KRESSER INSTITUTE
FOR FUNCTIONAL AND EVOLUTIONARY MEDICINE

Iron-Deficiency Anemia - Part Three

The next patient is a 46-year-old female with chief complaint of GI issues, arthritis, menopausal symptoms, and psoriasis.

Marker	Value	Functional Range	Lab Range
Glucose	87	75 - 90	65 - 99
Hemoglobin A1c	5.6	4.4 – 5.4	4.8 - 5.6
Uric Acid	4.4	3.2 - 5.5	2.5 - 7.1
BUN	14	13 – 18	6 - 24
Creatinine	0.90	0.85 – 1.1	0.57 - 1
BUN/Creatinine Ratio	16	9 – 23	9 - 23
Sodium	140	135 – 140	134 - 144
Potassium	4.4	4.0 – 4.5	3.5 - 5.2
Chloride	101	100 – 106	97 - 108
C02	26	25 – 30	18 - 29
Calcium	9.4	9.2 – 10.1	8.7 - 10.2
Phosphorus	3.3	3.5 – 4.0	2.5 - 4.5
Magnesium	1.8	2.0 – 2.6	1.6 - 2.3
Protein, total	7.0	6.9 – 7.4	6.0 - 8.5
Albumin	4.6	4.0 – 5.0	3.5 - 5.5
Globulin	2.4	2.4 – 2.8	1.5 - 4.5
A/G ratio	1.9	1.5 – 2.0	1.1 - 2.5
Bilirubin, total	0.4	0.1 – 1.2	0.0 - 1.2
Alkaline Phosphatase	52	42 – 107	39 - 117
LDH	168	140 - 180	119 - 226
AST	17	10 - 30	0 - 40
ALT	14	10 - 22	0 - 32
GGT	28	0 - 28	0 - 60
TIBC	447	250 – 350	250 - 450
UIBC	381	150 - 375	131 - 425
Iron	66	85 – 135	27 - 159
Iron saturation	15	15 – 45	15 - 55
Ferritin	12	15 - 120	15 - 150
Vitamin B-12	626	450 – 2000	211 - 946
Vitamin D, 25-hydroxy	53.6	35 - 60	30.0 - 100.0
Cholesterol, total	187	150 - 250	100 - 199
Triglycerides	68	50 – 100	0 - 149
HDL	91	55 – 85	> 39
LDL	82	0 - 175	0 - 99
T. Chol / HDL Ratio	2.1	< 3	0 - 4.4
Triglycerides / HDL Ratio	0.75	< 2	< 3.8
CRP-hs	0.05	< 1.0	0.00 - 3.00
Homocysteine	8.4	< 7.0	0.0 - 15.0

Marker	Value	Functional Range	Lab Range
TSH	2.260	0.5 – 2.5	0.45 - 4.50
T4, total	7.8	6.0 – 12	4.5 - 12
T3 Uptake	30	28 - 35	24 - 39
T3, Total	94	100 – 180	71 - 180
Copper	131		72 - 166
Zinc	140		56 - 134
Zinc / Copper Ratio	1.07	> 0.85	
Serum Methylmalonic Acid (MMA)	156	0 - 325	0 - 378
WBC	6.1	5.0 – 8.0	3.4 - 10.8
RBC	4.32	4.4 – 4.9	3.77 - 5.28
Hemoglobin	12.3	13.5 - 14.5	11.1 - 15.9
Hematocrit	38.1	37 - 44	34 - 46.6
MCV	88	85 – 92	79 - 97
MCH	28.5	27.7 – 32.0	26.6 - 33.0
MCHC	32.3	32 – 35	31.5 - 35.7
RDW	14.4	11.5 – 15.0	12.3 - 15.4
Platelets	269	150 – 415	150 - 379
Neutrophils	63	40 – 60	
Lymphocytes	27	25 – 40	
Monocytes	6	4.0 – 7.0	
Eosinophils	3	0.0 – 3.0	
Basophils	1	0.0 – 3.0	

Her TIBC, UIBC, serum iron, and iron saturation were all low according to the functional range, and her ferritin was lab-low at 12. Her red blood cells and hemoglobin were functionally low, so this would be iron deficiency with functional or borderline anemia. If it was untreated, it would likely progress to full clinical anemia. Remember, anemia is the last stage of iron deficiency, so you will typically see the iron deficiency markers go out of range first, and then you might see something like this, where the patient first has functional anemia, and then they would progress to clinical anemia, where the red blood cell indices are lab-low and RDW goes up.

