



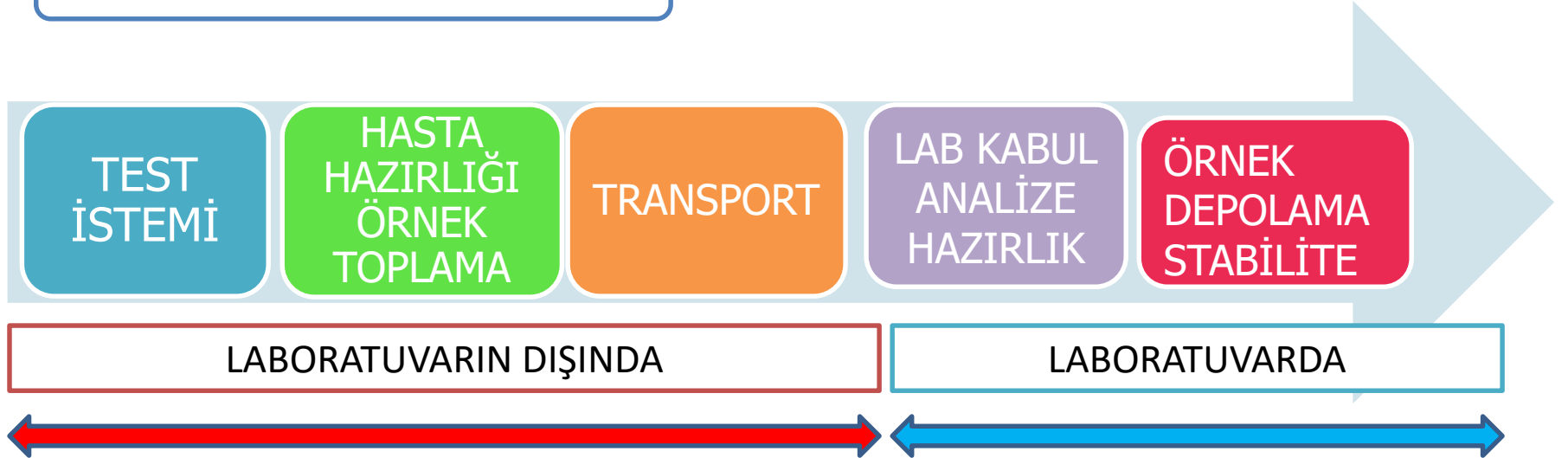
İMMUNOKİMYADA PREANALİTİK EVRE

Dr. DİDEM BARLAK KETİ

İÇERİK

- ✓ Preatalitik evre
- ✓ Serum indeksleri
- ✓ Endojen antikolar
- ✓ İnterferansı nasıl belirleyebiliriz
- ✓ Vaka örnekleri
- ✓ Algoritm
- ✓ Öneriler

PREANALİTİK EVRE



- ✓ Kontrolü zor
- ✓ Sürece dahil olan kiŐi sayısı fazla
- ✓ DeđiŐken bir grup
- ✓ İletişim eksikliđi
- ✓ Bilgi eksikliđi

TEST İSTEMİ



Hatalı ya da uygunsuz test istemi

Hasta no	Serbest B-hCG	Total-hCG
1	<2.0 ng/ml	978 mIU/mL
2	<2.0 ng/ml	-
	2.06 ng/ml	2734 mIU/mL



HASTA HAZIRLIĞI



İnsülin, C-peptid, gastrin, kalsitonin, kortizol



Tiroid hormonu, biotin, heparin, furosemid



Aktivite/postür/stres

Renin, kortizol, tiroksin

ACTH, GH, prolaktin, katekolaminler (stres)

EFLM-WG-PA

Kan örnekleri tercihen sabah 7 ile 9 arasında alınmalıdır.
Açlık 12 saat sürmelidir.

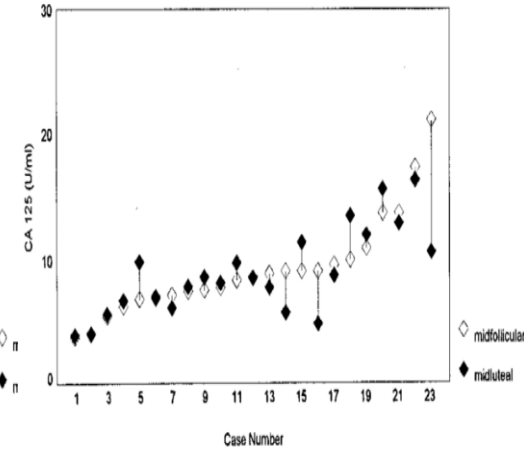
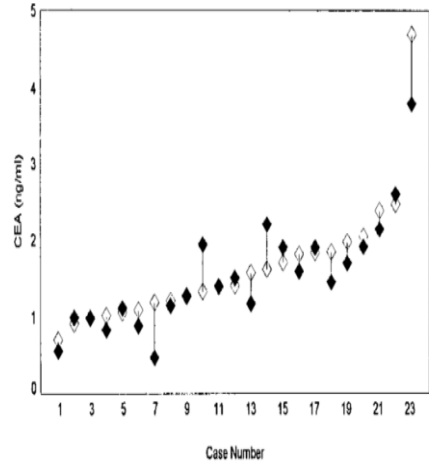
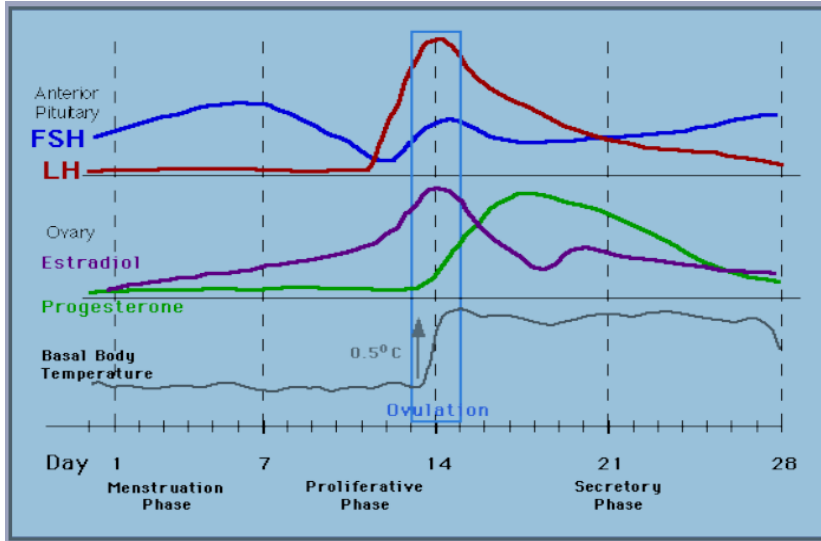
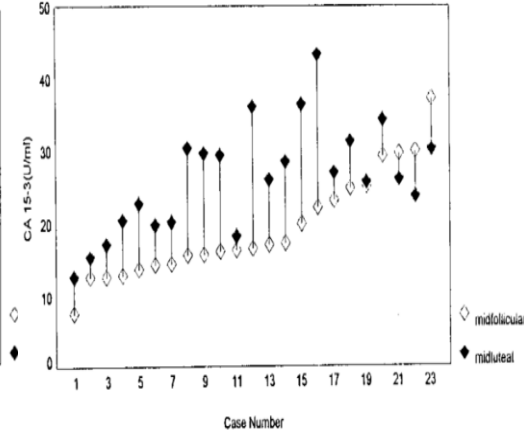
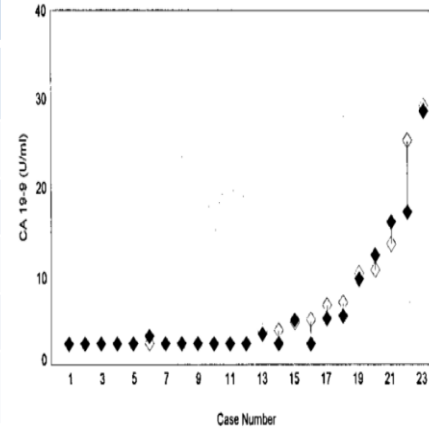
ÖRNEK TOPLAMA

Örnek toplama zamanı



Diurnal varyasyon

Analit	Maksimum	Minimum
Kortizol	5-8	21-3
Prolaktin	5-7	10-12
TSH	23-3	11-16
Aldosteron	2-4	12-14
Renin	0-6	10-12



ÖRNEK TOPLAMA

Örnek tipi, tüp sırası



ACTH, Glucagon, Gastirin hızla kanda bulunan enzimler tarafından yıkılır



EDTA metal iyonlarıyla şelat oluşturur ve proteazlar inhibe edilir. ACTH ve PTH ölçümü için EDTA'lı tüplerin kullanımı bu peptidlerin stabilitesini artırır.

BD Vacutainer® Order of Draw for Multiple Tube Collections

Designed for Your Safety

Reflects change in CLSI recommended Order of Draw (H3-A5, Vol 23, No 32, 8.10.2)

Closure Color	Collection Tube	Mix by Inverting
BD Vacutainer® Blood Collection Tubes (glass or plastic)		
Yellow	• Blood Cultures - SPS	8 to 10 times
Light Blue	• Citrate Tube*	3 to 4 times
Yellow or Red	• BD Vacutainer® SST™ Gel Separator Tube	5 times
Red	• Serum Tube (glass or plastic)	5 times (plastic) none (glass)
Orange	• BD Vacutainer® Rapid Serum Tube (RST)	5 to 6 times
Light Green or Green	• BD Vacutainer® PST™ Gel Separator Tube With Heparin	8 to 10 times
Green	• Heparin Tube	8 to 10 times
Purple or Pink	• EDTA Tube	8 to 10 times
White	• BD Vacutainer® PPT™ Separator Tube K ₂ EDTA with Gel	8 to 10 times
Grey	• Fluoride (glucose) Tube	8 to 10 times

Clin Biochem Rev Vol 29 Suppl (i) August 2008

Evans MJ, et al. Clin Biochem 2001;34:107-12

ÖRNEK TOPLAMA

TÜP İÇERİĞİ

- Bazı kan toplama tüplerinde bulunan silikon yağlar antikorları maskeliyebilir, antijen-antikor bağlanmasını bozabilir.
- Silikon C-reaktif protein (CRP) ile kompleks oluşturarak yanlış yüksek sonuçlara neden olabilir

NUMUNE VOLÜMÜ

- Yetersiz numune volümü, örnekte EDTA konsantrasyonu artıracığından EDTA'lı tüplerin $\leq\%50$ doldurulması PTH ve ACTH ölçümlerini etkileyebilir

Tate and Ward, Clin Biochem Rev 2004; 105-120



Stability study of 81 analytes in human whole blood, in serum and in plasma

Christiane Oddoze *, Elise Lombard, Henri Portugal

Table 4a
Stability of hormonal analytes of whole blood.

Analytes	To	Tubes	TCL	Mean difference%								Acceptable delays	
				T 6 h		T 24 h		T 48 h		T 72 h			
				4 °C	25 °C	4 °C	25 °C	4 °C	25 °C	4 °C	25 °C	4 °C	25 °C
FSH	12.7 UI/L	Glass tube	±9.8%	+1.1	+2.0	+1.8	+3.6	+2.7	+6.1	+3.9	+8.2	72 h	72 h
				+0.4	+0.9	+1.2	+3.4	+2.1	+8.1	+3.4	+10.5 ^a	72 h	48 h
Estradiol	168.4 ng/mL	Glass tube	±13.9%	-2.2	+2.8	+0.2	+3.8	+9.6	+9.3	+7.2	+10.6	72 h	72 h
				+4.4	+4.7	+4.8	+7.6	+2.6	+3.9	+5.5	+1.5	72 h	72 h
Prolactin	236 mUI/L	Glass tube	±6.6%	-0.8	+0.3	+0.1	+0.1	-0.2	+2.0	-0.1	+4.1	72 h	72 h
				-1.6	+0.1	-0.8	+2.5	+1.2	+7.7 ^a	+3.2	+10.6 ^a	72 h	24 h
Folate	14.1 nmol/L	Glass tube	±22.4%	+7.7	+2.4	+6.2	-4.7	+2.8	-15.1	+4.3	-27.4 ^a	72 h	48 h
C-peptide	0.73 nmol/L	Glass tube	±9.5%	-0.6	-2.0	-2.1	-18.4 ^a	-1.6	NT	-3.9	NT	72 h	6 h
				-1.0	-1.9	-1.5	-6.5	-0.3	-23.7 ^a	-2.0	-41.3 ^a	72 h	24 h
PTH	27.0 ng/mL	Glass tube	±8.9%	-5.3	-9.7 ^a	-6.1	-30 ^a	-9.9 ^a	NT	-14.6 ^a	NT	24 h	<6 h
				-5.7	-8.1	-8.4	-19 ^a	-7.8	-29 ^a	-10.9 ^a	-38 ^a	48 h	6 h
C-telopeptide	0.41 ng/mL	Glass tube	±8.4%	-7.8	-11.0 ^a	-14.8 ^a	-41 ^a	-15.8 ^a	NT	-23.2 ^a	NT	6 h	<6 h
				-4.5	-2.4	-6.8	-5.8	-3.0	-1.1	-0.6	-4.4	72 h	72 h

İnsülin EDTA' lı kan örneklerinde oda sıcaklığında 72 saat stabil

PTH EDTA' lı kan örneklerinde oda sıcaklığında 72 saat stabil

EDTA' lı kan örneklerinde ACTH oda sıcaklığında 4 saat stabil

NT: Not tested; To: initial value; TCL: Total Change Limit.

^a Exceeds the TCL.



Stability study of 81 analytes in human whole blood, in serum and in plasma

Stability of hormonal analytes on serum or plasma.

Analytes	To	Tubes	TCL	Mean difference%								Acceptable delays	
				T 6 h		T 24 h		T 48 h		T 72 h		4 °C	25 °C
				4 °C	25 °C	4 °C	25 °C	4 °C	25 °C	4 °C	25 °C		
FSH	12.7 UI/L	Glass tube	± 9.8%	+1.1	+1.0	+3.0	+3.5	+1.5	+2.8	+2.9	+4.5	72 h	72 h
		SST		+0.8	+2.3	+4.0	+6.4	+2.6	+4.2	+3.7	+5.7	72 h	72 h
		K3 EDTA		-0.1	+0.6	+1.8	+2.1	+1.8	+1.9	+2.3	+2.9	72 h	72 h
Estradiol	168.4 ng/mL	Glass tube	± 13.9%	-3.2	+0.8	+2.0	+2.5	+8.7	+8.5	+8.3	-0.6	72 h	72 h
		SST		-1.3	-3.1	+8.5	NT	-1.0	+4.2	-1.3	-15.0 ^a	72 h	48 h
		K3 EDTA		+2.3	+3.8	+5.7	+5.2	+5.0	+2.6	+0.4	+1.0	72 h	72 h
Prolactin	236 mUI/L	Glass tube	± 6.6%	-1.7	-1.4	-0.5	-0.6	-1.1	-1.7	-1.0	-2.2	72 h	72 h
		SST		-1.5	-0.9	+0.1	-1.6	-0.4	-2.0	-0.5	-2.6	72 h	72 h
		K3 EDTA		-1.3	-1.2	0.0	+0.4	+0.1	+0.05	+0.1	-0.03	72 h	72 h
Folate	14.1 nmol/L	Glass tube	± 22.3%	+3.8	+0.2	+6.1	+2.9	-3.5	-9.2	-0.5	-11.1	72 h	72 h
		SST		-3.2	-5.5	+1.3	-2.5	-4.5	-12.8	-3.4	-30.4 ^a	72 h	48 h
		K3 EDTA		-0.2	-4.8	-2.0	-8.3	-1.9	-12.7	-2.8	-18.3 ^a	72 h	48 h
C-Peptide	0.73 nmol/L	Glass tube	± 9.4%	-0.7	-1.7	-1.8	-6.5	-1.2	-12.0 ^a	-2.7	-21.9 ^a	72 h	24 h
		SST		-0.6	-0.4	-0.6	-1.7	+0.2	-7.1	-0.6	-13.3 ^a	72 h	48 h
		K3 EDTA		+2.6	+9.1	+2.3	+6.8	-2.8	-3.0	-2.3	-14.1	72 h	72 h
Osteocalcin	27.0 ng/mL	Glass tube	± 8.9%	-2.4	-13 ^a	-8.4	-28 ^a	-7.6	NT	-14.3 ^a	NT	48 h	<6 h
		SST		-3.3	-10.6 ^a	-10.6 ^a	-20 ^a	-6.8	-29 ^a	-12.8 ^a	-32 ^a	6 h	<6 h
		K3 EDTA		-2.8	-7.8	-7.0	-16 ^a	-1.7	-23 ^a	-5.4	-30 ^a	72 h	6 h
C-Telopeptide	0.41 ng/mL	Glass tube	± 8.4%	-8.1	-10.6 ^a	-13.9 ^a	-25 ^a	-15.3 ^a	NT	-20.4 ^a	NT	6 h	<6 h
		SST		-7.4	-10.3 ^a	-14.2 ^a	-21 ^a	-12.3 ^a	-31 ^a	-16.3 ^a	-38 ^a	6 h	<6 h
		K3 EDTA		-3.5	-4.5	-5.5	-6.0	-2.4	-5.4	-1.3	-6.3	72 h	72 h

İnsülin oda sıcaklığında serumda 6 saat, EDTA'lı plazmada 48 saat stabil

PTH oda sıcaklığında serumda 6 saat, EDTA'lı plazmada 72 saat stabil

NT: Not tested; To: initial value; TCL: Total Change Limit.

