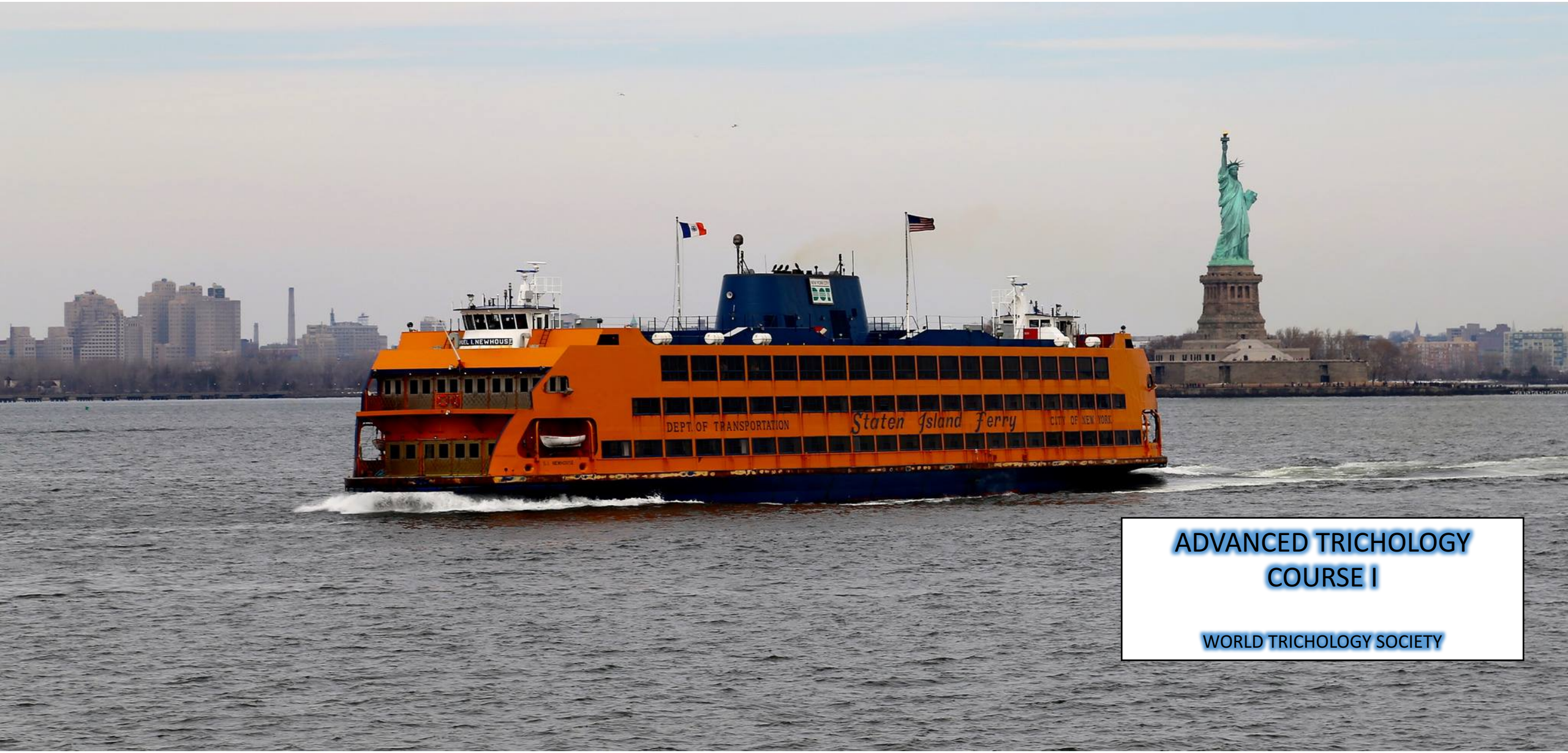

ADVANCED TRICHOLOGY COURSE I

WORLD TRICHOLOGY SOCIETY

ADVANCED TRICHOLOGY COURSE PART I

DISCLAIMER

- Most Trichologists are not physicians and so do not “diagnose” hair or scalp conditions.
- Certified Trichologists should be trained to “recognize” certain conditions and **work with physicians** for the betterment of the patient/client.
- This Advanced Trichology Course is designed to help the Certified Trichologist achieve this goal and is NOT intended to encourage him/her to make medical diagnoses or provide medical treatments for his/her patients/clients. **THE COURSE IS DESIGNED TO HELP THE TRICHOLOGIST LOOK AT THE BLOOD TEST RESULTS TRICHOLOGICALLY, TO HELP GUIDE HIS/HER TREATMENT PROTOCOL.**
- **ANY MEDICAL DIAGNOSIS OR MEDICAL TREATMENT MUST BE HANDLED BY THE PATIENT/CLIENT’S PHYSICIAN.**
- **FOR MORE INFORMATION ON EACH TOPIC IN THIS COURSE, PLEASE DO YOUR OWN ADDITIONAL RESEARCH AND READING.**
- The World Trichology Society expressly disclaims liability of errors or omissions in this information and materials. No warranty of any kind, expressed or implied, is given in conjunction with the information and materials. Your response to this information and material is entirely beyond World Trichology Society’s control and World Trichology Society rejects any responsibility/liability for your actions, and any subsequent actions by other persons at your behest, directly or indirectly associated with this course.
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ADVANCED TRICHOLOGY COURSE SYLLABUS

PART I & II: BLOOD (LABORATORY) TESTS FOR THE TRICHOLOGIST

-WHY A TRICHOLOGIST RECOMMENDS THESE TESTS

-WHAT BLOOD TESTS ARE IMPORTANT & WHAT THE RESULTS MEAN

-WHAT TREATMENTS ARE AVAILABLE FOR THE TRICHOLOGIST

-CONTACTING A PHYSICIAN (EXAMPLE LETTER)

-EXAMPLE BLOOD TEST SHEET

PART III & IV: EXAMINATION, RECOGNITION AND TREATMENT OF TRICHOLOGICAL HAIR LOSS CONDITIONS

-REVIEW OF HAIR LOSS PATTERNS AND HAIR & SKIN SCALES

-DISCUSSION OF TRICHOLOGICAL CASES AND CASE HISTORIES (REFERENCING BLOOD TEST RESULTS)