Note that this patient has high zinc. She had been on high-dose zinc supplements of 50 mg per day for one year. We know that copper deficiency can cause iron-deficiency anemia, and high doses of zinc supplements can induce copper deficiency. We also know that serum copper, which is normal for her here, is not a reliable marker for copper status, especially if there is any inflammation present. In this patient, you probably need copper along with iron in order to fully improve and, of course, stopping the high-dose zinc supplements.

MICROSCOPIC YEAST

Result:	Expected:
Many	None - Rare

The microscopic finding of yeast in the stool is helpful in identifying whether there is proliferation of yeast. Rare yeast may be normal; however, yeast observed in higher amounts (few, moderate, or many) is abnormal.

YEAST INFORMATION

Yeast normally can be found in small quantities in the skin, mouth, intestine and mucocutaneous junctions. Overgrowth of yeast can infect virtually every organ system, leading to an extensive array of clinical manifestations. Fungal diarrhea is associated with broad-spectrum antibiotics or alterations of the patient's immune status. Symptoms may include abdominal pain, cramping and irritation. When investigating the presence of yeast, disparity may exist between culturing and microscopic examination. Yeast are not uniformly dispersed throughout the stool, this may lead to undetectable or low levels of yeast identified by microscopy, despite a cultured amount of yeast. Conversely, microscopic examination may reveal a significant amount of yeast present, but no yeast cultured. Yeast does not always survive transit through the intestines rendering it unviable.

INTESTINAL HEALTH MARKERS

	Within	Outside	Reference Range
Red Blood Cells		Few	None - Rare
pH	6.8		6 - 7.8
Occult Blood	Neg		Neg

Red Blood Cells (RBC) in the stool may be associated with a parasitic or bacterial infection, or an inflammatory bowel condition such as ulcerative colitis. Colorectal cancer, anal fistulas, and hemorrhoids should also be ruled out.
pH: Fecal pH is largely dependent on the fermentation of fiber by the beneficial flora of the gut.
Occult blood: A positive occult blood indicates the presence of free hemoglobin found in the stool, which is released when red blood cells are lysed.

She had significant fungal overgrowth and also red blood cells in her stool, which are indicative of some kind of GI bleeding.

TEST	RESULT			
Array 3 – Wheat/Gluten Proteome Reactivity & Autoimmunity	**IN RANGE (Normal)**	**EQUIVOCAL***	**OUT OF RANGE**	**REFERENCE (ELISA Index)**
Wheat IgG	1.17			0.3-1.5
Wheat IgA	0.29			0.1-1.2
Wheat Germ Agglutinin IgG	0.60			0.4-1.3
Wheat Germ Agglutinin IgA	<0.20			0.2-1.1
Native & Deamidated Gliadin 33 IgG			>2.80	0.2-1.2
Native & Deamidated Gliadin 33 IgA	0.13			0.1-1.1
Alpha Gliadin 17-mer IgG	0.92			0.1-1.5
Alpha Gliadin 17-mer IgA	0.21			0.1-1.1
Gamma Gliadin 15-mer IgG		1.38		0.5-1.5
Gamma Gliadin 15-mer IgA	0.26			0.1-1.0
Omega Gliadin 17-mer IgG	0.52			0.3-1.2
Omega Gliadin 17-mer IgA	0.14			0.1-1.2
Glutenin 21-mer IgG	0.36			0.1-1.5
Glutenin 21-mer IgA	0.21			0.1-1.3
Gluteomorphin + Prodynorphin IgG	0.50			0.3-1.2
Gluteomorphin + Prodynorphin IgA	0.15			0.1-1.2
Gliadin-Transglutaminase Complex IgG	0.77			0.3-1.4
Gliadin-Transglutaminase Complex IgA	<0.20			0.2-1.5
Transglutaminase-2 IgG	0.79			0.3-1.6
Transglutaminase-2 IgA	0.21			0.1-1.6
Transglutaminase-3 IgG	0.49			0.2-1.6
Transglutaminase-3 IgA	<0.10			0.1-1.5
Transglutaminase-6 IgG	0.42			0.2-1.5
Transglutaminase-6 IgA	0.23			0.1-1.5

Cyrex Array 3 revealed strong positive antibodies to native and deamidated gliadin and equivocal antibodies to gamma gliadin, which indicates possible celiac, although there are no tissue transglutaminase-2 antibodies. We know from the unit where we talked about Cyrex Array 3 that that is not always the case in celiac. For her, we have GI malabsorption and possibly copper deficiency contributing to iron-deficiency anemia. I didn't mention that her magnesium levels were a little bit low on the last slide. That can also contribute in cases of iron-deficiency anemia.

