Lab Results
Oct 2002-April 2003

Dr Tim Smith &
Dr Freidman

500 Chipeta Way, Salt Lake City, Utah 84108
Edward R. Ashwood, M.D. Laboratory Director

Corrected plus Final

COPP, DOUGLAS F
(10298)X046461692
Male 51 years 03 Aug 1951
Primary Clinician:
Acc. #: T20756

TRI-CORE Reference Lab
2811 Stanford Drive N.E.
Albuquerque, NM 87107

Reported on: 07 Apr 2003 12:46 PM

ORDERED TEST	RESULT	UNITS	RESULT FLAG	REFERENCE INTERVAL

Accession #: 0309211681
Collected on: 01 Apr 2003 02:30 PM

POLYCHLORINATED BIPHENYLS @ SEE NOTE
PCB'S PANEL, SERUM

Analyte	Results	Units	Rep. Limit
PCB'S (POLYCHLORINATED BIPHENYLS)	3.9	PPB	

BASED ON AROCHLOR 1260.
GENERAL POPULATION: UP TO 30 PPB.
AVERAGE: 6 PPB.
ANALYSIS BY GAS CHROMATOGRAPHY (GC).
Performed at: National Medical Service, 3701 Welch Road, Willow Grove, PA 19090

Client Comments:
SPECIMEN TYPE: S

Received on: 03 Apr 2003 10:12 AM Ordering Clinician: HA, BEN

@ POLYCHLORINATED BIPHENYLS performed at National Medical Service, 3701 Welch Road, Willow Grove, PA 19090

TRICORE REFERENCE LABORATORIES
2811 Stanford Rd, Albuquerque, NM 87105 (505) 938-8922

Friedman.Robert MD
PO Box 5054
Santa Fe, NM 87502

PATIENT NAME	PATIENT ID	DOB	SEX	STATUS		
COPP, DOUGLAS F	X046461692	08/03/1951	M	Final		
PHYSICIAN	COLLECT DATE & TIME	DATE OF SERVICE			PRINT DATE/TIME	PAGE
Unlisted Physician,	04/01/2003 14:30 (a)	04/01/2003 15:39			04/14/2003 12:26	2
REQUISITION NO. / PT.PHONE NO / LAB REF NO.						
3171402 / 281-7977						

COMMENTS: RESULTS TO TIMOTHY J SMITH MD AT 2635 REGENT (Continued)...

TEST	Result In Range	Result Out of Range	Units	Reference Range	Site Code
...ST BERKELEY CA 94704 // T20756:- 99928 POLYCHLORINATED BIPHENYL (ARUP)					
Result	< 20 ng/dL				

(NOTE)
REFERENCE RANGE: < 20 - 150 ng/dL
Pubertal and Adults
Please refer to the Pregnenolone report for additional information.

Test performed by

Performed at Esoterix, Inc., 4301 Lost Hills Road, Calabasas, CA 91301

Test Name

POLYCHLORINATED BIPHENYL

Result 3.9 PPB

(NOTE)
~ Based on Arochlor 1260.
~ General Population: up to 30 PPB.
Average: 6 PPB
Analysis by Gas Chromatography (GC).

Test performed by

Performed at National Medical Services, 3701 Welsh Road, Willow Grove, PA 19090

Performing Labs

AR — Performed at ARUP Laboratories, Inc, 500 Chipeta Way, Salt Lake City, UT

End of Report

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Friedman,Robert MD
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PATIENT NAME	PATIENT ID	DOB	SEX	STATUS		
COPP, DOUGLAS F	X046461692	08/03/1951	M	Final		
PHYSICIAN	COLLECT DATE & TIME	DATE OF SERVICE	PRINT DATE/TIME			PAGE
Unlisted Physician,	04/01/2003 14:30 (a)	04/01/2003 15:39	04/14/2003 12:26			1
REQUISITION NO.	PT.PHONE NO	LAB REF NO.				
3171402	281-7977					

COMMENTS: RESULTS TO TIMOTHY J SMITH MD AT 2635 REGENT (Continued)...

TEST	Result In Range	Result Out of Range	Units	Reference Range	Site Code
...ST BERKELEY CA 94704 // T20756:- 99928 POLYCHLORINATED BIPHENYL (ARUP)					

—Footnotes—

(a) Multiple collection dates and times apply to tests on this order

Collected on: 04/01/2003 14:30
DHEA-Sulfate — 341 — ug/dL — 80-560

Collected on: 04/01/2003 14:30
TSH — 1.490 — uIU/mL — 0.40-4.5

All TSH values less than 0.400 uIU/mL represent 3rd Generation TSH. No extra charges apply.

Collected on: 04/01/2003 14:30
IGF 1 — 148 — AR

Reference range: 90 to 360
Unit: ng/mL
(NOTE)
REFERENCE INTERVAL: IGF-1 (Insulin-Like Growth I)

AGE	MALE	FEMALE
2 mos-5 yrs	17-248 ng/mL	17-248 ng/mL
6-8 yrs	88-474 ng/mL	88-474 ng/mL
9-11 yrs	110-565 ng/mL	117-771 ng/mL
12-15 yrs	202-957 ng/mL	261-1096 ng/mL
16-24 yrs	182-780 ng/mL	182-730 ng/mL
25-39 yrs	114-492 ng/mL	114-492 ng/mL
40-54 yrs	90-360 ng/mL	90-360 ng/mL
55 yrs and over	71-290 ng/mL	71-290 ng/mL

Values by Tanner Stage:

TANNER STAGE	MALE	FEMALE
I	109-485 ng/mL	128-470 ng/mL
II	174-812 ng/mL	186-695 ng/mL
III	230-818 ng/mL	292-883 ng/mL
IV	396-776 ng/mL	394-920 ng/mL
V	402-839 ng/mL	309-1138 ng/mL

Misc Referral Test Collected on: 04/01/2003 14:16
Test Name — DIOXANE 1,4 (DIOXAN) QUANTITATION, SERUM
Result — NONE DETECTED
(NOTE)
Rep. Limit = 1.0 mcg/mL
Following a 6 hour exposure to 50 PPM Dioxane, steady state plasma
levels averaged 12 mcg/mL.
Test performed by — Analysis by Gas Chromatography (GC).

Performed at National Medical Services, 3701 Welsh Road, Willow Grove, PA 19090

Misc Referral Test Collected on: 04/01/2003 14:30
Test Name — PREGNENOLONE

Continued on next page

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Santa Fe, NM 87502

PATIENT NAME	PATIENT ID	DOB	SEX	STATUS		
COPP, DOUGLAS F	X046461692	08/03/1951	M	Final		
PHYSICIAN	COLLECT DATE & TIME		DATE OF SERVICE		PRINT DATE/TIME	PAGE
Friedman, Robert MD	01/23/2003 12:40 (a)		01/23/2003 14:42		02/03/2003 12:28	1
REQUISITION NO. / PT.PHONE NO / LAB REF NO.						
1723234 / 281-7977						
COMMENTS:						

TEST	Result In Range	Result Out of Range	Units	Reference Range	Site Code
---Footnotes---					
(a) Multiple collection dates and times apply to tests on this order.					
Collected on: 01/23/2003 12:40					
DHEA-Sulfate	469		ug/dL	80-560	
Thyroid Screen Collected on: 01/23/2003 12:40					
FT4	1.3		ng/dL	0.8-1.6	
TSH	2.040		uIU/mL	0.40-4.5	
All TSH values less than 0.400 uIU/mL represent 3rd Generation TSH. No extra charges apply.					
Misc Referral Test Collected on: 01/23/2003 12:36					
Test Name: PREGNENOLONE, SERUM					
Result: 120 ng/dL					
Reference Range: < 20 to 150 ng/dL					
Test performed by: Performed at Esoterix, Inc., 4301 Lost Hills Road, Calabasas, CA 91301					
Misc Referral Test Collected on: 01/23/2003 12:40					
Test Name: POLYCHLORINATED BIPHENYLS					
Result: NONE DETECTED					
(NOTE) Rep. Limit = 2 PPB Based on Arochlor 1260. Average 6 PPB. Analysis by Gas Chromatography (GC).					
Test performed by: Performed at National Medical Services, 3701 Welsh Road, Willow Grove, PA 19090					
Collected on: 01/23/2003 12:40					
Digoxin		<0.3 L	ng/mL	0.8-2.0	
Note: The manufacturer has indicated that this Digoxin assay may exhibit negative interference from aldosterone inhibitors: spironolactone and canrenone. Contact the laboratory for alternate testing availability if clinically warranted.					

End of Report

Toxic Element Clearance Profile
Ran n/Timed in µg/g Creatinine

Great Smokies Diagnostic Laboratory℠
63 Zillicoa Street · Asheville, NC 28801-1074
www.gsdl.com

Patient: **DOUGLAS COPP**
Age: 51
Sex: M
MRN: 0000428962

Order Number: 36280198
Completed: December 31, 2002
Received: December 28, 2002
Collected: December 27, 2002

Toxic Elements

Element	(µg / g creat.)	Ref Range
Lead	20.49	<= 1.38
Mercury	1.62	<= 1.72
Aluminum	2.2	<= 74.0
Antimony	0.056	<= 0.170
Arsenic	86.8	<= 66.7
Barium	3.41	<= 7.40
Bismuth	11.111	<= 0.370
Cadmium	1.33	<= 0.74
Cesium	3.59	<= 11.20
Gadolinium	0.015	<= 0.019
Gallium	3.77	<= 3.15
Nickel	4.32	<= 9.40
Niobium	0.02	<= 0.05
Platinum	0.013	<= 0.014
Rubidium	821.0	<= 2,398.0
Tellurium	<dl	<= 0.520
Thallium	0.160	<= 0.510
Thorium	<dl	<= 0.000
Tin	0.52	<= 3.03
Tungsten	0.112	<= 0.330
Uranium	<dl	<= 0.013

Nutrient Element

Element	(mg / g creat.)	Ref Range
Sulfur	586.6	350.0-965.0

Creatinine Concentration & Urine Volume

Creatinine	81.36	30.00-209.00 mg/dL

Urine Total Volume (in milliliters): 450

Provocation Comments

Post-provocation laboratory results.

Legend

- Reference Range for Toxic Elements
- Reference Range for Nutrient Elements
- Cautionary Level - Result is outside the reference range. Pre-collection dietary variables, supplements or use of challenge substances may be the cause. Such values should be assessed with the individuals symptoms, physical findings, nutritional status and exposure potential in mind.
- Tentative Maximum Permissible Level (TMPL) - Element excretion is elevated. These levels are not strict toxicological points, but represent excessive excretion and therefore potential exposure or body burden of the element which can impact negatively on overall health. The TMPL's for Pb, Hg, Al, Sb, Cd, Ni, Tl, and Co are derived from Casaret and Doull's TOXICOLOGY: The Basic Science of Poisons 5th Ed. 1996 McGraw Hill NY, NY. with standardization of units.

Reference Range Information

Element reference ranges were developed from a healthy population under non-provoked/non-challenged conditions. Provocation with challenge substances is expected to raise the urine level of some elements to varying degrees, often into the cautionary or TMPL range. The degree of elevation is dependent upon the element level present in the individual and the binding affinities of the challenge substance.

Commentary

Lab Comments
Elevated results verified through a repeat analysis. rbw 12/31/02

<dl = Unable to determine results due to less than detectable levels of analyte.

Commentary is provided to the practitioner for educational purposes, and should not be interpreted as diagnostic or treatment recommendations. Diagnosis and treatment decisions are the responsibility of the practitioner.