-MULTIMODAL TREATMENTS

-MORE DIFFICULT HAIR LOSS ASSESSMENTS THAT CONSIDER OTHER HEALTH ISSUES IMPORTANT FOR THE TRICHOLOGIST

PARTS I & II: BLOOD TESTS FOR THE TRICHOLOGIST

LEARNING OBJECTIVES

- TO LEARN WHICH ARE THE MOST COMMON BLOOD TESTS IMPORTANT FOR THE TRICHOLOGIST
- TO LEARN WHAT THE BLOOD TEST RESULTS MEAN
- TO LEARN WHAT TREATMENTS ARE AVAILABLE FOR THE TRICHOLOGIST
- TO LEARN HOW TO CONTACT A PHYSICIAN

WHY A TRICHOLOGIST RECOMMENDS THESE TESTS

- Trichologists not only recognize hair and scalp problems, but also need to help find the cause(s).
- As hair cycle disturbances can be the result of many issues, blood tests are sometimes necessary to help in determining some of the reasons for the hair loss.
- These tests are performed by the client/patient's **physician**.
- The medical doctor will analyze the results medically, however, the trichologist can analyze the results trichologically to see if there is a vitamin and/or mineral deficiency that could be causing the client/patient's hair problem.
- The trichologist will look at the ranges of the results and assess potential trichological deficiencies.
- Any deficiencies can result in hair cycle disturbances and may be treated with supplementation.
- Deficiencies in vitamins/minerals, in particular, can lead to:

  1) reduced **cellular energy (ATP) production,** and/or
  2) reduced enzymatic/co-enzymatic activity (**important fo protein synthesis**.

Fill in: **Underline and bold**

WHY A TRICHOLOGIST RECOMMENDS THESE TESTS

- Trichologists not only recognize hair and scalp problems, but also need to help find the cause(s).
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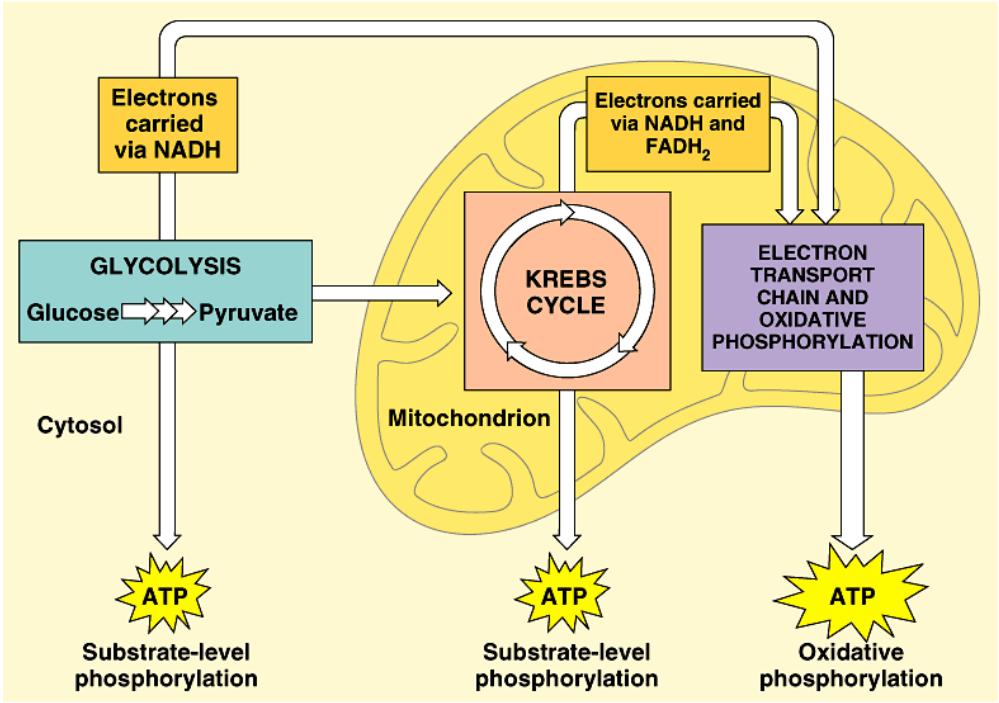
  2) reduced enzymatic/co-enzymatic activity (**important for** _____).

ATP PRODUCTION OVERVIEW

- ATP = _____.
- Cellular respiration (the production of ATP from food in the mitochondria of hair cells) occurs in three metabolic stages:
  Stage 1-_____,
  Stage 2-the _____, and
  Stage 3-the _____.
- Efficient respiration in humans needs _____.
- Carbohydrates and _____ are very important in this process.
- Millions of these processes are carried out in _____.



