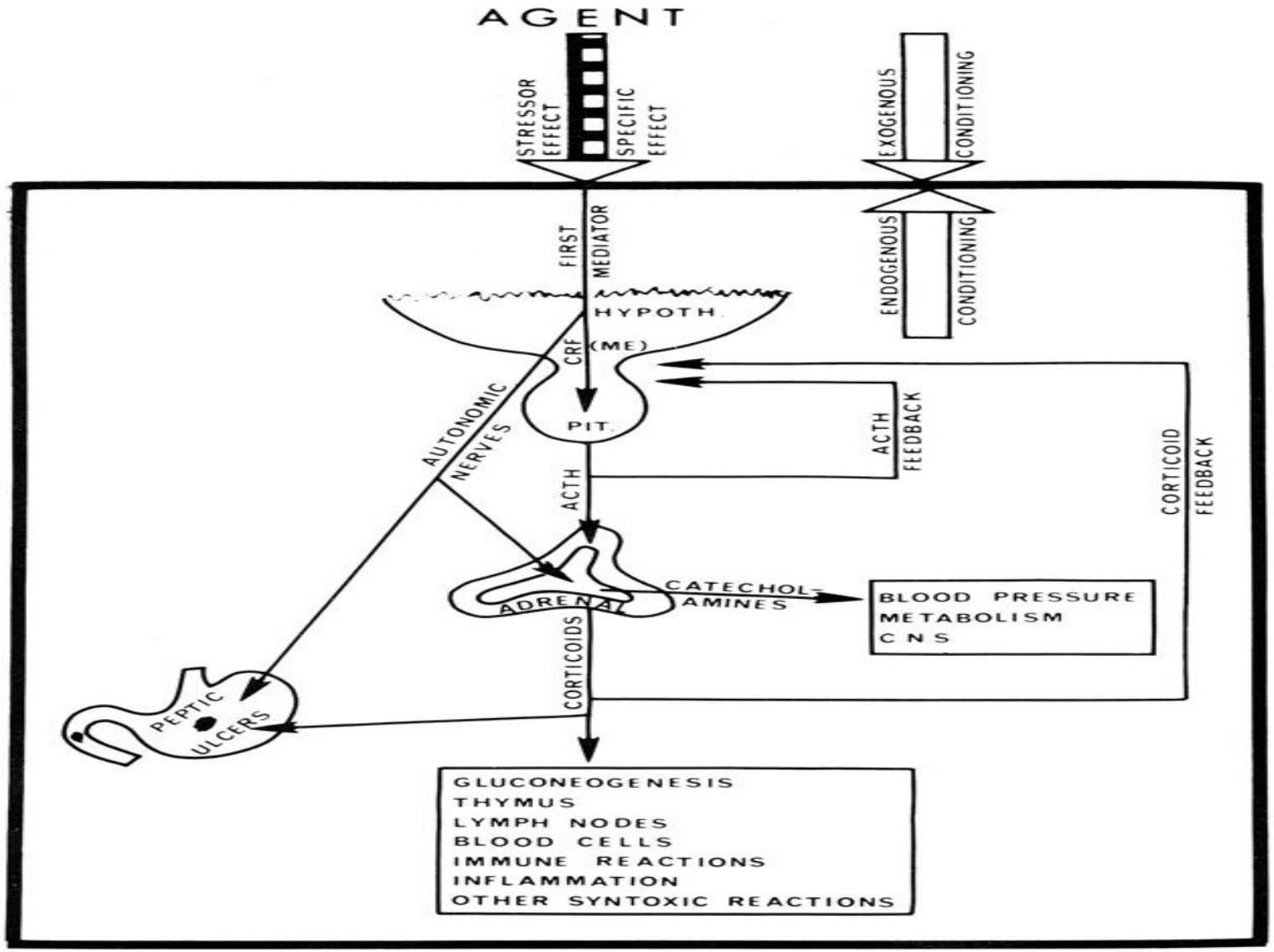
Stress Response And Cortisol Impact



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Overlap Of Symptoms Between Adrenal/Thyroid/Serum Ferritin and/or Low-grade Infection