^a Exceeds the TCL.

Elodie A. Hanon, Catharine M. Sturgeon and Edmund J. Lamb*, prepared on behalf of the IFCC Scientific Division Working Group on PTH

Sampling and storage conditions influencing the measurement of parathyroid hormone in blood samples: a systematic review

Table 2 Good practice recommendations for blood collection for PTH measurement developed as a result of the present systematic review.

Recommendation 1: Type of sample tube	We recommend blood samples for PTH measurement should be taken into tubes containing EDTA and the plasma separated from the cells within 24 h of venepuncture [Strong recommendation].
Recommendation 2: Sample storage	We recommend EDTA plasma samples for PTH measurement should be stored at 4°C and analysed within 72 h of venepuncture [Strong recommendation].
Recommendation 3: Site of sampling	We recommend blood samples for PTH measurement should always be collected from the same sample site (central or peripheral) for comparison both within and between individuals. Clinical guidelines should explicitly state whether targets refer to peripheral or central venous concentrations [Strong recommendation].
Recommendation 4: Seasonal variation	We suggest season, latitude and vitamin D status should be considered and/or reported in all studies undertaking reference range determinations for PTH and when interpreting PTH results in individual patients [Weak recommendation].
Recommendation 5: Time of collection	We suggest blood samples for PTH measurement should be collected between 10.00 and 16.00 and results interpreted against a reference interval derived for this sampling time [Weak recommendation].

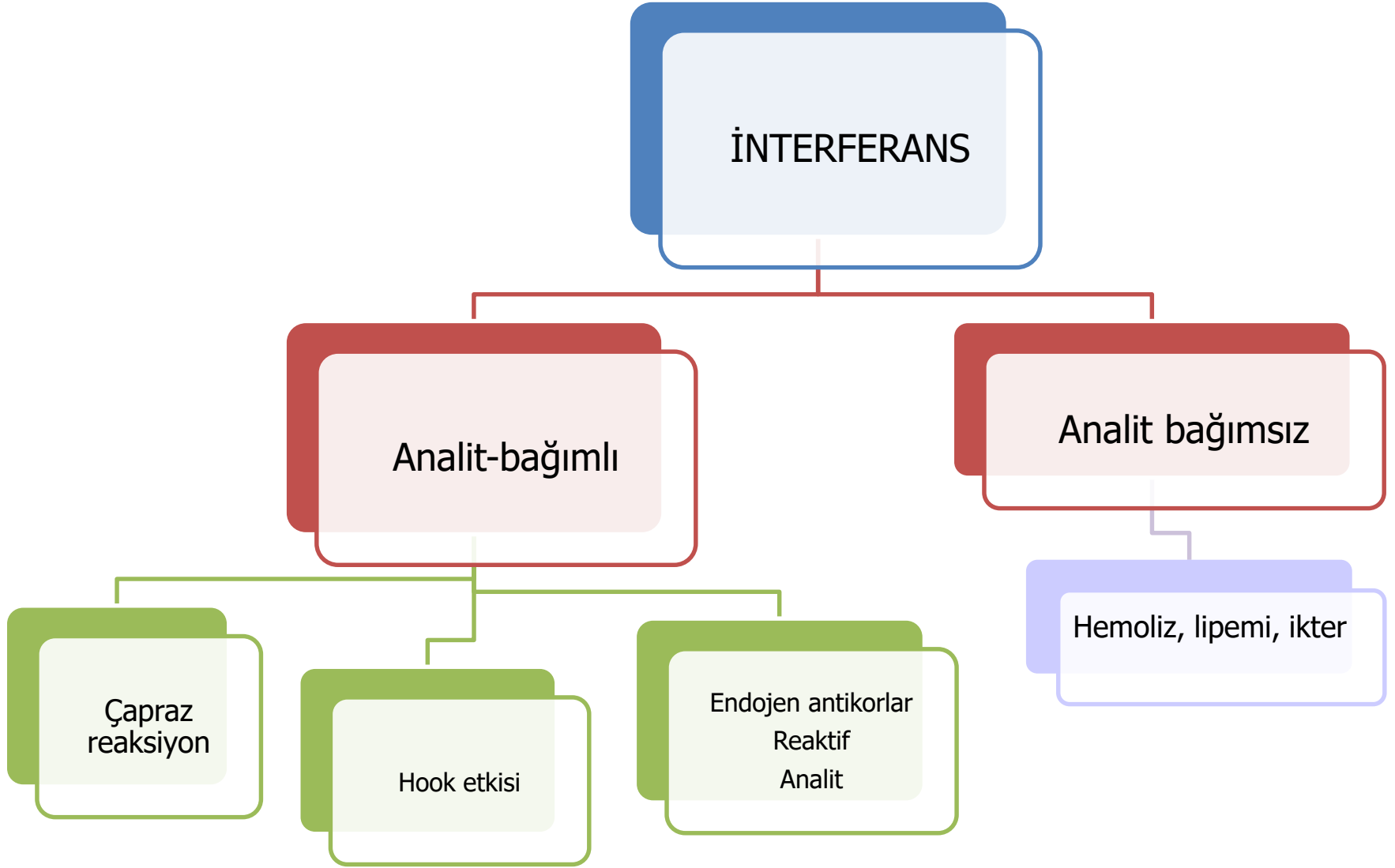
EDTA, ethylenediaminetetraacetic acid; PTH, parathyroid hormone.

ÖRNEK DEPOLAMA VE STABİLİTE

	0.dk n=10	8 saat oda sıcaklığında stabilite n=10	%Bias
İNSÜLİN	126	116	-%7.9
HI<20	18.9	17	-%10
HI 20-50	32.6	23.6	-%27.6
HI 50-100	17.3	12.2	-%29.5

Tate and Ward, Clin Biochem Rev 2004; 105-120

İTERFERANS



SERUM İNDEKSLERİ

ÖRNEK KALİTESİ

CLSI C56-A

Hemolyzed (red)



mg/dL	0	50	150	250	525
g/L	0	0.50	1.50	2.50	5.25

Hemoglobin

Icteric (yellow)



mg/dL	0	1.7	6.6	16	30
µmol/L	0	29.1	112.9	273.6	513

Total Bilirubin

Lipemic (turbid)



mg/dL	0	125	250	500	1000
mmol/L*	0	1.41	2.83	5.65	11.83

Intralipid®

* Concentrations based on dilutions of 20% Intralipid® (or the equivalent).

İmmunoassaylar; **H**emoliz, **İ**kter ve **L**ipemi (HİL)' den spektrofotometrik ölçümler kadar etkilenmez. Ancak hemoliz nedeniyle eritrositlerden salınan proteolitik enzimler labil analitlerin sonuçlarını etkilediği için kabul edilemez.

Table 1 Laboratory parameters affected by haemolysis and/or blood cell lysis in the specimen.

Parameter	Bias	Cause	Reference
Adrenocorticotrophic hormone	Negative	Proteolysis	36
Activated partial thromboplastin time	Negative	Release of thromboplastic substances	39
Antithrombin	Negative	Analytical interference	41
Aspartate aminotransferase	Positive	Cellular release	27
Alanine aminotransferase	Positive	Cellular release	27
Albumin	Negative	Dilution	27
Alkaline phosphatase	Negative	Analytical interference	27
Bilirubin (neonatal)	Variable	Analytical interference	29
Bilirubin (total)	Negative	Analytical interference	23
Calcitonine	Positive	Proteolysis	36
Chloride	Negative	Dilution	27
Cortisol	Negative	Analytical interference	31
Creatine kinase	Positive	Analytical interference	27
Creatinine	Positive	Analytical interference	27
D-dimer	Positive	Release of thromboplastic substances	39
Fibrinogen	Negative	Release of thromboplastic substances	39
Folate	Positive	Cellular release	36
γ -Glutamyltransferase	Negative	Analytical interference	27
Gastrin	Negative	Proteolysis	36
Glucagon	Negative	Proteolysis	36
Glucose	Negative	Dilution	27
Haptoglobin	Negative	Analytical interference	38
Homocysteine	Negative	Analytical interference	37
Insulin	Negative	Proteolysis	36
Iron	Positive	Analytical interference	27
Lactate dehydrogenase	Positive	Cellular release	27
Lipase	Positive	Analytical interference	27
Magnesium	Positive	Cellular release	27
Parathormon	Negative	Proteolysis	36
Phosphorus	Positive	Cellular release	27
Potassium	Positive	Cellular release	27
Prostate specific antigen	Positive	Analytical interference	31
Prothrombin time	Positive	Release of thromboplastic substances	39
Sodium	Negative	Dilution	27
Urea	Positive	Cellular release	27
Testosterone	Negative	Analytical interference	31
Troponin I	Positive	Analytical interference	31
Troponin T	Negative	Analytical interference	33
Vitamin B12	Negative	Analytical interference	31

HEMOLİZ

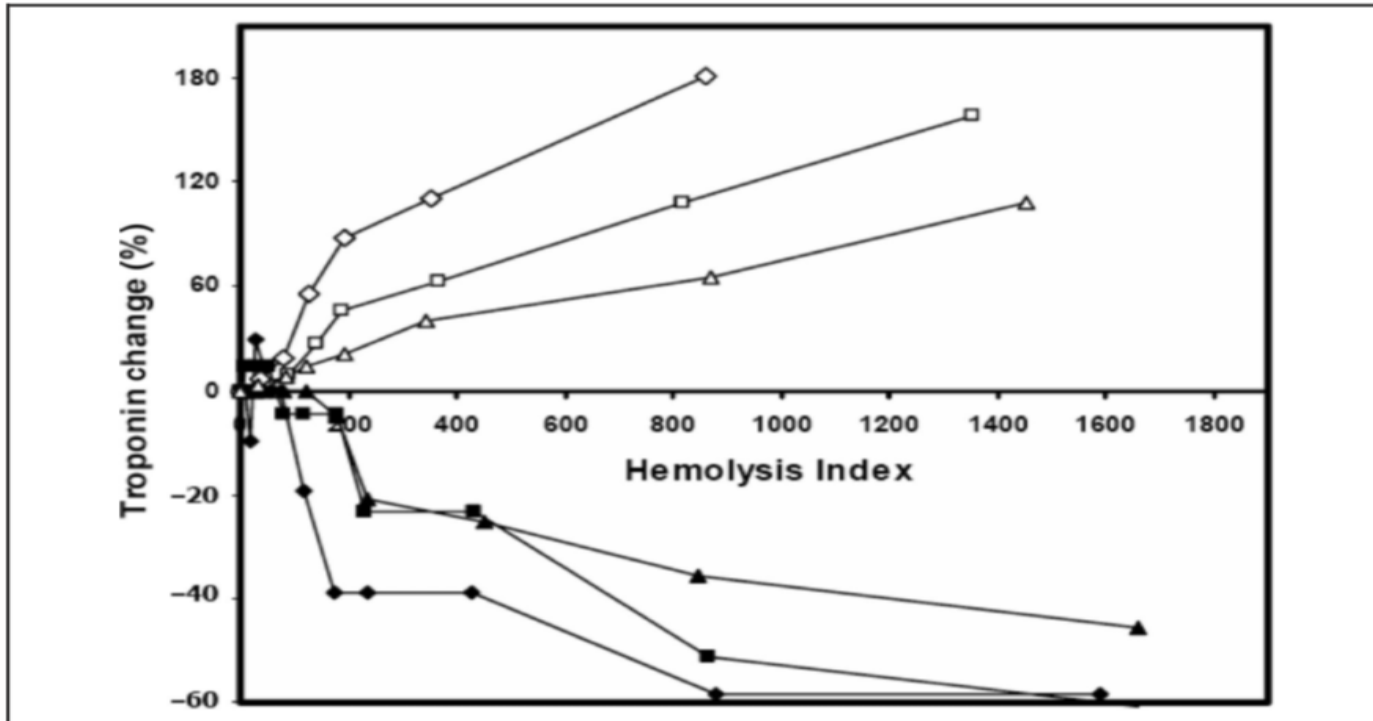


Fig. 1. Effect of increasing added hemolysis on the Ortho Clinical Diagnostics TnI ES assay (open symbols) and the Roche TnT hs assay (closed symbols). A 20% change was considered clinically significant. The 3 cTnI concentrations were 24 ng/L (◇), 36 ng/L (□), and 49 ng/L (△), and the 3 cTnT concentrations were 6 ng/L (◆), 12 ng/L (■), and 23 ng/L (▲). (Note that the negative and positive scales are not equal.)