Lead is above the reference range. 75% to 80% of absorbed lead is typically excreted via urine, 15 to 20% via bile, and the remainder via sweat, hair and nails. In non-provoked urine, lead levels can fluctuate according to variable dietary and physiological factors, and the level does not necessarily reflect body burden. Provoked levels, however, can be indicative of excess lead in body tissues. It is notable that for children (compared with adults), lead can be more toxic, with detrimental effects occurring at much lower levels. Furthermore, toxicity of lead can be significantly increased synergistically by the presence of either mercury or cadmium.

Most lead uptake occurs via ingestion of contaminated food or water. Inhalation of lead dusts and transdermal absorption of organic lead salts are other modes of uptake. While temporarily carried in the bloodstream, lead is at least 90% bound to erythrocytes, however, with chronic low-level or long-ago exposure, only 2% or less of total body lead remains in the blood. Lead primarily deposits and accumulates in the aorta, liver, kidneys, adrenal and thyroid glands, bones and teeth. This element interferes with membrane functions, bonds to sulfhydryl (-SH), phosphate, hydroxyl and amino sites on proteins and enzyme cofactors, and interferes with heme synthesis, iron transport, erythrocyte lifespan, and hepatic cytochrome P-450 functions. Other deleterious effects include: reduced vitamin D synthesis, slowed nerve conduction, peripheral neuropathy, hypertension (adults) and loss of IQ and developmental disorders (children). Anemia, neuropathies and encephalopathy are end-stage conditions of severe lead excess.

Although historic uses of lead (housepaint, anti-knock gasoline additives, and soldered joints in water systems) have been discontinued, old building materials, paint chips, plumbing and the environment may contain residual amounts from these sources. Other sources include batteries in cars, trucks, boats, and power backup systems, art supplies, colored glass kits, bullets, fishing sinkers, balance weights, radiation shields, bearing alloys, babbitt metal, some ceramic glazes or pigments, and sewage sludge. Some cities that have not replaced old water mains may have variable amounts of lead in the drinking water.

Arsenic is above the reference range. Most forms of ingested arsenic are excreted in urine, and variations in dietary intake, such as a single meal of arsenic containing shellfish, can cause urine levels to temporarily increase by a factor of 50 to 100. Therefore, increased urine arsenic indicates exposure but does not necessarily imply tissue accumulation or toxicity. Besides ingestion, arsenic can be assimilated by inhalation and via contact with the skin. Detoxication occurs via methylation, requiring S-adenosylmethionine (SAMe). Arsenic can be increased in urine

Commentary

)llowing administration of sulfhydryl (-SH) detoxifying agents such as DMSA, DMPS, or D-Penicillamine.

Arsenic has multiple toxic effects including inhibition of mitochondrial function, including metabolism of pyruvate, succinate and alpha-ketoglutarate (Kreb's Cycle metabolites), inactivation of lipoic acid, impairment of lymphocyte stimulation and proliferation, and interference with DNA repair processes. Symptoms consistent with excessive arsenic ingestion include garlic breath and increased salivation, fatigue, chest pain, diarrhea and hypotension. Long term or chronic signs may include hair loss, skin hypopigmentation, white-streaked fingernails, anorexia, peripheral neuropathy, leukopenia, and erythrocyte fragility.

Commonly encountered sources of arsenic include contaminated shellfish or other seafoods, edible seaweeds, production of semiconductor or photoelectric components (particularly, gallium arsenide), electroplating, galvanizing and etching processes, certain fungicides and pesticides, chemical process industry (reagents, catalysts), fireworks (intense white and blue colors), leather tanning and taxidermy, textile printing, lead and copper alloys (cable sheaths, solders, shot), and specialty glass manufacture (opal glass, IR transmitting, decolorizing).

Bismuth is above the reference range. This element is typically present at low levels in drinking water and in fruits, vegetables and grains. Most (about 90%) is not absorbed from the GI tract. However, excretion of absorbed bismuth is mainly via the urine. The over-the-counter remedy for GI distress, "Pepto-Bismol" contains bismuth subsalicylate, which is mostly unabsorbed. Certain forms of bismuth are used medicinally for peptic and duodenal ulcers, Helicobacter pylori infection, and to treat diarrhea. When taken at pharmacologic doses, urine levels may rise moderately. Absorbed bismuth that is not promptly excreted concentrates primarily in the liver and kidney, with lesser amounts going to soft tissues and bones.

The toxicokinetics of bismuth are similar to those of arsenic and antimony. Binding to sulfhydryl (-SH) sites and enzyme inactivation may occur, and methylation is required for detoxication. Nephrotoxicity with renal tubular lesions and necrosis of proximal tubules is an end-stage organ failure caused by severe bismuth excesses. Symptoms of chronic bismuth excess include decreased appetite, weight loss, general malaise and weakness, diarrhea, proteinuria (protein loss in the urine), rheumatic pains, dermatitis, gingivitis and sometimes a telltale blue-black line on the gums. Besides food, drink and pharmaceuticals, bismuth sources include: cosmetics and lipstick (pearlescent tones), low-melting temperature alloys in fuses, automatic fire sprinklers and solders, pigments and paints, semiconductors, electronic components and batteries, metal casting, and ore refining and production operations for copper and lead.

Cadmium is above the reference range. Measurement of cadmium in the urine is the preferred method for assessing overall body burden of this quite toxic element. The kidneys are the main target organ for cadmium. Accumulation of excessive cadmium causes nephrotoxicity with proteinuria, hyperaminoaciduria (generalized urinary wasting of amino acids), beta 2-microglobulinuria, glucosuria, tubular necrosis and deficient metabolism of vitamin D. Osteomalacia can be an eventual outcome. Administration of detoxifying agents, EDTA or DMSA, may increase urinary excretion of cadmium.

Besides impairing renal transport, cadmium interferes with gluconeogenic enzymes, cellular energy production and oxidative phosphorylation. Inhaled cadmium vapor/dust can cause pulmonary edema and eventually, emphysema;)ral cadmium causes GI distress with severe irritation of the gastric epithelium. Absorbed cadmium, by any route, occasionally affects hematologic functions, possibly resulting in iron-disordered anemia. Neuropsychological

Commentary

roblems such as mood and behavior changes are also reported. The presence of mercury or lead with cadmium may dramatically increase toxic effects.

Cadmium has many industrial, commercial and environmental sources. Plants (vegetables, especially potatoes and leafy vegetables) readily assimilate it, and contaminated soils and sewage sludge products are possible sources. Other sources include cadmium-plated hardware (nuts, bolts), electroplating processes, Nickel-Cadmium batteries, some photovoltaic cells, brazes and solders, pigments (paints, inks, glazes), cigarettes, old copy machine drums, photographic and engraving chemicals, ore smelting operations, and power plant exhaust plumes.

Gallium is above the reference range. This element is chemically similar to aluminum in that absorption of gallium from the intestines is inhibited by the presence of dietary phosphate but increased by the presence of citric or malic acid (carboxylic acids). In animal studies, gallium uptake (like aluminum uptake) is increased in iron-deficiency or low plasma transferrin conditions with deposition occurring in liver, spleen, brain, renal cortex and bone. Once absorbed, humans with normal renal function excrete 4 to 55% of a total, point-in-time exposure within four days, with urine being the major route for gallium excretion.

Although chemically similar to aluminum, the scientific literature reports gallium to be somewhat less toxic. However, with chronic exposure, there can be irritation of mucosal membranes, decreased gastric function, and kidney tubular damage. Controlled acute exposures in animals produced hyperexcitability, photophobia, rapid weight loss with anorexia, and GI distress with diarrhea and bloody feces.

Gallium nitrate is a therapeutic agent used for cancer-related hypercalcemia, Hodgkin's disease and non-Hodgkin's lymphoma. Use of gallium for these purposes is expected to cause notable urinary increases. Gallium (as arsenide or phosphide) is used to manufacture semiconductor materials, light-emitting diodes ("LEDs") and microwave components. It is used instead of mercury in high-temperature thermometers and as a substitute for mercury in arc or fluorescent lamps. Dental materials including root-canal sealers may contain gallium. In scientific or laboratory equipment, it often is used for vacuum or pressure seals and may be in "vacuum grease" as well.

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Friedman.Robert MD
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Santa Fe, NM 87502

PATIENT NAME	PATIENT ID	DOB	SEX	STATUS		
COPP, DOUGLAS F	**X046461692**	**08/03/1951**	**M**	**Final**		
PHYSICIAN	COLLECT DATE & TIME	DATE OF SERVICE			PRINT DATE/TIME	PAGE
Unlisted Physician,	**12/26/2002 14:00**	**12/26/2002 14:39**			**01/06/2003 16:28**	**1**
REQUISITION NO.	PT.PHONE NO.	LAB REF NO.				
3164066	**281-7977**					

COMMENTS: CC TO PATIENT AT 2635 REGENT ST BERKELEY CA (Continued)...

TEST	Result In Range	Result Out of Range		Units	Reference Range	Site Code
...94704 PH5105488022						
Comp Metabolic Panel						
Sodium	140			mmol/L	136-146	
Potassium	4.4			mmol/L	3.5-5.0	
Chloride	109			mmol/L	96-110	
CO2	23			mmol/L	16-30	
Anion Gap	8				7-17	
Glucose	90			mg/dL	60-126	
BUN	22			mg/dL	3-25	
Creatinine	0.9			mg/dL	0.5-1.4	
Calcium	9.8			mg/dL	8.4-10.4	
Total Protein	7.5			gm/dL	5.9-8.3	
Albumin	4.6			gm/dL	3.1-4.7	
Globulin	2.9			gm/dL	2.0-3.9	
Bilirubin, total	0.5			mg/dL	0.0-1.4	
Alk Phos	66			U/L	20-145	
AST(SGOT)	25			U/L	3-70	
ALT(SGPT)	51			U/L	3-78	
Fasting	YES					SF
Lipid Panel						
Triglyceride		309	H	mg/dL	<150	
Cholesterol		239	H	mg/dL	<200	
HDL	46			mg/dL	>40	
LDL(calc)		131	H	mg/dL	<100	

```
LDL Cholesterol-Primary Target of Therapy
   <100.....Optimal
   100-129.....Near optimal/above optimal
   130-159.....Borderline high
   160-189.....High
   >190.....Very high
Total Cholesterol
   <200.....Desirable
   200-239.....Borderline high
   >240.....High
HDL Cholesterol
   <40.....Low
   >60.....High
ATP III Classification of Serum Triglycerides
   <150.....Normal
   150-199.....Borderline high
   200-499.....High
   >500.....Very High
ATP III Classification of Fasting Lipids
JAMA 2001; 285:2486-2497
```

CBC				
WBC	5.9	x10E3	4.0-10.6	
RBC	4.69	x10E6	4.64-6.00	

Continued on next page

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PATIENT NAME
COPP, DOUGLAS F
PHYSICIAN
Unlisted Physician,
REQUISITION NO. **3164066**
PT.PHONE NO. **281-7977**
LAB REF NO.

PATIENT ID **X046461692**
DOB **08/03/1951**
SEX **M**
STATUS **Final**
COLLECT DATE & TIME **12/26/2002 14:00**
DATE OF SERVICE **12/26/2002 14:39**
PRINT DATE/TIME **01/06/2003 16:28**

COMMENTS: CC TO PATIENT AT 2635 REGENT ST BERKELEY CA (Continued)...