High Cortisol also interferes with thyroid hormone effects on cell, and thyroid function producing symptoms of hypothyroidism:

- Hair falls out – brittle
- Fatigue
- Infections – recurring
- Skin changes
- Can't find energy to work out
- Easy weight gain

Also check serum ferritin levels with these symptoms

If all lab tests show normal then consider chronic infection (fatigue/lethargy) or depression and neurotransmitter problems

In too many cases these patients are simply given anti-depressant drugs without comprehensive thyroid/adrenal/ferritin assessment, or use Oregago capsules to kill virus or other pathogen

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Adrenal Support Formula Example:

Per capsule:

- Rodiola – 100 mg - (std to 3.5 total rosavins)
- Ashwaghanda – 225 mg (std to 5% withanolides)
- Schisandra – 100 mg (std to 2% schizandrins)
- Vitamin B6 – 25 mg
- Pantothenic acid – 25 mg
- Magnesium – 85 mg
- Vitamin C – 50 mg
- Zinc – 5 mg

Directions: take one capsule twice per day with meals or as directed by your health practitioner. Do not exceed a dosage of 4 capsules per day.

Best to avoid Ginseng and Licorice as these have drug-nutrient interactions and/or raise blood pressure, increase risk of bleeding

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Physiological Effects Of Adaptogens

- Suppress over secretion of cortisol
- Decrease adrenal hypertrophy
- Decrease inflammation (inhibit COX, LOX, NF-kb, TNF- alpha, other inflammatory cytokines)
- Increase energy and work capacity
- Improved memory and mental performance in human treatment group under stress, compared to control group (inhibit acetylcholinesterase and decrease beta-amyolid plaque, acts as brain antioxidant, enhances serotonin levels, nerve stem cell proliferation and differentiation in stressed animals and saves injured neurons of the hippocampus)
- Increase RBC production in chemotherapy-induced anemia
- Improved sex drive and performance

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Total Estrogens

- Men: Less than 100 pg/mL (367 pmol/ml)

- Women under 50 yrs old): 180 – 200 pg/mL (660 – 735 pmol/L)
- Women over 50 yrs old) 60 – 120 pg/mL (220 – 440 pmol/L)

- Estrogen is a dominant female hormone that contributes to many physical female characteristics. It also affects mood, brain function, bone density, skin, cholesterol levels and other functions. High levels of estrogen contribute to increased risk of breast cancer, and possibly prostate cancer in men.

- To lower estrogen levels it is advisable to eat a low fat animal diet, increase fiber intake, cruciferous vegetables (e.g. broccoli, cauliflower), perform aerobic exercise and have two tablespoons of ground flaxseed per day.

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Supplements

- If low estrogen levels are due to menopause then supplementation with a combination of black cohosh, soy extract and gamma-oryzanol can be very useful in reversing hot flashes, slowing aging and maintaining normal secretions of the vaginal tract.

- The addition of natural progesterone cream of tablets may also be beneficial to supporting female well being during and after menopause.

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Total Progesterone

In general, normal serum progesterone test results fall in the following ranges:

- men, postmenopausal women, and women at the beginning of their menstrual cycle: 1 ng/mL or under (3.1 nmol/L)
- women in the middle of their menstrual cycle: 5 to 20 ng/mL (16 - 63 nmol/L);

- Progesterone is a dominant female hormone, which supports brain function, bone density, skin and female reproductive tissues. In premenopausal women with low progesterone levels supplementation with black cohosh can raise progesterone levels, helping to balance the estrogen/progesterone ratio.

- In menopausal women, ingestion of natural micronized progesterone or the use of natural progesterone cream can help support bone density, improve mood, libido and overall well being.

- In menopausal women it often works with best with a combination of black cohosh, soy isoflavones and gamma-oryzanol supplementation.

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Progesterone/Estrogen Ratio

- Men: 15 – 20:1
- Women: 10 – 20:1

- This ratio represents the optimal ratio for these two hormones with respect to longevity and total well being.