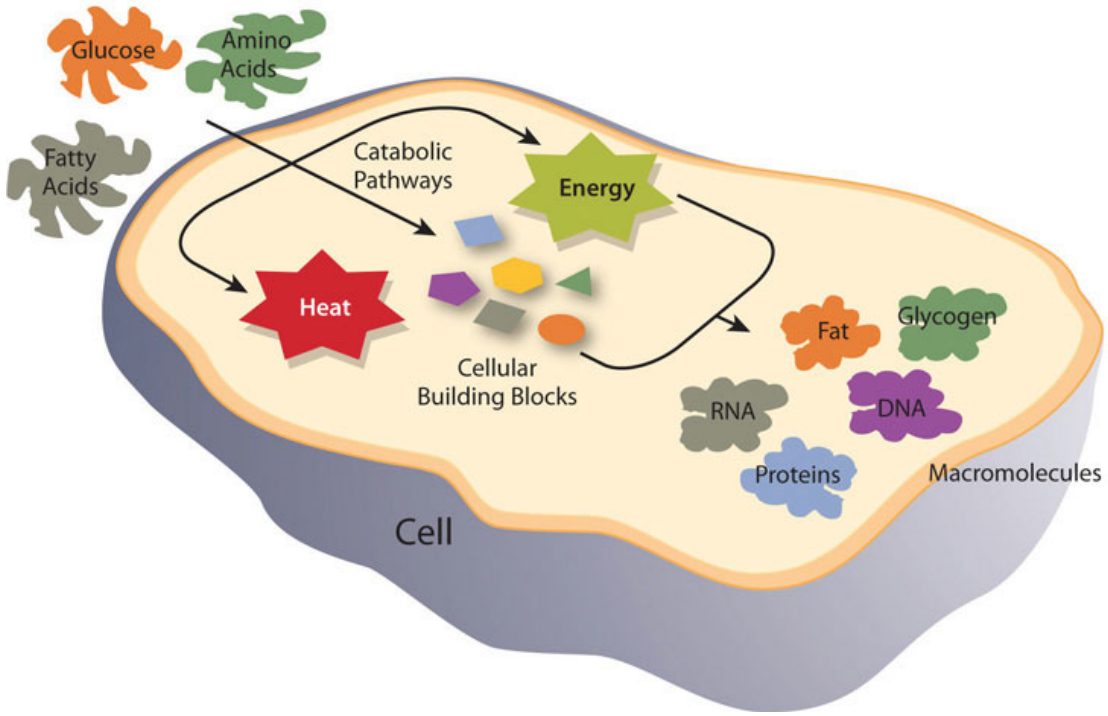
ATP PRODUCTION I

- Stage 1: Glycolysis (_____): the splitting of glucose
- Important raw materials:

  _____ >> _____ >> _____,

  Biotin (vitamin B7), Zinc

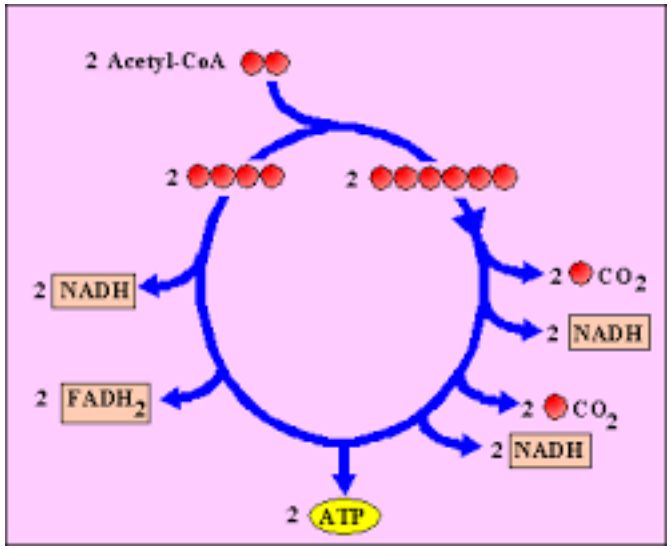
- -glucose is split into 2 pyruvates,
  -the pyruvates are then changed to acetyl-CoA
- 2 ATP molecules (net) are produced



ATP PRODUCTION II

- Stage 2: The Krebs cycle (_____):
  produce high energy molecules that will be used in Stage 3

- Important raw materials:
  Glucose (in form of acetyl-CoA), _____,
  Thiamin (vitamin B1), Riboflavin (vitamin B2),
  Niacin (vitamin B3), Pantothenic Acid (vitamin B5),
  Biotin (vitamin B7)

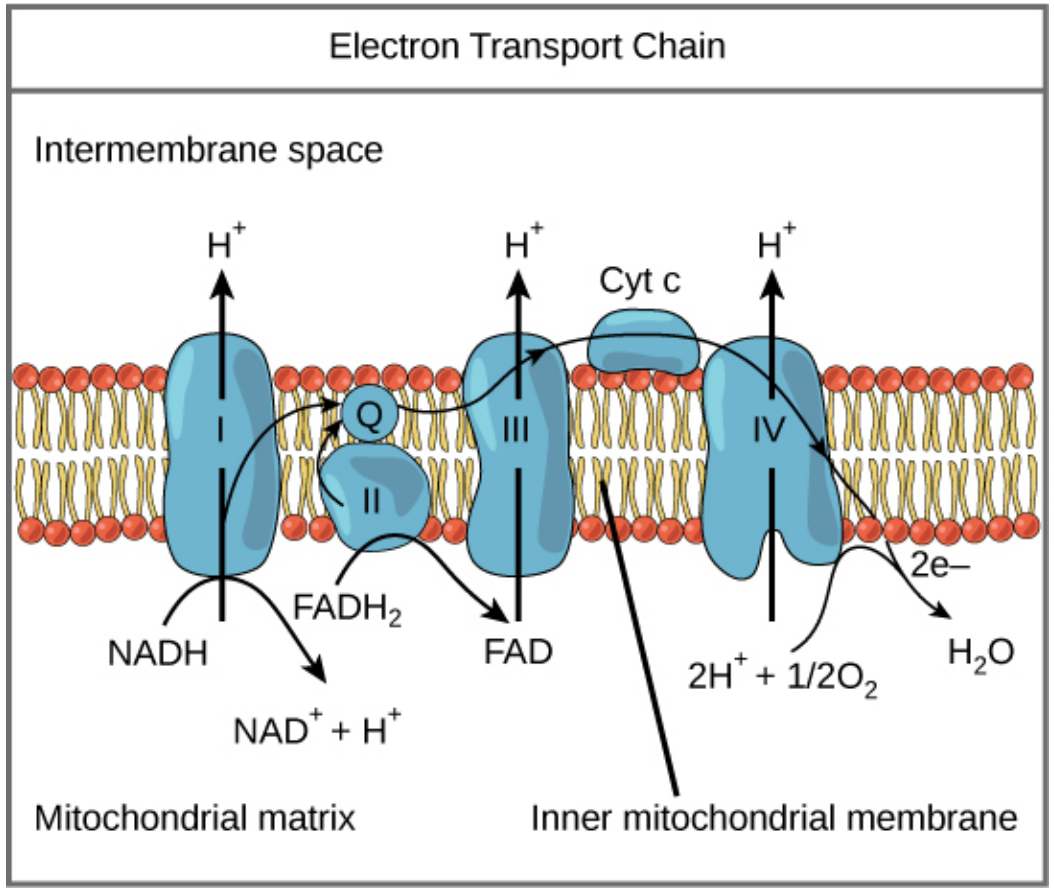


- -the acetyl-CoA goes through
  the cycle producing **<u>NADH</u> and**
  <u>FADH</u> energy containing molecules

- 2 more ATP molecules produced

ATP PRODUCTION III

- Stage 3: Electron transport chain (inside mitochondria): converts high energy molecules (NADH and FADH from Stage 2) into ATP
- Important raw materials:
  Oxygen, _____, _____, Sulfur, Copper



- -cytochromes (iron containing proteins) are essential in this process
- 34 more ATP molecules produced
- TOTAL ATP over all 3 Stages per glucose molecule = approx. 38 ATP

ATP PRODUCTION SUMMARY

- Food (carbohydrates) >> energy (ATP).
- The carbs are broken down in 3 stages.
- Some of the important raw materials for this process are:

Biotin (B7)

_____.

_____.

_____.

Niacin (B3)

Oxygen

Pantothenic Acid

Riboflavin (B2)

Sulfur

Thiamin (B1)

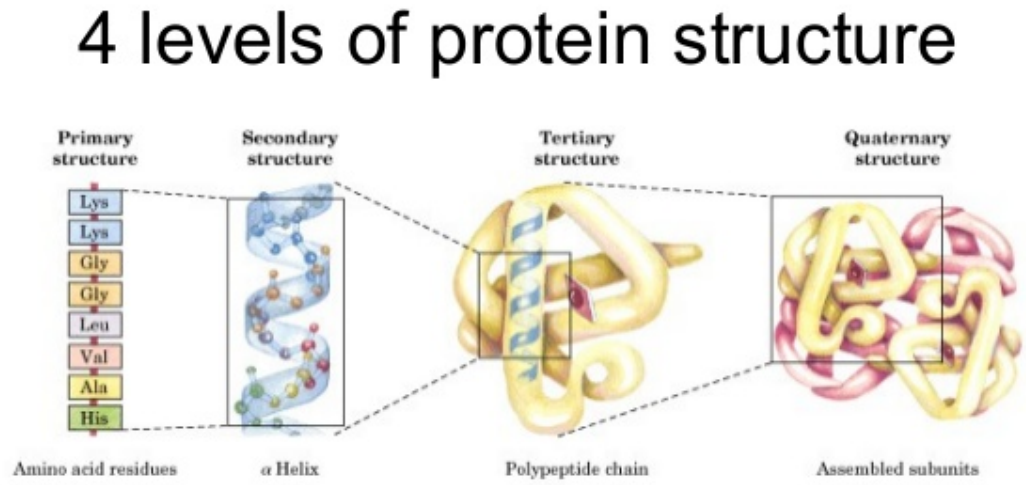
_____.

_____.

PROTEIN SYNTHESIS and COENZYMES I

A review from your WTS certification course.

- To review this subject (including transcription and translation) see Chapter 6 in your WTS certification course.
- Protein production is determined by the _____in DNA.
- Protein synthesis requires _____obtained from food.
- Enzymes (themselves proteins) are essential to _____the process of protein synthesis.
- Enzymes need 'help' to perform correctly. Help comes from _____.
- These coenzymes are extremely useful because they can often be _____ and reused multiple times.

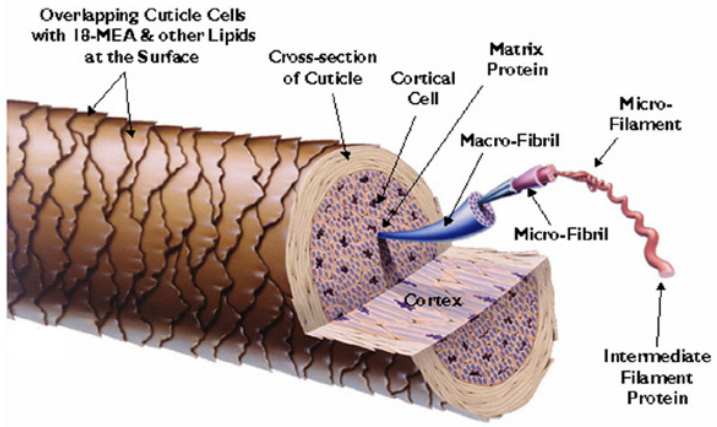


- Primary – sequence of amino acids
- Secondary – interactions between adjacent amino acids
- Tertiary – 3D folding of the polypeptide
- Quaternary – arrangements of multiple polypeptides

PROTEIN SYNTHESIS and COENZYMES II

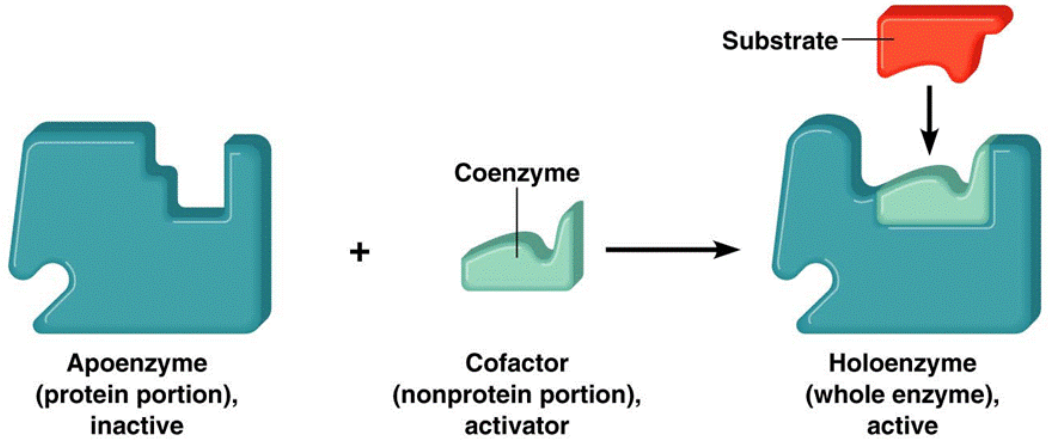
A review from your WTS certification course.

- Hair is a _____ tissue and so any deficiencies may be received by the hair follicle last – or the hair is the first thing that the body cuts back on if there is a deficiency.
- Hair protein **(**_____**)** contains approximately _____in its structure. In order of quantity: Cysteine, Serine, Glutamic Acid, Threonine, Glycine, Leucine, Valine, Arginine, Aspartic Acid, Alanine, Proline, Isoleucine, Tyrosine, Phenylalanine, Histidine, Methionine**.**
- Hair is made from approximately _____**%** keratin protein.