Marker	Value	Functional Range	Lab Range
Glucose	78	75 – 90	65 - 99
Hemoglobin A1c	5.6	4.4 – 5.4	4.8 - 5.6
Uric Acid	4.5	3.2 - 5.5	2.5 - 7.1
BUN	12	13 – 18	6 - 20
Creatinine	0.74	0.85 – 1.1	0.57 - 1
BUN/Creatinine Ratio	16	9 – 23	8 - 20
Sodium	138	135 – 140	134 - 144
Potassium	3.8	4.0 – 4.5	3.5 - 5.2
Chloride	98	100 – 106	97 - 108
C02	21	25 – 30	18 - 29
Calcium	9.1	9.2 – 10.1	8.7 - 10.2
Phosphorus	4.5	3.5 – 4.0	2.5 - 4.5
Magnesium	1.9	2.0 – 2.6	1.6 - 2.6
Protein, total	7.6	6.9 – 7.4	6.0 - 8.5
Albumin	4.3	4.0 – 5.0	3.5 - 5.5
Globulin	3.3	2.4 – 2.8	1.5 - 4.5
A/G ratio	1.3	1.5 – 2.0	1.1 - 2.5
Bilirubin, total	0.3	0.1 – 1.2	0.0 - 1.2
Alkaline Phosphatase	141	42 – 107	39 - 117
LDH	196	140 - 180	119 - 226
AST	16	10 - 30	0 - 40
ALT	27	10 - 22	0 - 32
GGT	98	0 - 28	0 - 60
TIBC	436	250 – 350	250 - 450
UIBC	416	150 - 375	150 - 375
Iron	20	85 – 135	35 - 155
Iron saturation	5	15 – 45	15 - 55
Ferritin	6	15 - 120	15 - 150
Cholesterol, total	145	150 – 250	100 - 199
Triglycerides	127	50 – 100	0 - 149
HDL	47	55 – 85	> 39
LDL	73	0 – 175	0 - 99
T. Chol / HDL Ratio	3.1	< 3	0 - 4.4
Triglycerides / HDL Ratio	2.70	< 2	
TSH	2.660	0.5 – 2.5	0.450 - 4.500
T4, total	7.0	6.0 – 12	4.5 - 12.0
T3 Uptake	27	28 - 35	24 - 39
T3, Total	126	100 – 180	71 - 180
Vitamin D, 25-hydroxy	32.9	35 - 60	30.0 - 100.0

Marker	Value	Functional Range	Lab Range
WBC	8.1	5.0 – 8.0	3.4 - 10.8
RBC	5.11	4.4 – 4.9	3.77 - 5.28
Hemoglobin	11.2	13.5 - 14.5	11.1 - 15.9
Hematocrit	37.2	37 - 44	34.0 - 46.6
MCV	73	85 – 92	79 - 97
MCH	21.9	27.7 – 32.0	26.6 - 33.0
MCHC	30.1	32 – 35	31.5 - 35.7
RDW	17.6	11.5 – 15.0	12.3 - 15.4
Platelets	376	150 – 415	150 - 379
Neutrophils	46	40 – 60	
Lymphocytes	38	25 – 40	
Monocytes	9	4.0 – 7.0	
Eosinophils	6	0.0 – 3.0	
Basophils	1	0.0 – 3.0	
Eos (Absolute)	0.5		0.0 - 0.4
Additional Tests:			
CRP-hs	5.93	< 1.0	0.00 - 3.00
Homocysteine	11.2	< 7.0	0.0 - 15.0
Vitamin B-12	389	450 – 2000	211 - 946
Copper	134		72 - 166
Zinc	79		56 - 134
Zinc / Copper Ratio	0.59	> 0.85	
Serum Methylmalonic Acid (MMA)	107	0 - 325	0 - 378

The next patient is a 23-year-old female with chief complaint of intestinal bleeding, bloating, and diarrhea. She had a colectomy a few years ago and now has a J-pouch. We've seen this patient's case a number of times now.

This is one of those rare textbook cases for iron-deficiency anemia. You don't see this very often. All of her iron markers are out of the lab range except TIBC, which is right at the top of the lab range. Remember that is an inverse marker, so that means deficiency.