National Academy of Clinical Biochemistry Laboratory Medicine Practice Guidelines: Troponin değerinde \pm %20 farklılık önemli

Mechanism of interference by haemolysis in the **cardiac troponin T** immunoassay

Ravinder Sodi, Simon M Darn, Andrew S Davison, Anthony Stott, Alan Shenkin

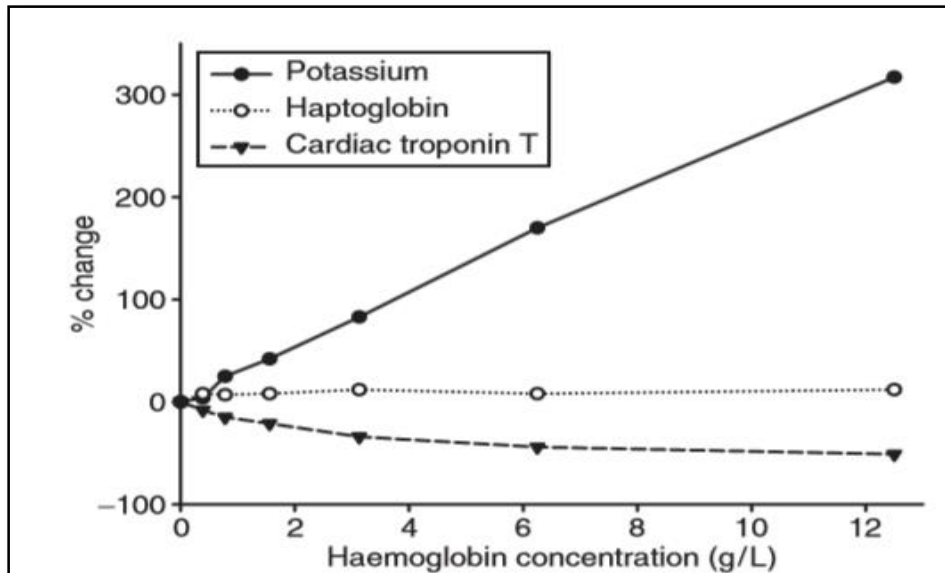


Figure 2 Effect of haemolysis on potassium, haptoglobin and cardiac troponin T (cTnT). The initial cTnT level was 0.1 $\mu\text{g/L}$. Mean of duplicates are shown

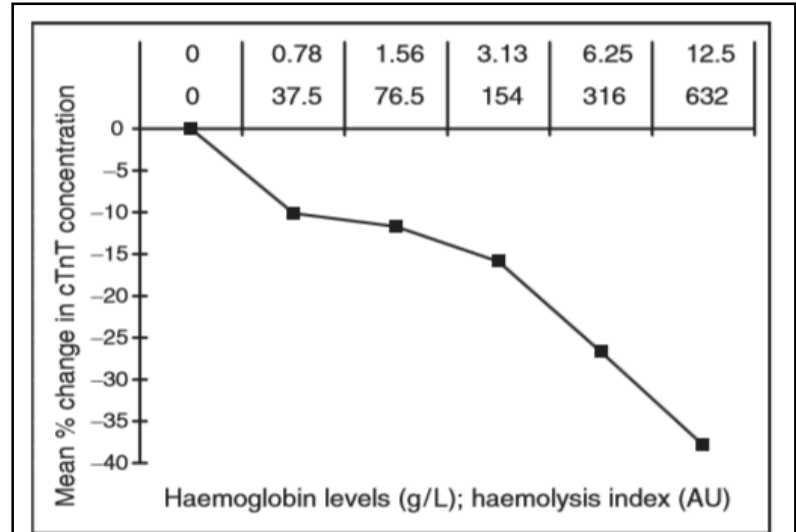
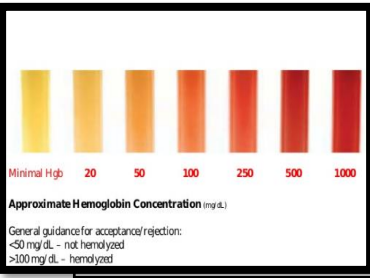


Figure 3 Interferogram showing the magnitude of the effect of haemolysis on the cardiac troponin T assay. A decrease of more than 10% from an initial level of 0.1 $\mu\text{g/L}$ was seen at the haemolysis index of approximately 31 arbitrary units (AU), which is the haemolysis threshold in our clinical laboratory using the Roche Modular Analytics unit. Note that in order to show both the haemolysis index (bottom) and the corresponding haemoglobin levels (top) on the same graph the x-axis is categorical and non-linear

HEMOLİZ

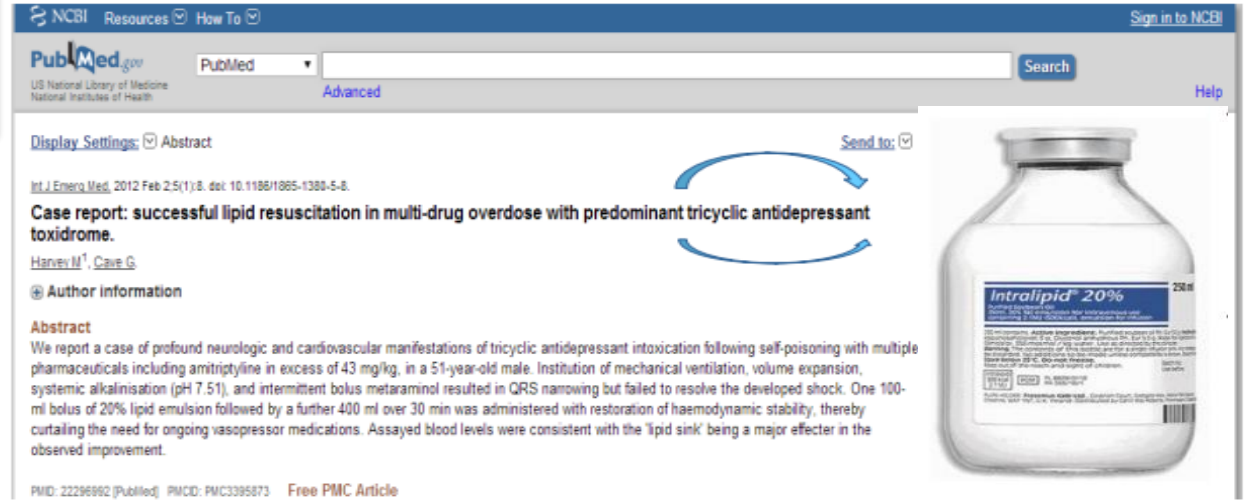


	Serum havuzu	Serum havuzu + dilüent	HEMOLİZ İNDEKSİ				
			50	100	200	400	800
Estradiol	50.17	46.26	38.82	42.95	39.85	40.4	44.41
T.Testosteron	173.6	169.3	167.6	243.9	168.1	169.5	169.4
FSH	11.22	10.53	10.36	10.28	10.40	10.44	10.34
LH	8.40	7.93	7.71	7.80	7.78	7.64	7.56
B12	381.8	391.7	352.3	385.7	364.3	372	397.2
Kortizol	12.4	11.24	11.45	11.33	11.58	11.44	11.79
Ferritin	35.95	31.42	32.75	% Bias: 11		34.87	37.46
Folat	8.7	% Bias: 18	10.06	12.59	16.34	>20	>20
İnsülin	10.03	9.28	9.41	8.81	-%11.4	8.22	3.92
PRL	10.4	9.63	9.53	9.35	9.44	9.48	9.65
PTH	48.6	43.30	42.54	42.12	43.76	44	43.53
TSH	2.63	2.46	2.44	2.42	2.47	2.41	2.40
Troponin Ths	1.81	1.65	1.66	1.64	-%15	1.40	1.28

LİPEMİ



Steroidler gibi lipidlerde çözünen analitler
Türbidimetrik analizler
FT4



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Int J Emerg Med. 2012 Feb 2;5(1):8. doi: 10.1186/1865-1380-5-8.

Case report: successful lipid resuscitation in multi-drug overdose with predominant tricyclic antidepressant toxidrome.


Harvey M¹, Cave G.

Author information

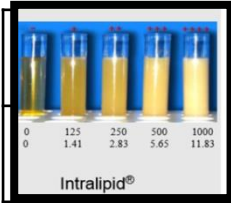
Abstract

We report a case of profound neurologic and cardiovascular manifestations of tricyclic antidepressant intoxication following self-poisoning with multiple pharmaceuticals including amitriptyline in excess of 43 mg/kg, in a 51-year-old male. Institution of mechanical ventilation, volume expansion, systemic alkalinisation (pH 7.51), and intermittent bolus metaraminol resulted in QRS narrowing but failed to resolve the developed shock. One 100-ml bolus of 20% lipid emulsion followed by a further 400 ml over 30 min was administered with restoration of haemodynamic stability, thereby curtailing the need for ongoing vasopressor medications. Assayed blood levels were consistent with the 'lipid sink' being a major effector in the observed improvement.

PMID: 22296992 [PubMed] | PMCID: PMC3395873 | Free PMC Article



Lipoproteinler reaktif antikorları üzerinde bağlanma bölgelerini bloke ederek antijen-antikor reaksiyonunu etkileyebilir, yanlış düşük veya yüksek sonuçlara neden olabilirler.



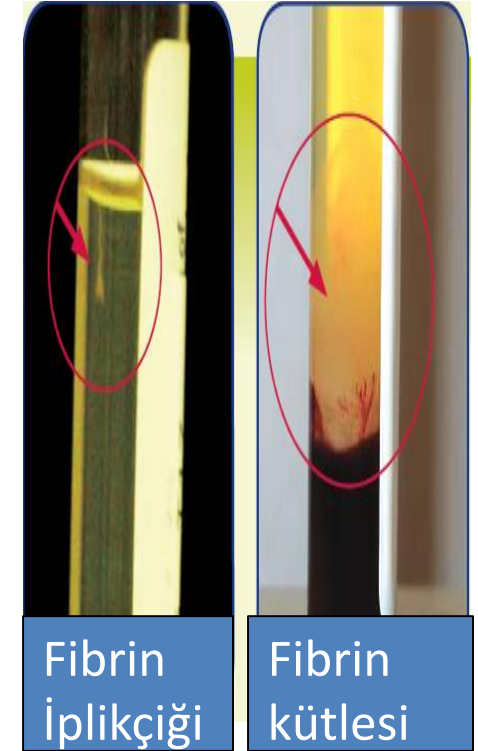
	Serum havuzu	Serum havuz u + dilüent	LİPEMİK İNDEKS					SANTRİFÜJ SONRASI (15000 g 15 dk) LİPEMİK İNDEKS				
			150	300	1000	1500	3000	127	47	34	87	71
Estradiol	361	328	319	319	-%20 bias		262	322	322	-%10.3		294
T.Testosteron	43.61	43.56	42.04	41.29	-%22.7		33.65	44.23	42.27	43.	-%5.5	41.16
Progesteron	0.371	0.326	0.31	0.339	%24.5		0.406	0.32	0.308	0.38	%20.5	0.393
AFP	2.45	2.29	2.38	2.25	2.2	1.99	1.93	2.24	2.26	2.25	2.24	2.51
Ca-125	16.41	14.91	15.28	15.18	14.5	15.03	14.64	14.76	15.25	15.24	15.48	18.13
Ca-19-9	14.62	13.8	14.32	13.73	13.29	13.93	13.68	14.17	13.64	13.68	13.84	14.66
Ca-15-3	17.5	16	16.1	16.16	15.92	15	16.26	15.76	16.17	16.38	16.91	18.62
CEA	1.4	1.21	1.32	1.25	1.24	1.28	1.23	1.19	1.27	1.28	1.31	1.44
B12	481	445	445	444	433	424	445	443	438	445	452	474
Kortizol	9.71	8.99	9.26	9.02	8.95	8.83	9.23	9.29	9.42	9.38	9.57	9.24
Ferritin	62.48	56.1	57.17	56	55.05	55.66	54.57	55.95	57.18	58.26	58.76	63.77
Folat	8.16	7.67	7.79	7.16	7.22	7.21	7.26	7.24	7.95	8.06	7.5	8.17
İnsülin	12.78	11.51	11.52	11.52	11.52	11.5	11.44	10.98	11	11.37	11.33	10.42
PRL	8.25	7.55	7.54	7.45	7.43	7.28	7.42	7.6	7.69	7.84	7.85	7.77
PTH	58	53	52	51	52	51	53	49	50	50	51	49
TSH	1.33	1.24	1.26	1.24	1.24	1.26	1.27	1.25	1.26	1.27	1.31	1.27

FİBRİN

Preanalitik fazda fibrin oluşumuna etkisi olabilecek önemli faktörler

- ✓ Pıhtılaşma zamanını etkileyebilen hastalık ya da tedavi
- ✓ Uygun tüp tipinin seçilmesi
- ✓ Tüplere kan alma sırası
- ✓ Tüpün karıştırılması
- ✓ Pıhtılaşma için izin verilen süre

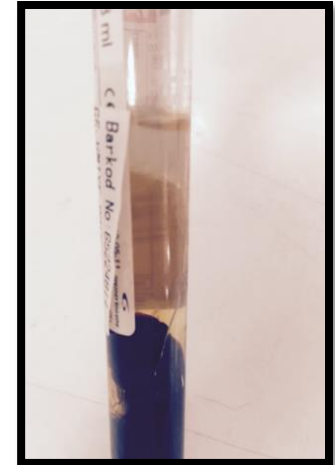
Fibrin oluşumu, yanlış yüksek cTnI sonuçlarına neden olabilir. Antikörün fibrine nonspesifik bağlanması ya da indikatör enzimin fibrin tarafından maskelenmesi bu interferansa katkıda bulunan faktörlerdir.



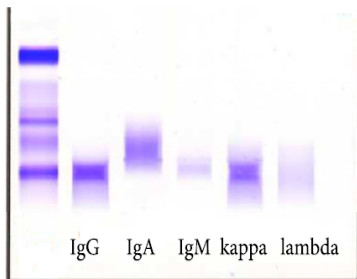
PARAPROTEİN

Table 1. Summary of the Laboratory Investigations in Current Case

Hormonal Testing	Matrix	Result	Age-Adjusted Reference Range	Method
Estradiol, pmol/L	Serum	3073	18–201	Immunoassay, Roche Cobas 602
Progesterone, nmol/L	Serum	30 /L	0–5	Immunoassay, Roche Cobas 602
Total testosterone, nmol/L	Serum	4.1	0.1–1.4	Immunoassay, Roche Cobas 602
Bioavailable testosterone, nmol/L	Serum	1.75	0–0.43	Calculated using SHBG, total testosterone, and albumin; done with Roche Cobas 602 and 702
Cortisol, nmol/L	Serum	1250 at 10 AM 1433 at 3 PM	100–450 50–300	Immunoassay, Roche Cobas 602
DHEA-S, µmol/L	Serum	10.3	0.26–6.68	Immunoassay, Roche Cobas 602
17-OH-progesterone, nmol/L	Serum	2.5	0.6–5.2	Immunoassay, Roche Cobas 602
SHBG, nmol/L	Serum	34	20–130	Immunoassay, Roche Cobas 602
LH, U/L	Serum	16	8–59	Immunoassay, Roche Cobas 602
FSH, U/L	Serum	27	67–135	Immunoassay, Roche Cobas 602
AMH, ng/mL	Serum	<0.16	<0.16	ELISA (Beckman Coulter) done with GEMINI
Inhibin B	Serum	<10	<10	ELISA (Beckman Coulter) done with Tecan Sunrise plate reader
IgG, g/L	Serum	17.7	7–16	Roche Cobas 602
Clone IgG κ, g/L	Serum	9.9	None	Sebia Capillarys2 (electrophoresis and clone quantification) plus Sebia Hydrasys for immunofixation
Free estradiol, pg/mL	Serum	<0.5	<0.5	LC/MS-MS, by Arup Laboratories
Total testosterone, nmol/L	Serum	<0.2	0.3–2.1	LC/MS-MS, at Centre Hospitalier Universitaire de Sherbrooke
Free testosterone, pmol/L	Serum	<4	0–25	LC/MS-MS, at Centre Hospitalier Universitaire de Sherbrooke



Immunofixation: IgG kappa gamma pahty

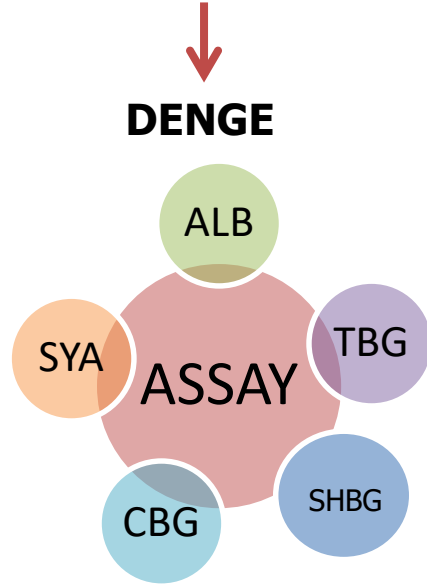


IgG : 17.7 g/L (7-16)
 IgA : 2.4 g/L (0.7-4.0)
 IgM : 0.3 g/L (0.4-2.3)
Kappa : 31.7 g/L (3.3-19.4)
 Lambda : 17.3 g/L (5.71-26.3)

Paraproteinler antijen-antikor bağlanmasını etkileyebilir.
 IgG k paraprotein yanlış yüksek D-dimer, yanlış düşük TSH sonuçlarına neden olabilir

dehydroepiandrosterone-S; ELISA, enzyme-linked im-tandem mass spectometry.