PROTEIN SYNTHESIS and COENZYMES III

- _____ and _____ are essential for co-enzymatic activity during protein synthesis (some of many): **Iron, Folic Acid, Vitamin D, Vitamin B12**
- Coenzymes bind with the inactive enzyme (called an _____) to form the active enzyme (called a _____).
- Coenzymes help enzymes in many different ways. In this example the coenzyme adds a _____, allowing the substrate (_____) and enzyme to join together so that the chemical process can take place.



PROTEIN SYNTHESIS and COENZYMES III SUMMARY

- Hair Protein Synthesis means the building of the hair protein, _____.
- Proteins are built from amino acids using _____.
- _____ are needed to help the enzymes in this building process.
- Some of the important raw materials for this process are:

Iron, Folic Acid, Vitamin D, Vitamin B12

WHAT BLOOD TESTS ARE IMPORTANT & WHAT THE RESULTS MEAN

- Over the years, many minerals and vitamins have been discovered as being important for _____.
- Published research has shown that deficiencies in certain minerals and vitamins have been recognized to be _____of hair loss.
- Some of the most important minerals and vitamins for the trichologist to investigate are:
  - Ferritin plus Iron Profile and CBC
  - Vitamin B12
  - Vitamin D
  - Folic acid/Folate
  - Copper
  - Zinc

MINERAL/VITAMINS

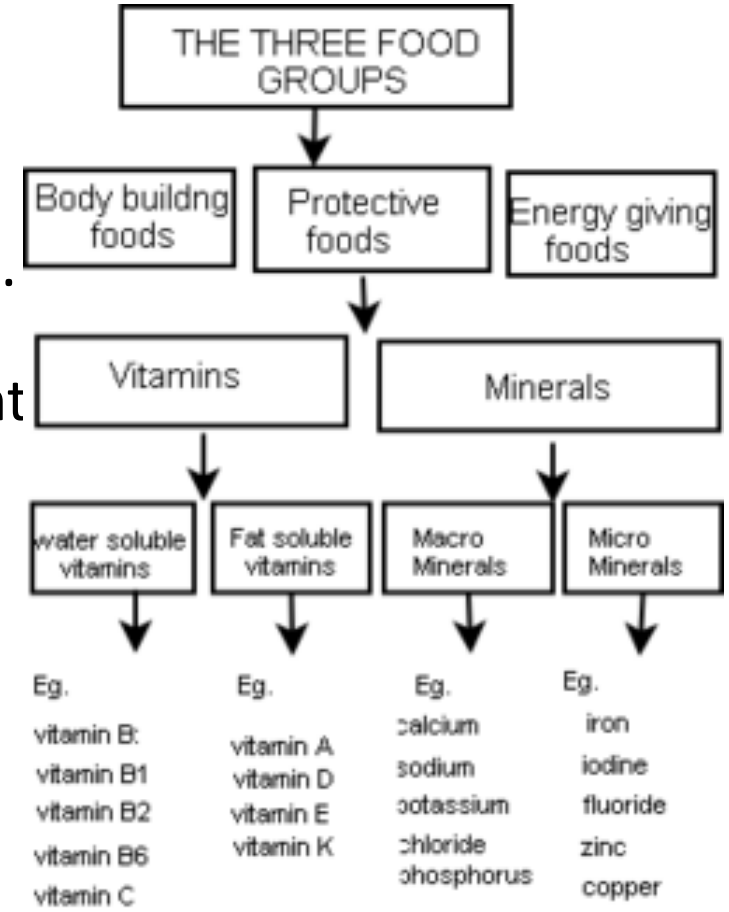
Overview

- Vitamins are _____ compounds required by the human body for _____.
- Vitamins cannot be synthesized in sufficient amounts by the human body, and therefore must be _____. There are 13 essential vitamins needed for the body to function.
- Minerals are _____ elements essential for normal body functioning and development.
- There are 16 essential minerals important for the health of the body.

MINERAL/VITAMIN DEFICIENCY

Overview

- Hair is one of the _____tissues in the body, therefore, cells in the hair follicle are very active metabolically.
- This means that the hair papilla cells are _____and producing many proteins such as keratin.
- This exceptional rate of activity means hair follicles need a plentiful supply of _____(ATP) as well as important raw materials such as protein, vitamins and minerals.
- A _____ in any of these raw materials can lead to a drastic reduction in hair follicle metabolism causing the hair cycle to be disturbed causing hair loss (particularly telogen effluvium).
- The specific action of individual vitamins and minerals is not fully known, however, many can act in _____ or _____ activities which help in the process of tissue synthesis and ATP production.

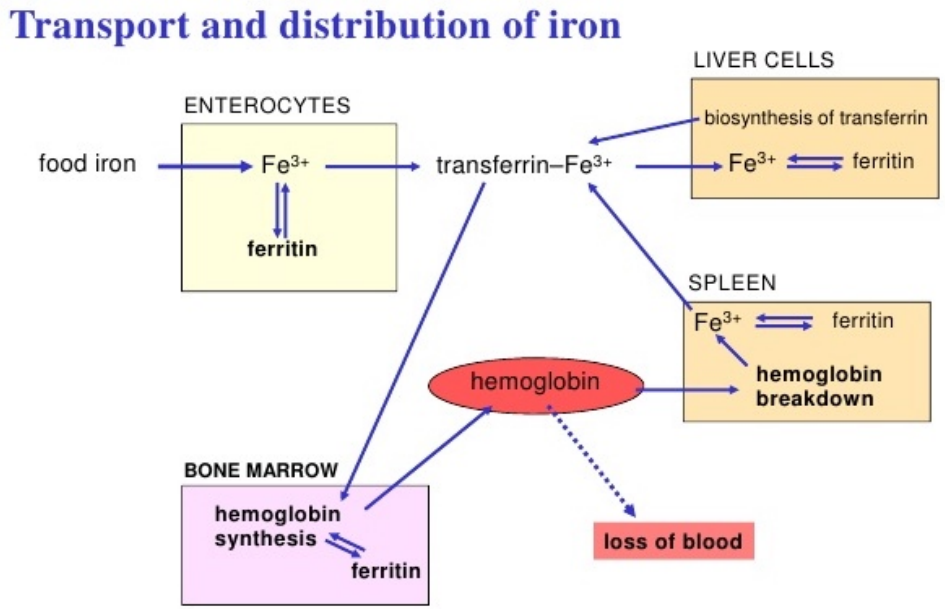


IRON

DEFINITIONS

- Iron is the most _____ trace metal in the human body.
- Iron is a critical micronutrient with a major role in the transport of _____.
- Iron is the functional center of _____, meaning it coordinates the oxygen molecule into the hemoglobin so that it can be transported from the lungs to the tissues.
- Transferrin helps _____ iron.
- Ferritin is the _____ protein of iron.
- **Iron sources:** red meat, poultry, seafood, beans, dark green leafy vegetables (natural); cereal, bread, pasta (fortified).