TEST	Result In Range	Result Out of Range	Units	Reference Range	Site Code
...94704 PH5105488022					
Hgb	14.8		gm/dL	14.5-17.7	
Hct	42		%	42-53	
MCV	89		fL	81-98	
MCHC	35.1		gm/dL	31.2-35.2	
RDW	12.2		%	11.0-14.5	
Platelets	314		x10E3	150-400	
Differential					
Diff Type	Auto Diff				
Neutrophils	57		%	40-76	
Lymphocytes	31		%	16-47	
Monocytes	9		%	3-13	
Eosinophils	3		%	0-5	
Basophils	0		%	0-2	
Abs: Neutrophil	3.4		x10E3	1.8-7.0	
Abs. Lymphocyte	1.8		x10E3	1.0-3.4	
Abs. Monocyte	0.5		x10E3	0.2-0.8	
Abs. Eosinophil	0.2		x10E3	0.0-0.3	
Abs. Basophil	0.0		x10E3	0.0-0.1	
Urinalysis					
Source	Unknown				
Color	Yellow			YEL	
Appearance	Clear			CLEAR	
Specific Gravity	1.019			1.003-1.030	
pH	5.0			5.0-8.0	
Glucose	Negative		mg/dL	NEG	
Bilirubin	Negative			NEG	
Ketones,Urine	Negative		mg/dL	NEG	
Blood	Negative			NEG	
Protein	Negative		mg/dL	NEG	
Urobilinogen	Normal		EU/dL	NORM	
Nitrite	Negative			NEG	
Leukocyte Esterase		Trace		NEG	
UA Microscopic					
WBC	2		/hpf	0-5	
RBC	0		/hpf	0-3	
Bacteria	Moderate		/hpf		
Squamous Epithelial	6		/lpf		
DHEA-Sulfate	150		ug/dL	80-560	
Free T3	3.7		pg/mL	1.6-5.6	
PSA	1.7		ng/mL	0-4.0	
PSA results were obtained with the IMMULITE DPC 2000 PSA assay. Results obtained from other manufacturers' assay methods may not be used interchangeably.					
Total T3	122		ng/dL	57-175	
Total Testosterone	4.4		ng/mL	2.2-8.4	

Continued on next page

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PHYSICIAN	COLLECT DATE & TIME	DATE OF SERVICE			PRINT DATE/TIME	PAGE
Unlisted Physician,	**12/26/2002 14:00**	**12/26/2002 14:39**			**01/06/2003 16:28**	**3**

REQUISITION NO. **3164066** PT.PHONE NO. **281-7977** LAB REF NO.

COMMENTS: CC TO PATIENT AT 2635 REGENT ST BERKELEY CA (Continued)...

TEST	Result In Range	Result Out of Range	Units	Reference Range	Site Code
...94704 PH5105488022					
Thyroid Screen					
FT4	1.1		ng/dL	0.8-1.6	
TSH	2.310		uIU/mL	0.40-4.5	

All TSH values less than 0.400 uIU/mL represent 3rd Generation TSH. No extra charges apply.

Misc Referral Test
Test Name: Pregnenolone
Result: 49 ng/dL

Normal Levels (Adult): 20 to 150 ng/dL
(NOTE)
Please refer to special Pregnenolone report for additional information.

Test performed by

Performed at Esoterix, Inc., 4301 Lost Hills Road, Calabasas, CA 91301

Performing Labs
SF

Performed at TriCore Reference Lab Santa Fe Branch, 465 St Michael's Dr, Ste 116, Santa Fe, NM 87505

End of Report

TriCore Reference Laboratories
2811 Stanford NE
Albuquerque, NM 87107
(505)938-8922

Patient Name: COPP,DOUGLAS F
Medical Record: X046461692
DOB:08/03/1951 Age:51Y Sex:M
Account Number:
Attending MD: Unlisted Physician
Patient ID:
Patient Phone:281-7977

H36783 COLL: 12/26/2002 14:00 REC: 12/26/2002 14:39 PHYS: Unlisted Physician
Req# : 3164066
CC TO PATIENT AT 2635 REGENT ST BERKELEY CA 94704 PH5105488022

Comp Metabolic Panel				
Sodium		140	[136-146]	mmol/L
Potassium		4.4	[3.5-5.0]	mmol/L
Chloride		109	[96-110]	mmol/L
CO2		23	[16-30]	mmol/L
Anion Gap		8	[7-17]	
Glucose		90	[60-126]	mg/dL
BUN		22	[3-25]	mg/dL
Creatinine		0.9	[0.5-1.4]	mg/dL
Calcium		9.8	[8.4-10.4]	mg/dL
Total Protein		7.5	[5.9-8.3]	gm/dL
Albumin		4.6	[3.1-4.7]	gm/dL
Globulin		2.9	[2.0-3.9]	gm/dL
Bilirubin, total		0.5	[0.0-1.4]	mg/dL
Alk Phos		66	[20-145]	U/L
AST(SGOT)		25	[3-70]	U/L
ALT(SGPT)		51	[3-78]	U/L
Fasting		YES		

{SF}

Lipid Panel				
Triglyceride	H	309	[<150]	mg/dL
Cholesterol	H	239	[<200]	mg/dL
HDL		46	[>40]	mg/dL

TriCore Reference Laboratories
2811 Stanford NE
Albuquerque, NM 87107
(505)938-8922

Patient Name: COPP,DOUGLAS F
Medical Record: X046461692
DOB:08/03/1951 Age:51Y Sex:M
Account Number:
Attending MD: Unlisted Physician
Patient ID:
Patient Phone:281-7977

H36783 COLL: 12/26/2002 14:00 REC: 12/26/2002 14:39 PHYS: Unlisted Physician
Req# : 3164066
CC TO PATIENT AT 2635 REGENT ST BERKELEY CA 94704 PH5105488022

Lipid Panel (CONTINUED)

LDL(calc)	H 131	[<100]	mg/dL

LDL Cholesterol-Primary Target of Therapy
<100.....Optimal
100-129.....Near optimal/above optimal
130-159.....Borderline high
160-189.....High
>190.....Very high
Total Cholesterol
<200.....Desirable
200-239.....Borderline high
>240.....High
HDL Cholesterol
<40.....Low
>60.....High
ATP III Classification of Serum Triglycerides
<150.....Normal
150-199.....Borderline high
200-499.....High
>500.....Very High
ATP III Classification of Fasting Lipids
JAMA 2001; 285:2486-2497

CBC

WBC	5.9	[4.0-10.6]	x10E3
RBC	4.69	[4.64-6.00]	x10E6
Hgb	14.8	[14.5-17.7]	gm/dL
Hct	42	[42-53]	%
MCV	89	[81-98]	fL
MCHC	35.1	[31.2-35.2]	gm/dL
RDW	12.2	[11.0-14.5]	%
Platelets	314	[150-400]	x10E3

Differential

Diff Type	Auto Diff		
Neutrophils	57	[40-76]	%
Lymphocytes	31	[16-47]	%
Monocytes	9	[3-13]	%
Eosinophils	3	[0-5]	%
Basophils	0	[0-2]	%
Abs. Neutrophil	3.4	[1.8-7.0]	x10E3

CONTINUED

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Req# : 3164066
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Differential (CONTINUED)				
Abs. Lymphocyte	1.8	[1.0-3.4]	x10E3	
Abs. Monocyte	0.5	[0.2-0.8]	x10E3	
Abs. Eosinophil	0.2	[0.0-0.3]	x10E3	
Abs. Basophil	0.0	[0.0-0.1]	x10E3	
Urinalysis				
Source	Unknown			
Color	Yellow	[YEL]		
Appearance	Clear	[CLEAR]		
Specific Gravity	1.019	[1.003-1.030]		
pH	5.0	[5.0-8.0]		
Glucose	Negative	[NEG]	mg/dL	
Bilirubin	Negative	[NEG]		
Ketones,Urine	Negative	[NEG]	mg/dL	
Blood	Negative	[NEG]		
Protein	Negative	[NEG]	mg/dL	
Urobilinogen	Normal	[NORM]	EU/dL	
Nitrite	Negative	[NEG]		
Leukocyte Esterase *	Trace	[NEG]		
UA Microscopic				
WBC	2	[0-5]	/hpf	
RBC	0	[0-3]	/hpf	
Bacteria	Moderate		/hpf	
Squamous Epithelial	6		/lpf	
DHEA-Sulfate	150	[80-560]	ug/dL	
Free T3	3.7	[1.6-5.6]	pg/mL	
PSA	1.7	[0-4.0]	ng/mL	

PSA results were obtained with the IMMULITE DPC 2000 PSA assay. Results obtained from other manufacturers' assay methods may not be used interchangeably.

Total T3	122	[57-175]	ng/dL
Total Testosterone	4.4	[2.2-8.4]	ng/mL
Thyroid Screen			
FT4	1.1	[0.8-1.6]	ng/dL

CONTINUED

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Req# : 3164066
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Thyroid Screen	(CONTINUED)		
TSH	2.310	[0.40-4.5]	uIU/mL

All TSH values less than 0.400 uIU/mL represent 3rd Generation TSH. No extra charges apply.

Misc Referral Test	PENDING	

{SF} = Performed at TriCore Reference Lab Santa Fe Branch, 465 St Michael's Dr, Ste 116, Santa Fe, NM 87505

END OF REPORT

500 Chipeta Way Salt Lake C[illegible] Utah 84108
Ronald L. Weiss, M.D. Laboratory Director

Other Info h36783

CLIENT NUMBER 10298

TRICORE - CORE
2811 STANFORD DR. NE
ALBUQUERQUE, NM 87107

FINAL

NAME/I.D.# COPP, DOUGLAS

ARUP REF.I.D.# (10298)002361001

SEX M
AGE 51 YRS
DATE OF BIRTH 08/03/1951

DATE COLLECTED 26DEC02 TIME 1400
DATE RECEIVED 28DEC02 TIME 0831
DATE REPORTED 06JAN03 TIME 1521

REFERRING PHYSICIAN
LIENT ID - DR:

TEST	RESULT	H/L	REFERENCE RANGE	UNITS
ENDOCRINOLOGY				
------ GONADOTROPINS AND SEX HORMONES ------				
PREGNENOLONE @	SEE NOTE			
REGNENOLONE... 26DEC02 1400 TEST	RESULT			
----	------			
Pregnenolone, Serum	49			ng/dL
Normal Levels				
Adults:			20 - 150	ng/dL (Mean=65)
Pubertal Age Groups (11 - 16 years)			10 - 150	ng/dL (Mean=52)

*ASR - Analyte Specific Reagent

This test was developed and its performance characteristics determined by Esoterix. It has not been cleared or approved by the U.S. Food and Drug Administration. The FDA has determined that such clearance is not necessary. This test is used for clinical purposes. It should not be regarded as investigational or for research. This laboratory is regulated under the Clinical Laboratory Improvement Amendment (CLIA) of 1988 as qualified to perform high complexity clinical testing.

Note: The normal data shown are specific for the gender and age information provided. Additional normal data can frequently be found found in our directory of services or can be obtained by calling the laboratory. This additional information includes data by pubertal stage, from pre-term infants, from special venous draw sites and from response testing. Unless indicated otherwise, normal serum or plasma data are from basal or baseline venous collections typically obtained in the morning following an 8-12 hour overnight fast. Urine normal data are usually from basal random or overnight collections.