SERBEST VE BAĞLI HORMONLAR

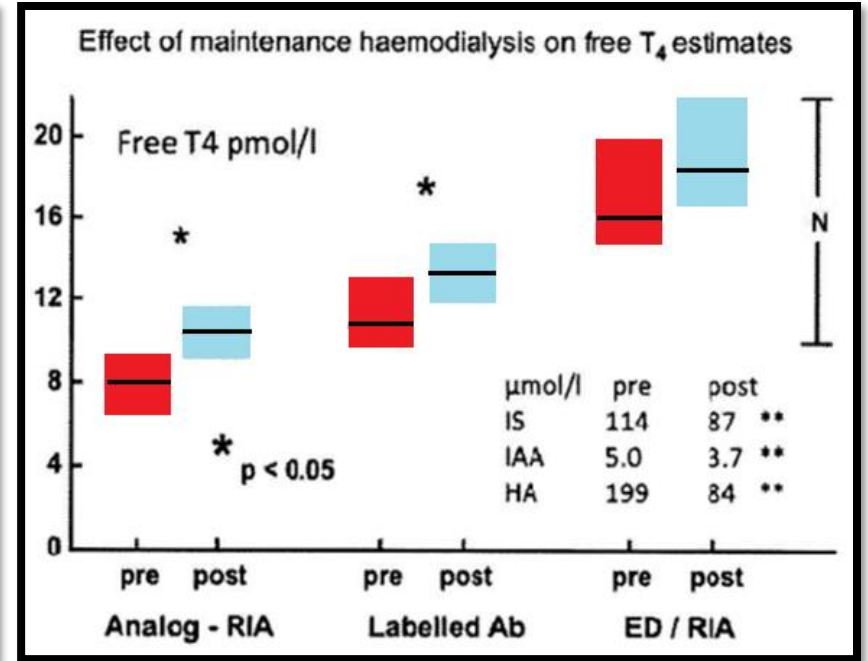
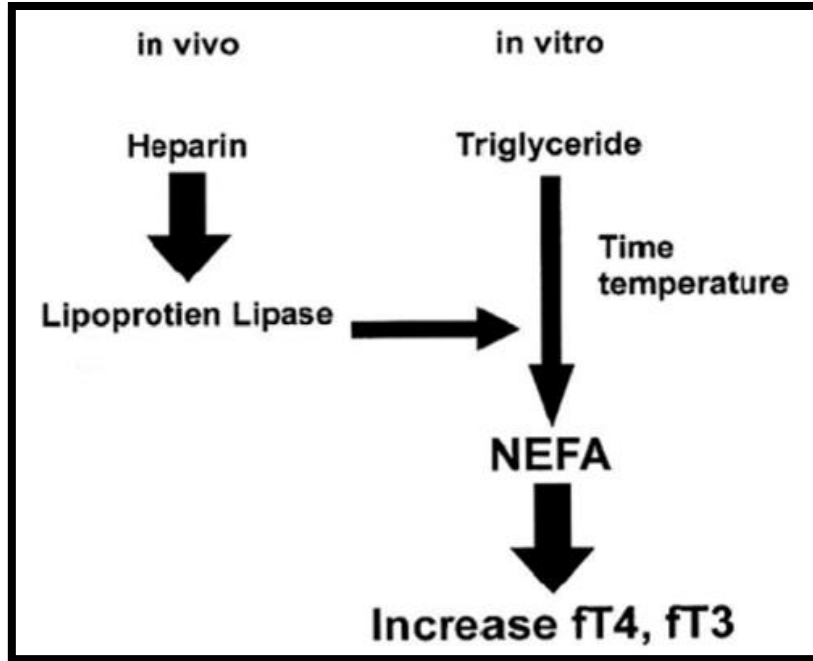


Diyabetik ketoasidoz → FT3, FT4 yüksekliği

Heparin → FT3, FT4 yüksekliği

İLAÇLAR

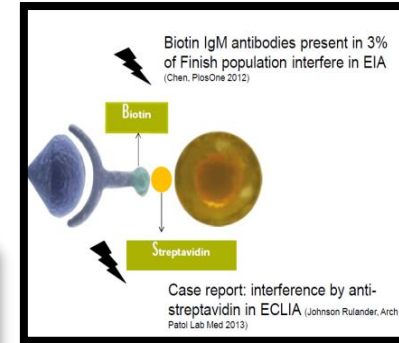
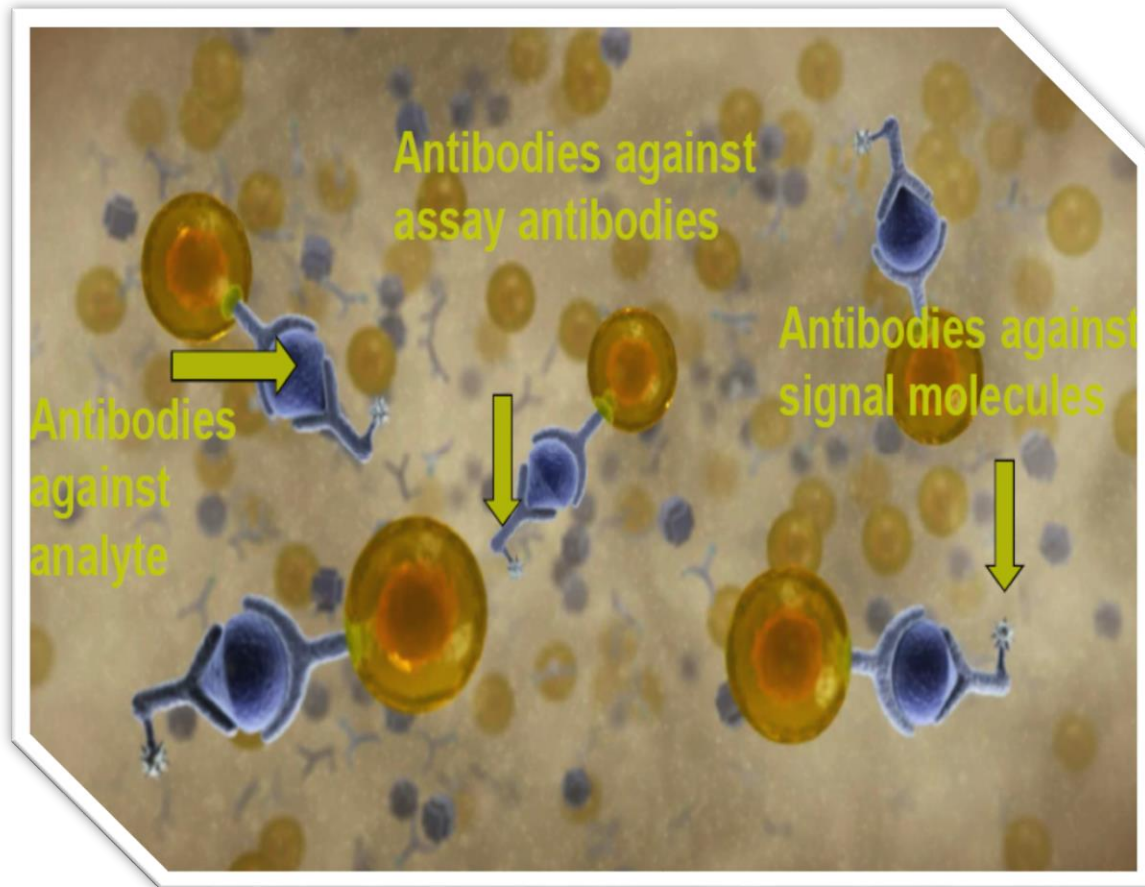
In vivo heparin tedavisi in vitro FT3 ve FT4 düzeylerinde artış



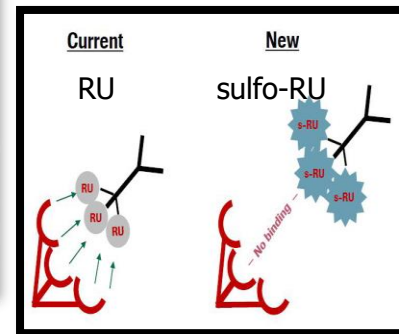
J.R. Stockigt, C.-F. Lim / Best Practice & Research Clinical Endocrinology & Metabolism 23 (2009) 753–767

Fraksiyone ya da unfraksiyone heparin alan hastalarda heparinin indüklediği lipoprotein lipaz aktivitesi nedeniyle artan serbest yağ asitleriyle taşıyıcı proteinlerden T3,T4'ün yerdeğiştirmesi (preanalitik gecikme önemli)

ENDOJEN ANTİKORLAR



Anti-RU

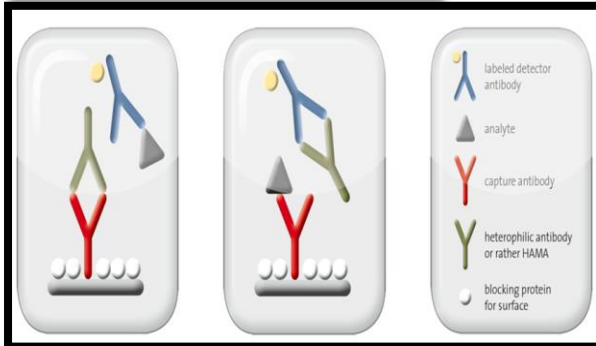
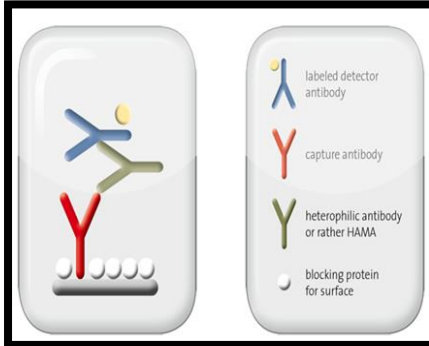
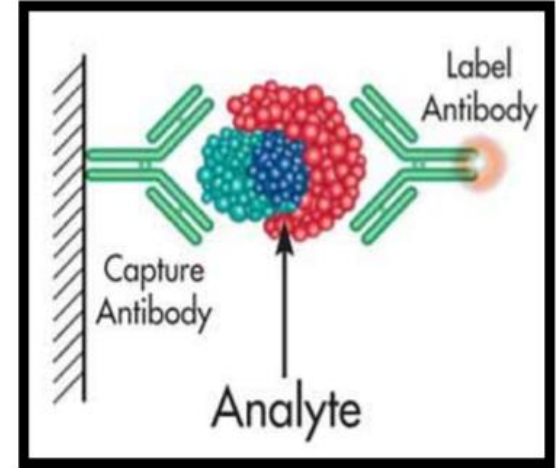
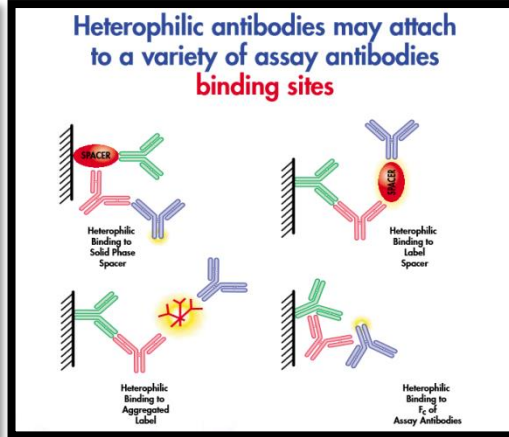
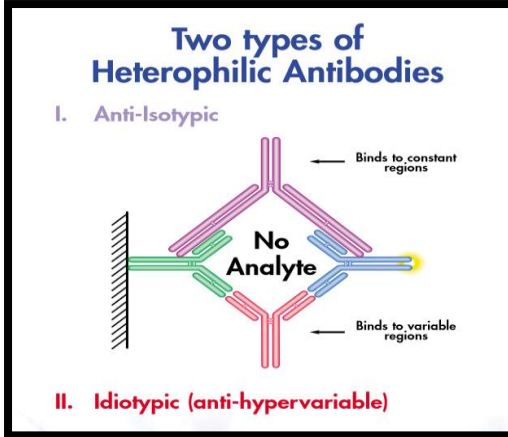




	Heterofilik	HAMA	RF
Etiyoloji	Bilinen bir immunojen yok	Bilinen antijenik stimulus	Oto-antikor, IgG'nin Fc kısmına karşı gelişen Ig M
Spesifite	Düşük: Farklı Ig türlerini bağlar	Yüksek	Düşük: Farklı Ig türlerinin Fc bölgesini bağlar
Affinite	Düşük	Yüksek	Düşük
Titre	Düşük	Yüksek	Aktif hastalıkta yüksek
Ig	IgG, IgM	IgG, IgA, IgM	Genellikle IgM
Prevalans	%40	Mouse MAbs ile tedavi edilen hastaların %40-70'inde	%5-10 %70 Otoimmun romatizmal hastalıkta

Annals of Clinical Biochemistry Volume 48 September 2011
Sturgeon and Viljoen. Immunoassay error and interference

HETEROFİLİK ANTİKOR



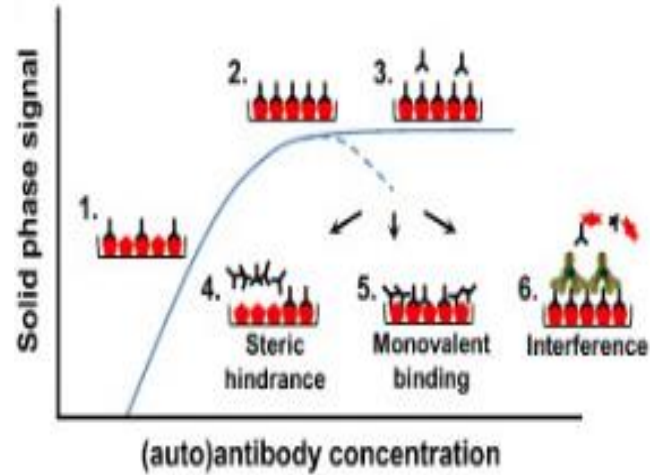
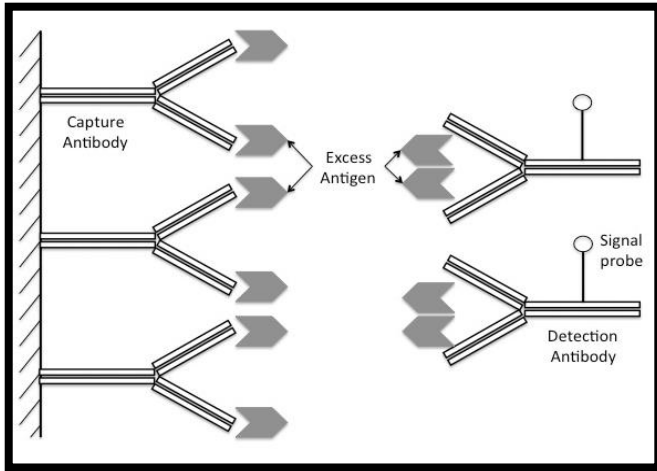
Animal-derived pharmaceuticals

Drug	Source	Ref.#
Antibody-targeted imaging reagents	Mouse	23
	Rat	24
Antibody-targeted drugs	Mouse	23
	Rat	24
Anti-thymocyte globulin	Horse	25
	Rabbit	26
Anti-snake venom	Horse	27
Calcitonin	Salmon	28
Digibind (anti-digoxin Fab)	Sheep	29
Factor VIII	Pig	30
Insulin	Pig	31
Vaccines	Rabbit	32
	Chicken	33
Patent Medicines	Rabbit	34

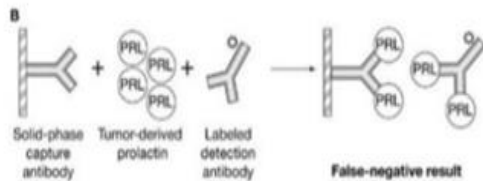
Ref: Kricka, Larry J., "Human Anti-Animal Antibody Interferences in Immunological Assays." *Clin Chem* 45:7, 942-956 (1999)

İnterferansa neden olan antikor kaynakları:
 İmmunoterapi, aşı, kan transfüzyonu ya da tanısal görüntüleme mouse monoklonal antikorların kullanılması ve kanser tedavisi, mikrobiyal ajanlara ve yabancı hayvan proteinlerine maruziyet, RA gibi otoimmün hastalıklar

HOOK ETKİSİ (KANCA ETKİSİ)



- Mildly elevated prolactin level
- A Very large pituitary tumor



To distinguish

1. Large prolactinoma → Dilution of sample and recheck prolactin
2. NFPA

ÇAPRAZ REAKTİVİTE

Changing specificity of cortisol assays.

