A case of hyperuricemia in the ICU

HOSP #		**WARD**	Surgical ICU
CONSULTANT	Heleen Vreede / George van der Watt	**DOB/AGE**	30 year Male

Abnormal Result

The result upon the query being raised by the reviewer was a uric acid of 0.95 mmol/L (0.21-0.43 mmol/L). Three days prior to this result, the patient had a uric acid serum concentration of 0.38 mmol/L.

Presenting Complaint

The patient presented to the hospital with a history of a swollen tonsil unilaterally. This worsened over few days to a severe infection (sepsis) as described below.

History

No significant history. Patient reported sober habits.

Examination

At initial presentation, the patient appeared to have a suppurative tonsillitis. The tonsillitis later developed into a retropharyngeal abscess and soon extended into the thorax, forming a pericardial abscess, which is what was found clinically at the time of admission to Groote Schuur Hospital.

Laboratory Investigations

Date: newest to oldest (only chemistry results included)

Test Set	Test Item	12/01/2019 04:53	11/01/2019 04:18	10/01/2019 04:40	09/01/2019 08:21	09/01/2019 06:57	08/01/2019 05:15	07/01/2019 04:18	06/01/2019 06:11	05/01/2019 15:45
Test Set	Test Item									
NA	Na				δ+ 145				δ+ 140	131 L
K	K				4,6				4,1	INVH
CL	Cl				δ+ 106				98	
UREA	Urea	25,7 H	23,5 H	31,3 H	δ+ 33,3 H	31,6 H	18,4 H	20,7 H	25,1 H	22.0 H
CRT	Creat	172 H	δ- 166 H	307 H	δ+ 396 H	324 H	87	δ- 110 H	198 H	194 H
CRT	MDRD	41	42	21	16	20	>60	>60	35	35
CA	Ca				δ- 1,72 L			δ+ 2,18	1,95 L	
MG	Mg	δ- 0.79	δ- 0.96	1,26 H	1,28 H	1,19 H		δ+ 1,26 H	0.80	
PO4	Phos	δ- 0.69 L	1,83 H	δ+ 1,67 H	0.83	0.70 L		δ- 1,07	2,79 H	
UA	Uric acid				δ+ 0.95 H				0.38	
TP	otal prot		CEGK		CEGK				61	
ALB	Alb		δ+ 16 L		δ- 14 L				26 L	
TBIL	otal bili		22 H		29 H				32 H	
CBIL	Conj bili		22 H		29 H				30 H	
ALT	ALT		48 H		49 H				81 H	
AST	AST		130 H		183 H				223 H	
ALP	ALP		δ+ 129 H		73				68	
GGT	GGT		103 H		136 H				117 H	
LD	LD				415 H				390 H	

Other Investigations

CT scan: images to follow

Final Diagnosis

Retropharyngeal abscess progressing to a thoracic abscess and causing overt signs and symptons of heart failure.

Patient required a thoracotomy and pericardial drainage of the abscess.

Take Home Messages

- Do not take tonsillitis lightly. If not adequately managed, it may cause serious complications.
- Elevated Uric acid is a risk factor for acute kidney injury. This may be by means of acute gouty crystal

deposition, but other crystal-independent roles has also been described.

- Uric acid concentration will rise significantly in severe infection, most likely due to the fast tempo of tissue or DNA turnover, both by bacteria and host tissue breakdown and repair. Uric acid is a product of the metabolic breakdown of purine nucleotides.
- Uric acid, being a heterocyclic compound, I thought could interfere in various assays, and I thought even in the Jaffe reaction for creatinine, but it doesn't seem to be a common interferent when doing a quick literature search.
- Uric acid appears to be the major anti-oxidant in human serum constituting around 61% of total anti-oxidant activity, evidenced by Maxwell et al.:

Table 2. Comparison of antioxidant status in patients with IDDM and NIDDM uncomplicated by microvascular or macrovascular disease and groups of age-matched non-diabetic control subjects