FERRITIN (IRON STORES) I

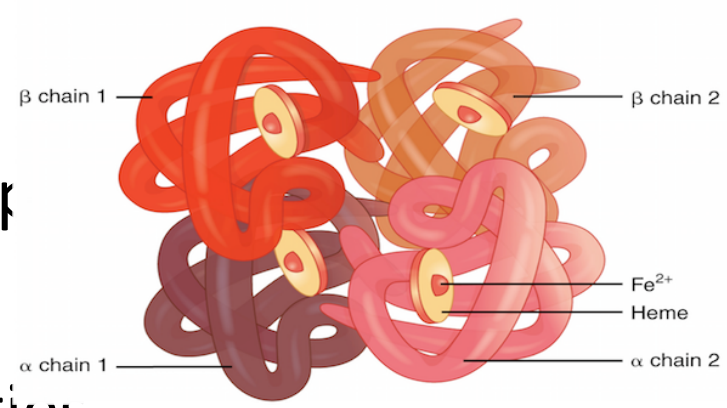


SUMMARY

- Ferritin is a protein in the blood that _____.
- Transferrin helps _____ iron.
- Each ferritin molecule can 'hold' up to _____ iron atoms
- The iron is released from the ferritin as the body requires.
- Most ferritin is found in the spleen, liver, muscles, and bone marrow.
- Red blood cells (_____) need iron to form normally and carry oxygen around the body.
- Low levels of ferritin may lead to iron-deficiency anemia.
- Ferritin/iron _____ may be caused by heavy menstruation, poor diet, vegetarianism, high caffeine intake and high alcohol intake.

FERRITIN (IRON STORES) II

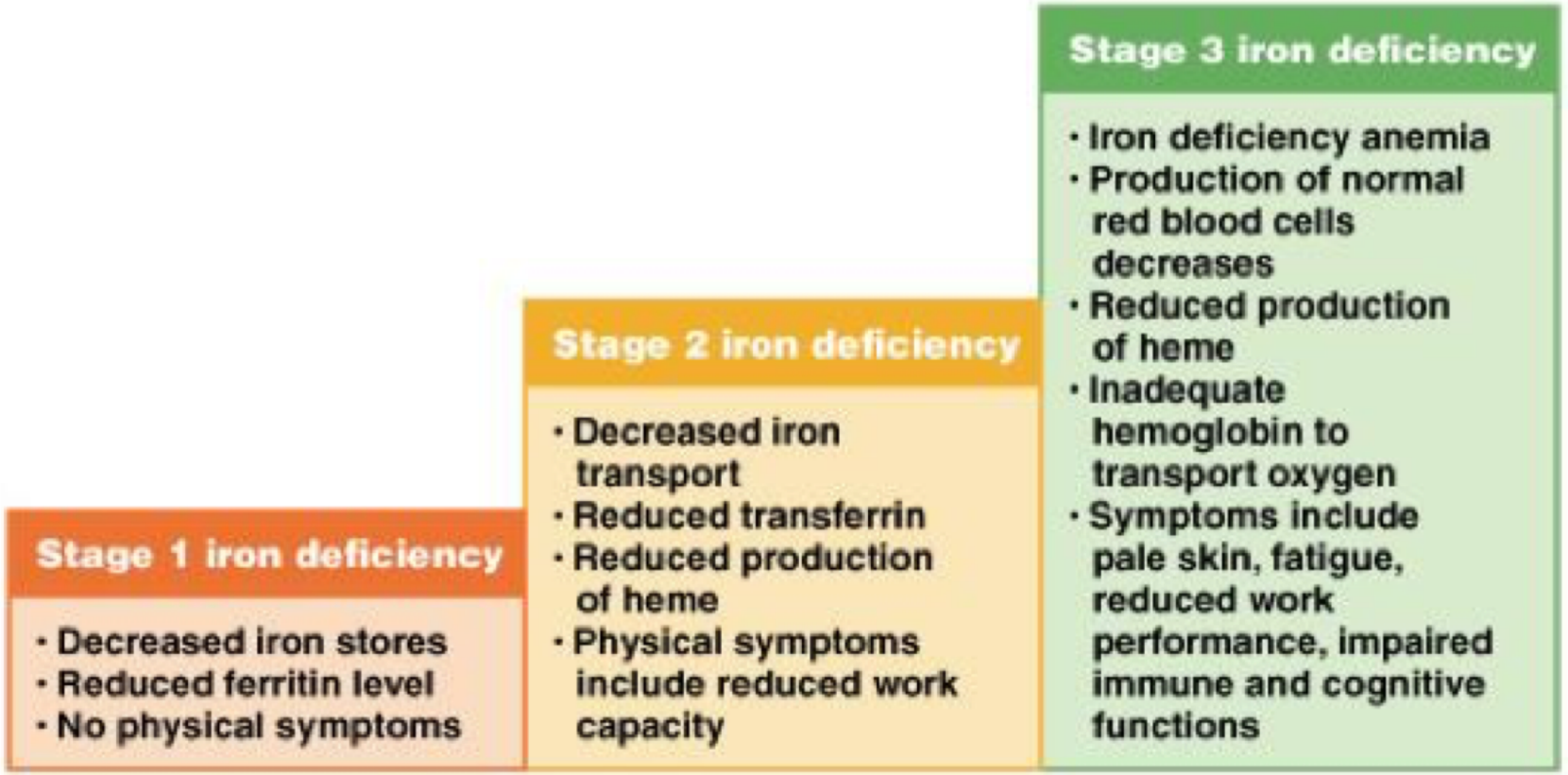
ACTION OF FERRITIN IN TISSUE



- Iron is the central atom of the _____ group in hemoglobin that binds oxygen (O_2) in the lungs and carries it to all of the other cells in the body (e.g., the hair) that need oxygen to perform their activities.
- Iron plays a role in electron transfer (_____) during the third step of ATP production.
- Iron deficiency can result in a reduction of _____leading to reduced ATP (energy) production and cell division.
- Iron is stored in ferritin as a ferric (Fe III) ion (non-soluble) and released as a ferrous (Fe II) ion (_____).
- Hemoglobin contains the ferrous ion which binds to oxygen.
- L-Lysine and _____increase the absorption of iron.