	Cross reactivity (%)				
	Roche	Centaur	Immulite	DXi	Architect
<i>Specificity of cortisol assays (serum steroids) 2014</i>					
Cortisol	100	100	100	100	100
Corticosterone	5.8	5.3	1.2	2.1	0.9
Cortisone	0.3	31.1	1.0	8.1	2.7
11-Deoxycortisol	4.1	23.3	1.6	17.8	1.9
17- α -OH-progesterone	1.5	1.2	0.2	5.3	0.6
Progesterone	0.4	< 0.1	< 0.1	0.50	< 0.1
11-Deoxycorticosterone	0.7	1.8	< 0.1	0.9	< 0.1
Prednisolone	171	109	62	7.6	12.3
5 α -Tetrahydrocortisol	165	6.5		??	??
Fludrocortisone	Not tested	Not tested	??	Not tested	36.6
Dexamethasone	< 0.1	0.2	< 0.1	< 0.1	< 0.1
<i>Specificity of cortisol assays (serum steroids) 2017</i>					
Cortisol	100	100	100	100	100
Corticosterone	2.5	5.3	1.2	2.1	0.9
Cortisone	6.6	31.1	1.0	8.1	2.7
11-Deoxycortisol	4.9	23.3	1.6	17.8	1.9
17- α -OH-progesterone	< 0.1	1.2	0.2	5.3	0.6
Progesterone	0.4	< 0.1	< 0.1	0.50	< 0.1
11-Deoxycorticosterone	0.6	1.8	< 0.1	0.9	< 0.1
Prednisolone	8	109	62	23.9	12.3
5 α -Tetrahydrocortisol				< 0.1	0.5?
Fludrocortisone	0.2				36.6
Dexamethasone	< 0.1	0.2	< 0.1	< 0.1	< 0.1

Clinical Biochemistry 50 (2017) 1306–1311

ÇAPRAZ REAKTİVİTE

Estradiol immunoassays – interference from the drug fulvestrant (Faslodex®) may cause falsely elevated estradiol results

Government of Canada / Gouvernement du Canada | **October 18, 2016** | Canada.gc.ca | Services | Departments | Français

Recalls and safety alerts

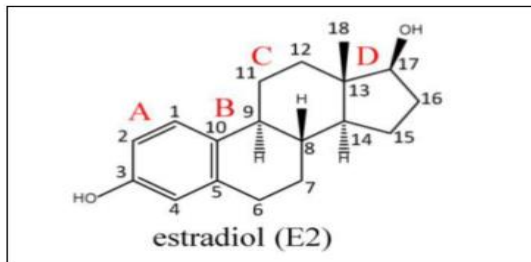
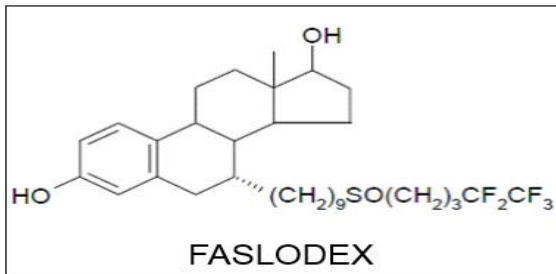
Recalls & alerts · Kids · Food · Your Health · Environment · Consumer products

Home > Recalls & alerts

FASLODEX (fulvestrant) - Risk of Unnecessary Therapy Modification due to Falsely Elevated Estradiol Levels

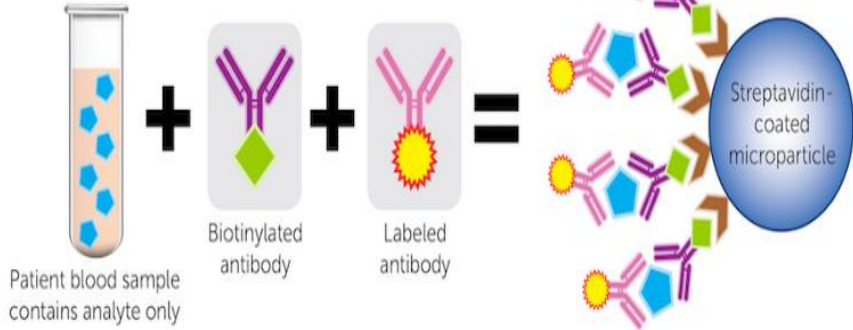
Share Contrast Print

There have been reports that FASLODEX can interfere with estradiol blood tests and produce incorrect results. Incorrect test results could potentially lead to beneficial therapy being changed or stopped unnecessarily. In rare cases, misinterpreting a patient as premenopausal can lead to unnecessary surgery.

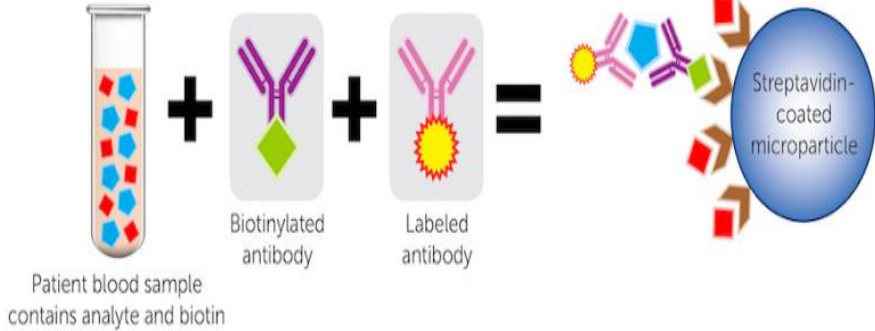


BIOTİN TEDAVİSİ

Biotin-free patient sample



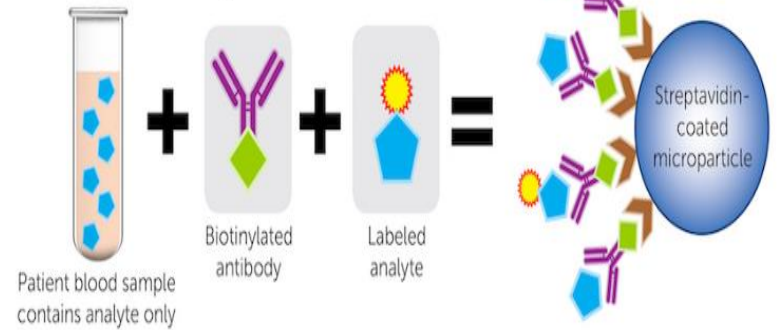
Biotin-containing patient sample



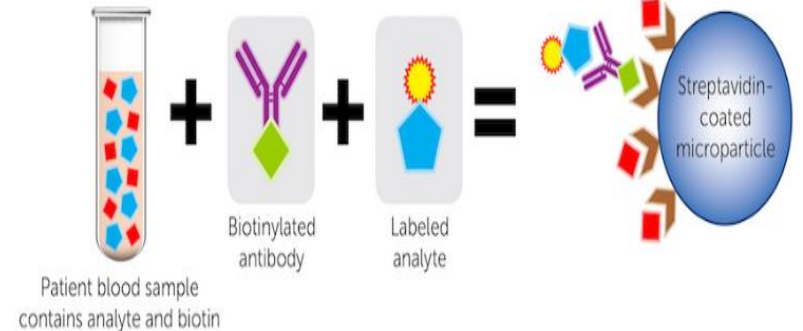
Sandwich format

◆ Biotin in patient sample

Biotin-free patient sample



Biotin-containing patient sample



Yarışmalı format

◆ Biotin in patient sample

YANLIŞ DÜŞÜK

TBD-BD PREANALİTİK EVRE SEMPOZYUMU
KAYSERİ 2018

YANLIŞ YÜKSEK

Biotin interfered with thyroid-function tests and other tests of serum obtained from a patient with multiple sclerosis who had received a single dose of 300 mg of biotin several hours before the blood sample was obtained.

Trambas et al. NEJM October 27, 2016

Table 1. Biotin Interference with Streptavidin–Biotin Immunoassays Leading to Falsely High Results in Competitive Formats and Falsely Low Results in Sandwich Formats.*

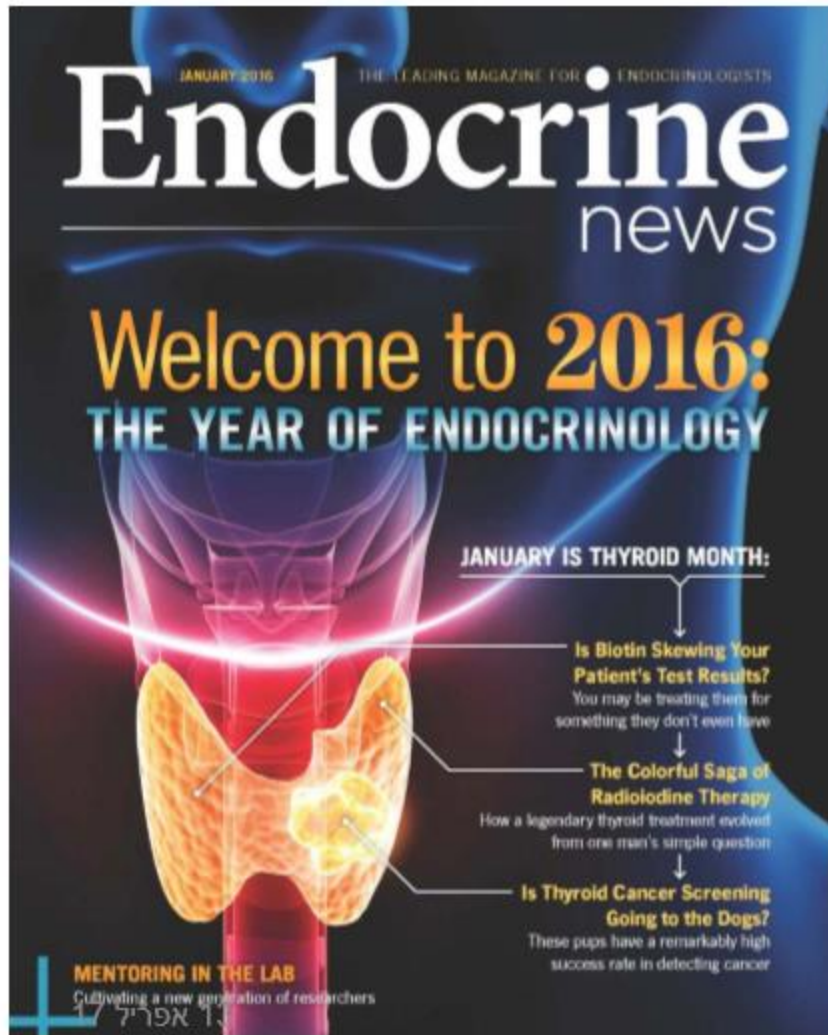
Test	Biotin-Affected Assay		Non–Biotin-Affected Assay	
	Result	Normal Reference Interval, Adults	Result	Normal Reference Interval, Adults
Competitive immunoassays				
Free thyroxine (pmol/liter)	>100.0†	12.0–22.0	11.3	9.0–19.0
Free triiodothyronine (pmol/liter)	17.3†	3.2–6.4	4.5	2.6–6.0
Testosterone (nmol/liter)	42.9†	9.9–27.8	10.1	9.5–28.0
Estradiol (pmol/liter)	740†	<160	73	<160
Progesterone (nmol/liter)	125.4†	<4.3	0.4	<4.1
DHEA sulfate (μmol/liter)	>27.1†	1.2–9.0	6.6	3.0–16.0
Vitamin B ₁₂ (pmol/liter)	>1400†	200–700	380	135–650
Sandwich immunoassays				
Thyrotropin (mU/liter)	0.02‡	0.50–5.50	1.30	0.40–4.00
Prostate-specific antigen (ug/liter)	0.04‡	0.25–3.00	0.60	0.25–3.00
Parathyroid hormone (pmol/liter)	0.6‡	1.6–6.9	2.8	1.6–6.9
Luteinizing hormone (IU/liter)	0.2‡	1.7–8.6	1.4	1.1–8.8
Follicle-stimulating hormone (IU/liter)	0.4‡	1.5–12.4	8.5	1.0–12.0

* DHEA denotes dehydroepiandrosterone.

† Results are falsely high owing to biotin interference.

‡ Results are falsely low owing to biotin interference.

Is Biotin Skewing Your Patient's Test Results?



How can we overcome biotin interference?

- Change autoanalyzer
- Stop Biotin Therapy 12 hours prior to blood draw

Numunedeki biotinin streptavidin partikülleri kullanılarak nötralizasyonu

Table 2: Hormone results observed before and after biotin neutralization (protocol N5, shaded in grey) in the 23 samples. Data listed according to biotin plasma concentrations.

Samples	Biotin	FT3	FT4	TSH	PTH	25OH D	FSH	LH	Prolactine	Cortisol	C peptide
Units	µg/L	pmol/L	pmol/L	mUI/L	ng/L	µg/L	UI/L	UI/L	µg/L	µg/dL	nmol/L
Reference values		3.1–6.8	12–22	0.27–4.2	15–65	30–60				6.2–19	0.37–1.47
V3	31.7	4.8	17.9	2.42	58.0	52	3.7	5.2	6.4	11.5	0.96
	<LOQ	4.6	16.9	2.87	56.6	45	3.7	5.4	6.3	11.1	0.94
V1 ^a	43.9	5.0	19.3	1.16	40.1	46	117	62.3	16.6	10.8	0.98
	<LOQ	4.4	17.6	1.54	41.9	35	132	68	16.4	10.3	0.98
V2	56.8	5.4	20.3	0.76	48.9	41	3.0	4.4	10.4	11.1	1.07
	<LOQ	4.8	18.5	1.07	54.5	33	3.4	4.8	10.2	10.8	1.11
P7	169	5.7	16.7	0.66	13.8	113^b	0.99	5.75	30.6	15.9	0.34
	<LOQ	4.9	13.0	3.90	26.3	>70	2.7	8.9	32.6	13.6	0.42
P9	176	6.5	18.9	0.41	20.6	90.7^b	2.09	2.25	11.3	18.2	0.61
	<LOQ	5.8	15.3	2.40	39.9	54.5	5.8	3.4	11.3	16.1	0.74
P5 ^a	180	5.21	21.4	0.098	10.9	75.6^b	11.1	11.2	19.0	13.5	0.41
	<LOQ	4.6	15.8	1.05	28.7	20.7	41.6	19.9	20.3	11.8	0.54
P8	233	5.6	25.6	0.062	14.5	115^b	0.84	0.96	11.8	11.5	0.57
	<LOQ	4.8	17.7	1.46	34.7	48.4	3.76	1.74	12.3	10.1	0.80
P6 ^a	363	7.75	49.5	0.037	7.67	>140^b	13.8	16.5	9.8	22.0	0.29
	<LOQ	4.5	18.6	1.87	20.3	68.5	132	59.2	11.8	17.9	0.67
T9	407	8.68	56.4	0.02	7.98	>140^b	0.22	0.56	24.2	20.7	0.43
	<LOQ	4.7	16.3	1.21	22.5	26.5	2.0	2.4	28.2	17.6	1.44
P3 ^a	487	13.0	95.8	0.016	7.31	>140^b	3.5	3.2	4.4	11.4	0.11
	<LOQ	5.2	14.6	1.49	30.5	65.1	48.9	24.3	6.9	7.5	0.491
P1	507	11.7	>100	0.008	6.76	>140^b	0.40	0.84	2.1	8.8	0.14
	<LOQ	4.9	17.6	0.83	22.9	17.3	4.9	5.4	3.0	6.0	0.62
T6	669	13.28	>100	0.021	8.63	>140^b	0.28	0.47	9.4	17.7	0.09

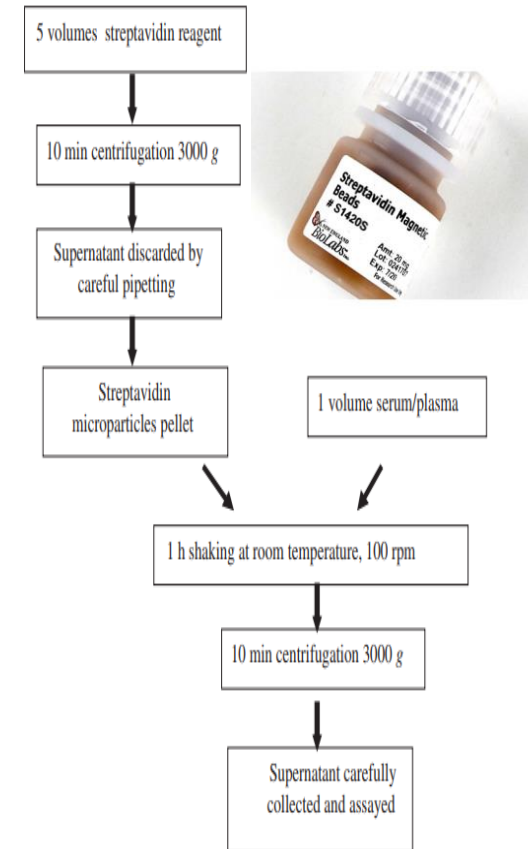


Figure 1: Biotin removal procedure (neutralization protocol N5).