Total Testosterone/Estrogen Ratio

- Men: 80 – 120:1
- Women: 2 – 5:1

- This ratio represents the optimal ratio for these two hormones with respect to longevity and total well being.

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Total Testosterone

- Men: 270-1070 ng/dL (9.4 – 27 nmol/L)
- Women: 15-70ng/dL (0.5 – 2.5 nmol/L)

- Testosterone is a dominant male hormone. It helps to maintain lean mass, metabolic rate, strength, sexual virility, bone density and other functions. Men and women with low levels may benefit from testosterone replacement therapy or DHEA supplementation.

- However, testosterone replacement therapy may increase risk of prostate cancer in men.

- Men with a history of prostate cancer and women with a history of any reproductive cancer should not supplement with DHEA. In men, DHEA supplementation requires semi-annual testing of PSA.

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Growth Hormone and IGF-1

IGF-1 (after age 40)

- Above 250 mcg/L (above 250 ng/mL)
- IGF-1 provides an indicator for levels of growth hormone. As we age, growth hormone levels decline, which hasten many aspects of the aging process.
- The ingestion of natural growth hormone releasing agents can often increase IGF-1 to more youthful levels and provide significant anti-aging benefits if your IGF-1 levels have dropped below 250 g/L (250 ng/mL). (see www.meditropin.com)
- Individuals with very low IGF-1 levels (below 100 – 150) often benefit from low dose GH injections
- Individuals with a history of cancer are not advised to supplement with growth hormone releasing agents of receive GH injections

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Age-Related Decline In Growth Hormone: A 20 year old averages 20 ng/ml of HGH in their blood, *a 60 year old averages 2 ng/ml*

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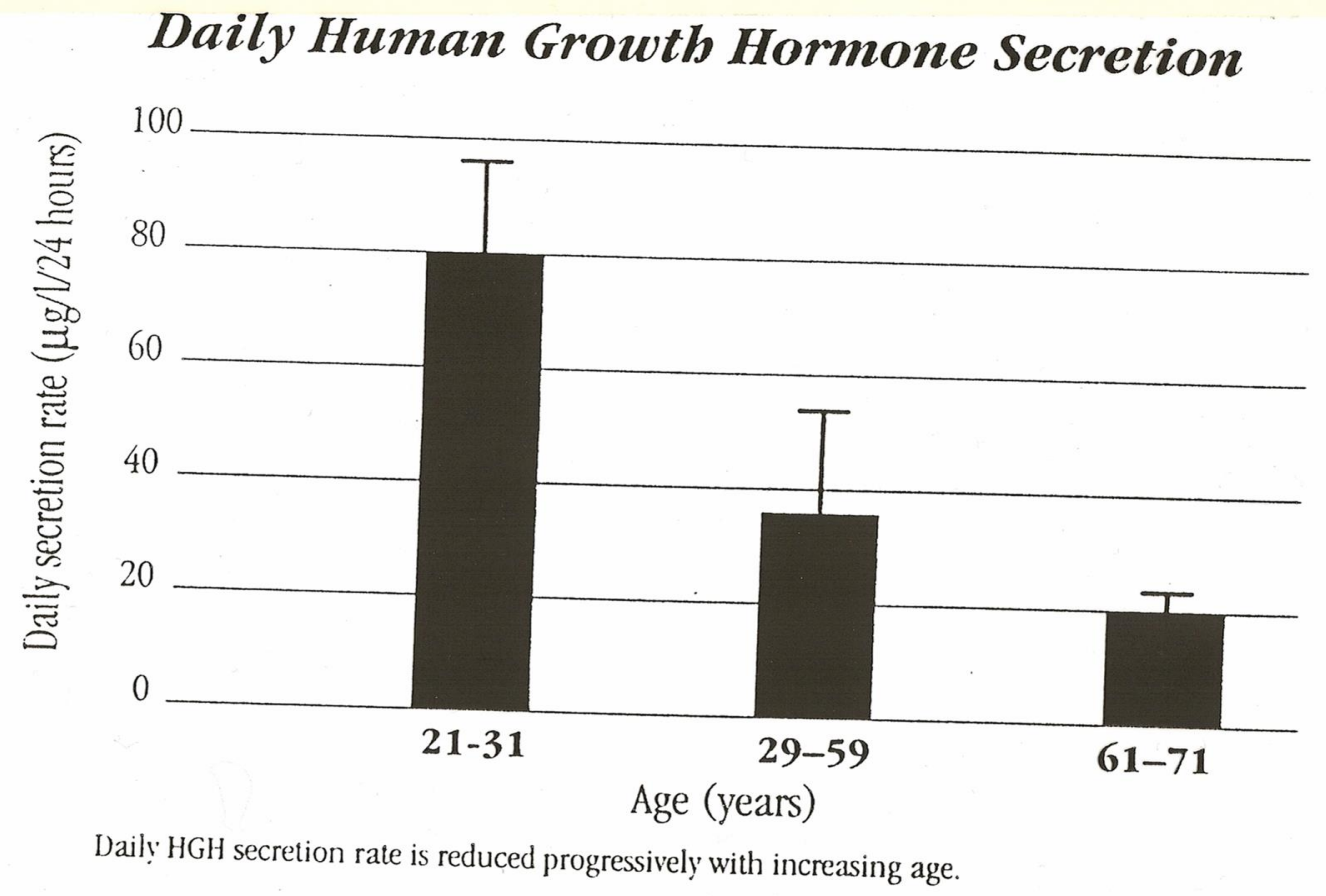
Oral GH Secretagogues Can Return IGF-1 To Age 35 Levels – 275 ng/mL