CS

= PREGNENOLONE Performed at Esoterix Endocrine, 4301 Lost Hills Rd, Calabassas Hills, California 91301

Rahim Kanjee, M.D. Medical Director

Patient Name: COPP, DOUGLAS
Patient I.D.: X046461692

TRICORE REFERENCE LABORATORIES
ATTN: SENDOUT DEPARTMENT
2811 STANFORD N.E.
ALBUQUERQUE, NM. 87107

Blood Drawn	Processed	Reported	IBL No.
10/23/02	10/25/02	11/11/02	135065

TEST	RESULTS NORMAL	RESULTS ABNORMAL	REFERENCE RANGE	UNITS
*** FUNGAL PANEL 2 ***				
IgG ALTERNARIA TENUIS + A		5193	0-1600	ELISA
IgE ALTERNARIA TENUIS + A	45		0-50	ELISA
IgG ASPER FUMIGATUS		2272	0-1600	ELISA
IgE ASPER FUMIGATUS	38		0-50	ELISA
IgG ASPER NIGER	522		0-1600	ELISA
IgE ASPER NIGER	41		0-50	ELISA
IgG CANDIDA		4717	800-3200	ELISA
IgE CANDIDA		76	0-50	
IgG CLADOSPORIUM HERBARUM	420		0-1600	ELISA
IgE CLADOSPORIUM HERBARUM		57	0-50	ELISA
IgG EPICOCCUM NIGRUM		6515	0-1600	ELISA
IgE EPICOCCUM NIGRUM	43		0-50	ELISA
IgG GEOTRICHUM CANDIDUM		2174	0-1600	ELISA
IgE GEOTRICHUM CANDIDUM	35		0-50	ELISA
IgG PENICILLIUM NOTATUM	1263		0-1600	ELISA
IgE PENICILLIUM NOTATUM	48		0-50	ELISA
IgG PHOMA HERBARIUM	1554		0-1600	ELISA
IgE PHOMA HERBARIUM	46		0-50	ELISA
IgG PULLULARIA PULLULANS		3080	0-1600	
IgE PULLULARIA PULLULANS		69	0-50	
IgG RHIZOPUS NIGRICANS	736		0-1600	ELISA
IgE RHIZOPUS NIGRICANS	39		0-50	ELISA

CONTINUED ON NEXT PAGE

8383 Wilshire Boulevard / Suite 200 / Beverly Hills, CA 90211 • Tel: (310) 657-1077 • Fax: (310) 657-1059

[redacted] LAB., Inc.
Reuben Kaplan, M.D. Medical Director

Patient Name: COPP, DOUGLAS
Patient I.D.: X046461692

[redacted]

TRICORE REFERENCE LABORATORIES
ATTN: SENDOUT DEPARTMENT
2611 STANFORD N.E.
ALBUQUERQUE, NM. 87107

Blood Drawn	Processed	Reported	ISL No.
10/23/02	10/25/02	11/11/02	135965

TEST	RESULTS NORMAL	RESULTS ABNORMAL	REFERENCE RANGE	UNITS
IgG RHODOTORULA GLUTINIS		1600	0-1600	ELISA
IgE RHODOTORULA GLUTINIS	41		0-50	ELISA

IgE titers greater than100 are indicative of atopic allergy to that fungus

IgG titers greater than 1600 are suggestive of chronic exposure to that fungus or of prior desensitization. Assay should be repeated three months later to confirm successful desensitization or avoidance of the fungus.

Some analyte-specific reagents used in these in-house procedures are classified under Class I devices by the FDA and are exempt from the premarket notfication requirements of Section 510(K) of the act.

This test was developed and its performance characteristics determined by Immunosciences Lab., Inc. It does not have to be cleared by the FDA, pursuant to act 21 CFR 809 30(e).

These tests have undergone stringent quality control and assurance, and comparison studies have been performed in compliance with the State of California's requirements.

CONTINUED ON NEXT PAGE

Immunosciences Lab., Inc.
Rahim Kanjee, M.D. Medical Director

REFERRING PHYSICIAN

TRICORE REFERENCE LABORATORIES
ATTN: SENDOUT DEPARTMENT
2811 STANFORD N.E.
ALBUQUERQUE, NM. 87107

Patient Name: COPP, DOUGLAS
Patient I.D.: X0456461692

Blood Drawn	Processed	Reported	ISL No.
10/23/02	10/25/02	11/11/02	135063

TEST	RESULTS NORMAL	RESULTS ABNORMAL	REFERENCE RANGE	UNITS

The number and functional capacity of circulating peripheral blood leukocytes reflects the overall state of immune competence of an individual. In variety of clinical situations, test for granulocyte, lymphocyte, and monocyte number and function have become routine in the diagnosis of disease and in monitoring immunosuppressive and immunorestorative treatments. Flow cytometric measurements allow the enumeration of different types of lymphocytes by identification of their light-scattering properties and surface antigen-binding to fluorochrome-conjugated monoclonal antibodies. The clinical significance of each lymphocyte markers namely: CD3, CD19, CD4, CD8, CD 15+56 and CD26(TA1) are as follows; Decreased numbers of CD3+(T-cells) lymphocytes are found in patients with autoimmune disorders including multiple sclerosis, systemic lupus erythematosus, and eczema and also thymic aplasia(DiGeorge syndrome). Increased number of CD3+ lymphocytes are noted in patients with acute infectious mononucleosis and some forms of acquired agammaglobulinemia due to the presence of activated suppressor cells. The CD19+(B-cells) monoclonal antibody, however, are reactive with all non-T-cell ALL(Acute Lymphoblastic Leukemia) and CML(Chronic Myelogenous Leukemia) blast crisis cells suggesting a B-cell origin of these tumor cells. CD19 monoclonal antibody may also be useful in defining early B-cells and in the study of immunodeficiency diseases. On the other hand, abnormal levels of CD4+(T-helper) and CD8+ (T-suppressor) lymphocytes may aid in the diagnosis and/or prognosis of immunodeficiency diseases such as agammaglobulinemia, thymic aplasia, severe combined immunodeficiency, and AIDS. CD8+ cells are elevated in early HIV infection, and may begin to decline with time. At the time of an AIDS diagnosis, CD8+ cells have returned to normal levels. In addition, increased levels of CD8+ T-lymphocytes are associated with viral infections such as Hep-B, EBV, and CMV. CD4/CD8(H/S) ratios have been used to monitor HIV disease progression.
Low numbers of CD16+56 cells are found in patients with CFIDS. When used with CD3 monoclonal antibody, NK can be used to define distinct subsets on non-MHC restricted cytolytic cells used in the identification and enumeration of lymphoproliferative diseases involving NK cells. CD26+(TA1) is an activation marker found to be elevated in 80% of patients with Chronic Fatigue Syndrome.

References:

1. Owens, Marilyn, Loken Michael. Flow Cytometry Principles for Clinical Laboratory Practice. Wiley-Liss, 1965.

CONTINUED ON NEXT PAGE

Immunosciences Lab., Inc.
Ashim Kadoo, M.D. Medical Director

Patient Name: COPP, DOUGLAS
Patient I.D.: X046461692

REFERRING PHYSICIAN

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2811 STANFORD N.E.
ALBUQUERQUE, NM. 87107

Blood Drawn	Processed	Reported	ISL No.
10/23/02	10/25/02	11/11/02	135065

TEST	RESULTS NORMAL	RESULTS ABNORMAL	REFERENCE RANGE	UNITS

*** URINE D-GLUCARIC ACID ***

URINE D-GLUCARIC ACID	1.6		1-5	mol/ mol crea

The microsomal enzyme system of the liver can be activated by various drugs and chemicals. Thus, the biotransformation of endogenous and exogenous substances in the human organism and the biological availability of chemicals are decisively influenced. This process occurs since the human body cleanses itself by enzymatic detoxification from foreign chemicals (xenobiotics). Determination of glucaric acid excretion in urine has proved to be a suitable index to microsomal enzyme activity and presence of many xenobiotics. However, for confirmation measurements of urine D-glucaric acid in combination with serum gamma glutamyl transferase or gamma glutamyl transpeptidase is recommended.

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Immunosciences Lab., Inc.
Rahim Kanjoo, M.D. Medical Director

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TRICORE REFERENCE LABORATORIES
ATTN: SENDOUT DEPARTMENT
2811 STANFORD N.E.
ALBUQUERQUE, NM. 87107

Patient Name:	COPP, DOUGLAS
Patient I.D.:	X046461692

Blood Drawn	Processed	Reported	ISL No.
10/23/02	10/25/02	11/11/02	135065

TEST	RESULTS NORMAL	RESULTS ABNORMAL	REFERENCE RANGE	UNITS

*** GAMMA GLUTAMYL TRANSFERAS ***

GAMMA GLUTAMYL TRANSFERAS		65.2	0-43	UNITS/ML

RESULT VERIFIED BY REPEAT ANALYSIS

Elevated GGTP levels have been observed in the following conditions:

Cholelithiasis	Liver cirrhosis
Chronic alcoholism	Liver metastasis
Epilepsy	Myocardial infraction
Hepatic neoplasms	Obstructive jaundice
Hepatitis (viral, drug, chronic)	Pleurisy
Highly vascularized brain lesions	

Administration of certain drugs or ingestion of ethanol has been shown to influence serum GGTP levels. For example, increased serum GGTP activity has been observed in patients taking anti-epileptic drugs, such as phenytoin or barbiturates.

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ALBUQUERQUE, NM. 87107

Patient Name: COPP, DOUGLAS
Patient I.D.: X046461592

Blood Drawn	Processed	Reported	ISL No.
10/23/02	10/25/02	11/11/02	135065

TEST	RESULTS NORMAL	RESULTS ABNORMAL	REFERENCE RANGE	UNITS
*** MYELIN BASIC PROTEIN Ab ***				
IgG MYELIN BASIC PROTEIN	62		0 - 100	ELISA
IgM MYELIN BASIC PROTEIN	45		0 - 50	ELISA
IgA MYELIN BASIC PROTEIN	20		0 - 20	ELISA
BIALOGANGLIOSIDE GM1 Ab	18.00		0 - 20	ELISA
ANTI SULPHATIDE Ab	16.00		0 - 20	ELISA

Myelin is a multilaeller membrane surrounding nerve fibers in both the central and peripheral nervous systems. It is derived from the plasma membrane of the oligodendrocyte in the central nervous system and the schwann cell in the peripheral nervous system. Myelin consists of approximately 70% lipid and 30% protein by weight. The proteins, the proteolipids, and the basic proteins constitute 85% of the total protein of the membrane of which the myelin basic protains (MBPs), are the most completely characterized. Antibodies (IgG, IgM, IgA) against MBP and gangliosides, including GM1, GD1a, GD1b, GT1b, and LM1, and other acidic glycolipids, including LK1 and sulphatide, of human brain and peripheral nerve, have been observed in the high percentage of patients with the following neurological conditions:
Multiple sclerosis, guillain barr'e syndrome, chronic inflamatory demyelinating polyradiculo neuropathy, motor neuron disease or peripheral neuropathies, peripheral neuropathy associated with monoclonal IgM antibody (IgM gammopathy), vascular multiinfarct dementia, alzheimer's, rheumatoid arthritis, toxic chemical exposure and silicone adjuvant disease.

The major antigen of Myelin Basic Protein in this assay consist of Myelin associated Glycoprotein or MAG.
Some analyte-specific reagents used in these in-house procedures are classified under Class I devices by the FDA and are exempt from the premarket notfication requirements of Section 510(K) of the act.
This test was developed and its performance characteristics determined by Immunosciences Lab., Inc. It does not have to be cleared by the FDA, pursuant to act 21 CFR 809 30(e).

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Immunosciences Lab., Inc.
Rahim Kanjoo, M.D. Medical Director

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Patient Name: COPP, DOUGLAS
Patient I.D.: X046461692

Blood Drawn	Processed	Reported	ISL No.
10/23/02	10/25/02	11/11/02	135065

TEST	RESULTS NORMAL	RESULTS ABNORMAL	REFERENCE RANGE	UNITS

These tests have undergone stringent quality control and assurance, and comparison studies have been performed in compliance with the State of California's requirements.