Piketty, 2017 Clin Chem Lab Med

OTOANTİKORLAR

*** Makrohormon

Hormon-Immunglobulin kompleksi

(Makroprolaktin, makro-TSH, makrotroponin, makrokalsitonin)

*** Antitiroglobulin

*** Antiinsülin

*** Anti-T3, antiT4 antikoru (otoimmün tiroid hastalığı olanların \leq %20)
çoğunlukla Ig G ve poliklonal, hastaların
çoğu anti-Tg antikoru da sahip)



Ölçüm formatı

Antikor titresi, affinitesi ve spesifitesi interferansı etkiler

İMMUNOASSAY REAKTİVİTESİ

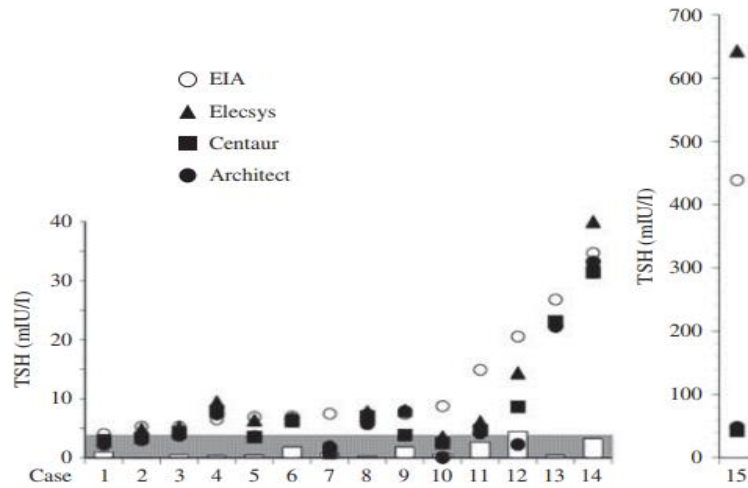
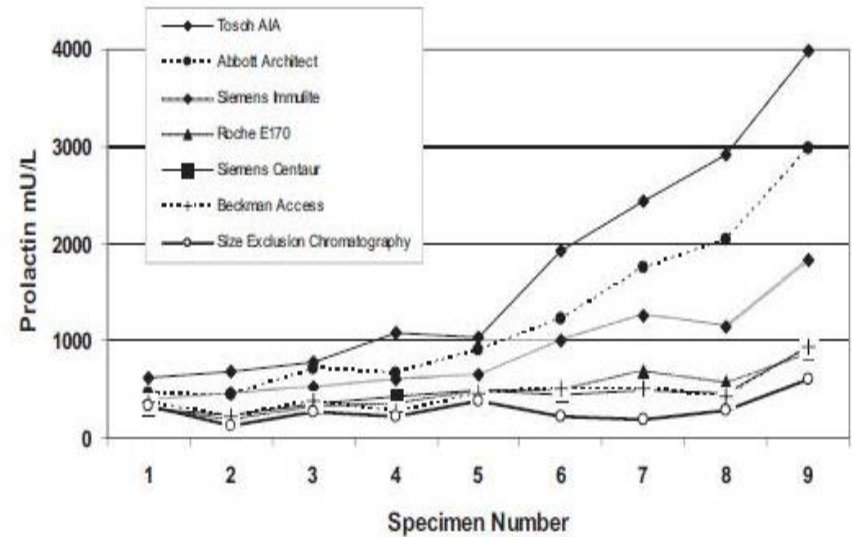


Figure 2

Serum TSH levels determined with different immunoassay systems. Serum TSH values were determined in sera from 15 patients with macro TSH with EIA (○), Elecsys (▲), Centaur (■) and Architect (●), together with monomeric TSH levels shown as open bars. Shaded areas indicate the reference range of TSH determined with EIA.



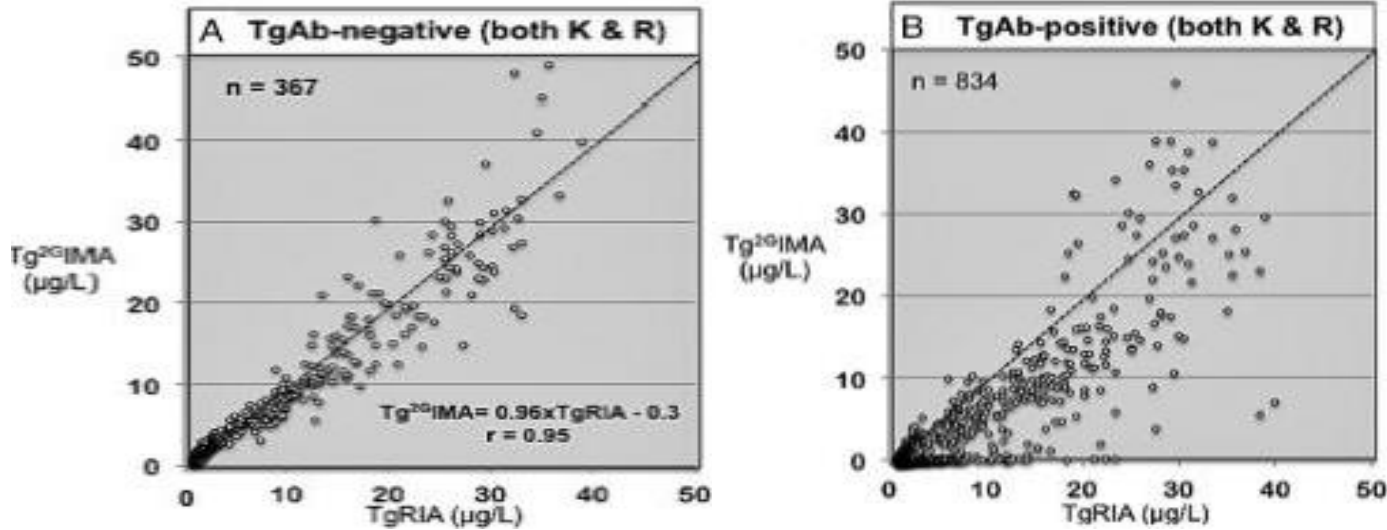
Reaktivite

- Epitop
- Yakalayıcı antikorlarının affinitesi
- İnkübasyon zamanı
- Örnek dilüsyonuna bağlı

Tiroglobulin ölçümünde Anti-TG interferansı

⚠ Anti-Tg interferansı immünoimetrik assaylerde yaygın bir problem

⚠ DTC olan hastaların takibinde, Tg ölçümüne anti-Tg ölçümü eşlik etmeli

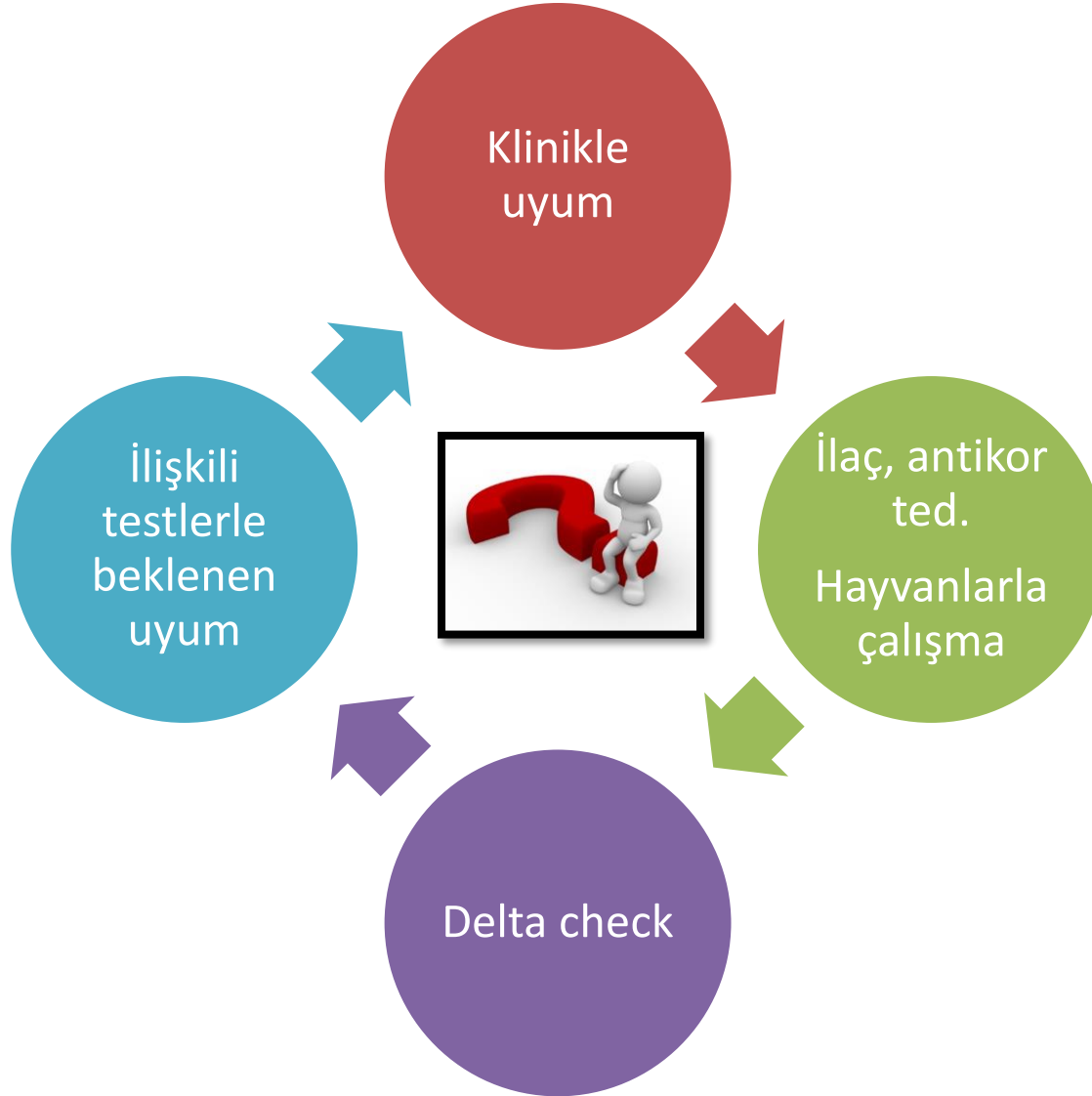


Anti-Tg genel popülasyonun %10'unda
DTC %25'inde
Otoimmün tiroid hastalarının %60'ında

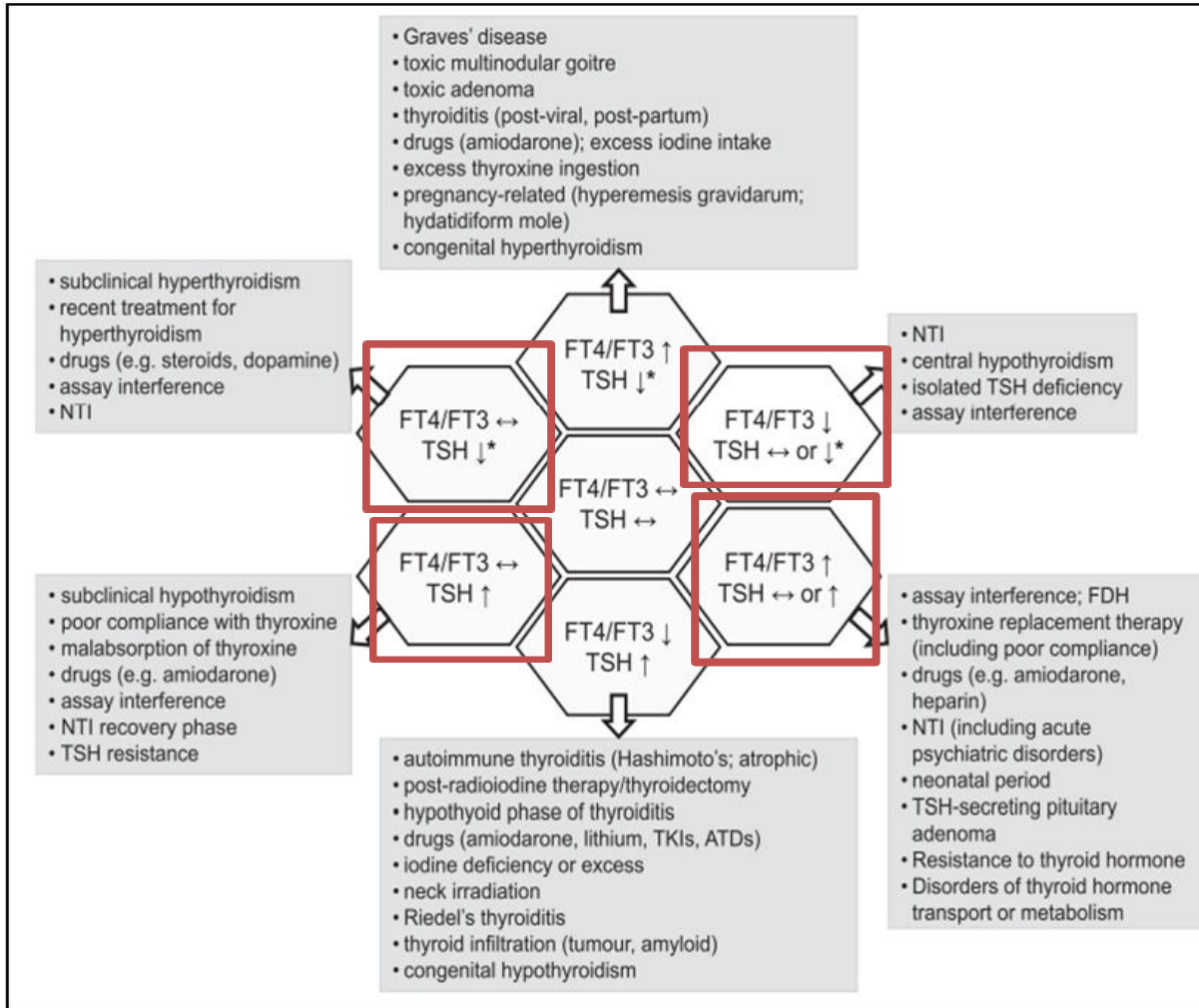
Nonkompetitif assaylerde
yanlış düşük sonuçlar

Spencer et al. JCEEN Tg-RIA and Tg-IMA presence of TgAb
2014; 99: 4589

İNTERFERANSDAN ŞÜPHELENMEK



TİROİD FONKSİYON TESTLERİ



O. Koulouri et al. / Best Practice & Research Clinical Endocrinology & Metabolism 27 (2013) 745–762
 Gurnell et al, Clin Endocrinol 2011 74(6):673-8

