Anemia, and Sub-Clinical Anemia

Physiology of a Cell – The Basics

Mitochondria are the primary producers of energy in our body. They create something called Adenosine TriPhosphate (ATP), which is the main fuel source for much of our body's machinery. Mitochondria are so important that if enough of them are not working properly, nothing in your body will be including: organs, glands, muscles, our brain, etc… In fact, dysfunctional mitochondria are a hallmark of aging and many chronic diseases.

There are two things mitochondria need to produce ATP, oxygen and glucose. Without either of these two compounds in sufficient amounts, the mitochondria will not produce optimal amounts of ATP to fuel our body's processes. This can directly impact our tolerance to exercise, or our ability to lose weight, our athletic performance and our overall health.

Physiology of a Red Blood Cell – The Basics

One of the primary functions of a red blood cell is to transport oxygen around our body. As a red blood cell passes by our lungs, it grabs oxygen molecules and then drops them off wherever the body needs it. The red blood cell then goes back up to the lungs to repeat the cycle.

If for some reason our red blood cells are not functioning properly, they will not be able to carry, or deliver, oxygen to our cells. And again, without oxygen mitochondria cannot function optimally.

To use an analogy, picture a high performance sports car – a Ferrari for example. These cars require the highest quality gasoline available to achieve top performance. Anything less and they will still run, but their performance will suffer dramatically.

The same is true of our body. If your blood is delivering sub-optimal amounts of oxygen, the cells of your body will still work, but not as well as if they had optimal amounts of oxygen.

You can take all the fancy supplements, optimize your post-workout nutrition shake, and follow the latest exercise program, but if your cells are not getting oxygen, none of that really matters.

Lack of Oxygen, Medically Speaking

In conventional medicine, a decrease in the ability to deliver oxygen to cells is diagnosed as anemia, a condition referring to a quantitative and/or qualitative deficiency for red blood cells to deliver oxygen to the tissues and organs of the body.

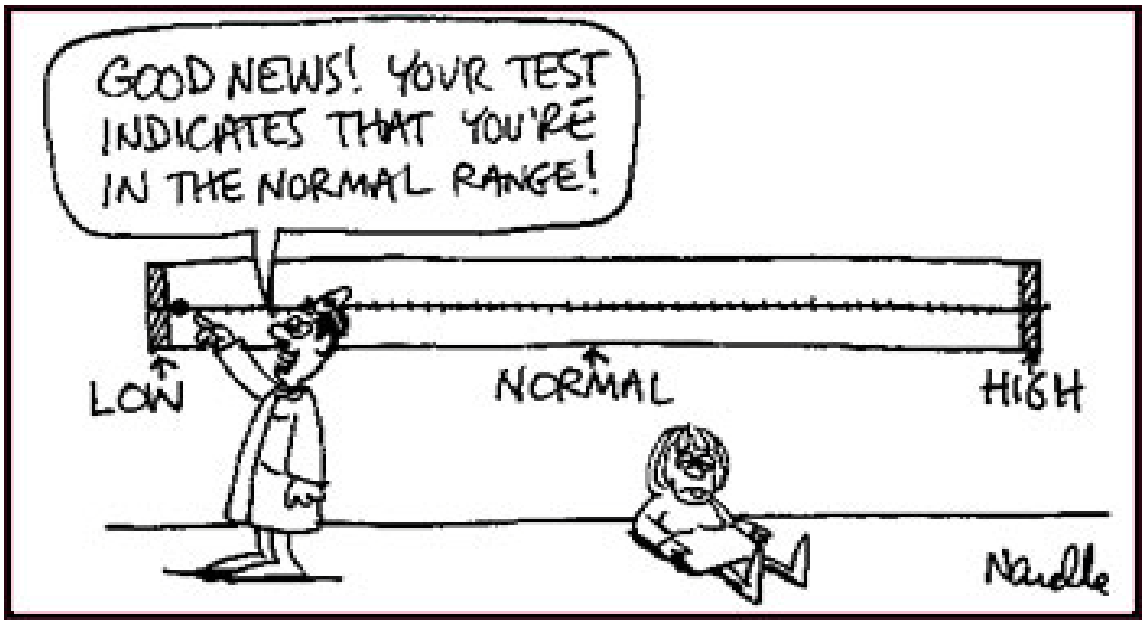
Anemia can be caused by any number of things – iron deficiency, vitamin B12/folate deficiency, excessive blood loss (i.e. heavy menses, gastrointestinal bleeding), medications, specific chronic or hereditary conditions (i.e. thalassemia), etc. The three main causes of anemia are red blood cell destruction, blood loss, or an inability to produce an adequate number of healthy red blood cells.