Daily HGH secretion rate is reduced progressively with increasing age.

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Growth Hormone Released With Exercise (also Testosterone)

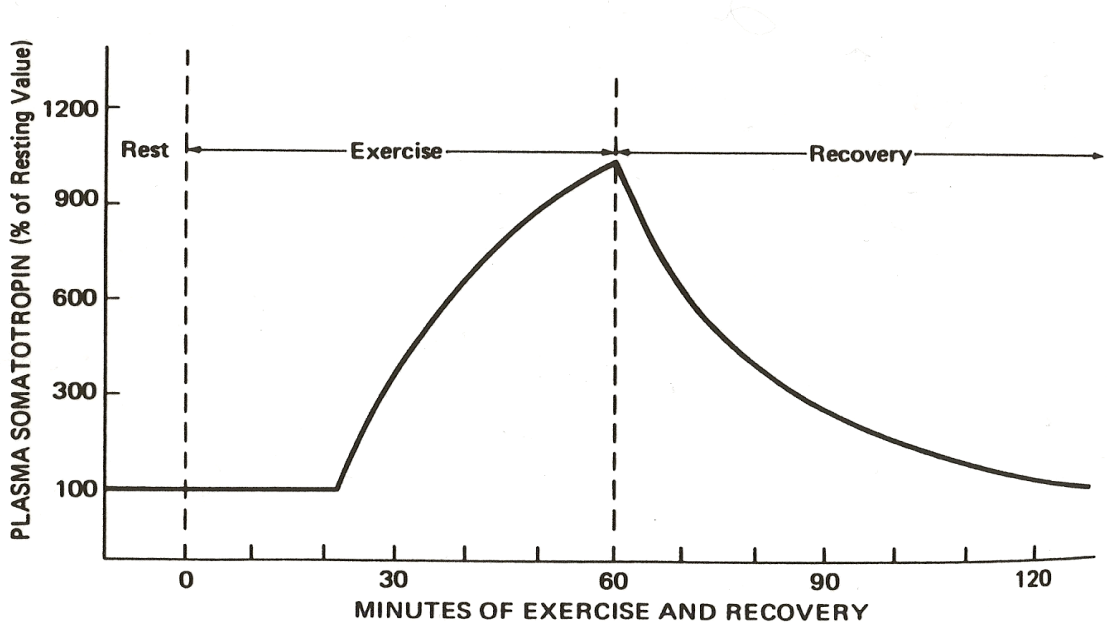

FIGURE 17.2. Diagram of growth hormone concentration in blood plasma during exercise and recovery.