TİROİD FONKSİYON TESTLERİ

Table I. **Pitfalls in thyroid interpretation**

Pre-analytical

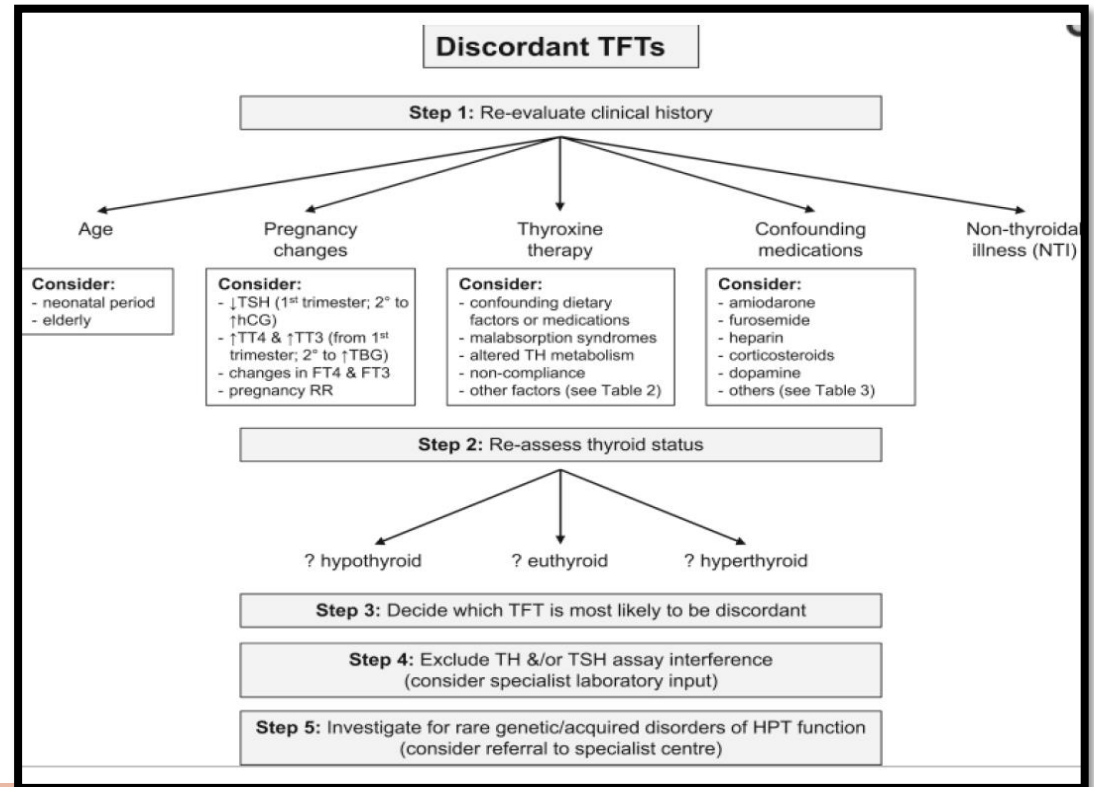
- Anomalous binding of thyroid hormones (T4 & T3) to serum proteins
 - Genetic
 - Drug-induced
 - Disease-induced
 - Pregnancy
- Altered reference intervals for thyroid hormones or TSH
 - Childhood
 - Pregnancy
 - Old age
- Disrupted set point of the hypothalamic-pituitary-thyroid axis
 - Non-thyroidal illness (NTI), including acute psychiatric illness
 - Drugs
 - Unusual thyroid conditions, including thyroid hormone resistance
- Specimens
 - Free fatty acid (FFA)
 - Heparin artifact

Analytical

- Heterophilic antibodies
- Auto-antibodies

Table II. **Effects of some drugs on thyroid function tests**

Cause	Drugs	Effects
Inhibit thyroid hormone synthesis or release from the thyroid gland	Lithium, sulfonyleureas	↓ FT4, ↓ FT3, ↑ TSH
Decreases triiodothyronine hormone production by inhibiting peripheral conversion of FT4 to FT3	Glucocorticoids, propranolol, amiodarone, propylthiouracil	↓ FT3 leads to ↑ FT4
Stimulate TSH secretion	Iodine, lithium, dopamine antagonists, cimetidine	↑ TSH
Inhibit TSH secretion	Glucocorticoids, dopamine agonists, somatostatin	↓ TSH
Inhibit T4 and T3 binding to transport proteins	Phenytoin, sulfonyleureas, diazepam, furosemide, salicylates	↑ FT4, ↑ FT3
Inhibit gastrointestinal absorption of ingested thyroid hormones for those on thyroid treatment	Cholestyramine, ferrous sulfate, aluminum hydroxide, and sucralfate	↓ FT4, ↑ TSH



O. Koulouri et al. / Best Practice & Research Clinical Endocrinology & Metabolism 27 (2013) 745–762

ALGORİTİM

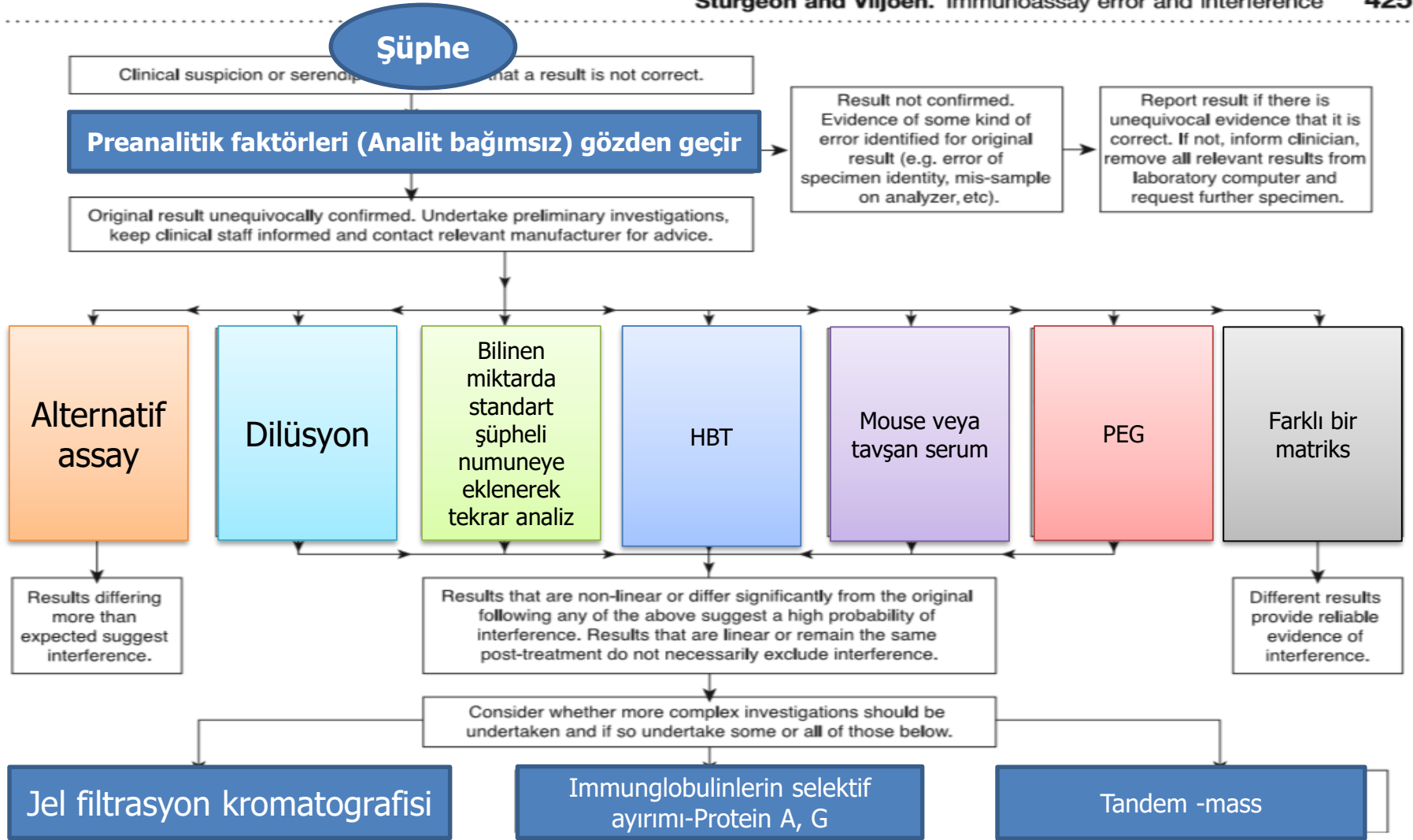


Figure 3 Flow chart showing sequence of investigations that might be undertaken to investigated suspected immunoassay interference

VAKA ÖRNEKLERİ

		Referans aralık
TSH	>100	0.270-4.20 μ IU/mL
FT4	1.75	0.93-1.7 ng/dL
FT3	3.58	2.0-4.4 pg/mL
A-TPO	13.85	<34 IU/mL
A-TG	337	115 IU/mL

	Assay	Alternatif Assay	Referans aralık
FT4	1.75	1.71	0.85-1.65
TSH	>100	0.05	0.34-5.6

ONE-STEP

TWO-STEP

Dilüsyon Hasta	TSH	TSHx DF
1/2	95.35	190
1/5	28.90	144
1/10	11.35	110

PEG	İşlem öncesi	İşlem sonrası	% recovery
Hasta TSH	>100	5.08	%5.3
Kontrol TSH	3.52	2.94	83.5

Dilüsyon kontrol	TSH	TSHx DF
1/2	14.5	30.2
1/5	5.9	29.5
1/10	3.1	31

VAKA ÖRNEKLERİ

Farklı sonuçlar

TARİH	TEST	SONUÇ	Referans aralık
0.9.08.2017	Troponin I	2.26	0-0.1 ng/mL
	CK	138	29-200 U/L
	CK-MB	13	<25 U/L
10.08.2017	Troponin I	1.5	
	CK	64	
	CK-MB	19	
14.08.2017	Troponin I	1.48	
	CK	39	
	CK-MB	12	

	Assay 1 Troponin Ths	Assay 2 Troponin I	Assay 3 Troponin I	Assay 4 Troponin I	Referans aralık
Troponin	0.003	0.002	0.001	<0.1	<0.014

Dilüsyon Hasta	Troponin	Troponin xDF
1/5	0.187	0.935
1/10	0.055	0.550
1/20	0.002	0.04

Azalmış
recovery

PEG	İşlem öncesi	İşlem sonrası	% recovery
Hasta Troponin	2.34	0.01	0.85
Kontrol Troponin	0.62	0.52	83.8

Dilüsyon	Troponin	Troponin xDF
1/5	7.23	36
1/10	3.65	36.5
1/20	1.64	32.8

Nedenler:

Heterofil antikor, HAMA, otoantikorlar, RF, kandaki endojen komponentler, yüksek ALP aktivitesi, makro-immun kompleks oluşumu

HBT	İşlem öncesi	İşlem sonrası
Troponin I	2.34	2.18



Thyroxine (T4) Autoantibody Interference of Free T4 Concentration Measurement in a Patient With Hashimoto's Thyroiditis

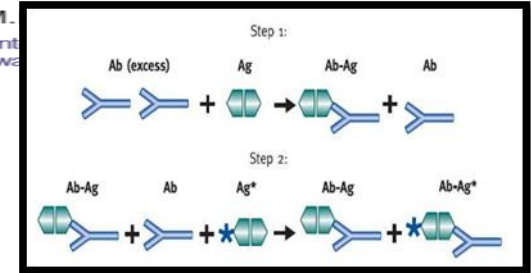
Mi-Na Lee, M.D.¹, Soo-Youn Lee, M.D.², Kyu Yeon Hur, M.D.³, and Hyung-Doo Park, M.D.¹
Green Cross Laboratories¹, Yongin; Department of Laboratory Medicine and Genetics², Samsung Medical Center, Seoul; Division of Endocrinology³, Department of Medicine, Samsung Medical Center, Sungkyunkwan University, Seoul

Table 1. Comparison of thyroid hormone test results according to the method of detection

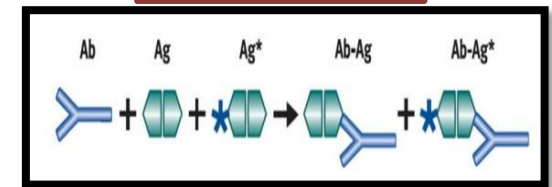
Test item	SI Unit	Siemens (One-step)	RI	Abbott (Two-step)	RI	RIA	RI	Direct dialysis	RI
Free T4	pmol/L	54.70	11.46–23.17	13.00	9.01–19.05	16.73	8.24–22.14	11.58	10.30–34.75
Total T4	nmol/L	140.28	41.18–162.16	Not tested	Not applicable	Not tested	Not applicable	Not applicable	Not applicable
TSH	mIU/L	6.23	0.55–4.78	5.97	0.35–4.94	7.98	0.3–6.50	Not applicable	Not applicable
Total T3	nmol/L	1.50	0.92–2.79	1.55	0.89–2.45	1.77	1.17–2.93	Not applicable	Not applicable

Abbreviations: RI, reference interval; RIA, radioimmunoassay; T3, triiodothyronine; T4, thyroxine; TSH, thyroid stimulating hormone.