Red blood cells and hemoglobin are functionally low, with hemoglobin nearly out of the lab range, and then MCV, MCH, and MCHC are lab-low and RDW is lab-high. Her C-reactive protein and homocysteine are high, and her B12 was low, so it's likely she has B12 deficiency as well as iron deficiency, which shouldn't be surprising given her condition. Then, her zinc-to-copper ratio is also low, which confirms inflammation along with CRP and possibly copper deficiency. As we just talked about, copper is not a reliable indicator for copper status, serum copper. She also has a little bit low levels of magnesium, which could be contributing, and her TSH is high-normal at 2.66, which could be contributing via hypothyroidism, so she has a lot of underlying issues here that we're seeing even just in a blood panel alone that could contribute to anemia.

The next patient is a 40-year-old female. Chief complaint of multiple autoimmune conditions such as uveitis, thyroiditis, liver autoimmunity, autoimmune hepatitis, joint issues, skin issues, IBS, and also a history of Lyme and Kawasaki disease, so a patient with a lot going on.

She had East Indian ethnicity, was a cultural vegetarian, and had not eaten meat in her entire life.

TESTS	RESULT	FLAG	UNITS	REFERENCE INTERVAL	LAB
Fe+TIBC+Fer					
Iron Bind.Cap.(TIBC)	379		ug/dL	250 - 450	
UIBC	355		ug/dL	150 - 375	01
Iron, Serum	**24**	**Low**	ug/dL	35 - 155	01
Iron Saturation	***6***	***Alert***	%	15 - 55	
Ferritin, Serum	18		ng/mL	15 - 150	01
TSH+T4F+T3Free					
TSH	2.270		uIU/mL	0.450 - 4.500	01
Triiodothyronine,Free,Serum	2.2		pg/mL	2.0 - 4.4	01
T4,Free(Direct)	1.12		ng/dL	0.82 - 1.77	01
HNK1 (CD57) Panel					
% CD8-/CD57+ Lymphs	3.0		%	2.0 - 17.0	02
This test was developed and its performance characteristics determined by LabCorp. It has not been cleared or approved by the Food and Drug Administration. The FDA has determined that such clearance or approval is not necessary. Results of this test are for investigational purposes only. The result should not be used as a diagnostic procedure without confirmation of the diagnosis by another medically established diagnostic product or procedure.					
Abs.CD8-CD57+ Lymphs	87		/uL	60 - 360	
This test was developed and its performance characteristics determined by LabCorp. It has not been cleared or approved by the Food and Drug Administration. The FDA has determined that such clearance or approval is not necessary. Results of this test are for investigational purposes only. The result should not be used as a diagnostic procedure without confirmation of the diagnosis by another medically established diagnostic product or procedure.					
WBC	9.0		x10E3/uL	3.4 - 10.8	01
RBC	4.67		x10E6/uL	3.77 - 5.28	01
Hemoglobin	**10.8**	**Low**	g/dL	11.1 - 15.9	01
Hematocrit	35.3		%	34.0 - 46.6	01

TESTS	RESULT	FLAG	UNITS	REFERENCE INTERVAL	LAB
MCV	**76**	**Low**	fL	79 - 97	01
MCH	**23.1**	**Low**	pg	26.6 - 33.0	01
MCHC	**30.6**	**Low**	g/dL	31.5 - 35.7	01
RDW	**16.4**	**High**	%	12.3 - 15.4	01
Platelets	**490**	**High**	x10E3/uL	150 - 379	01
Neutrophils	59		%		01
Lymphs	33		%		01
Monocytes	8		%		01
Eos	0		%		01
Basos	0		%		01
Neutrophils (Absolute)	5.3		x10E3/uL	1.4 - 7.0	01
Lymphs (Absolute)	2.9		x10E3/uL	0.7 - 3.1	01
Monocytes(Absolute)	0.7		x10E3/uL	0.1 - 0.9	01
Eos (Absolute)	0.0		x10E3/uL	0.0 - 0.4	01
Baso (Absolute)	0.0		x10E3/uL	0.0 - 0.2	01
Immature Granulocytes	0		%		01
Immature Grans (Abs)	0.0		x10E3/uL	0.0 - 0.1	01

You can see that her iron saturation is very low at 6 percent. Serum iron is lab-low at 24. Ferritin is borderline low at 18. TIBC and UIBC are normal interestingly enough, so here is a case where we don't see the textbook presentation.

Her hemoglobin is lab-low. Her red blood cells and hematocrit are normal. Her MCV, MCH, and MCHC are lab-low, and her RDW is high. Her platelets are also high, which can happen in anemia, iron-deficiency anemia in particular.

Her TSH is slightly elevated in the functional range at 2.27, and her free T3 is functionally low at 2.2. We have multiple contributing factors here: diet, autoimmunity, infection, Lyme, and hypothyroidism.