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Other Tests of Importance

- **Urinalysis**: this is a standard assessment of urine to screen for a variety of health and disease indicators.

- **Blood Pressure:** high blood pressure is a critical risk factor for heart disease and stroke. Your blood pressure should remain below 130/80.
- **ECG/EKG**: the electrocardiogram provides details about the heart's performance. Abnormal electrocardiogram readings can indicate insufficient blood flow to the heart muscle, impaired conduction of nerve impulses throughout the heart, or asynchronous contraction patterns called fibrillations.

- **Women: Pap Smear and Internal Exam**– this is common testing used routinely to screen for cervical cancer and cervical dysplasia (precancerous condition) in women, as well as to screen for other uterine abnormalities.

- **Women: Mammogram**

- **Men: PSA blood test**

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Colonoscopy/ Sigmoidoscopy – these procedures are recommended for individuals over fifty years of age to screen for early detection of colon cancer. Colon cancer affects one in 16 adults over their lifetime in most developed countries. As such, these procedures can catch it early, before it spreads and becomes a lethal disease.

Colonoscopy is also a treatment procedure, as polyps can be removed during colonoscopy assessment

Occult Blood in Stool Test (some doctors substitute this for colonoscopy due to risk of bowel perforation)

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Bone Mineral Density – This test is used to screen for osteoporosis, which is estimated to affect one in four women and one in eight men by age 50.

1. Are you a woman over the age of 50?
2. Are you a woman, who entered into early menopause (40-45), or premature menopause (before 40)?
3. Are you a woman who has had both ovaries surgically removed before normal menopause (45-55)?
4. Are you a woman under 45 years of age who routinely misses menstrual cycles or has greatly diminished menstrual flow due to estrogen and/or progesterone deficiency?
5. Have you ever suffered from anorexia nervosa or bulimia?
6. Are you a woman who at some time in your life exercised excessively or competitively to the point where your body fat was very low?

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Bone Density Continued

7. Have you undergone treatment with oral glucocorticosteroid (prednisone, cortisone etc.) drugs for more than 3 months at any time in your life?

8. Have you ever been diagnosed with hyperparathyroidism?

9. If you are a woman, did your mother or a sister develop osteoporosis?

10. Are you a man over 65 years of age?

11. Are you older than 45 and your doctor has told you that you are underweight?

12. In general, do you have poor muscular development and strength?

13. Have you ever taken anticonvulsant medication for more than 2 years?

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- **Patient's Name ____MR PL_____**
- **Assessment Date_2011/07/21_____**
-
- **Gender M___ Age**_55_____
-
- Systolic Blood Pressure_____
- Diastolic Blood Pressure_____
- Pulse___ bts/min
- Diabetes: Yes___ No____ comment (IDD or Non IDD):_____
- Smoking: Yes____ No___ comment (How many per day): _____
- Total Cholesterol **"4.92"**
- LDL-Cholesterol **"2.57"**
- HDL-Cholesterol 1.93
- TC:HDL Ratio 2.5
- Fasting Glucose **" 5.4"**
- Fasting Triglycerides 0.91
- C-Reactive Protein 0.7
- Fibrinogen
- ESR
- INR
- GFR (eGFR) >=90
- Blood Creatinine 77.
- Homocysteine **"9"**
- Fructosamine
- Uric Acid 216.
- Sodium 140.
- Potassium 4.2
- Chloride 102.
- Calcium

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Mr PLS continued

- Hemoglobin 151.
- Hematocit 0.43
- RBC count 4.67
- White blood cell count 6.0
- White blood cell differential Normal
- Serum ferritin **“5.48”**
- Vitamin B12 **292 (Deficicency)**
- Vitamin D (25 hydroxy cholecalaciferol) **53 (Deficiency)**
- Total Bilirubin
- Blood Urea Nitrogen (BUN)
- Albumin 44.
- Total Protein
- GGT
- ALT 23.
- Hepatitis C
- ALT 23.
- PSA **“1.77”**
- TSH 1.07
- Free T3 4.9
- Free T4 18
- DHEA 9.8
- Cortisol **am “547.”**
- Estrogen
- Progesterone
- Testosterone 11.5 (Low) 7.6-31.4 nmol/L
- Insulin Growth Factor-1 (IGF-1) **“139”**