TWO-STEP

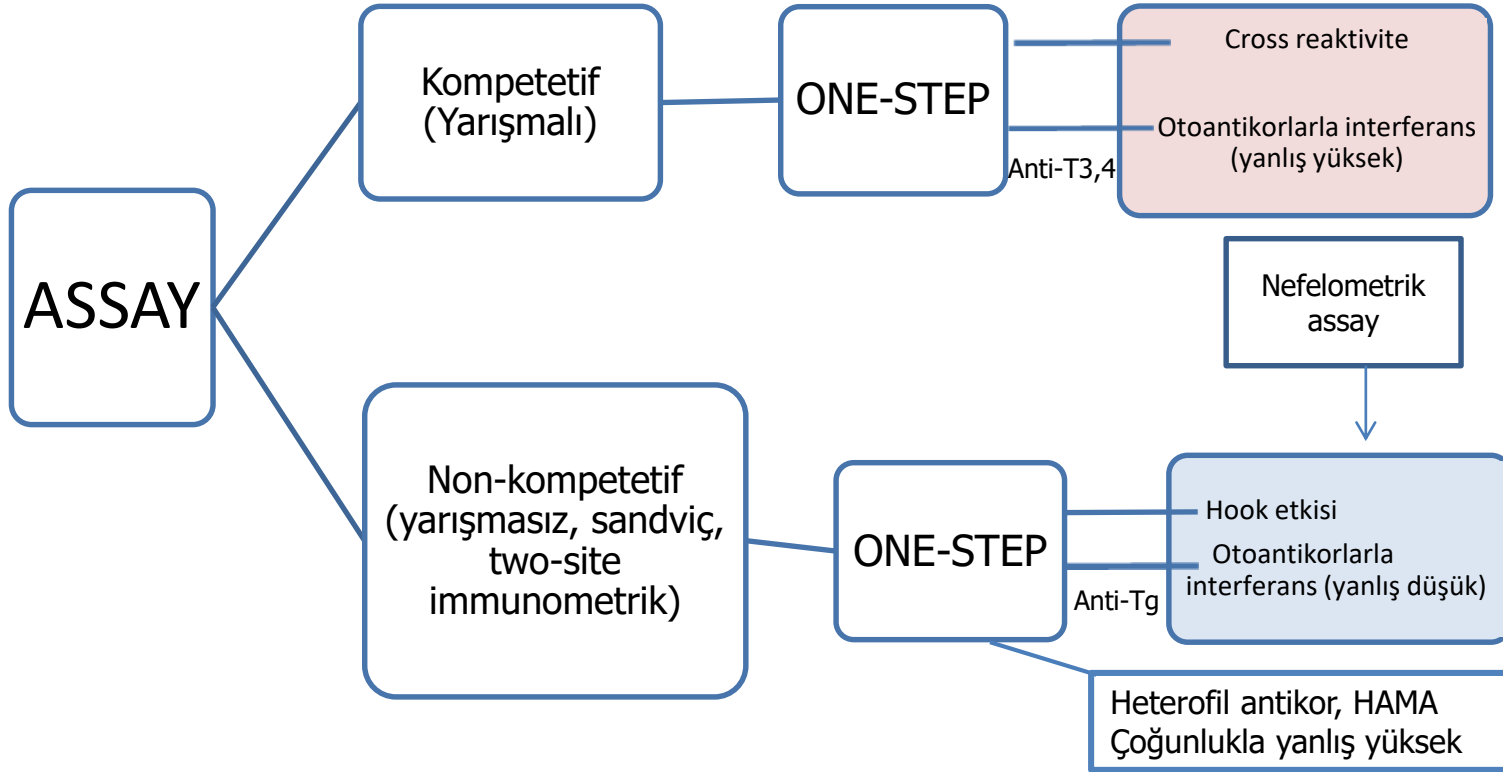


ONE-STEP

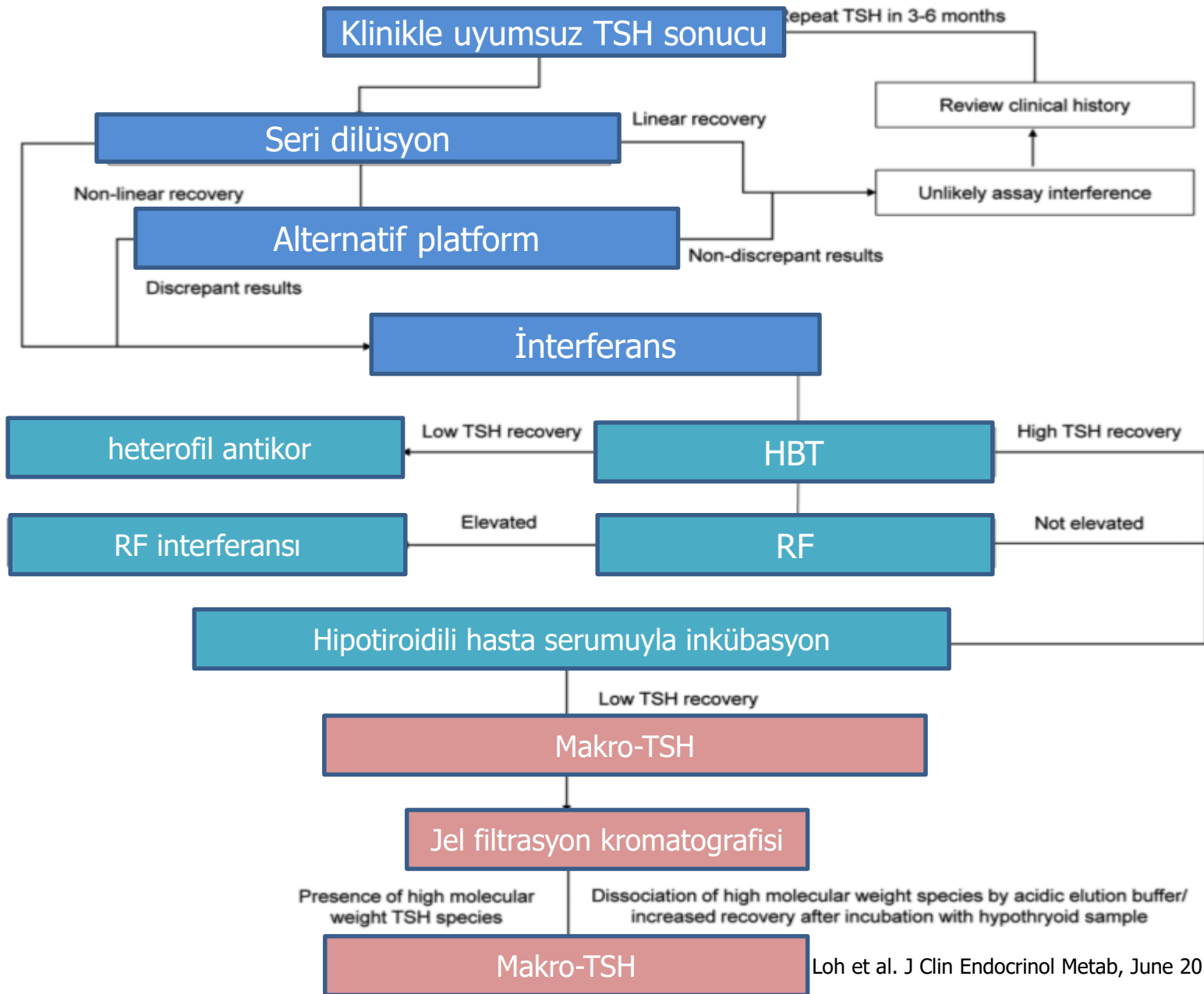


Two-step assay işaretli antijen ilave edilmeden önce yıkama basamağıyla bağlanmayan FT4 ve interferans oluşturan faktörler elimine ediliyor.

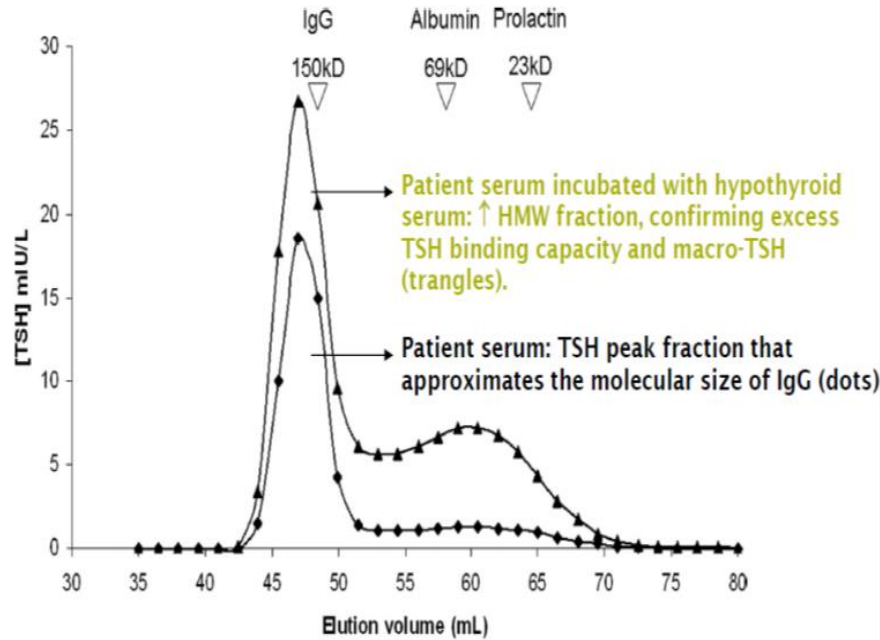
IMMUNOASSAY FORMATI



ALGORİTİM



Makro-TSH'ın jel filtration kromatografisi ile konfirmasyonu



The Five Immunoglobulin (Ig) Classes					
	IgM pentamer	IgG monomer	Secretory IgA dimer	IgE monomer	IgD monomer
Heavy chains	μ	γ	α	ϵ	δ
Number of antigen binding sites	10	2	4	2	2
Molecular weight (Daltons)	900,000	150,000	385,000	200,000	180,000
Percentage of total antibody in serum	6%	80%	13%	0.002%	1%
Crosses placenta	no	yes	no	no	no

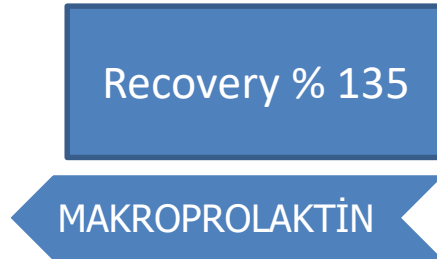
Yüksek molekül ağırlıklı TSH fraksiyonu artıyor

Loh T P, JCEM 2012

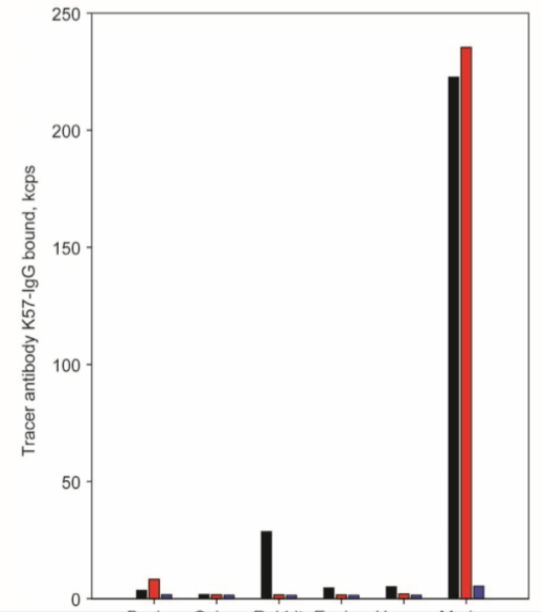
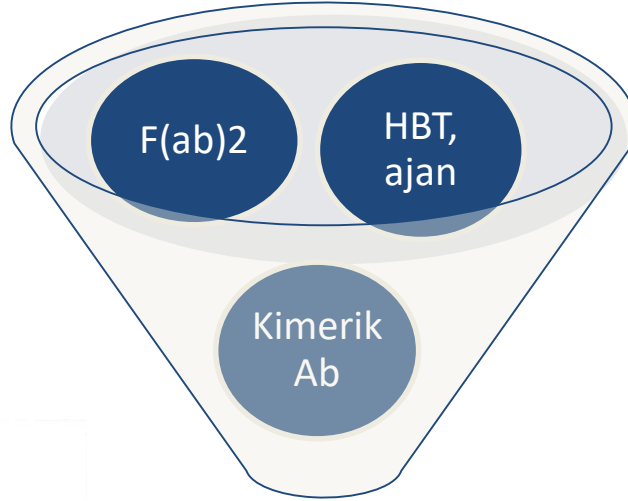
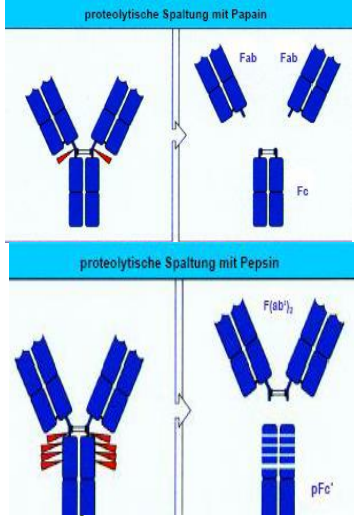
	MAKRO-HORMON
Alternatif assay	İmmunreaktivitesine bağlı olarak değişebilir
HBT	Etki yok
Seri dilüsyon	Recovery ↑ ya da N (disosiasyon nedeniyle)
PEG ile presipitasyon	Recovery ↓
Dışarıdan analit eklemek (hipotiroidili hastanın serumu)	Recovery ↓ (Serbest anti-hormon antikorlar eklenen analite bağlanır)

	Heterofilik Antikor
Alternatif assay	Farklı sonuçlar
HBT	Recovery ↓
Seri dilüsyon	Recovery ↓
PEG ile presipitasyon	Recovery ↓

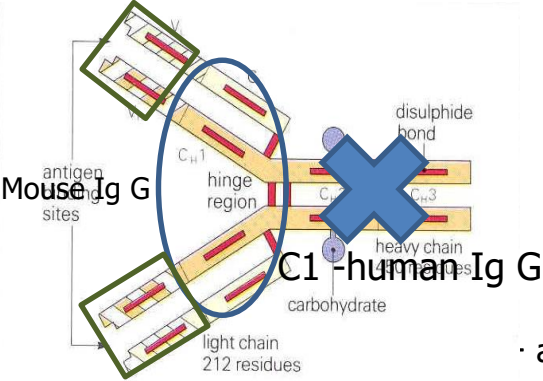
Dilüsyon	PRL
1/1	63.41
1/2	70.71
1/5	80.82
1/10	86.46



HETEROFİL ANTİKOR İNTERFERANSINI AZALTMAK



Heterofilik antikorların farklı hayvan türlerine ait Ig G'ye reaktivitesi

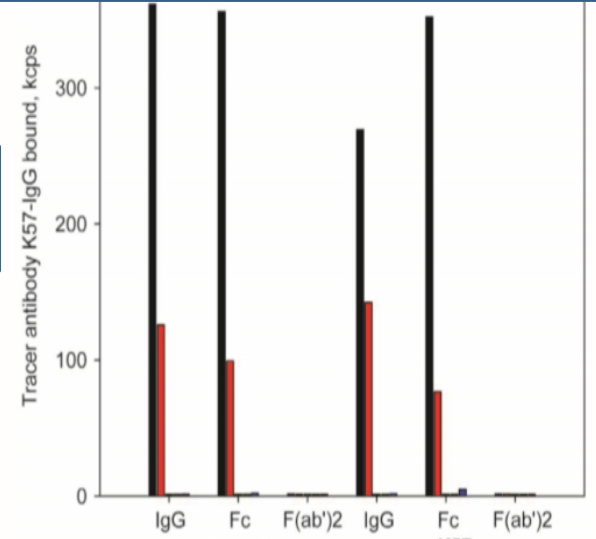


Immunoassaylerde interferansı azaltmak mümkün

- animal serum
- animal nonimmune immunoglobulin
- aggregated mouse monoclonal IgG1 (MAK33)

“blocking agent” assay antikorlarıyla aynı tür

Clin Chem Lab Med 2011;49(12):2001–2006



Heterofilik antikorların murine Ig G1 fragmanlarına reaktivitesi

Yapılan işlem	İnterferans kaynağı	İşlem sonrası	Sonuç	Dezavantajları
PEG ile presipitasyon	Analit-Antikor kompleksi (Makro) Endojen antikorlar (Heterofil, HAAA, otoantikorlar)	Düşük % recovery Ig G ve M 'in tamamını, Ig A'nın %50-80'ini çöktürür	İnterferansa neden olan yüksek molekül ağırlıklı maddelerin varlığını gösterir	Farklı analitler için PEG konsantrasyonu ? Farklı analitler için % recovery değerinin belirlenmesi PEG prosedürü analit için valide edilmeli Matriks etkisi nedeniyle ölçüm yapılamayabilir Çoklu test interferansı için uygun olmayabilir Spesifik değil
Alternatif immunoassay	Her şey olabilir	Farklı sonuçlar	Analitik bir hata yoksa interferans varlığını destekler	Alternatif bir assayle de aynı interferans görülebilir
Dilüsyon	Hook effect Heterofil antikor	Artmış değerler Lineariteden sapma	Aşırı analit fazlalığı	Lineariteden sapma olmaması interferansı ekarte ettirmez
Heterofil antikor bloke eden tüp/reaktif	Heterofil antikor	Düşük % recovery	Heterofil antikor	Heterofil antikor bloke eden reaktiflerin kendisi de bazı assaylerde interferansa neden olabilir. İşlem sonrası düşük recovery eldeedilmemesi interferansı dışlamaz
Protein G, A, A/G, L	Analit-Antikor kompleksi (Makro) Endojen antikorlar (Heterofil, HAAA, otoantikorlar)	Düşük % recovery Sadece Ig G'yi bağlar	İnterferansa neden olan yüksek molekül ağırlıklı Ig G	Pahalı
Dışarıdan analitin eklenmesi	Otoantikorlar	Düşük % recovery	Analit-Antikor kompleksi (Makro) lehine	

I/LA30-A

Immunoassay Interference by Endogenous Antibodies; Approved Guideline

This guideline discusses the nature and causes of interfering antibodies, as well as their effects on immunoassays and mechanisms by which interference occurs. Methods to identify and characterize the interferences are addressed along with assessment of methods used to eliminate interference.



**SABRINIZ İÇİN
TEŞEKKÜRLER**