TEST	RESULT			
Array 3 – Wheat/Gluten Proteome Reactivity & Autoimmunity	IN RANGE (Normal)	EQUIVOCAL*	OUT OF RANGE	REFERENCE (ELISA Index)
Wheat IgG	0.53			0.3-1.5
Wheat IgA	0.44			0.1-1.2
Wheat Germ Agglutinin IgG	0.60			0.4-1.3
Wheat Germ Agglutinin IgA	0.49			0.2-1.1
Native & Deamidated Gliadin 33 IgG	0.62			0.2-1.2
Native & Deamidated Gliadin 33 IgA	0.80			0.1-1.1
Alpha Gliadin 17-mer IgG			1.84	0.1-1.5
Alpha Gliadin 17-mer IgA		0.93		0.1-1.1
Gamma Gliadin 15-mer IgG			1.65	0.5-1.5
Gamma Gliadin 15-mer IgA		0.88		0.1-1.0
Omega Gliadin 17-mer IgG		0.94		0.3-1.2
Omega Gliadin 17-mer IgA	0.79			0.1-1.2
Glutenin 21-mer IgG			1.68	0.1-1.5
Glutenin 21-mer IgA		1.09		0.1-1.3
Gluteomorphin + Prodynorphin IgG	0.98			0.3-1.2
Gluteomorphin + Prodynorphin IgA	0.39			0.1-1.2
Gliadin-Transglutaminase Complex IgG	1.09			0.3-1.4
Gliadin-Transglutaminase Complex IgA		1.15		0.2-1.5
Transglutaminase-2 IgG	1.26			0.3-1.6
Transglutaminase-2 IgA	0.79			0.1-1.6
Transglutaminase-3 IgG			2.69	0.2-1.6
Transglutaminase-3 IgA	0.53			0.1-1.5
Transglutaminase-6 IgG			2.38	0.2-1.5
Transglutaminase-6 IgA	0.81			0.1-1.5

She also had very significant gluten intolerance, possibly celiac.

GI Pathogen Screen with H. pylori Antigen - 401H

Parameter	Result
***** Stool Culture *****	
Preliminary Report	Normal flora after 24 hours
Final Report	* Enterobacter species isolated *
Amount of Growth	Moderate
***** Ova & Parasites *****	
Ova & Parasites #1	No Ova/Parasites detected
Ova & Parasites #2	* Endolimax nana cysts detected *
Ova & Parasites #3	No Ova/Parasites detected
Ova & Parasites #4	No Ova/Parasites detected
Trichrome Stain	No Ova/Parasites detected
***** Stool Antigens *****	
Cryptosporidium Antigen	Not detected
Giardia lamblia Antigen	Not detected
***** Additional Tests *****	
Fungi	No fungi isolated
C. difficile Toxin A	Not detected
C. difficile Toxin B	Not detected
Yeast	Light growth of Candida species isolated
Occult Blood	Not detected
*****Helicobacter Pylori Stool Antigen*****	
H. pylori Antigen	Not detected

Light growth of Candida was isolated on BioHealth, so we know that her gut is contributing as well as the other factors that I mentioned. Then, of course, her diet because she didn't eat animal products, which contain heme iron and is much better absorbed than plant-based forms of iron, especially where the gut isn't functioning well.

When a patient like this is not going to eat meat, you will definitely need to supplement, preferably with heme or liposomal iron. You probably will need to do that indefinitely, given all of the conditions that she is dealing with.

The next patient is a 65-year-old female with chief complaint of high blood pressure, Hashimoto's, and acid reflux. She also had a benign 2 cm nodule on her thyroid.