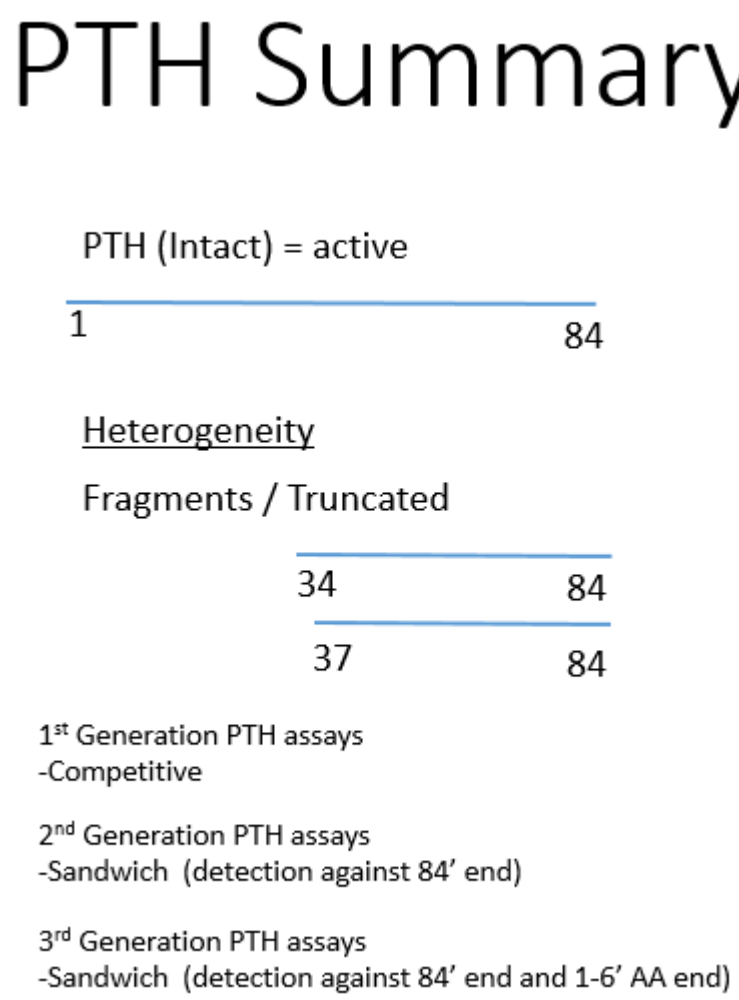
	IDDM	Control	NIDDM	Control
AOA (μmol L^{-1})	320·2 ± 11·3***	427·5 ± 19·2	433·8 ± 25·4	473·9 ± 30·2
Urate (μmol L^{-1})	209·4 ± 10·4***	297·1 ± 16·7	299·5 ± 19·4	324·8 ± 21·4
Vitamin C (μmol L^{-1})	63·6 ± 6·0**	87·5 ± 4·9	38·6 ± 5·7*	58·5 ± 5·3
Vitamin E				
Absolute (μmol L^{-1})	25·2 ± 1·4	27·5 ± 1·4	32·0 ± 1·8	33·3 ± 3·3
Corrected	5·21 ± 0·25	5·79 ± 0·16	5·29 ± 0·23	5·44 ± 0·37
Vitamin A (μmol L^{-1})	1·30 ± 0·05***	1·94 ± 0·10	2·23 ± 0·14	2·23 ± 0·18
Thiols (μmol L^{-1})	458·9 ± 8·0**	499·6 ± 8·7	457·9 ± 7·4*	424·0 ± 15·2
Bilirubin (μmol L^{-1})	8·7 ± 0·9	9·7 ± 0·7	7·5 ± 0·6	7·4 ± 0·5

All values are means ± SE. Antioxidant activity (AOA) is measured in μmol L^{-1} trolox equivalents.
Corrected vitamin E values are absolute concentration (μmol L^{-1}) divided by cholesterol (mmol L^{-1}).
Significant differences between the diabetic patients and their respective control groups are indicated by *P<0·05, **P<0·01 and ***P<0·001.

- Relative contribution to total serum anti-oxidant activity in this study was: urate 65.1%, vitamin C 8.7%, vitamin E 10.6%, vitamin A 5.7%, thiols 7.8% (as in albumin) and bilirubin 1.9%.
- One immediately thinks that a patient with such a rapidly progressing infection has to be immunocompromised, the most common cause(s) in South Africa being HIV or diabetes mellitus. This patient however was HIV negative, according to HIV ELISA and did

not have reported signs and symptoms of diabetes.

PTH Summary



Dr. Jody Rusch's simplistic explanation of PTH and its measurement
n-truncated are deficient in the first few aa's (7-84) – hence biologically inactive.

1-11 aa sequence is necessary for function.

Different assays:

- Intact PTH measurements: 7-84 and 1-84

- Bioactive PTH: 1-84
- CAP assay: cAMP inducible PTH. This assay determines the biologically active PTH by its ability to induce cAMP.
- PTHrP assays and PTH assays are exclusive to each other by design.