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- **Patient's Name _____MRS TS_____**
- **Assessment Date____June 2011_____**
-
- **Gender** __F_ **Age**___40____
-
- Systolic Blood Pressure_____
- Diastolic Blood Pressure_____
- Pulse___ bts/min
- Diabetes: Yes___ No____ comment (IDD or Non IDD):_____
- Smoking: Yes____ No___ comment (How many per day): _____
- Total Cholesterol **4.89**
- LDL-Cholesterol **2.76**
- HDL-Cholesterol 1.53
- TC:HDL Ratio 3.2
- Fasting Glucose **5.3**
- Fasting Triglycerides 1.31
- C-Reactive Protein
- Fibrinogen
- ESR
- INR
- GFR (eGFR) >=90.
- Blood Creatinine 58.
- Homocysteine
- Fructosamine
- Uric Acid
- Sodium 140.
- Potassium 4.2
- Chloride 102
- Calcium

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INTEGRATIVE MEDICINE ACADEMY

Mrs TS Continued

- Hemoglobin 115.
- Hematocit 0.33
- RBC count 3.65
- White blood cell count 2.9
- White blood cell differential Normal
- Serum ferritin 166.
- Vitamin B12
- Vitamin D (25 hydroxy cholecalaciferol)
- Total Bilirubin
- Blood Urea Nitrogen (BUN)
- Albumin
- Total Protein
- GGT
- ALT “42”. mmol/L
- CK 55 mmol/L
- Hepatitis C
-
- TSH “**2.33”**
- Free T3
- Free T4
- DHEA
- Cortisol
- Estrogen
- Progesterone
- Testosterone
- Insulin Growth Factor-1 (IGF-1)

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Mr Mas male: 51 yrs (assess date July 2011)

- Systolic Blood Pressure_____
- Diastolic Blood Pressure_____
- Pulse___ bts/min
- Diabetes: Yes___ No____ comment (IDD or Non IDD):_____
- Smoking: Yes____ No___ comment (How many per day): _____
- Total Cholesterol **7.09 (High)**
- LDL-Cholesterol **4.25**
- HDL-Cholesterol 1.62
- TC:HDL Ratio **4.4**
- Fasting Glucose **5.7** mmol/L
- Fasting Triglycerides **2.67**
- C-Reactive Protein
- Fibrinogen
- ESR
- INR 0.9
- GFR (eGFR) >=90.
- Blood Creatinine 71.
- Homocysteine
- Fructosamine
- Uric Acid 322.
- Sodium
- Potassium
- Chloride
- Calcium

GLOBAL
INTEGRATIVE MEDICINE ACADEMY

Mr Mas continued

- Hemoglobin
- Hematocit
- RBC count
- White blood cell count
- White blood cell differential Normal
- Serum ferritin
- Vitamin B12
- Vitamin D (25 hydroxy cholecalaciferol)
- Total Bilirubin 9.
- Blood Urea Nitrogen (BUN)
- Albumin
- Total Protein
- GGT
- ALT
- Hepatitis C

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Patient's Name _Mr ASDC

Assessment Date: March 2011

- **Gender** _M____ **Age**___38____
-
- Systolic Blood Pressure_____
- Diastolic Blood Pressure_____
- Pulse___ bts/min
- Diabetes: Yes___ No____ comment (IDD or Non IDD):_____
- Smoking: Yes____ No___ comment (How many per day): _____
- Total Cholesterol__4.96_____
- LDL-Cholesterol__"**2.87"**_____
- HDL-Cholesterol **"0.96 (L)"**
- TC:HDL Ratio **"5.1"**
- Fasting Glucose **5.2**
- Fasting Triglycerides **"1.96"**
- C-Reactive Protein **' 8.2 (H)'**
- Fibrinogen 3.2
- INR 1.2
- GFR (eGFR) >=90
- Blood Creatinine 78
- Homocysteine
- Fructosamine
- Uric Acid 4.1
- Sodium 140
- Potassium 4.2
- Chloride 104
- Calcium

GLOBAL
INTEGRATIVE MEDICINE ACADEMY

- **Patient's Name _Mr ASDC**

- Hemoglobin 153
- Hematocit 0.45
- RBC count 5.33
- White blood cell count 6.3
- White blood cell differential Normal
- Serum ferritin
- Vitamin B12
- Vitamin D (25 hydroxy cholecalaciferol)
- Total Bilirubin 11
- Blood Urea Nitrogen (BUN)
- Albumin 44
- Total Protein 70
- GGT
- ALT 18
- Hepatitis C
-
- TSH **"2.93"**
- Free T3
- Free T4 20
- DHEA 10.9
- Cortisol 386
- Estrogen
- Progesterone
- Testosterone **"10.8" – below 11 is low**
- Insulin Growth Factor-1 (IGF-1)

GLOBAL
INTEGRATIVE MEDICINE ACADEMY

- **Patient's Name _____MRS MMS_____**
- **Assessment Date_Mar 14_____**
-
- **Gender** _F__ **Age**___34____
-
- Systolic Blood Pressure_____
- Diastolic Blood Pressure_____
- Pulse___ bts/min
- Diabetes: Yes___ No____ comment (IDD or Non IDD):_____
- Smoking: Yes____ No___ comment (How many per day): _____
- Total Cholesterol **"6.35"(H)**
- LDL-Cholesterol **"3.61"**
- HDL-Cholesterol 2.10
- TC:HDL Ratio 3.0
- Fasting Glucose 4.4
- Fasting Triglycerides 1.40
- C-Reactive Protein **"4.9"**
- Fibrinogen
- ESR **"24"**
- INR
- GFR (eGFR)
- Blood Creatinine "**109 (H),** "53 (L)"
- Homocysteine
- Fructosamine
- Uric Acid 7.4
- Sodium 139
- Potassium 4.1
- Chloride 104
- Calcium
-

GLOBAL
INTEGRATIVE MEDICINE ACADEMY

Mrs MMS continued

- Hemoglobin 142
- Hematocit 0.42
- RBC count 4.52
- White blood cell count 8.6
- White blood cell differential Normal
- Serum ferritin
- Vitamin B12
- Vitamin D (25 hydroxy cholecalaciferol)
- Total Bilirubin 14
- Blood Urea Nitrogen (BUN)
- Albumin 42
- Total Protein 68
- GGT
- ALT
- Hepatitis C
-
- **TSH "3.29"**
- Free T3
- Free T4 15
- DHEA **"3.1"**
- Cortisol **"699 (H)"**
- Estrogen
- Progesterone
- Testosterone 1.5
- Insulin Growth Factor-1 (IGF-1)
-

GLOBAL
INTEGRATIVE MEDICINE ACADEMY

Suggested Fasting Blood Tests

- Standard CBC (RBC, Hb, Hct, MCHC, MCV, Platelets, WBC and WBC Differential Neutrophils, Lymphocytes, Monocytes, Basophils, Eosinophils)
- Glucose
- HbA1c (Fructosamine is optional)
- Total cholesterol
- LDL-cholesterol
- HDL-cholesterol
- Total cholesterol to HDL-cholesterol ratio
- Triglycerides
- Uric Acid
- hsCRP
- ESR
- Serum ferritin
- Albumin
- Total bilirubin
- Fibrinogen
- Blood urea nitrogen (BUN)

GLOBAL
INTEGRATIVE MEDICINE ACADEMY

- Creatinine
- eGFR
- ALT
- GGT
- TSH (possibly T3 and T4 if indicated)
- RBC Folate
- Serum Vitamin B12
- Cortisol
- PSA (men over 40)
- Testosterone (men) – if indicated
- IGF-1 (if indicated)
- Estrogen/Progesterone (women) – if indicated
- Potassium
- Sodium
- Chloride
- Homocysteine (often not covered by government health plan)
- Vitamin D (often not covered by government health plan)