Marker	Value	Functional Range	Lab Range
Glucose	94	75 - 90	65 - 99
Hemoglobin A1c	6.4	4.4 – 5.4	4.8 - 5.6
Uric Acid	4.6	3.2 - 5.5	2.5 - 7.1
BUN	10	13 – 18	8 - 27
Creatinine	0.79	0.85 – 1.1	0.57 - 1
BUN/Creatinine Ratio	13	9 – 23	11 - 26
Sodium	140	135 – 140	134 - 144
Potassium	4.1	4.0 – 4.5	3.5 - 5.2
Chloride	102	100 – 106	97 - 108
C02	24	25 – 30	18 - 29
Calcium	8.5	9.2 – 10.1	8.7 - 10.3
Phosphorus	4.4	3.5 – 4.0	2.5 - 4.5
Magnesium	1.9	2.0 – 2.6	1.6 - 2.3
Protein, total	6.5	6.9 – 7.4	6.0 - 8.5
Albumin	4.1	4.0 – 5.0	3.6 - 4.8
Globulin	2.4	2.4 – 2.8	1.5 - 4.5
A/G ratio	1.7	1.5 – 2.0	1.1 - 2.5
Bilirubin, total	0.5	0.1 – 1.2	0.0 - 1.2
Alkaline Phosphatase	51	42 – 107	39 - 117
LDH	190	140 - 180	119 - 226
AST	18	10 - 30	0 - 40
ALT	17	10 - 22	0 - 32
GGT	29	< 15	0 - 60
TIBC	332	275 – 425	250 - 450
UIBC	195	175 - 350	118 - 369
Iron	137	40 – 135	27 - 139
Iron saturation	41	17 – 45	15 - 55
Ferritin	12	30 - 100	15 - 150
Vitamin B-12	294	450 – 2000	211 - 946
Vitamin D, 25-hydroxy	46.5	35 - 60	30.0 - 100.0
Cholesterol, total	223	150 - 250	100 - 199
Triglycerides	71	50 – 100	0 - 149
HDL	83	55 – 85	> 39
LDL	126	0 - 175	0 - 99
T. Chol / HDL Ratio	2.7	< 3	0 - 4.4
Triglycerides / HDL Ratio	0.86	< 2	< 3.8
CRP-hs	0.65	< 1.0	0.00 - 3.00
Homocysteine	15.7	< 7.0	0.0 - 15.0

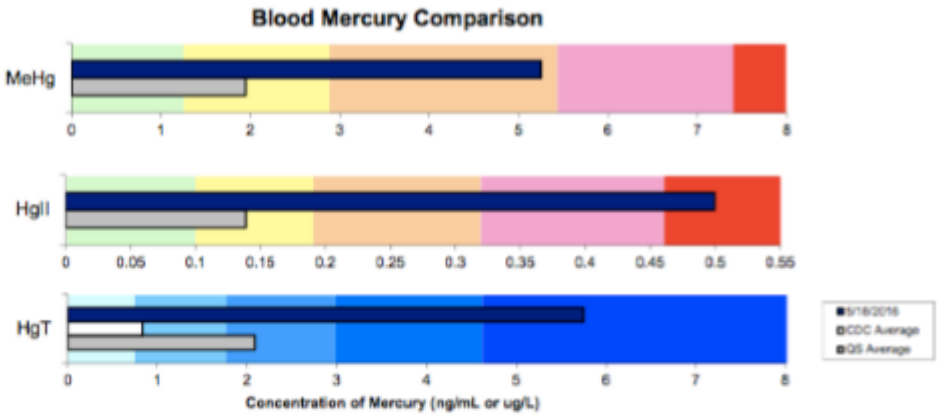
Marker	Value	Functional Range	Lab Range
TSH	2.110	0.5 – 2.5	0.45 - 4.50
T4, total	7.5	6.0 – 12	4.5 - 12
T3 Uptake	32	28 - 35	24 - 39
T3, Total	94	100 – 180	71 - 180
T3, Free	2.7	2.5 - 4.0	2 - 4.4
T4, Free	1.19	1 - 1.5	0.82 - 1.77
Thyroid – TPO Ab	576		0 - 34
Thyroid – TGA	<1.0		0 - 0.9
Copper	90		72 - 166
Zinc	70		56 - 134
Zinc / Copper Ratio	0.78	> 0.85	
Serum Methylmalonic Acid (MMA)	270	< 300	0 - 378
WBC	4.0	5.0 – 8.0	3.4 - 10.8
RBC	4.47	4.4 – 4.9	3.77 - 5.28
Hemoglobin	11.8	13.5 - 14.5	11.1 - 15.9
Hematocrit	37.1	37 - 44	34 - 46.6
MCV	83	85 – 92	79 - 97
MCH	26.4	27.7 – 32.0	26.6 - 33.0
MCHC	31.8	32 – 35	31.5 - 35.7
RDW	15.6	11.5 – 15.0	12.3 - 15.4
Platelets	246	150 – 415	150 - 379
Neutrophils	46	40 – 60	
Lymphocytes	44	25 – 40	
Monocytes	7	4.0 – 7.0	
Eosinophils	2	0.0 – 3.0	
Basophils	1	0.0 – 3.0	

Her ferritin is lab-low, but her other iron markers are normal with the exception of iron being actually functionally high. Her B12 is functionally low. Her homocysteine is lab-high at 15.7. This suggests both B12 and iron deficiency causing anemia.