CONTINUED ON NEXT PAGE

Patient Name: COPP, DOUGLAS
Patient I.D.: X046461692

2811 STANFORD N.E.
ALBUQUERQUE, NM. 87107

Blood Drawn	Processed	Reported	ISL No.
10/23/02	10/25/02	11/11/02	135065

TEST	RESULTS NORMAL	RESULTS ABNORMAL	REFERENCE RANGE	UNITS
*** AUTO IMMUNE PANEL ***				
ANTI-CENTROMERE	NEGATIVE		NEGATIVE	
ANTI-MICROSOMAL	5		<20	IU/ml
ANTI-MITOCHONDRIAL	NEGATIVE		NEGATIVE	
ANTI-MYOCARDIAL	1:20		0-20	ELISA
ANTI-NATIVE DNA	NEGATIVE		NEGATIVE	
ANTI-NUCLEAR AB BY HEP-2		1:320 SPECKLED	1:20	
ANTI-PARIETAL CELL	1:23		0-40	ELISA
ANTI-RNP	N.D.		NOT DETECTED	
ANTI-SM	N.D.		NOT DETECTED	
ANTI-SMOOTH MUSCLE		1:25	0-20	ELISA
ANTI-SSA	N.D.		NOT DETECTED	
ANTI-SSB	N.D.		NOT DETECTED	
ANTI-STRIATED MUSCLE	1:19		0-20	ELISA
ANTI-THYROGLOBULIN	8		<45	IU/ml
C3-COMPLEMENT		167.0	75-140	ug/dl
C4-COMPLEMENT		36.0	10-34	ug/dl
RHEUMATOID FACTOR		25.0	0-20	IU/ml
TOTAL IMMUNE COMPLEX		52.0	0-50	ug eq/ml

N.D. = NOT DETECTED
Autoimmune diseases can be separated into two categories. One group is characterized by the presence of autoantibodies

CONTINUED ON NEXT PAGE

Immunosciences Lab., Inc.
Rahim Kanjee, M.D. Medical Director

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2811 STANFORD N.E.
ALBUQUERQUE, NM. 87107

Patient Name: COPP, DOUGLAS
Patient I.D.: X046461692

Blood Drawn	Processed	Reported	ISL No.
10/23/02	10/25/02	11/11/02	135065

TEST	RESULTS NORMAL	RESULTS ABNORMAL	REFERENCE RANGE	UNITS

that are broadly reactive with nuclear or cytoplasmic antigens and that do not demonstrate any tissue specificity. Included in this group are diseases such as rheumatoid arthritis, systemic lupus eryhtematosus, mixed connective tissue disease, sleroderma, Sjogren's syndrome, and dermatomyositis or polymyositis. A second group of autoimmune diseases is characterized by autoantibodies which demonstrate tissue specificity. These diseases include thyroiditis, chronic liver diseases (including primary biliary cirrhosis and chronic active hepatitis), certain cases of pernicious anemia, and myasthenia gravis.

The detection of circulating antibodies to nuclear antigens is an important tool in the investigation of systemic rheumatic diseases. Many techniques have been developed to detect antinuclear antibodies (ANA), but the fluorescent-ANA (FANA) or enzyme-ANA EANA) test continues to be the most widely used and accepted. When the ANA is performed by using substrate of choice such as human epidermoid cell line (HEP-2) the ANA incidence is positive in 99% of SLE; 85% of Sjogren; 88% of sleroderma; 55% of rheumatoid arthritis and 40% of juvenile chronic arthritis.

Antinuclear antibodies may be classified biochemically according to whether they bind a nucleic acid per se, a chromatin component such as histone, ribunucleoprotein (RNP), or some other nuclear constituent. Antibodies within each class can be detected readily in assays based on immunofluorescence using HEP-2 cell line, enzyme immunoassay and Western Blot Assays using biochemically purified antigens.

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Immunosciences Lab., Inc.
Rahim Kanjee, M.D. Medical Director

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ATTN: BENDOUT DEPARTMENT
2811 STANFORD N.E.
ALBUQUERQUE, NM. 87107

Patient Name: COPP, DOUGLAS
Patient I.D.: X0466461692

Blood Drawn	Processed	Reported	ISL No.
10/23/02	10/25/02	11/1/02	135065

TEST	RESULT NORMAL	RESULT ABNORMAL	REFERENCE RANGE	UNITS
*** CHEMICAL ANTIBODIES ***				
IgG FORMALDEHYDE	8		16	ELISA
IgE FORMALDEHYDE	8		16	ELISA
IgM FORMALDEHYDE	8		64	ELISA
IgG ISOCYANATE	8		16	ELISA
IgE ISOCYANATE	8		16	ELISA
IgM ISOCYANATE	8		64	ELISA
IgG TRIMELLITIC ANHYDRIDE	8		16	ELISA
IgE TRIMELLITIC ANHYDRIDE	8		16	ELISA
IgM TRIMELLITIC ANHYDRIDE	8		64	ELISA
IgG PHTHALIC ANHYDRIDE	8		16	ELISA
IgE PHTHALIC ANHYDRIDE	8		16	ELISA
IgM PHTHALIC ANHYDRIDE	8		64	ELISA
IgG BENZENE RING	8		16	ELISA
IgE BENZENE RING	8		16	ELISA
IgM BENZENE RING	8		64	ELISA

Formaldehyde, isocyanate, trimellitic anhydride, phthalic anhydride, benzene, hexane, styrene, and toluene are the major cause of industrial and indoor air pollution. These chemicals are found in thousands of modern products for home and industry and, therefore, millions of people are constantly exposed to low-levels of these chemicals at work and at home. The common health problems related to chemical exposure include headache, depression, fatigue, irritability allergy-like symptoms, immune dysfunctions, infections, heart disease and possibly cancer. The immunological damages are caused by chemical linking to human proteins, cells, or tissues and thereby invoking antigenic or allergenic

CONTINUED ON NEXT PAGE

Immunosciences Lab., Inc.
Rahim Kanjee, M.D. Medical Director

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TRICORE REFERENCE LABORATORIES
ATTN: SENDOUT DEPARTMENT
2811 STANFORD N.E.
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Patient Name: COPP, DOUGLAS
Patient I.D.: X046461692

Blood Drawn	Processed	Reported	ISL No.
10/23/02	10/25/02	11/11/02	135065

TEST	RESULTS NORMAL	RESULTS ABNORMAL	REFERENCE RANGE	UNITS

responses. These new antigenic determinants may not only induce IgG, IgM, IgA, and IgE antibody production against the chemicals, but also to one's own body's proteins thereby possibly leading to autoimmune diseases.

IgG or IgE ELISA UNITS GREATER THAN 16 AND IgM ELISA UNITS GREATER THAN 64 ARE SUGGESTIVE OF SENSITIVITY OR CHRONIC EXPOSURE TO THAT CHEMICAL.
Some analyte-specific reagents used in these in-house procedures are classified under Class I devices by the FDA and are exempt from the premarket notification requirements of Section 510(K) of the act.
This test was developed and its performance characteristics determined by Immunosciences Lab., Inc. It does not have to be cleared by the FDA, pursuant to act 21 CFR 809 30(e).
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Immunosciences Lab., Inc.
Rahim Kanjoo, M.D. Medical Director

REFERRING PHYSICIAN

TRICORE REFERENCE LABORATORIES
ATTN: SENDOUT DEPARTMENT
2811 STANFORD N.E.
ALBUQUERQUE, NM. 87107

Patient Name: COPP, DOUGLAS
Patient I.D.: X0046461692

Blood Drawn	Processed	Reported	ISL No.
10/23/02	10/25/02	11/11/02	135065

TEST	RESULTS NORMAL	RESULTS ABNORMAL	REFERENCE RANGE	UNITS
*** IMMUNE COMPLEX ASSAY ***				
IgG IMMUNE COMPLEX		23	0-20	ug eq/ml
IgM IMMUNE COMPLEX		16	0-15	ug eq/ml
IgA IMMUNE COMPLEX		13	0-10	ug eq/ml

Interactions between antigens and antibodies can form molecular aggregates in the body known as immune complexes. They can deposit in blood vessels, tissue and various glands throughout the body, producing inflammation and pathological conditions. They may initially form in the circulation prior to deposition or directly in tissue. Elevated levels have been detected in many diseases including autoimmune conditions such as SLE, rheumatoid arthritis and glumerulonephritis, as well as malignancies and various infectious diseases. They have also appeared in migraine headaches, psoriasis, and other unexpected diseases.
Their presence during a disease state does not necessarily implictas them as causative factors in the disease process. Other clinical data and the condition of the patient should be taken into consideration when interpreting results. Immune complex levels up to two times the upper range of normal may be significant but should not be considered diagnostic or prognostic unless supported by a strong clinical picture.

References:
Carol Ann Toth, Douglas Pohl, and Vincent Agnello. "Methods for Detection of Immune Complexes by Utilizing C1q or Rheumatoid Factors" in Manual of Clinical Laboratory Immunology, 3rd edition, ed. Noel R. Rose, Herman Friedman and John L. Fahey (Washington, D.C., 1986), pp. 204-207.
Some analyte-specific reagents used in these in-house procedures are classified under Class I devices by the FDA and are exempt from the premarket notfication requirements of Section 510(K) of the act.
This test was developed and its performance characteristics determined by Immunosciences Lab., Inc. It does not have to be cleared by the FDA, pursuant to act 21 CFR 809.30(e).
These tests have undergone stringent quality control and assurance, and comparison studies have been performed in compliance with the State of California's requirements.

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Immunosciences Lab., Inc.
Rahim Kanjoo, M.D. Medical Director

Patient Name: COPP, DOUGLAS
Patient I.D.: X046461692

REFERRING PHYSICIAN

TRICORE REFERENCE LABORATORIES
ATTN: SENDOUT DEPARTMENT
2811 STANFORD N.E.
ALBUQUERQUE, NM. 87107

Blood Drawn	Processed	Reported	IGL No.
10/23/02	10/25/02	11/11/02	135065

TEST	RESULTS NORMAL	RESULTS ABNORMAL	REFERENCE RANGE	UNITS
*** SECRETORY IgA ***				
SECRETORY IgA	11.0		10-28	Ug/ml

Secretory IgA is the first line of defense and response to foreign antigens including bacteria, viruses, parasites, and food proteins. Secretory IgA is found only in surface mucosal secretions, and its absence is the most common immunodeficiency disorder accounting for 15% of all such cases. Frequency of certain diseases, mainly neurological (24%), gastrointestinal (28%), collagen, autoimmune (20%), and recurrent infections (23%), may occur in patients with selective IgA deficiency. These include neuropathies, endocrinopathies, atopy, Celiac Disease, asthma, food allergies, Rheumatoid Arthritis, Lupus, Malabsorption Syndrome, lymphomas, bacterial, viral and fungul infections.