But even if you do not have anemia, can you still have sub-optimal oxygen delivery? Yes.

The Problem With Diagnostic Criteria

A diagnosis is nothing more than a label applied to an agreed upon set of signs, symptoms and/or laboratory criteria that describes physiology gone awry. In other words, when physiology strays too far from normal, then there is a diagnosable condition.

However, one of the main problems in medicine today is that the diagnostic criteria, lab ranges, are often based on a sick group of people, not healthy ones.



Evaluating Decreased Oxygen Deliverability

Since we are not talking about a diagnosis of anemia here, let's help you look for sub-optimal physiology leading to an inability for your body to deliver oxygen to the cells, which will limit your ability to reach your health and fitness goals.

Below is a table that contains blood chemistry markers, normal reference ranges for those markers – the ones your doctor might use to look for disease – and optimal ranges that look at health.

Blood Markers	Reference Range*	Optimal Reference Range
Hemoglobin (Hgb)	Female 12.1-15.1g/dl	Female 13.5-14.5g/dl
	Male 13.6-17.7g/dl	Male 14-15g/dl
Hematocrit (Hct)	Female: 36-44 g/dl	Female: 27-40 g/dl
	Male: 41-50 g/dl	Male: 40-48 g/dl

RBC	Female: 3.8-5.2	Female: 3.9-4.5
	Male: 4.4-5.9	Male: 4.2-4.9
MVC	78-98	85-92
MCH	28-34%	27-32%
MCHC	32-36%	32-35%
RDW	11.5-14.5%	<13%
Iron	40-155 ug/dL	85-130 ug/dL
TIBC	250-460 ug/dL	250-350 ug/dL
Ferritin	18-300 ng/ml	10-122 ng/mlL
Transferritin	15-55%	20-35%

* From FamilyPracticeNotebook.com. Labs use different values, so they may vary on your lab work.

Here are some very general guidelines that pertain only if your blood work is within the laboratory reference range. If it is outside of the laboratory reference range, you need to consult with a physician.

If your hemoglobin, hematocrit, red blood cells, iron, MCV, MCH, MCHC and ferritin are decreased below the optimal reference range, and transferrin is increased above the optimal reference range, you may consider a decreased oxygen deliverability due to low iron. If this is the case, increased dietary iron might be necessary, but first consult with a qualified medical professional.

If your hemoglobin, hematocrit, red blood cells, are decreased below the optimal reference range, but your MCV, MCHC and MCH are increased above the optimal reference range, you might be experiencing decreased oxygen deliverability due to either deficient B12, folic acid or both. If this is the case, increasing dietary B12 and/or folic acid might be necessary. Additionally, digestive function should be assessed as this pattern is often due to poor absorptive abilities.

Conclusion

People with blood values within the laboratory reference range, but outside of the optimal reference range is very common. In fact, this is one of the first patterns we look for. As long as the patient does not have oxygen being delivered to the cells of their body everything else we do for the patient will have limited therapeutic value.

Oxygen is one of the two fundamental components necessary for proper energy production at the cellular level. The less oxygen is delivered, the more poorly cells will function. There are many possible reasons oxygen deliverability may be decreased, two of which are due discussed above. Other mechanisms must be ruled out and discussed with a medical professional.