Her hemoglobin is low. Her MCV and MCHC are functionally low, and her MCH is lab-low, and then her RDW is lab-high. That would suggest that the iron deficiency may be more significant than the B12 deficiency as a cause of anemia because those markers are low rather than high, the MCV, MCH, and MCHC.

Her TPO antibodies are positive. Her magnesium and calcium are low, so this is indicative of malabsorption of several nutrients and suggests that malabsorption is playing a significant role in her anemia.

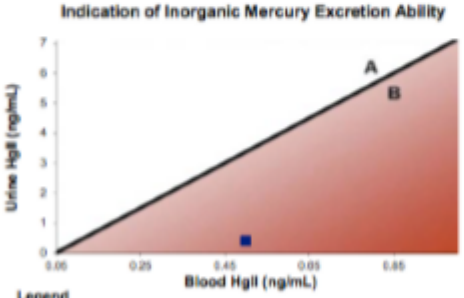
Note that her fasting glucose is high at 94, and her hemoglobin A1c is high at 6.4, but recall that hemoglobin A1c is not accurate where anemia is present because A1c is a measurement of glycation of red blood cells, and the survival time of red blood cells is affected by anemia. That is a situation where A1c is not particularly accurate.



	Results (ng/mL)			Reference Ranges						
				QS n=1011; CDC n=1928			Percentile			
	5/18/2016	NA	% Change	Source	Range	Average	50th	75th	90th	95th
Methylmercury— MeHg	5.25	NA	NA	QS	<0.003 to 23.3	1.95	1.2	2.9	5.4	7.4
Inorganic Mercury— Hg^{II}	0.500	NA	NA	QS	<0.007 to 1.75	0.139	0.10	0.19	0.32	0.46
Sum— HgT	5.75	NA	NA	CDC	0.038 to 9.96	0.833	0.7	1.7	3	4.8

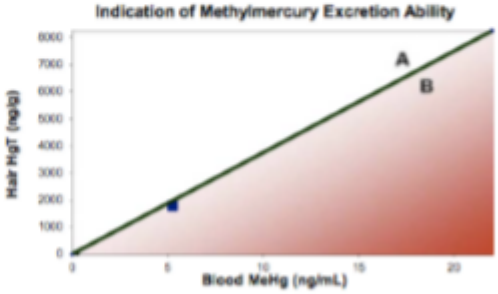
Blood Reference Values: Quicksilver Scientific (QS) Data represents 1011 males and females that have utilized our testing. CDC data represents 1928 females, ages 16 to 49. QS blood Hg concentrations are higher that CDC because QS analyzes blood a population that already suspects mercury toxicity.
Data and Analysis Information: Mercury speciation was performed at Quicksilver Scientific, and all values are in concentrations of ng Hg per mL of blood

Urine Results



Legend
A) Average Excretion: Mercury output is average or above average when at a ratio of at least 375:1 Hg^{II} in hair to MeHg in blood and 6.6:1 Hg^{II} in urine to Hg^{II} in blood.
B) Below Average Excretion: Mercury output is below average when the tissue Hg comparisons are below ratios mentioned above (red area)

Hair Results



	Urine Results (ng/mL)			Hair (ng/g)
	5/18/2016	NA	%Change	5/18/2016
Methylmercury— MeHg	0.004	NA	NA	NA
Inorganic Mercury— Hg^{II}	0.404	NA	NA	NA
Sum— HgT	0.408	NA	NA	1778

She had high levels of inorganic mercury with severely impaired detox capacity for inorganic mercury. She currently, at the time of the testing, had dental mercury amalgams still, so that was the source for her.