A Case of Neurodevelopmental Delay

HOSP #		**WARD**	Neurodevelopmental clinic – Inkosi Albert Luthuli Hospital
CONSULTANT	Prof. George van der Watt	**DOB/AGE**	2y male

Abnormal Result

Urine organic acid analysis was performed upon which a big peak was seen, representative of phenylpyruvate.

Presenting Complaint

The patient was a 2 year old male evaluated at a neurology clinic for neurodevelopmental delay.

History

The patient’s brother died at 3 or 4 years of age with similar neurodevelopmental delay.

Examination

Unfortunately this information was unavailable. The clinician I got hold of at Inkosi Albert Luthuli hasn’t seen the patient himself.

Laboratory Investigations

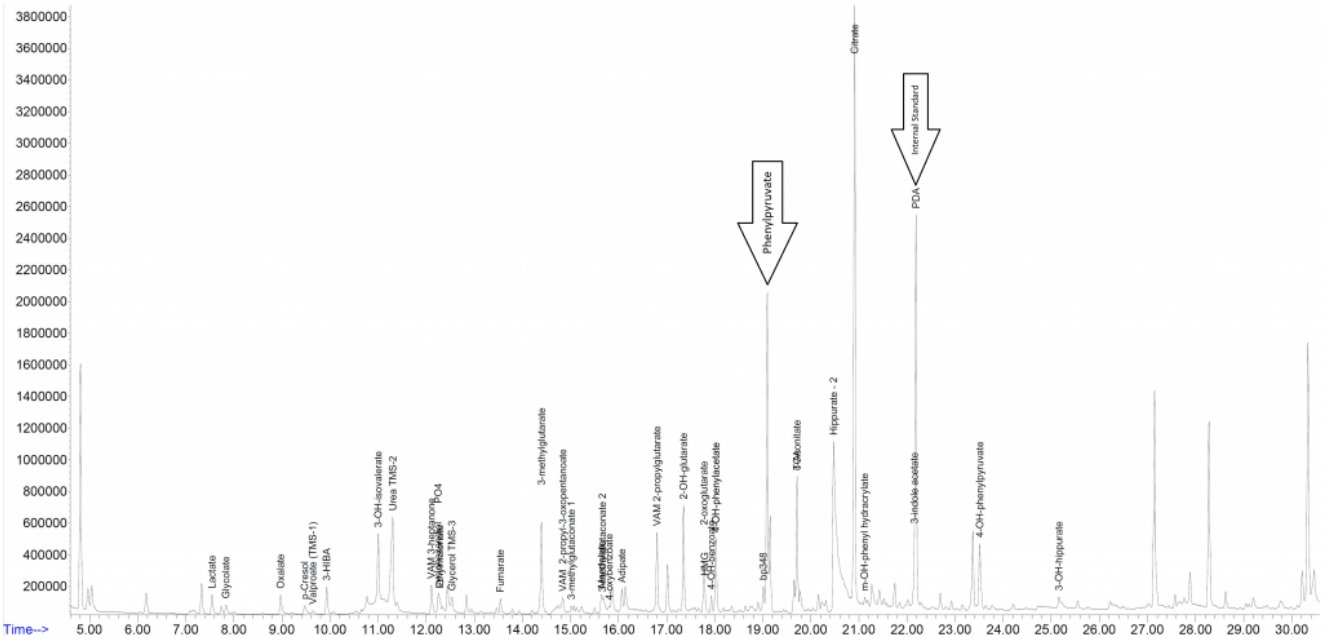


Fig 1 – Urine organic acid screening by GCMS demonstrates elevations of the phenylketones: phenylpyruvate and 4-OH phenylpuyruvate. These findings are indicative of a diagnosis of phenylketonuria due to autosomal recessive deficiency of phenylalanine hydroxylase.

Other Investigations

The urine amino acid analysis yielded a significantly raised phenylalanine: 672 umol/L (ref <67)

Final Diagnosis

This is a case of phenylketonuria

The diagnosis is also supported by a plasma phenylalanine of 672 umol/L (ref < 67).

Take Home Messages

Build-up of phenylalanine gets metabolised to phenylpyruvate (which is seen in urine at high levels).

> *Phenylalanine levels >600 umol/L in serum is highly indicative of phenylketonuria*
>
> *Prof. George van der Watt*

Biopterin cycling defects usually cause levels >125 umol/L.