High levels of Secretory IgA is associated with chronic viral syndromes, parotitis, gingivitis, and may be indicative of mucosal surfaces infection with EBV, CMV, Herpes, HIV, Streptococcus, Bacteroides and Candida albicans.
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CONTINUED ON NEXT PAGE

Patient Name: COPP, DOUGLAS

Patient I.D.: X046461692

10/23/02 10/2[illegible]

TEST	RESULTS NORMAL	RESULTS ABNORMAL	REFERENCE RANGE
*** T AND B CELL FUNCTION ***			
PHYTOHEMAGGLUTININ	112.0		75-125%
CONCANAVALIN A	92.0		75-125%
POKEWEED MITOGEN	83.0		75-125%
LIPOPOLYSACCHARIDE	92.0		75-125%
S. AUREUS ANTIGENS	85.0		75-125%

Lymphocyte proliferation or transformation is the process whereby new DNA synthesis and cell division take place in lymphocyte after a stimulus of some type (chemical, bacteria, virus, or other antigens), resulting in a series of changes. This test has a broad range of applications, including assessment and monitoring of congenital immunological defects which range from complete lack of function, as in severe combined immunodeficiency disease and DiGeorge Syndrome, to a partial deficit, as in ataxia telangiectasia, Wiskott-Aldrich Syndrome, chemically induced immune dysfunction syndrome, chronic fatigue syndrome, and chronic mucocutaneous candidiasis, to normal reactivity, as in X-linked hypogammaglobulinemia. A wide variety of acquired conditions has been shown to have induced lymphocyte transformation. These conditions include exposure to a variety of chemicals, bacterial and viral infections, as well as autoimmune diseases, such as Sjogren's Syndrome and systemic lupus erythematosus. Lymphocyte transformation has also been used to monitor sequential samples from patients undergoing a variety of immunoenhancing or immunosuppressive therapies in the treatment of disease states.

Some analyte-specific reagents used in these in-house procedures are classified under Class I devices by the FDA and are exempt from the premarket notification requirements of Section 510(K) of the act.

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Immunosciences Lab., Inc.
Rahim Kanjoo, M.D. Medical Director

REFERRING PHYSICIAN

TRICORE REFERENCE LABORATORIES
ATTN: SENDOUT DEPARTMENT
2811 STANFORD N.E.
ALBUQUERQUE, NM. 87107

Patient Name: CORP, DOUGLAS
Patient I.D.: X046461692

Blood Drawn	Processed	Reported	ISL No.
10/23/02	10/25/02	11/11/02	135065

TEST	RESULTS NORMAL	RESULTS ABNORMAL	REFERENCE RANGE	UNITS
*** NK CELL ACTIVITY PANEL ***				
NK CELL ACTIVITY		10.90	20-50	LUs
NK CELL ACTIVITY/CELL	9.40		5.1-10	mm3
%NATURAL KILLER CELLS	7.0		5.5-20%	mm3
% IMMUNOCOMPETENT -NKHT3+		1.0	1.5-5%	mm3
% NKHT3 NEGATIVE	6.0		4-15%	mm3
% T3 POSITIVE CELLS		81.0	53-79%	mm3

One of the major mechanisms by which the immune response deals with foreign or abnormal cells is to damage or destroy them. Such immunologic cytotoxicity may lead to complete loss of viability of the target cells (cytolysis) or an inhibition of the ability of the cells to continue growing (cytostasis). Immunologic cytotoxicity can be manifested against a wide variety of target cells. These include malignant cells, normal cells from individuals unrelated to the responding host, and normal cells of the host that are infected with viruses or other microorganisms. In addition, the immune system can cause direct cytotoxic effects on some microorganisms, including bacteria, parasites, and fungi. Immunologic cytotoxicity is a principal mechanism by which the immune response copes with and often eliminates foreign materials or abnormal cells. Natural killer cell activity is influenced by a variety of conditions including stress, chemical exposure, infections, chronic fatigue syndrome, immune deficiencies and cancer. In an increasing number of studies of clinical treatments of patients with various diseases, serial monitoring of cytotoxic reactivity is performed. The objective is to determine whether the treatment can produce a significant alteration from the pretreatment levels of NK activity, Antibody Dependent Cytotoxic activity, or both. Interleukin 2, interferon and natural killer cytotoxic factor has been shown to enhance NK cell activity. Therefore enhancement of Interleukin 2 Production may be useful in reactivation of NK cells in patients with the above mentioned conditions.

****

REFERENCE RANGE:

CONTINUED ON NEXT PAGE

Immunosciences Lab., Inc.
Rahim Kanjee, M.D. Medical Director

REFERRING PHYSICIAN

TRICORE REFERENCE LABORATORIES
ATTN: BENDOUT DEPARTMENT
2811 STANFORD N.E.
ALBUQUERQUE, NM. 87107

Patient Name: COPP, DOUGLAS
Patient I.D.: X046461692

Blood Drawn	Processed	Reported	ISL No.
10/23/02	10/25/02	11/11/02	#35065

TEST	RESULTS NORMAL ABNORMAL	REFERENCE RANGE	UNITS
***** SUMMARY RESULTS *****			
THE FOLLOWING ABNORMALITIES WERE DETECTED:			
IgG ALTERNARIA TENUIS + A	5193	0-1600	ELISA
IgG ASPER FUMIGATUS	2272	0-1600	ELISA
IgG CANDIDA	4717	800-3200	ELISA
IgE CANDIDA	76	0-50	
IgE CLADOSPORIUM HERBARUM	57	0-50	ELISA
IgG EPICOCCUM NIGRUM	6515	0-1600	ELISA
IgG GEOTRICHUM CANDIDUM	2174	0-1600	ELISA
IgG PULLULARIA PULLULANS	3080	0-1600	
IgE PULLULARIA PULLULANS	69	0-50	
IgG RHODOTORULA GLUTINIS	1688	0-1600	ELISA
% T HELPER CELL (T4)	39.0	35-55%	mm3
T-HELPER/T-SUPPRESSOR	2.7	1-2.5	mm3
% IMMUNOCOMPETENT -NKHT3+	1.0	1.5-5%	mm3
% T2 POSITIVE CELLS	81.0	53-79%	mm3
GAMMA GLUTAMYL TRANSFERAS	65.2	0-43	UNITS/ML
RESULT VERIFIED BY REPEAT ANALYSIS			
ANTI-NUCLEAR AB BY HEP-2	1:320	1:20	
SPECKLED			
ANTI-SMOOTH MUSCLE	1:25	0-20	ELISA
C3-COMPLEMENT	167.0	75-140	mg/dl

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Immunosciences Lab., Inc.
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REFERRING PHYSICIAN

TRICORE REFERENCE LABORATORIES
ATTN: BENDOUT DEPARTMENT
2811 STANFORD N.E.
ALBUQUERQUE, NM. 87107

Patient Name: COPP, DOUGLAS
Patient I.D.: X0464616928

Blood Drawn	Processed	Reported	ISL No.
10/23/02	10/25/02	11/11/02	135065

TEST	RESULTS NORMAL	RESULTS ABNORMAL	REFERENCE RANGE	UNITS
C4-COMPLEMENT		36.0	10-34	ug/dl
RHEUMATOID FACTOR		25.0	0-20	IU/ml
TOTAL IMMUNE COMPLEX		52.0	0-50	ug eq/ml
IgG IMMUNE COMPLEX		23	0-20	ug eq/ml
IgM IMMUNE COMPLEX		16	0-15	ug eq/ml
IgA IMMUNE COMPLEX		13	0-10	ug eq/ml
NK CELL ACTIVITY		10.90	20-50	LUs
% IMMUNOCOMPETENT -NKHT3+		1.0	1.5-5%	mm3
% T3 POSITIVE CELLS		81.0	53-79%	mm3

Immunosciences Lab., Inc.
Rahim Kanjoo, M.D. Medical Director

REFERRING PHYSICIAN

TRICORE REFERENCE LABORATORIES
ATTN: SENDOUT DEPARTMENT
2811 STANFORD N.E.
ALBUQUERQUE, NM. 87107

Patient Name: COPP, DOUGLAS
Patient I.D.: X046461692

Blood Drawn	Processed	Reported	ISL No.
10/23/02	10/25/02	11/11/02	135065

TEST	RESULT NORMAL	RESULT ABNORMAL	REFERENCE RANGE	UNITS

****
****
Very Low Activity: 0 - 5 units mm3

Low Activity: 5.1 - 10 units mm3

Normal: 10.1 - 15 units mm3

High: 15.1 - 25 units mm3

Very High: >25 units mm3
****
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CONTINUED ON NEXT PAGE

Patient Name: COPP, DOUGLAS
Patient I.D.: X046461692

DEPARTMENT
2811 STANFORD N.E.
ALBUQUERQUE, NM. 87107

Blood Drawn	Processed	Reported	IBL No.
10/23/02	10/25/02	11/11/02	I35065

TEST	RESULTS NORMAL	RESULTS ABNORMAL	REFERENCE RANGE	UNITS
*** AUTO IMMUNE PANEL ***				
ANTI-CENTROMERE	NEGATIVE		NEGATIVE	
ANTI-MICROSOMAL	5		<20	IU/ml
ANTI-MITOCHONDRIAL	NEGATIVE		NEGATIVE	
ANTI-MYOCARDIAL	1:20		0-20	ELISA
ANTI-NATIVE DNA	NEGATIVE		NEGATIVE	
ANTI-NUCLEAR AB BY HEP-2		1:320 SPECKLED	1:20	
ANTI-PARIETAL CELL	1:23		0-40	ELISA
ANTI-RNP	N.D.		NOT DETECTED	
ANTI-SM	N.D.		NOT DETECTED	
ANTI-SMOOTH MUSCLE		1:25	0-20	ELISA
ANTI-SSA	N.D.		NOT DETECTED	
ANTI-SSB	N.D.		NOT DETECTED	
ANTI-STRIATED MUSCLE	1:19		0-20	ELISA
ANTI-THYROGLOBULIN	8		<45	IU/ml
C3-COMPLEMENT		167.0	75-140	ug/dl
C4-COMPLEMENT		36.0	10-34	ug/dl
RHEUMATOID FACTOR		25.0	0-20	IU/ml
TOTAL IMMUNE COMPLEX		52.0	0-50	ug eq/ml

N.D. = NOT DETECTED
Autoimmune diseases can be separated into two categories. One group is characterized by the presence of autoantibodies

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Detoxification Profile (Comprehensive)

Great Smokies Diagnostic Laboratory℠
63 Zillicoa Street · Asheville, NC 28801-1074
www.gsdl.com

Patient: **DOUGLAS COPP**
Age: 51
Sex: M
MRN: 0000428962

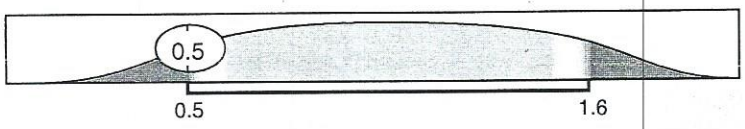
Order Number: 34240611
Completed: October 28, 2002
Received: October 24, 2002
Collected: October 23, 2002

TIMOTHY SMITH MD
5281 Thomas Road
Sebastopol, CA 95472

Phase I

Caffeine Clearance

Ref Range mL/min/kg



Phase II

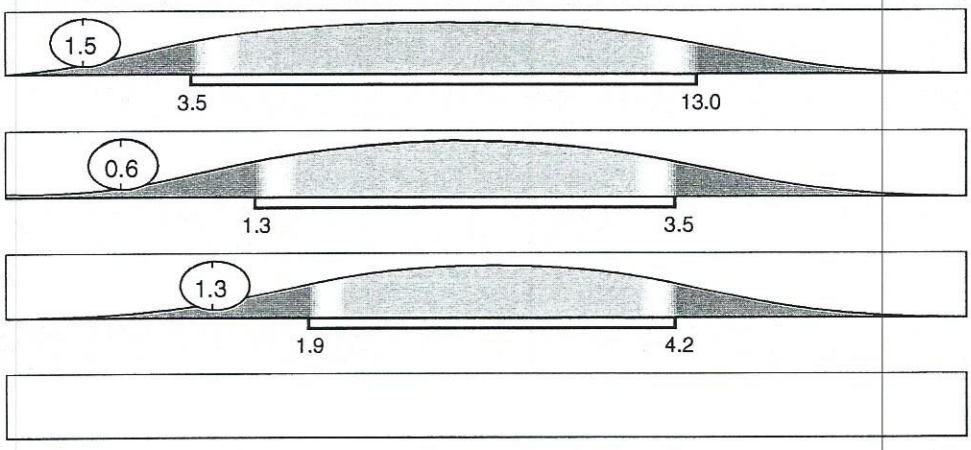
Plasma Cysteine

Plasma Sulfate

Glutathione Conjugation	Glycine Conjugation	Sulfation	Glucuronidation
Acetaminophen Mercapturate	Salicyluric Acid	Acetaminophen Sulfate	Acetaminophen Glucuronide
% Recovery	% Recovery	% Recovery	% Recovery
9.8	89	34	38
5.6 – 11.4	30 – 53	16 – 36	27 – 56

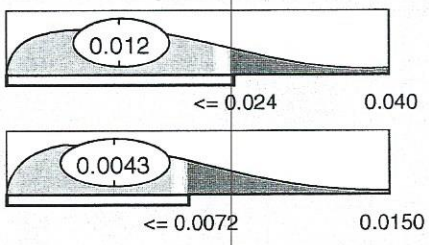
This test was developed and its performance characteristics determined by GSDL, Inc. It has not been cleared or approved by the U.S. Food and Drug Administration.

Ratios

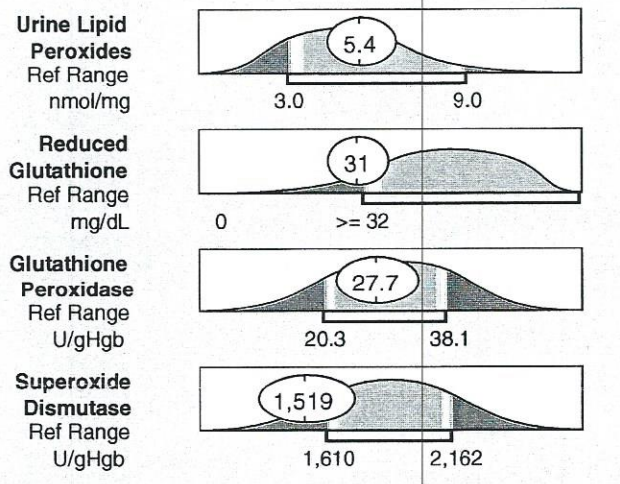


Free Radical Markers

Salicylic Acid **Hydroxyl Radical**



Lipids **Free Radicals**



Total Urine Volume

mL per 10 hours: 1,200

Commentary

Lab Comments

No plasma received. 10/24/02 TH

Commentary

Commentary is provided to the practitioner for educational purposes, and should not be interpreted as diagnostic or treatment recommendations. Diagnosis and treatment decisions are the responsibility of the practitioner.

To the patient:

Our bodies must be able to detoxify, or neutralize, toxins from the external environment as well as those produced within our own bodies. This process takes place mostly in the liver, and consists of two phases. In Phase I toxins are activated, which means that they are altered in such a way that carrier molecules (Phase II) are able to transport them out of the body. A handy analogy is the bagging of our trash (Phase I), so that the garbageman can pick it up and cart it away (Phase II). Phase I is accomplished by a family of enzymes called "cytochrome P450", and Phase II takes place via a number of important mechanisms, four of which we measure in this test, with the help of the challenge substances, caffeine, acetaminophen and aspirin. Both Phase I and Phase II of detoxification must function adequately so that toxins are able to be neutralized, and the two phases must be in balance with each other so that the activated compounds from Phase I cannot accumulate in the body and cause damage.

In your particular case, Phase I and Phase II are functioning adequately, and are in balance with each other. There is also some evidence of low anti-oxidant reserve. Anti-oxidants help to prevent free radical damage in the body ("oxidative stress") which does not seem to be occurring right now, despite the low reserve. With nutritional support, the insufficiency is usually correctable. The following is a detailed description of your test results.

To the clinician:

Caffeine clearance is within the reference range, indicating normal Phase I (cytochrome P450) activity.

Because the plasma cysteine and plasma sulfate were not available, it is not possible in this case to assess sulfoxidation ability (the generation of inorganic sulfate from cysteine).

"Note: Phase I/Phase II ratios which lie below the reference range will not be discussed within the commentary text, even though they may appear in the red boxes labeled "abnormal". At this time we have not found sufficient information to consider them clinically significant."

All Phase II detoxification pathways appear to be functioning adequately.

Urine lipid peroxides, markers for hydroxyl radical activity (catechol and 2,3 DHB) and the intracellular antioxidant, glutathione peroxidase (GSHPx), are all within the reference range.

The level of superoxide dismutase (SOD), however, was found depressed. The body utilizes this enzyme to rapidly convert the superoxide anion radical to hydrogen peroxide, which is less toxic to cells. Mitochondrial SOD requires manganese for its activity, while the cytoplasmic form requires copper and zinc. Reduced levels of SOD have been noted in several disorders, including rheumatoid arthritis, cataracts, infertility and compromised immune function. A low level indicates poor defense against the superoxide anion radical, thereby increasing the risk of free radical damage.

Reduced glutathione, an important antioxidant and detoxifying nutrient, was also found to be low. Replenishing reserves of glutathione, and maintaining optimal levels of all antioxidants can help to prevent oxidative stress.

The Phase I/Phase II ratios for sulfation, glycination and glucuronidation are all below the reference range. This is not considered to be clinically significant.

Elemental Analysis Hair

Great Smokies Diagnostic Laboratory℠
63 Zillicoa Street · Asheville, NC 28801-1074
www.gsdl.com

Patient: **DOUGLAS COPP**
Age: 51
Sex: M
MRN: 0000428962

Order Number: 34160533
Completed: October 21, 2002
Received: October 16, 2002
Collected: October 08, 2002

TIMOTHY SMITH MD
5281 Thomas Road
Sebastopol, CA 95472

Toxic Elements

Analyte	Reference	Reference Range
Aluminum	2.3	<=9.0
Antimony	0.035	<=0.030
Arsenic	<0.025	<=0.100
Barium	3.87	<=1.45
Bismuth	<0.0250	<=0.2000
Cadmium	0.309	<=0.150
Lead	2.03	<=1.40
Mercury	1.06	<=1.00
Nickel	0.821	<=0.400
Thallium	<0.0003	<=0.0012
Tin	0.102	<=0.280
Uranium	0.038	<=0.060

Reference range expressed in ppm

Nutrient Elements

Analyte	Reference	Reference Range
Calcium	2,317	220-780
Magnesium	265	16-90
Copper	30.6	10.5-28.0
Zinc	193	120-170
Manganese	1.54	0.12-0.45
Chromium	0.33	0.34-0.90
Cobalt	0.1260	0.0075-0.0400
Molybdenum	0.057	0.025-0.096
Boron	1.10	0.15-3.00
Iodine	0.38	0.16-1.75
Lithium	0.0388	0.0027-0.0320
Selenium	0.83	0.48-1.45
Strontium	8.79	0.35-3.25
Sulfur	52,207	44,200-53,000
Vanadium	0.101	0.014-0.150

Reference range expressed in ppm

Additional Elements

Analyte	Reference	Reference Range
Sodium	142	8-60
Potassium	2.4	1.5-30.0
Rubidium	0.012	0.004-0.045
Iron	17.4	6.0-18.0
Phosphorous	159	125-240
Titanium	0.56	0.25-1.25

Reference range expressed in ppm

Within FPR* | Outside FPR* | Outside Ref Range

	Inside Range	Outside Range	Reference
Ca/Mg	8.7		5.0-15.0
Ca/P		14.6	2.5-10.0
Na/K		59.2	1.5-10.0

20% 40% 60% 80% 100%
The % of shading represents the degree of confidence in an endogenous origin of the element.

Histograms on this report are not based on data from large populations and should be used for illustrative purposes only.

 RMS 60, Rev1

* The Functional Physiological Range (FPR) depicts a medical decision interval. Values outside of the FPR are not necessarily abnormal. Rather, the FPR has been established by GSDL's Department of Medical Science based upon current medical literature, collective clinical experience and consensus medical opinion.

Commentary

Commentary is provided to the practitioner for educational purposes, and should not be interpreted as diagnostic or treatment recommendations. Diagnosis and treatment decisions are the responsibility of the practitioner.

Antimony (Sb) is at an elevated level in the hair. Hair Sb reflects past or chronic skin exposure, inhalation or ingestion of this element. Sb is a nonessential element considered to be more toxic than arsenic. Antimony's deposition in body tissues and its detrimental effects depend upon the oxidation state of the element. Sb+3 affects liver functions, impairs enzymes, and may interfere with sulfur chemistry. If Sb impairs phosphofructokinase (PFK), then purine metabolism may be disrupted, resulting in elevated blood and/or urine levels of hypoxanthine, uric acid and possibly ammonia. Sb+5 deposits in bone, kidney, and in organs of the endocrine system. "Antimony spots" may result from skin contact with Sb salts and vapors. Symptoms can be variable, including fatigue, myopathy, hypotension, angina and immune dysregulation.

Barium (Ba) is at elevated level in the hair. Hair Ba may be used for monitoring the accumulated body burden. Insoluble Ba compounds are not absorbed from the GI tract, and Ba salts such as Ba sulfate are commonly administered for diagnostic purposes such as x-ray procedures. Soluble Ba salts (chloride, carbonate, nitrate, sulfide) are absorbed when ingested and can have detrimental effects. Biochemically, Ba displaces or antagonizes potassium-dependent functions and stimulates adrenal medullary secretion of catecholamines. Early or mild symptoms of Ba excess include nausea, diarrhea, muscle stimulation, and tingling in the extremities. Later or more severe manifestations are cardiac fibrillation, loss of tendon reflexes, convulsive tremors or muscular paralysis, and respiratory distress.

Cadmium (Cd) is at an elevated level in the hair. Hair Cd correlates with body burden and with past or chronic ingestion of this element. Cadmium can exert toxic effects by inhibiting sulfur -bearing enzymes and by displacing enzyme bound zinc or copper. In cells, Cd can inhibit gluconeogenesis and phosphorylation processes. Cadmium's deleterious effects may be delayed and insidious with a latent period of years before manifestations are apparent. Excessive body burden of Cd is associated with hypertension and impaired renal transport with proteinuria and urinary wasting of beta 2-microglobulin. Cd can also adversely affect heart, bone and testes. Inhalation of Cd salts or vapors may produce emphysema. Smoking and high sugar diets appear to increase Cd levels. In children, elevated Cd has been correlated with lowered IQ.

Hair is sensitive to contamination with Cd from hair preparations, especially hair sprays. The probability of such contamination is reflected by the shading of the circle for Cd on the lab report.

Lead (Pb) is at an elevated level in the hair. Hair Pb level correlates with body tissue deposition levels (bone, aorta, liver, kidney) and also correlates with blood levels if the exposure is periodic or chronic.

At the cellular level, lead interferes with membrane transport processes and with enzyme functions because it is able to bond to many chemically active sites. The interaction of lead with sulfhydryl (SH) sites causes most of the toxic effects which include impaired heme synthesis, inhibition of erythrocyte Na, K ATPase, diminished RBC glutathione, shortened RBC life span, impaired synthesis of RNA, DNA and protein and impaired metabolism of vitamin D. Lead may also be nephrotoxic, resulting in disordered renal transport with uricemia (possibly gout), hyperaminoaciduria, glycosuria and phosphaturia. Excess body burden of Pb can be consistent with fatigue, headaches, loss of appetite, insomnia, nervousness, anemia, weight loss, decreased nerve conduction and possibly motor neuron disorders.

Hair is sensitive to external contamination with Pb. Elevated hair Pb may be an artifact of certain hair preparations, especially dyes and darkening agents, e.g. "Grecian Formula". The probability of such contamination is

Commentary

reflected by the shading of the circle for Pb on the lab report.

Mercury (Hg) is at an elevated level in the hair. Hair Hg correlates with: Hg deposition in body tissues (kidneys, epithelium, pancreas, testicles, prostate, thyroid, liver), the number and size of dental amalgams, regular ingestion of fish, and blood Hg level when the Hg exposure is periodic or chronic. Both methylated and nonmethylated mercury are readily transported via mother's milk. Transplacental Hg contamination can occur, and hair of neonates and mothers correlate closely.

Manifestations of mercury excess can depend upon the chemical form and mode of exposure, metabolic status and levels of protective nutrients (vitamin E, selenium), the presence of synergistic toxins (cadmium, lead), and immune function. Hg binds to sulfur-bearing proteins and enzymes and has strong affinity for sulfhydryl groups (SH) such as glutathione, cysteine, and enzymes such as monoamine oxidase.

Mild mercury toxicity may result in reduced sensory abilities (taste, touch, vision and hearing), metallic taste with increased salivation, fatigue and anorexia. Chronic exposures may adversely affect lymphocyte activity, result in autoimmune complexes and increased risk for cardiovascular disease. Moderate and severe mercury excess can result in paresthesias, hypertension with renal dysfunction, irritability and excitability, psychoses, mania, anemia, tremors and incoordination.

Nickel (Ni) is at an elevated level in the hair. Hair Ni level correlates with chronic exposures and ingestion. In blood, Ni binds to albumin, globulins and amino acids, and is deposited in leukocytes. In cells, it binds to mitochondrial and cytosolic proteins. In so doing, it can displace zinc and copper, thereby activating, inhibiting, or dysregulating enzymes. A nickel exposure may hypersensitize the immune system, resulting in inflammatory responses to many environmental substances to which there was formerly little or no response. Possible symptoms of nickel excess include panallergy with rhinitis, sinusitis, conjunctivitis and asthma. Other symptoms may include vertigo, weakness and fatigue, nausea and headache. Nickel contact allergy ("nickel itch") or contact dermatitis is not necessarily reflected by elevated hair Ni.

Hair is sensitive to external contamination with Ni. Some shampoos and many hair perm dye bleach products place Ni into the hair. The probability of such contamination is reflected by the shading of the circle for Ni on the lab report.

Calcium (Ca) is at an elevated level in the hair. Hair Ca level correlates with long term dietary intake, absorption from the GI tract, and retention. However, hair Ca level does not necessarily reflect current serum calcium or calcium ion concentrations and may not have a linear or direct relationship with tissue deposition or bone density.

Elevated hair Ca is consistent with chronic hypercalcemia conditions, hyperparathyroidism, chronic hypervitaminosis D, vitamin D deficiency with osteoporosis, renal failure, hyperglycemia and diabetes, hepatitis and cirrhosis. Neoplastic disease may feature elevated hair Ca. In osteoporosis, hair Ca is elevated to some degree while the Ca/Mg ratio is notably elevated. Symptoms consistent with elevated hair Ca vary with conditions. Hypercalcemia may feature lethargy and muscle weakness, hypotonicity and constipation.

Elevated hair Ca may be an artifact of external contamination from hair preparations. The probability of such contamination is reflected by the shading of the circle for Ca on the lab report.

Magnesium (Mg)is at an elevated level in the hair. Hair Mg reflects longterm dietary intake, absorption from the GI tract and retention. However, hair Mg does not necessarily reflect current plasma or cellular levels. Elevated hair Mg usually indicates maldistribution of the element without direct correlation to blood levels. Abnormal levels or imbalances of calcium or phosphorus may result in elevated hair Mg. Elevated hair Mg may be associated with renal failure, with overall Mg excess, hypoglycemia, chronic physical or emotional stress, and hypoparathyroidism.

Copper (Cu) is at an elevated level in the hair. Hair Cu correlates with tissue levels except in copper loading diseases.

Commentary

Elevated hair Cu may coincide with: zinc or molybdenum deficiency, biliary insufficiency or obstruction, cirrhosis or chronic hepatitis and copper toxicity. Copper toxicity may feature tremor, dementia, Parkinsonism, hemolytic anemia, jaundice and renal damage. Occasionally, emotional instability, aggressive or violent behaviors, are seen in individuals with elevated hair Cu. Suggested for further assessment of copper status are the following measurements: copper amino acid carriers in plasma (histidine, threonine, glutamine), serum ceruloplasmin, erythrocyte Cu content and urinary Cu.

Elevated hair copper may be an artifact of exposure to swimming pool water where Cu algicides are used, and of hair treatments or shampoos. Acidic wash water carried through copper pipes can also affect the hair Cu level. The probability of such contamination is reflected by the shading of the circle for Cu on the lab report.

Zinc (Zn) is at an elevated level in the hair. Elevated hair Zn almost always reflects maldistribution of zinc or dysfunction in the liver and other organs and tissues. Some studies suggest that elevated hair Zn corresponds to longstanding Zn deficiency and dysfunction in an individual. Rarely, elevated hair Zn results from global Zn excess or Zn toxicity. Blood, cell and urine analyses should be considered for diagnosis of zinc status.

With few exceptions, elevated hair Zn is consistent with prolonged deficiency of dietary zinc, poor digestive proteolysis, malabsorption syndromes or chronic diarrhea. Many possible physiological conditions or diseases may be coincident with zinc dysfunction. These include: impaired taste or smell, poor night vision, fatigue, dermatoses, gastrointestinal distress, eating disorders, obesity, sexual dysfunction, growth retardation in children and (partial) alopecia. Elevated cholesterol has been reported to correlate with elevated hair Zn. Some malignancy conditions may also raise hair Zn level.

Manganese (Mn) is at an elevated level in the hair. Hair Mn level correlates with ingestion, other exposures, and with clinical conditions related to Mn excess.

Elevated hair Mn may be the result of excessive Mn exposure or ingestion, inadequate detoxication or excretion of Mn chemicals, or exposure to radioactivity. Short term symptoms of excess body burden of Mn include: tiredness, headache, fatigue and depressed systolic pressure. Longer term symptoms may include insomnia, sexual impotence and dementia. Conditions reported to correspond with elevated hair Mn include asthenia, muscle rigidity, bradykinetic syndrome indistinguishable from Parkinson's disease, emotional instability, aberrant behaviors, aggressiveness and violence.

Hair is sensitive to external contamination with Mn. Elevated hair Mn may be an artifact of hair treatments such as perms, dyeing or bleaching. Some wash waters from private water wells may contaminate hair with Mn. The probability of contamination is reflected by the shading of the circle for Mn on the lab report.

Chromium (Cr) is at a depressed level in the hair. Hair Cr corresponds to nutritional and physiological status. Chromium potentiates insulin function. Subnormal Cr in hair is consistent with: abnormal glucose metabolism, hyper/hypoglycemia following dietary intake of sugar and carbohydrate, diabetes, and elevated blood lipids including LDL cholesterol. Symptoms or conditions may include chronic fatigue, lack of physical endurance and weight gain or obesity.

Cobalt (Co) is at an elevated level in the hair. Rarely, elevated Co results from endogenous Co excess following ingestion or inhalation of cobalt salts or organocobalt chemicals. Cobalt excess in body tissue (liver, muscle, spleen, kidney, adrenals, bone, skin and hair) may result from occupational or environmental exposures. Megadoses of vitamin B12 have not been observed to raise hair Co above the normal range. Co excess affects heme synthesis and disorders blood protein components, characteristically causing an increase in alpha-globulin. Endogenous Co excess or toxicity symptoms may include fatigue, depressed iodine uptake, hypothyroid function, goiter, anorexia, nausea, diarrhea, tinnitus and occasionally dermatoses.

Elevated hair Co may be an artifact of external contamination from hair preparation products. Occasionally, hair

Commentary

treatments, occupational or environmental exposures to cobalt dusts or chemicals may cause external contamination. The probability of contamination is reflected by the shading of the circle for Co on the lab report.

Iodine (I) level is within the reference range. Hair is indicative of past ingestion of I and of health conditions relating to deficiency or excess. The reported I level may include some external contamination by hair preparation products. The probability of such contamination is reflected by the shading of the circle for iodine on the lab report.

Lithium (Li) is at an elevated level in the hair. Hair Li correlates with tissue levels and with longterm dietary intake of Li. Additionally, Li level has been reported to correlate with lithium carbonate therapy.

Elevated hair Li is consistent with increased dietary intake, usually from ground water, and with use of lithium salts in bathing. Very elevated hair Li often corresponds to lithium therapy. Excessive Li ingestion may provoke hypotension, edema, nausea and mental confusion. Blood serum measurement is advised for monitoring therapeutic Li level.

Selenium (Se) level is within the reference range. However, hair Se levels may reflect external contamination from Se-containing shampoos, which can contribute to the measured level. The probability of such contamination is reflected by the shading of the circle for Se on the lab report.

Strontium (Sr) is at an elevated level in the hair. Sr has been reported to correlate with tissue levels. Sr usually tracks the calcium level as well. Natural Sr is a mixture of stable (not radioactive) isotopes. Sr acquired a bad reputation due to formation of radioactive Sr from fission of uranium during nuclear weapons testing. The Sr measured and reported by GSDL is natural and stable Sr 88 which is associated with calcium in animal and vegetable tissues, in soils and in the earth's crust.

Conditions which may be consistent with elevated Sr include chronic hypercalcemia, hyperparathyroidism, chronic hypervitaminosis D, osteoporosis (possibly with vitamin D deficiency), renal failure, hypoglycemia, hepatitis and liver cirrhosis.

Elevated Sr may be an artifact of external contamination from hair preparation products, which contribute to the measured level. The probability of such contamination is reflected by the shading of the circle for Sr on the lab report.

Sulfur (S) level is within the reference range. Experience* suggests hair levels of S can reflect the status of important sulfur bearing amino acids: cysteine, cystine, and taurine. However, hair S is susceptible to external influences, particularly from hair straightener products, which may significantly lower S content, or hair conditioning or permanent treatments, which raise it. The probability of such influences is reflected by the shading of the circle for S on the lab report.

The lab report lists six elements in a grouping entitled "Other." In hair, these elements do not correlate with blood or other tissue levels, but they can be markers for contamination or may have special meaning. Hair sodium levels are very subject to external contamination by shampoos and hair treatment products, which may contribute to the measured levels. Hair potassium is less subject to external contamination. Hair sodium and potassium vary with metabolic, homeostatic and stress conditions. Rubidium is a relatively benign element which typically parallels the potassium level. It varies according to levels found in water supplies. At extremely high levels, Rb may compete with potassium for activity in the cellular potassium pump; in practical terms this is rarely seen. Hair iron is not usually reflective of iron status but can be a marker for external contamination. Additionally, elevated hair iron may be found in smokers, x- ray technicians and individuals with certain forms of cancer. Notably low or high hair phosphorus is consistent with abnormal calcium and/or magnesium metabolism. Hair phosphorus also is typically elevated with kidney dialysis, and appears to be depressed in chronic hepatitis. Hair phosphorus is seldom altered by external influences. Hair is extremely susceptible to contamination with titanium from hair treatment products. Most common forms of titanium are inert, insoluble and nontoxic, especially titanium dioxide pigment. Titanium is included in this

Commentary

analysis as an indicator for external contamination of hair with various elements.

* (if present): Observations of Bob Smith, Vice President, Elemental Analysis, who has approximately 20 years experience working with hair analysis reports.