Comprehensive Stool Analysis / Parasitology x3

BACTERIOLOGY CULTURE

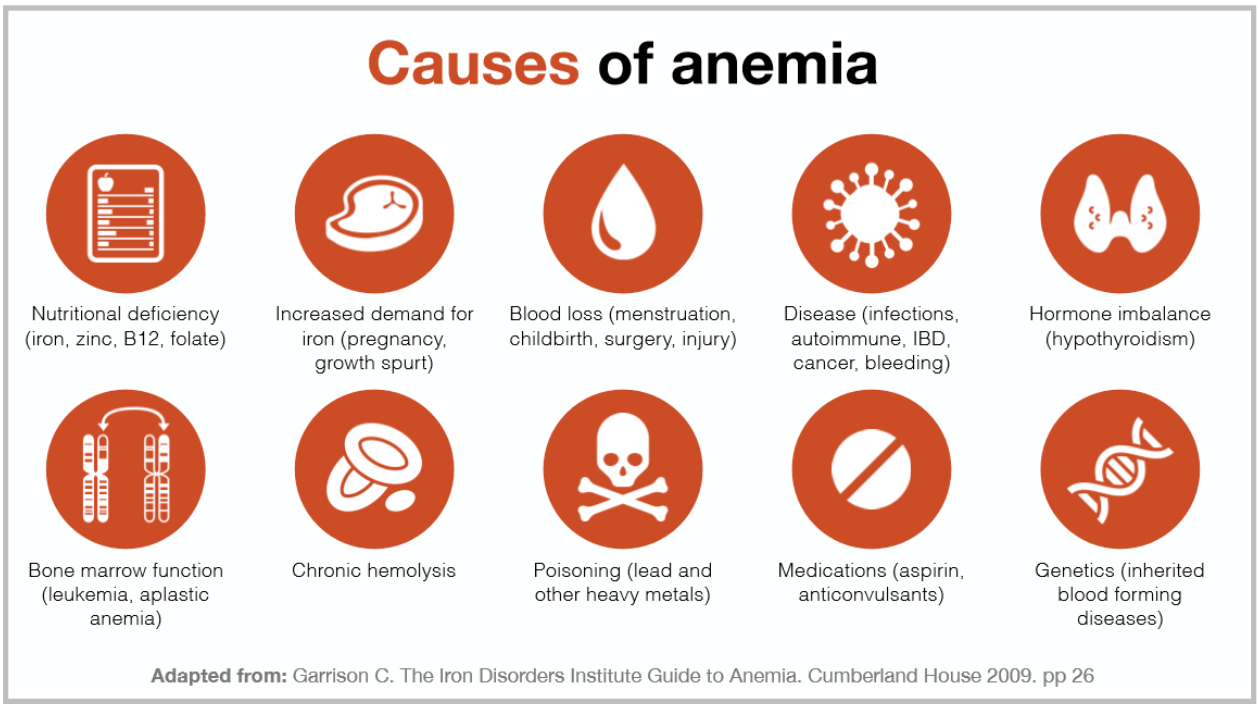
Expected/Beneficial flora	Commensal (Imbalanced) flora	Dysbiotic flora
4+ Bacteroides fragilis group	4+ Gamma hemolytic strep	4+ Klebsiella oxytoca
3+ Bifidobacterium spp.	2+ Hafnia alvei	4+ Klebsiella pneumoniae ssp pneumoniae
4+ Escherichia coli	4+ Lactococcus lactis	
2+ Lactobacillus spp.		
4+ Enterococcus spp.		
4+ Clostridium spp.		
NG = No Growth		

INFLAMMATION

	Within	Outside	Reference Range
Lactoferrin		8.4	< 7.3 µg/mL
Calprotectin*	40		<= 50 µg/g
Lysozyme*	524		<= 600 ng/mL
White Blood Cells	None		None - Rare
Mucus	Neg		Neg

Lactoferrin and **Calprotectin** are reliable markers for differentiating organic inflammation (IBD) from function symptoms (IBS) and for management of IBD. Monitoring levels of fecal lactoferrin and calprotectin can play an essential role in determining the effectiveness of therapy, are good predictors of IBD remission, and can indicate a low risk of relapse. **Lysozyme*** is an enzyme secreted at the site of inflammation in the GI tract and elevated levels have been identified in IBD patients. **White Blood Cells** (WBC) and **Mucus** in the stool can occur with bacterial and parasitic infections, with mucosal irritation, and inflammatory bowel diseases such as Crohn's disease or ulcerative colitis.

Stool tests revealed pathogenic dysbiosis and gut inflammation with high lactoferrin, so we have multiple issues here: GI malabsorption, thyroid, and heavy metal toxicity.



Treatment of iron-deficiency anemia involves addressing the underlying cause, of course, and this could include nutrient deficiency, GI pathology, metal toxicity, hypothyroidism, autoimmunity, inflammation, infection, etc.—all the causes we covered earlier in the presentation, which are listed here again on this slide.

We've covered how to address these causes in other sections of the ADAPT training, or we will be covering them, so I'm not going to go into detail here. Refer to the iron-deficiency presentation for detailed information on how to restore iron levels. If the patient does have iron-deficiency anemia, I suggest increasing dietary copper intake, especially if background copper intake is low, or there are other signs of deficiency. Remember that some studies have shown that increasing copper intake alone without even giving the patient iron can resolve iron-deficiency anemia in some cases because copper helps iron to get into the cells.

Okay, that's it for this presentation. In the next presentation, we'll talk about B12 and folate-deficiency anemia.