IRON

DEFICIENCY STAGES



IRON BLOOD TEST RESULTS

Normal Range
60 – 170 mcg/dL

Iron Deficiency
_____mcg/dL

Iron Excess
Greater than 170 mcg/dL

- Refer to Ferritin for treatment options.

- mcg = micrograms (one millionth of a gram) per dl = deciliter (one tenth of a liter)

FERRITIN BLOOD TEST RESULTS

- Normal range:
  18-270 ng/ml

- Ferritin HAIR SUFFICIENCY (STABLE):
  _____ ng/ml

- Ferritin HAIR SUFFICIENCY (IMPROVE):
  _____ng/ml

- Ferritin HAIR SUFFICIENCY PLUS THYROID:
  _____ ng/ml

- ng = nanograms (one billionth of a gram) per ml = milliliter (one thousandth of a liter)

FERRITIN (iron)
Treatments Options Available for the Trichologist

- Iron with Vitamin C plus L-Lysine

- Annual or bi-annual blood testing recommended for ferritin

- Normal Daily Dosage:

Iron: 15 mg (daily)
Vitamin C: 75-90 mg (daily)
L-Lysine: 750-900 mg (daily)

- Trichological Supplementation:

Iron: **(25 mg x 3 daily)**
Vitamin C: **(x1 daily)**
L-Lysine **(x1 daily)**

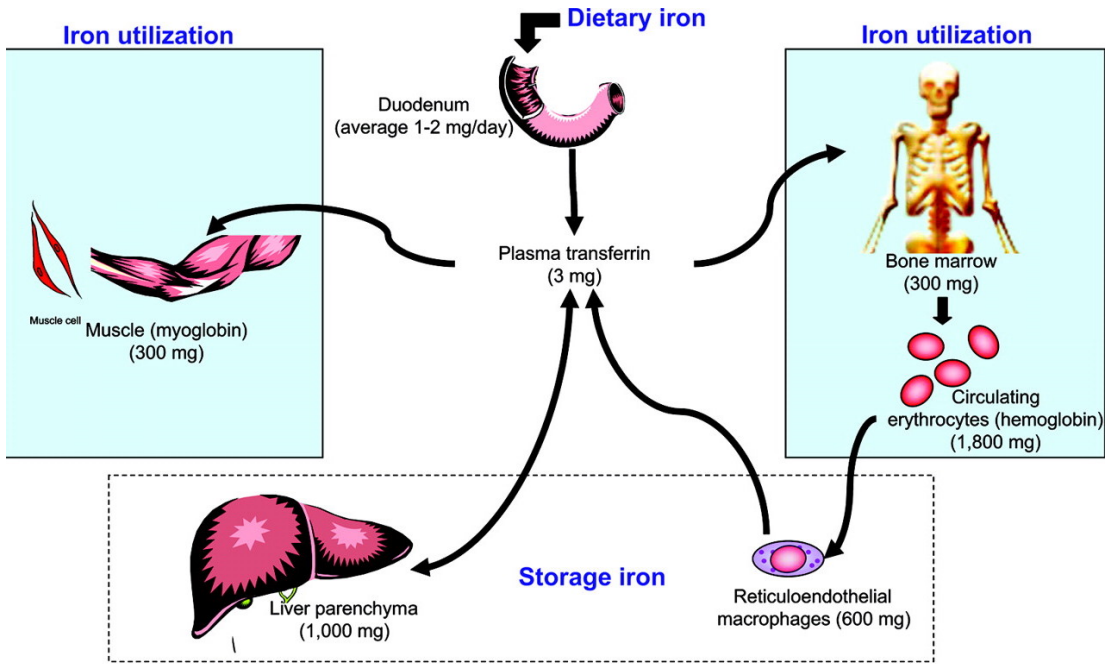
- Medical Prescription:

Iron: (intravenous/blood transfusion)
Vitamin C: 1,000 mg (daily)
L-Lysine 2,000-3,000 mg (daily) for cold sores

TOTAL IRON BINDING CAPACITY, TRANSFERRIN & PERCENT TRANSFERRIN SATURATION

SUMMARY

- Just measuring Ferritin and Iron are sometimes not enough. For a more complete assessment of iron deficiency, the blood levels of **total iron-binding capacity (TIBC),** _____ and/or **percent transferrin saturation (%TS)** may also be important.
- **Transferrin** binds and transports iron in the blood between body tissues. If transferrin is _____ it means that it is NOT binding much iron and could indicate an _____.
  If it is _____, then the transferrin is carrying a high amount of iron, which could indicate _____.



TOTAL IRON BINDING CAPACITY, TRANSFERRIN & PERCENT TRANSFERRIN SATURATION

SUMMARY (continued)

- The **% Transferrin saturation (%TS)** blood test shows the percentage of iron bound by transferrin. This result is often assessed _____ to the transferrin result, meaning that a high %TS would indicate too much iron and a low %TS, too little iron.
- **Total iron-binding capacity** (TIBC) measures how much iron is carried in the bloodstream. (Transferrin does the actual iron carrying).
- **TIBC is similar to the transferrin level** and these two laboratory tests can be used _____ (usually the lab will only report one or the other).

TOTAL IRON BINDING CAPACITY, TRANSFERRIN & PERCENT TRANSFERRIN SATURATION

ACTION IN BLOOD

- Total iron-binding capacity (TIBC) is most frequently used along with a _____test to evaluate people suspected of having either iron deficiency or iron overload.
- These two tests (TIBC and iron) are used to calculate the transferrin **saturation** (%TS).
- In iron deficiency:
  -the iron level is _____,
  -the TIBC (Transferrin) is _____,
  -the transferrin **saturation** is _____.
- In iron overload states (_____):
  -the iron level is _____,
  -the TIBC (Transferrin) will be _____ (or low normal),
  -the transferrin **saturation** is _____.
- TIBC (Transferrin) levels also drop when there is not enough protein in the diet, so this test can also be used to _____.

TABLE COMPARING DIFFERENT IRON LEVELS

Disease	Iron	TIBC/Transferrin	%Transferrin Saturation	Ferritin
Iron Deficiency	Low	High	Low	Low
Hemochromatosis (Iron overload)	High	Low	High	High

TOTAL IRON BINDING CAPACITY BLOOD TEST RESULTS

- Normal range TIBC:
240-450 mcg/dl

- Iron deficiency:
_____mcg/dl

- Iron excess:
less than 240 mcg/dl

- The TIBC result is inverse to the amount of iron available.
- A high TIBC level often indicates a low amount of iron is present in the blood.
- A low TIBC level often indicates normal/high levels of iron.
- Refer to Ferritin for treatment options.

- mcg = micrograms (one millionth of a gram) per dl = deciliter (one tenth of a liter)

PERCENT TRANSFERRIN SATURATION BLOOD TEST RESULTS

- Normal range % Transferrin Saturation:
20-50 %

- Iron deficiency:
_____%

- Iron excess:
greater than 50 %

- Do not suggest iron supplements to a client with high % transferrin saturation, even if the ferritin level is low.
- Refer to Ferritin for treatment options.

- % = percent

COMPLETE BLOOD COUNT (CBC)
BLOOD TEST I

- To fully assess iron deficiency _____, a CBC blood test should also be performed. There are _____taken with a CBC screen.
- The most important results for a trichologist include:
  - The number of _____(RBC Count). RBCs play a vital role in transporting oxygen from the lungs to the rest of the body. These oval-shaped cells contain _____, the protein that binds oxygen while it is being carried to the body cells (_____cells).
  - Remember:
    -the chemical process that converts food into energy (ATP) requires _____;
    -the papilla cells require _____ to function;
    -therefore, the hair cells need oxygen, and are dependent on the _____to transport it.

COMPLETE BLOOD COUNT (CBC)
BLOOD TEST II

- _____ is a blood test that measures how much of a person's blood is made up of red blood cells. This measurement depends on the _____of the red blood cells.
- _____ are parts of the blood that help the blood clot.
- The number of _____(WBC Count).
  A WBC count is a blood test to measure the number of white blood cells (WBCs) in the blood. This can indicate the presence of infection
- Sometimes CBC's are done with _____.
  Here the blood is examined microscopically.
  A differential provides more information about the blood sample, such as platelets and the percentages of each type of WBC.

COMPLETE BLOOD COUNT (CBC)
BLOOD TEST RESULTS

RBC Count

_____: 4.32-5.72 trillion cells/L

_____: 3.90-5.03 trillion cells/L

Hemoglobin

Male: 13.5-17.5 grams/dL

Female: 12.0-15.5 grams/dL

Hematocrit

Male: 38.8-50.0 percent

Female: 34.9-44.5 percent

Platelet Count

150-450 billion/L

WBC Count

3.5-10.5 billion cells/L

A differential will give more information about the platelets and the % of each type of WBC

L = liter
dL = deciliter (one tenth of a liter)

REFERENCES FOR PARTS I & II

- Arnaud J, Beani JC, Favier AE, Amblard P. Zinc status in patients with telogen defluvium. Acta Derm Venereol. 1995 May;75(3):248-9.
- Auerbach R. Low iron levels. Arch Dermatol. 1968 Dec; 98(6):681.
- Aydingoz IE, Ferhanoglu B, Guney O. Does tissue iron status have a role in female alopecia? J Eur Acad Dermatol Venereol. 1999 Jul; 13(1):65-7.
- D'Ovidio, R, etal. Reduced level of vitamin D in chronic/relapsing alopecia areata. Poster WCHR 2013: Edinburgh, U.K.
- Fawzi MMT, et al. Assessment of vitamin D receptors in alopecia areata and androgenetic alopecia. J Cosmet Dermatol, 2016 15: 318–323.
- Freinkel RK, Freinkel N. Hair growth and alopecia in hypothyroidism. Arch Dermatol. 1972 Sep; 106(3):349-52.
- Haugen BR. Drugs that suppress TSH or cause central hypothyroidism. Best Practice & Res. Clinical Endo. & Metabolism. 2009; 23(6):793 – 800.
- Kay RG. Zinc and copper in human nutrition. J Hum Nutr. 1981 Feb; 35(1):25-36.
- Lindelof B. [Zinc and the hair; a review of the research results published in the latest literature]. Z Hautkr. 1979 Nov 1 ;54(21):959-71.
- Olsen EA. et al. Evaluation and treatment of male and female pattern hair loss. Journal of the Am. Acad. of Derm. 2005 Volume 52(2): 301 – 311.
- Rushton DH. Management of hair loss in women. Dermatol Clin. 1993 Jan; 11(1):47-53.
- Rushton DH, et al. Biochemical and trichological characterization of diffuse alopecia in women. Br J Dermatol. 1990 Aug; 123(2):187-97.
- Rushton DH, Ramsay ID. The importance of adequate serum ferritin levels during oral cyproterone acetate and ethinyl oestradiol treatment of diffuse androgen-dependent alopecia in women. Clinical Endocrinology.1992 Apr; 36(4):421-7.
- Sachdeva A, et al. Association between serum ferritin and thyroid hormone profile in hypothyroidism. Int J Med Sci Public Health 2015; 4:863-865
- Sterry W, Konrads A, Nase J. Alopecia in thyroid diseases: Characteristic trichograms. Hautarzt. 1980; 31:308–14.
- Tasman-Jones C, Kay RG, Lee SP. Zinc and copper deficiency, with particular reference to parenteral nutrition. Surg Annu. 1978;10:23-52.
- van Beek N, et al. Thyroid Hormones Directly Alter Human Hair Follicle Functions: Anagen Prolongation and Stimulation of Both Hair Matrix Keratinocyte Proliferation and Hair Pigmentation. The Journal of Clinical Endocrinology & Metabolism 2008; 93(11): 4381–4388.
- Van Neste DJ, Rushton DH. Hair problems in women. Clin Dermatol. 1997 Jan-Feb; 15(1):113-25.
- White J. Postpartum alopecia and zinc. Med J Aust. 1983 Apr 30; 1(9):406.

ADVANCED TRICHOLOGY COURSE
END OF PART I