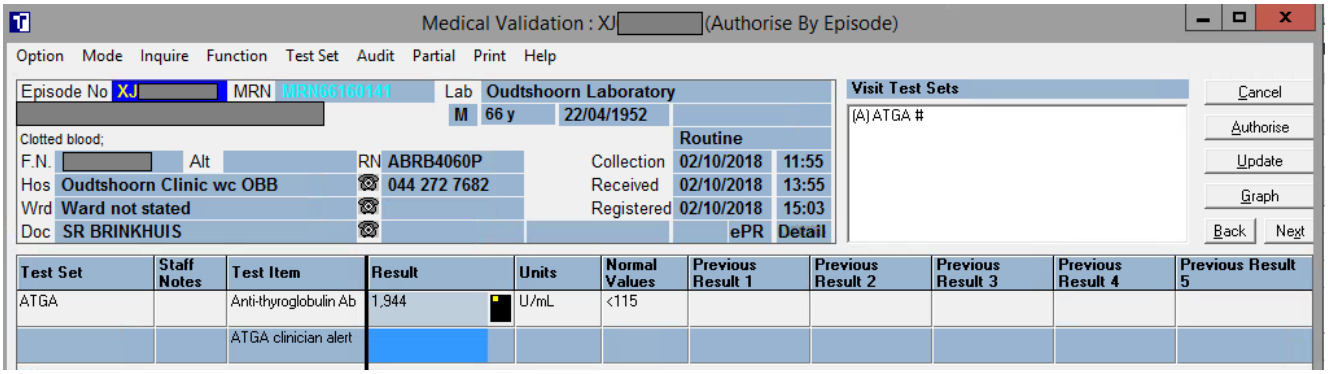
This deficiency is 4-monooxygenase deficiency.

Management of PKU is with a phenylalanine restricted diet.

Elevated anti-Thyroglobulin Antibodies

HOSP #		**WARD**	Oudtshoorn Clinic
CONSULTANT	George van der Watt & David Marais	**DOB/AGE**	66y Male

Abnormal Result



Presenting Complaint

Mr. X, a 66 year old male, complained of chest pain, was seen at the Oudtshoorn Emergency department and a myocardial infarction was excluded by three serial point-of-care (POC) Troponin I results.

History

- Known with hypothyroidism, but the cause was not defined yet.
- On Eltroxin 150 ug daily PO
- No other treatment.
- Various stool analyses had been sent in for culture, with no definitive result.

Examination

Unfortunately not known.

Laboratory Investigations

Free T4: 24.6 pmol/L (7.6 – 16.1 pmol/L)

Anti-Thyroglobulin Antibody levels were elevated at **1944 U/mL** (ref. <115 U/mL).

Other Investigations

Later, by retrospective viewing of the patient’s results it was revealed:

Total Cholesterol (TC) was elevated at 7.6 mmol/L. Hypothyroidism is associated with hypercholesterolemia. It can be concluded by the retrospective overview of results that upon an episode of hypothyroidism, the patient had hypercholesterolemia. This was most likely due to cessation of

Thyroxine treatment, to whatever reason.

Test Item	15/04/2019 17:38	11/01/2019 17:44	31/10/2018 18:32	31/10/2018 00:24	30/10/2018 17:21	02/10/2018 15:03	03/09/2018 15:13	31/08/2018 18:19	23/02/2018 14:30
Total chol	7,55							3,78	
Comment	CHOLC2							CHOLC2	
CRP								1	
Total PSA									
CEA									
Comment									
TSH	δ+25,53 H	δ+ 1,34			<.01 L			<.01 L	<.01 L
Free T4	δ- <3.2 L	δ- 8,9			δ- 15,9	δ- 24,6 H	34,3 H		27,6 H
Free T3							8,9 H		
Anti-thyrogl Ab						1944 H			

Index sample marked by the yellow shade. TC result which is raised (upper left corner) corresponds to the severely hypothyroid episode as revealed by the low T4 on that same sample.
Investigations also confirmatory for auto-immune hypothyroidism are:

- Anti-Thyroid peroxidase antibodies
- Anti-TSH receptor antibodies

Final Diagnosis

Auto-immune hypothyroidism

Take Home Messages

> *Interestingly, numerous patients with hypothyroidism is diagnosed at our Lipid Clinic at Groote Schuur Hospital. Patients are being referred for hypercholesterolaemia. Generally referral to this clinic happens when TC > 7.5 mmol/L. These patients are referred as presumed to have familial hypercholesterolaemia, but upon further work-up it is found that many of these patients have long-standing untreated hypothyroidism.*

Prevalences of antithyroid antibodies as summarized by Up-to-

date: