Normwerte im Schilddrüsenlabor

Expertengespräche
Die Schilddrüse – was ist normal?
Wien 28.11.2014

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Schilddrüsenordination Graz

Schilddrüsenambulanz der Internen Abteilung

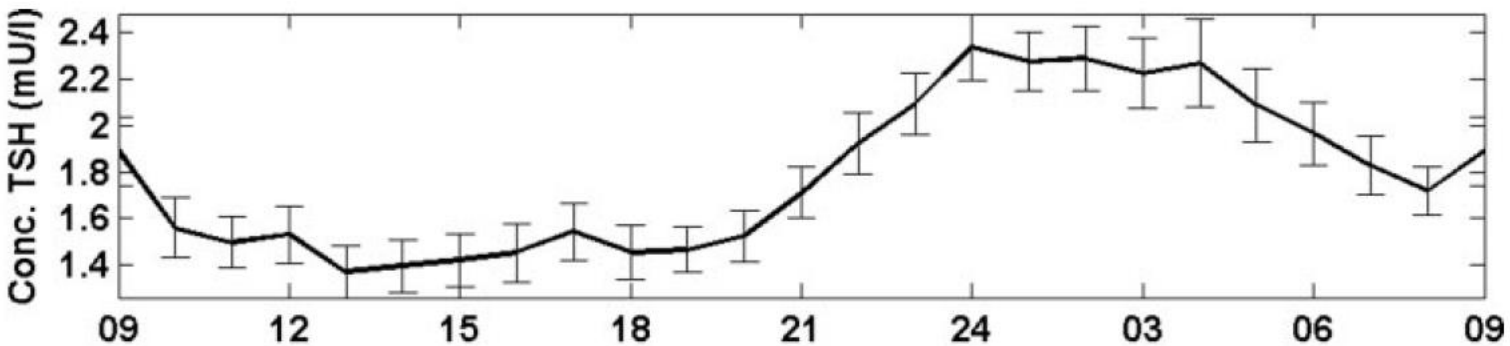
Krankenhaus der Barmherzigen Brüder Graz-Eggenberg

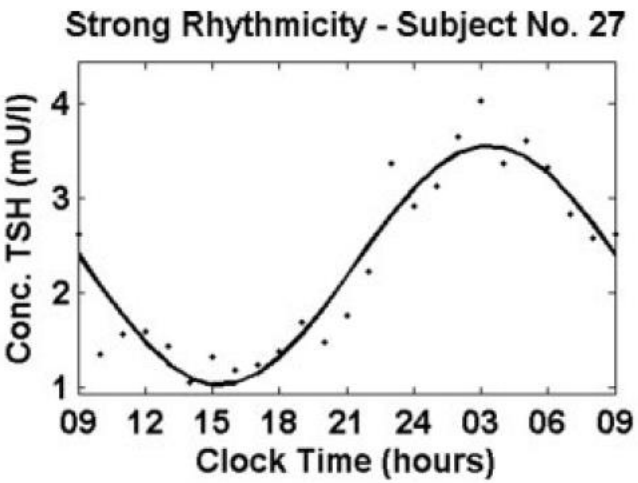
Schilddrüsenlabor

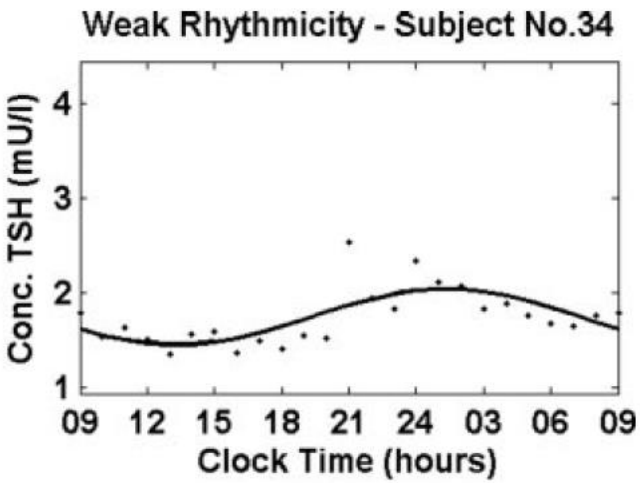
- Normwert: Referenzbereiche (bezogen auf die Gesamtbevölkerung)
- Graubereiche (noch normal oder schon pathologisch)
- altersspezifische/genderspezifische Referenzbereiche
  Kinderwunsch
  Schwangerschaft
  Alter

Schilddrüsenlabor

- TSH
- Schilddrüsenhormone (FT3, FT4)
- Schilddrüsenantikörper
  Antikörper gegen Thyreoglobulin
  Antikörper gegen Schilddrüsenperoxidase
  TSH-Rezeptor-Antikörper
- Tumormarker
  Thyreoglobulin
  Kalzitonin







Free Triiodothyronine Has a Distinct Circadian Rhythm That Is Delayed but Parallels Thyrotropin Levels

W. Russell,* R. F. Harrison,* N. Smith, K. Darzy, S. Shalet, A. P. Weetman, and R. J. Ross

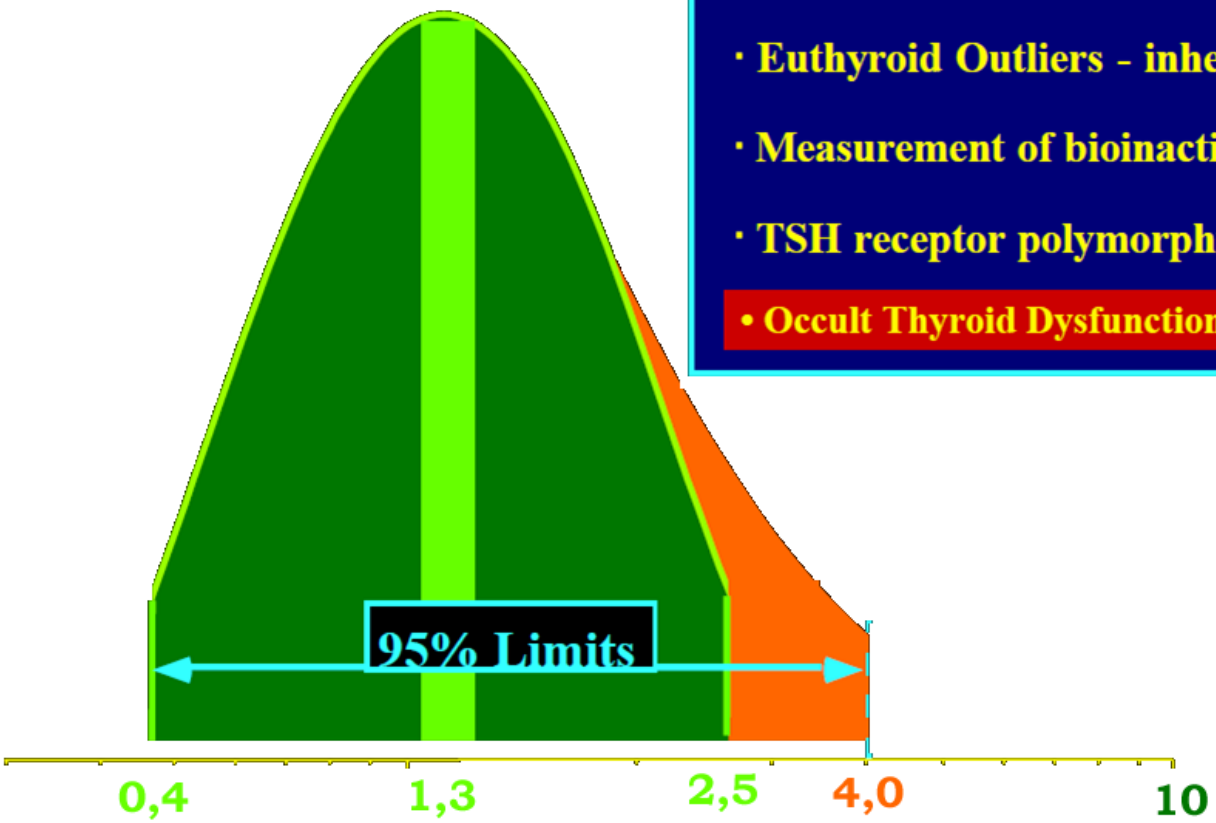
Academic Unit of Diabetes (W.R., A.P.W., R.J.R.), Endocrinology & Metabolism, and Department of Automatic Control and Systems Engineering (R.F.H.), The University of Sheffield, Sheffield S1 3JD, United Kingdom; Chemical Pathology (N.S.), Royal Hallamshire Hospital, Sheffield S10 2JF, United Kingdom; and Department of Endocrinology (K.D., S.S.), Christie Hospital, Manchester M20 4BX, United Kingdom

jcem.endojournals.org J Clin Endocrinol Metab. June 2008, 93(6):2300–2306

TSH Population Reference Range

Reasons for the persistent skew in the TSH upper limit include:

- Euthyroid Outliers - inherent TSH lability
- Measurement of bioinactive TSH isoforms
- TSH receptor polymorphisms - ↓TSH sensitivity
- Occult Thyroid Dysfunction (Hashimotos' Thyroiditis)



Aus: Carole Spencer: New Insights Regarding the TSH Reference Range

TSH Reference Ranges Differ For 9 Different Manufacturers Assays

TSH Kit	TSH Range
Roche Elecsys	0.27- 4.0
Immulite 2000	0.40- 4.0
Tosoh A1A	0.34- 3.8
Bayer Centaur	0.35- 5.5
Beckman Access	0.35- 3.5
Abbott AxSym	0.49- 4.7
Abbott Architect	0.35- 4.9
Ortho Eci	0.30- 3.1

Carole Spencer MD PHD - How should the TSH reference range be determined?

Perhaps the most respected expert on the TSH test and reference range is Carole Spencer MD PhD, Professor of Research at the Keck School of Medicine at the University of Southern California. (9-10) Carole Spencer says:

"It is impossible to establish a range using population data. The TSH upper reference limit is really a moving target. It depends upon the population being studied, the underlying pathology and iodine intake of that population, as well as the specificity of the assay for detecting the various TSH isoforms present in sera."

She also says: *"It is not possible to establish a universal TSH upper limit from population data.* ***An appropriate compromise would be to adopt an empiric TSH reference range approximating 0.3 to 3 mIU/L, as suggested by AACE****. It is important to recognize that the upper TSH reference limit is not the therapeutic threshold for initiating levothyroxine replacement therapy. "*

Table 7
Thyrotropin Upper Normal

Group, study, society	TSH upper normal	Comments
NACB	2.5	When there is no evidence of thyroid disease
NHANES III, disease free	4.5	No self-reported thyroid disease Not on thyroid medications
NHANES III, reference population	4.12	No self-reported thyroid disease Not on thyroid medications Negative anti-thyroid antibodies Not pregnant Not on estrogens, androgens, lithium
Hanford Thyroid Disease Study	4.10	No evidence of thyroid disease Negative anti-thyroid antibodies Not on thyroid medications Normal ultrasound (no nodules or thyroiditis)
Pregnancy, first trimester	2.0-2.5	See sections *L-thyroxine treatment of hypothyroidism* and *Hypothyroidism during pregnancy*
Pregnancy, second trimester	3.0	See sections *L-thyroxine treatment of hypothyroidism* and *Hypothyroidism during pregnancy*
Pregnancy, third trimester	3.5	See sections *L-thyroxine treatment of hypothyroidism* and *Hypothyroidism during pregnancy*

Sources: Stagnaro-Green et al., 2011 (10); Hollowell et al., 2002 (11); Hamilton et al., 2008 (81); Baloch et al., 2003 (85).
NACB, National Academy of Clinical Biochemists; NHANES, National Health and Nutrition Examination Survey

988 ENDOCRINE PRACTICE Vol 18 No. 6 November/December 2012

CLINICAL PRACTICE GUIDELINES FOR HYPOTHYROIDISM IN ADULTS: COSPONSORED BY THE AMERICAN ASSOCIATION OF CLINICAL ENDOCRINOLOGISTS AND THE AMERICAN THYROID ASSOCIATION

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for the American Association of Clinical Endocrinologists and American Thyroid Association Taskforce on Hypothyroidism in Adults

Tabelle 4. Richtwerte für Referenzintervalle für Kinder [29]

Alter	TSH mU/L	FT4 pmol/L
Frühgeborene 2.–4. Tag	0,8–6,9	5,2–36
Neugeborene 3. Tag	1,3–16	25,7–51,5
Kinder 1–12 Monate	0,9–7,7	11,6–33,5
Kinder präpubertär	0,6–5,5	10,3–28,3
Kinder pubertär	0,5–4,8	10,3–29,6

Labordiagnostischer Leitfaden zur Abklärung von Funktionsstörungen und Erkrankungen der Schilddrüse

Christian Bieglmayer[1], **Wolfgang Buchinger**[3], **Manuela Födinger**[1], **Mathias M. Müller**[1], **Pranav Sinha**[1], **Marietta Vogl**[1], **Michael Weissel**[2] und **Wolfgang Zechmann**[3]

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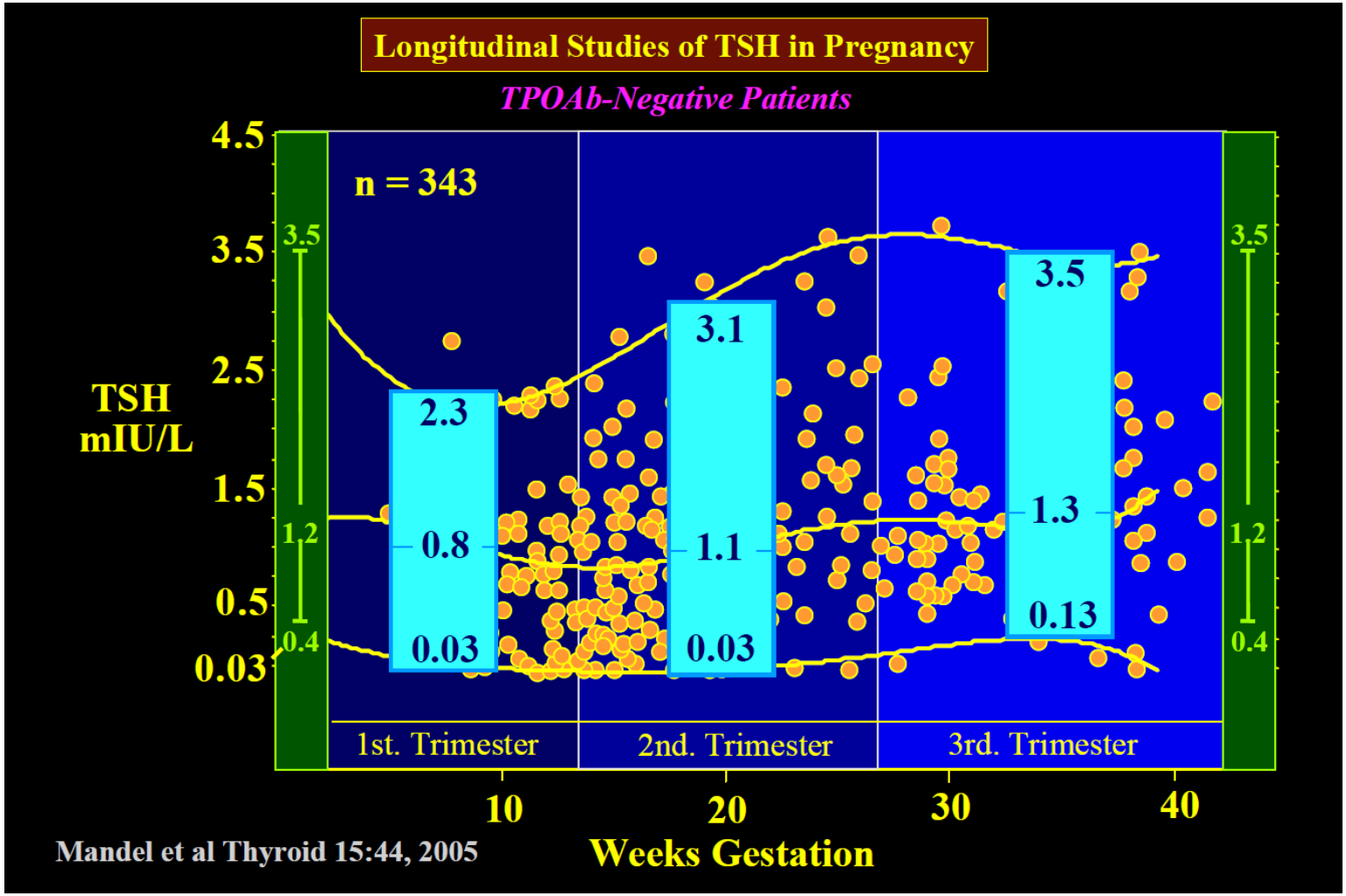
TSH-Verlauf
Unterschiedliche trimesterabhängige Normbereiche



Mütterlicher FT4 Spiegel in der 13. und 28. SSW indirekt proportional mit dem Geburtsgewicht

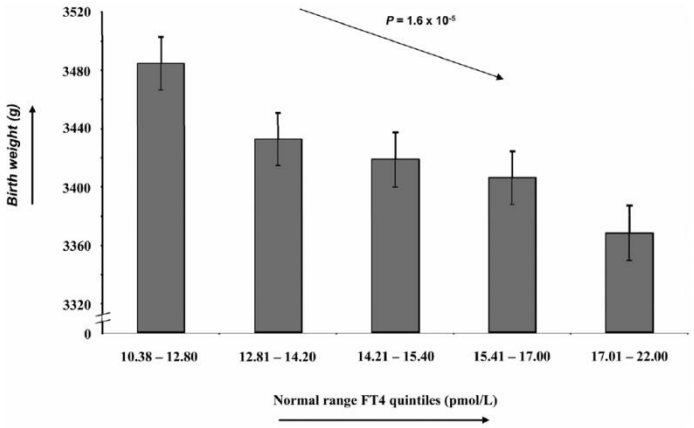


FIG. 1. Maternal early pregnancy normal-range FT4 quintiles and birth weight in 4464 mother-child pairs. Analyses were performed in mothers with normal-range FT4 and TSH levels, after exclusion of TPOAb positives, known thyroid disease or thyroid (interfering) medication usage, comorbidities, twin pregnancies, and pregnancies after fertility treatment. *Error bars* represent SE values.

Maternal Thyroid Hormone Parameters during Early Pregnancy and Birth Weight: The Generation R Study

Marco Medici, Sarah Timmermans, Willy Visser, Sabine M. P. F. de Muinck Keizer-Schrama, Vincent W. W. Jaddoe, Albert Hofman, Herbert Hooijkaas, Yolanda B. de Rijke, Henning Tiemeier, Jacoba J. Bongers-Schokking, Theo J. Visser, Robin P. Peeters, and Eric A. P. Steegers

J Clin Endocrinol Metab, January 2013, 98(1):59–66

TABLE 1. Correlations (r) between birth measures (adjusted for sex and gestational age) or gestational age (37–42 wk) and cord thyroid function tests (n = 616) and maternal FT4 (n = 905)

	Cord TSH[a]	Cord FT4	Cord FT3[a]	Maternal FT4[a]
Birth weight	0.04	0.25***	0.02	−0.18***
Birth length	−0.02	0.17***	0.03	−0.11*
Birth head circumference	0.05	0.11	0.02	−0.14***
Birth sum of skinfolds	−0.02	0.19***	0.05	−0.18***
Gestational age	−0.03	−0.10	0.009	0.01
Placental weight	0.004	0.20***	0.05	−0.16***

Bonferroni adjusted *P* values are presented: ***, <0.001; **, <0.01; *, <0.05.

[a] Log-transformed variables.

Fetal Thyroid Hormone Level at Birth Is Associated with Fetal Growth

Beverley M. Shields, Beatrice A. Knight, Anita Hill, Andrew T. Hattersley, and Bijay Vaidya

J Clin Endocrinol Metab, June 2011, 96(6):E934–E938

4464 Schwangere, Funktionsbestimmung in der SSW 13,3 +/- 1,7

616 Schwangere, Funktionsbestimmung in der SSW 28

TSH im Alter

TABLE 2. Age-related reference ranges for TSH derived from the cross-sectional reference group (n = 1751)

Age (yr)	n	TSH reference range (mU/liter) Lower limit	Mean	Upper limit
<30	304	0.51	1.34	3.54
30–40	299	0.48	1.25	3.21
40–50	269	0.44	1.32	3.92
50–60	321	0.42	1.31	4.09
60–70	334	0.38	1.34	4.70
>70	224	0.52	1.66	5.28
All	1751	0.44	1.35	4.10

Reference ranges were calculated as mean ± 2 SD of log-transformed serum TSH concentrations for each age stratum.

Bremner et al JCEM 2012; 97:1554

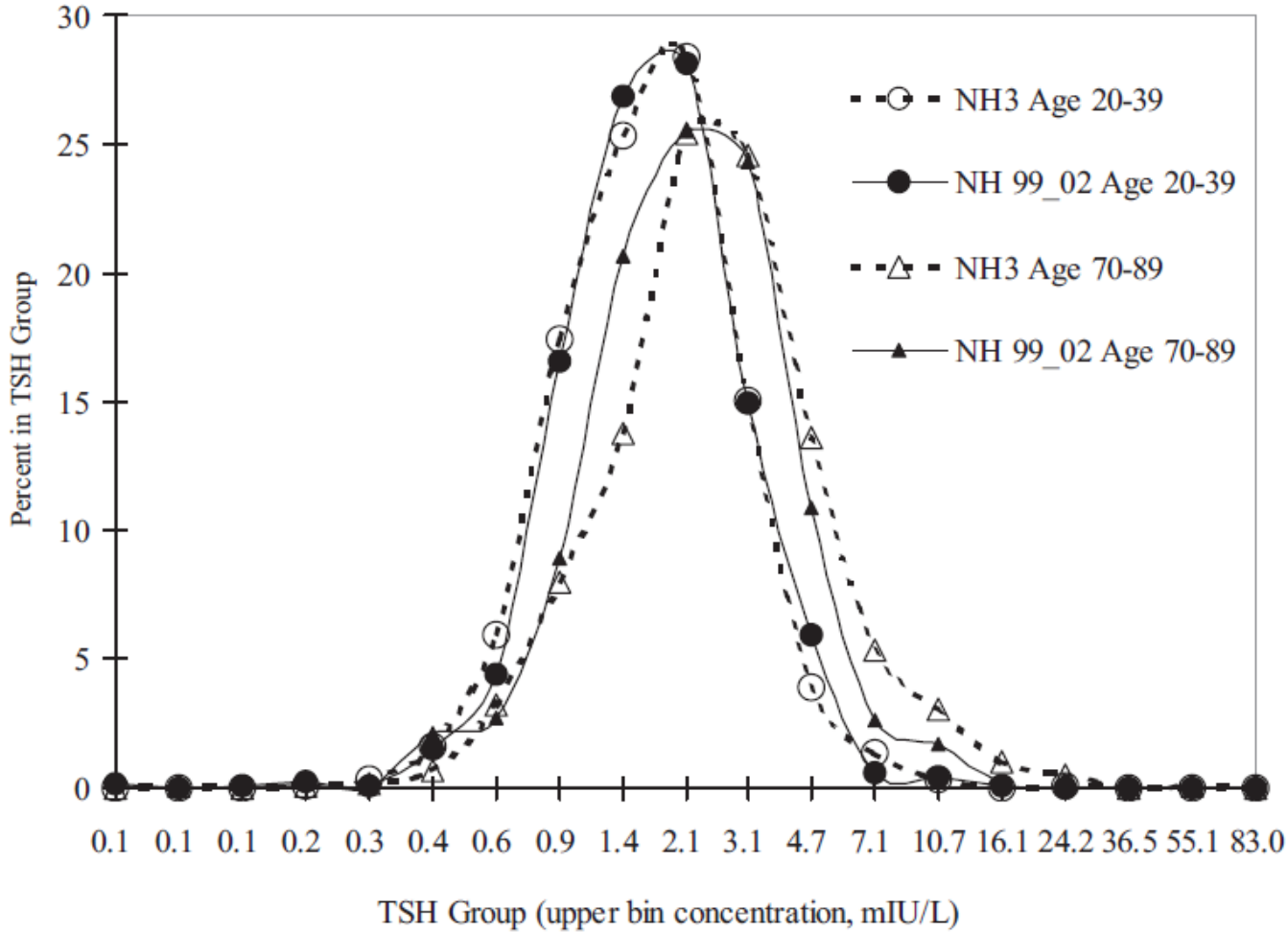


FIG. 2. Shift in TSH distribution to higher concentrations with age. Data from NHANES III (NH3) and NHANES 1999–2002 (NH 99_02) populations.

Age- and Race-Based Serum Thyrotropin Reference Limits

Martin I. Surks and Laura Boucai

Division of Endocrinology, Department of Medicine (M.I.S., L.B.) and Pathology (M.I.S.), Montefiore Medical Center and the Albert Einstein College of Medicine, Bronx, New York 10467

J Clin Endocrinol Metab, February 2010, 95(2):496–502

TSH im Alter

Sehr Alte
bei KHK subklinische Hypothyreose erst bei TSH > 10 mU/l therapieren
TSH-Zielbereich 4 – 6 mU/l
TSH-Erhöhung als protektiver Effekt für KHK?
Graubereich bei TSH 4,5 – 10 mU/l

Alte
Therapie bei TSH > 10 mU/l
bei Beschwerden und/oder positiven Schilddrüsenantikörpern
Therapie bereits bei niedrigeren TSH-Werten
TSH-Zielbereich 3 - 4 mU/l

niedrigere Thyoxindosis erforderlich da Halbwertszeit im Alter länger (9,3 d)

Biondi, Cooper Endocrine Reviews 2008;29:76

Antikörper

- TSH-Rezeptorantikörper (TRAK)
- Antikörper gegen Schilddrüsenperoxidase (TPO-AK)
- Mikrosomale Antikörper
- Antikörper gegen Thyreoglobulin

- Antikörpererhöhung bei Immunthyreopathie

0013-7227/02/$15.00/0
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The Journal of Clinical Endocrinology & Metabolism 87(2):489–499

Serum TSH, T_4, and Thyroid Antibodies in the United States Population (1988 to 1994): National Health and Nutrition Examination Survey (NHANES III)

JOSEPH G. HOLLOWELL, NORMAN W. STAEHLING, W. DANA FLANDERS, W. HARRY HANNON, ELAINE W. GUNTER, CAROLE A. SPENCER, AND LEWIS E. BRAVERMAN

"Disease-free Population"

- Anamnese (kein Hinweis auf Struma, Schilddrüsenerkrankung, Schilddrüsenhormonmedikation)
- Keine Untersuchung

- TgAB positiv: 10,4%
- TPOAb positiv: 11,3%
- Häufiger bei Frauen als bei Männern erhöht
- Zunahme mit steigendem Alter

TABLE 6. Percentage of U.S. population with positive antithyroid antibodies[a] by thyroid status, age, gender, and ethnicity; NHANES III (1988–1994)

	Antithyroid peroxidase (TPOAb)												Antithyrogobulin (TgAb)											
	Total population						Disease-free population[b]						Total population						Disease-free population					
	Total		Male		Female		Total		Male		Female		Total		Male		Female		Total		Male		Female	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
All ethnic groups																								
All ages	13.0	0.4	8.7	0.5	17.0	0.5	11.3	0.4	8.0	0.5	14.6	0.5	11.5	0.5	7.6	0.6	15.2	0.6	10.4	0.5	6.9	0.5	13.8	0.6
12–19	4.8	0.8	2.9	0.8	6.7	1.2	4.8	0.8	2.9	0.8	6.7	1.2	6.3	0.9	5.2	1.3	7.3	1.3	6.3	0.9	5.2	1.3	7.3	1.3
20–29	8.5	0.9	5.7	1.0	11.3	1.3	7.9	0.9	5.5	1.1	10.4	1.2	7.2	0.8	5.2	0.9	9.2	1.1	6.7	0.8	5.0	0.9	8.5	1.1
30–39	11.9	1.1	9.5	1.8	14.2	1.4	10.5	1.2	8.4	1.8	12.6	1.4	11.2	1.3	7.8	1.8	14.5	1.3	10.1	1.2	6.6	1.5	13.6	1.4
40–49	14.7	0.9	11.2	1.7	18.0	1.4	13.1	0.9	10.6	1.6	15.8	1.5	12.0	1.0	7.4	1.1	16.4	1.5	11.3	1.0	6.8	1.1	16.0	1.6
50–59	16.0	1.2	11.0	2.1	20.7	1.7	13.5	1.0	10.1	2.0	17.1	1.6	13.9	1.0	8.8	1.6	18.6	1.5	12.0	1.0	7.9	1.6	16.4	1.7
60–69	20.2	1.4	11.7	1.7	27.3	2.0	16.7	1.7	10.2	1.6	23.0	2.2	16.9	1.1	10.3	1.2	22.4	1.7	14.7	1.1	9.6	1.2	19.6	1.9
70–79	22.3	1.2	13.2	1.9	29.0	2.1	19.6	1.2	12.0	1.8	26.2	2.0	18.8	1.2	14.1	1.9	22.3	1.7	17.0	1.1	12.9	2.0	20.6	1.4
≥80	23.9	1.5	12.3	1.7	30.2	2.2	20.4	1.3	10.6	1.7	26.5	1.9	21.6	1.4	11.3	1.5	27.0	1.9	19.4	1.3	10.1	1.7	25.2	1.5
White, non-Hispanic																								
All ages	14.3	0.4	10.0	0.7	18.4	0.6	12.3	0.5	9.1	0.6	15.6	0.6	12.9	0.6	8.9	0.8	16.6	0.8	11.5	0.6	8.1	0.7	15.0	0.8
12–19	4.8	0.9	3.8	1.2	5.8	1.2	4.8	0.9	3.8	1.2	5.9	1.2	7.4	1.3	7.2	1.9	7.6	1.6	7.4	1.3	7.2	1.9	7.6	1.6
20–29	9.4	1.2	6.1	1.4	12.6	1.7	8.7	1.2	5.8	1.4	11.4	1.6	8.3	1.1	6.4	1.3	10.1	1.5	7.7	1.1	6.1	1.2	9.2	1.4
30–39	12.6	1.4	10.8	2.3	14.3	1.7	11.1	1.5	9.4	2.3	12.9	1.7	12.0	1.6	9.1	2.4	14.9	1.6	10.9	1.5	7.7	2.0	14.3	1.6
40–49	15.9	1.1	12.4	2.1	19.5	1.6	14.0	1.1	11.7	2.0	16.5	1.8	13.0	1.2	8.0	1.4	18.0	1.9	12.1	1.2	7.5	1.4	17.4	2.1
50–59	16.8	1.4	12.1	2.6	21.2	2.0	13.9	1.3	10.9	2.5	17.1	2.0	14.7	1.2	9.8	2.0	19.3	1.7	12.5	1.2	8.6	1.9	16.6	2.0
60–69	21.4	1.6	12.9	2.0	28.7	2.3	17.8	1.9	11.2	2.0	24.5	2.6	18.1	1.3	11.0	1.5	24.2	2.2	15.9	1.3	10.1	1.5	21.8	2.4
70–79	23.5	1.3	14.4	2.1	30.0	2.3	20.7	1.3	13.3	2.1	27.1	2.2	19.8	1.3	15.1	2.0	23.2	1.9	18.0	1.2	13.8	2.1	21.6	1.5
≥80	24.9	1.7	12.6	1.8	31.4	2.4	21.1	1.4	11.0	1.8	27.4	2.1	22.3	1.5	11.7	1.6	27.8	2.0	19.9	1.4	10.3	1.9	25.9	1.6
Black non-Hispanic																								
All ages	5.3	0.3	2.5	0.3	7.6	0.5	4.5	0.3	2.2	0.3	6.4	0.5	3.0	0.2	1.2	0.2	4.4	0.4	2.7	0.2	1.1	0.2	4.1	0.4
12–19	1.2	0.5	0.4	0.3	1.9	0.8	1.2	0.5	0.4	0.3	1.9	0.8	1.0	0.5	0.4	0.3	1.6	0.8	1.0	0.5	0.4	0.3	1.6	0.8
20–29	3.5	0.7	2.0	0.5	4.8	1.1	3.3	0.7	2.0	0.5	4.4	1.1	2.1	0.6	1.1	0.5	3.0	0.9	2.0	0.6	1.1	0.5	2.8	0.8
30–39	4.1	0.8	1.3	0.5	6.3	1.4	3.3	0.8	1.3	0.5	4.9	1.3	2.7	0.6	0.9	0.4	4.1	1.0	2.6	0.6	0.9	0.4	4.0	1.0
40–49	6.5	1.2	4.3	1.5	8.3	1.9	6.1	1.2	3.7	1.3	8.1	1.8	3.7	0.8	2.1	0.8	5.0	1.2	3.3	0.8	1.5	0.7	4.9	1.2
50–59	10.0	1.4	3.0	1.3	15.5	1.9	8.3	1.4	3.1	1.3	12.7	1.9	4.5	1.0	0.5	0.5	7.5	1.8	3.9	1.0	0.5	0.5	6.7	1.7
60–69	12.9	2.1	6.6	1.5	17.4	3.2	10.5	2.0	6.1	1.6	13.8	3.0	6.8	1.3	2.5	1.1	9.8	2.2	5.8	1.3	2.6	1.2	8.2	2.1
70–79	7.6	1.8	5.1	2.0	9.4	3.1	5.8	1.5	2.8	1.4	8.0	2.9	3.4	1.1	3.0	1.5	3.7	1.5	2.3	0.9	1.8	1.0	2.8	1.3
≥80	12.9	3.7	7.6	4.5	15.3	4.2	13.3	3.8	5.2	3.8	17.1	4.6	8.3	2.7	5.6	4.0	9.5	3.2	9.2	3.1	6.1	4.4	10.6	3.7
Mexican American																								
All ages	10.9	0.5	6.2	0.6	15.9	0.8	10.1	0.5	5.9	0.6	14.7	0.8	8.8	0.4	4.7	0.4	13.1	0.8	8.2	0.4	4.6	0.4	12.3	0.8
12–19	6.2	1.0	3.5	1.2	8.5	1.4	6.0	1.0	3.5	1.2	8.6	1.4	6.2	0.8	3.0	0.9	9.7	1.4	6.1	0.8	3.0	0.9	9.5	1.4
20–29	8.7	0.6	4.4	0.8	14.0	1.6	8.4	0.6	4.4	0.8	13.4	1.7	6.9	0.6	3.2	0.8	11.6	1.3	6.9	0.6	3.2	0.8	11.5	1.2
30–39	12.7	1.5	8.8	1.5	16.8	2.5	11.6	1.3	8.2	1.5	15.3	2.3	9.6	1.2	6.4	1.3	13.0	2.2	8.9	1.0	6.1	1.3	12.0	1.9
40–49	13.0	1.1	7.4	1.4	18.9	2.3	12.1	1.1	6.8	1.4	17.8	2.2	11.1	1.6	7.5	2.1	14.9	2.5	10.5	1.6	7.0	2.1	14.3	2.4
50–59	16.1	3.8	7.7	2.1	23.6	6.5	15.6	3.8	7.9	2.1	23.1	6.7	12.9	3.3	4.0	1.7	20.9	5.4	12.4	3.3	3.8	1.6	20.8	5.6
60–69	17.8	1.7	9.9	2.6	23.8	2.5	16.3	1.7	9.8	2.6	21.6	2.6	11.4	1.5	6.4	2.8	15.2	1.9	10.2	1.6	6.3	2.8	13.5	2.0
70–79	21.8	4.3	13.3	4.8	29.5	5.1	15.8	3.3	10.0	3.8	21.6	3.9	11.4	2.5	6.8	2.0	15.6	3.9	7.6	2.3	6.8	2.1	8.4	2.9
≥80	22.0	6.8	9.4	5.7	34.6	11.2	15.4	5.5	8.6	5.6	24.0	11.6	22.9	7.1	14.5	7.3	31.3	10.0	14.8	6.0	13.9	7.8	15.8	9.4

[a] TPOAb ≥0.5 U/ml. TgAb ≥1.0 U/ml.
[b] Disease-free population means those not reporting thyroid disease, goiter, or taking thyroid medications.

Tumormarker

- Thyreoglobulin (differenziertes Schilddrüsenkarzinom)
  Karzinomnachsorge
  präoperativ keine Aussagekraft
  Verdacht auf Hyperthyreosis factitia
- Kalzitonin (medulläres Schilddrüsenkarzinom)
  basal
  unter Pentagastrin- oder Kalziumstimulation
  präoperative Aussage über das Vorliegen eines medullären Karzinoms möglich

Tumormarker

- Thyreoglobulin in der Nachsorge des differenzierten Schilddrüsenkarzinoms
- unter TSH Supression
- bei hohem TSH-Wert (> 30 mU/l)
  endogene Stimulation (Hypothyreose)
  exogene Stimulation (rekombinantes humanes TSH)
- Ziel: Thyreoglobulin unter der Nachweisgrenze
- Thyreoglobulinwert unter hohen TSH-Spiegeln aussagekräftiger

Tumormarker

- Kalzitonin basal präoperativ
  unauffällig < 10 pg/ml
  Grauzone 10 -100 pg/ml
  pathologisch > 100 pg/ml
- Pentagastrinstimulationstest
  bei basalem Kalzitonin 10 - 100 pg/ml
  stimulierter Wert > 100 pg/ml: pathologisch
  Stimulation bei jedem erhöhten Kalzitoninwert?

TABLE 3. Tumor diameter and lymph node metastases by basal calcitonin level

Basal calcitonin level (pg/ml)		Largest primary tumor diameter (mm)[a]		Number of involved lymph nodes		Number of removed lymph nodes		Biochemical cure[b]
(<5–10 pg/ml)[c]	n[d]	Mean (95% CI)	Range	Mean (95% CI)	Range	Mean (95% CI)	Range	n (%)[b]
10.1–20	23	3.3 (2.4; 4.2)	1–8	0	0	8.3 (4.9; 11.7)	1–31	22 (100)
20.1–50	35	4.5 (3.6; 5.4)	1–12	0.5 (0; 1.2)	0–12	36.1 (25.0; 47.1)	1–105	31 (100)
50.1–100	23	6.2 (4.5; 7.8)	1.3–20	0.3 (0; 0.6)	0–3	54.1 (38.3; 69.9)	3–130	19 (100)
100.1–200	26	8.9 (6.7; 11.0)	2–25	1.5 (0; 2.9)	0–17	49.5 (36.8; 62.2)	1–128	17 (81)
200.1–500	29	11.4 (9.7; 13.0)	5–21	2.3 (0.9; 3.8)	0–16	64.2 (52.4; 75.9)	11–137	21 (81)
500.1–1,000	34	20.4 (15.0; 25.9)	1.5–70	7.5 (3.9; 11.1)	0–41	69.8 (58.5; 81.2)	24–158	14 (50)
1,000.1–2,000	34	24.0 (19.2; 28.8)	2–60	9.3 (4.1; 14.6)	0–56	68.2 (58.8; 77.6)	4–118	10 (40)
2,000.1–10,000	39	27.5 (23.3; 31.7)	9–55	15.9 (10.6; 21.3)	0–68	64.1 (56.1; 72.1)	8–128	6 (18)
Greater than 10,000	25	34.9 (28.3; 41.6)	12–65	35.3 (21.3; 49.4)	0–167[e]	71.3 (52.9; 89.8)	6–209	0 (0)
Total	268	15.9 (14.2; 17.7)	1–70	8.2 (6.2; 10.3)	0–167	55.3 (51.0; 59.6)	1–209	140 (61)

CI, Confidence interval.

[a] Based on 256 patients with information on primary tumor diameter.

[b] Normalization of postoperative calcitonin levels based on 231 patients with pertinent information at a mean follow-up of 54.4 months.

[c] Based on the ELSA-hCT assay (CIS Bio International; used between September 1995 and May 2004; normal range <10 pg/ml) and the Immulite 2000 calcitonin assay (Diagnostic Products Corp.; used after May 2004; normal range <5 pg/ml for women and <8.4 pg/ml for men), respectively.

[d] Number of patients in the respective calcitonin bracket (base are 268 patients after exclusion of 23 patients with basal calcitonin levels ≤10 pg/ml and nine patients whose preoperative calcitonin levels were not determined with the ELSA-hCT or Immulite 2000 calcitonin assay).

[e] No nodes involved among 63 removed nodes (basal calcitonin level 17,511 pg/ml).

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(<5–10 pg/ml)[c]	n[d]	Mean (95% CI)	Range	Mean (95% CI)	Range	Mean (95% CI)	Range	n (%)[b]
10.1–20	23	3.3 (2.4; 4.2)	1–8	0	0	8.3 (4.9; 11.7)	1–31	22 (100)
20.1–50	35	4.5 (3.6; 5.4)	1–12	0.5 (0; 1.2)	0–12	36.1 (25.0; 47.1)	1–105	31 (100)
50.1–100	23	6.2 (4.5; 7.8)	1.3–20	0.3 (0; 0.6)	0–3	54.1 (38.3; 69.9)	3–130	19 (100)
100.1–200	26	8.9 (6.7; 11.0)	2–25	1.5 (0; 2.9)	0–17	49.5 (36.8; 62.2)	1–128	17 (81)
200.1–500	29	11.4 (9.7; 13.0)	5–21	2.3 (0.9; 3.8)	0–16	64.2 (52.4; 75.9)	11–137	21 (81)
500.1–1,000	34	20.4 (15.0; 25.9)	1.5–70	7.5 (3.9; 11.1)	0–41	69.8 (58.5; 81.2)	24–158	14 (50)
1,000.1–2,000	34	24.0 (19.2; 28.8)	2–60	9.3 (4.1; 14.6)	0–56	68.2 (58.8; 77.6)	4–118	10 (40)
2,000.1–10,000	39	27.5 (23.3; 31.7)	9–55	15.9 (10.6; 21.3)	0–68	64.1 (56.1; 72.1)	8–128	6 (18)
Greater than 10,000	25	34.9 (28.3; 41.6)	12–65	35.3 (21.3; 49.4)	0–167[e]	71.3 (52.9; 89.8)	6–209	0 (0)
Total	268	15.9 (14.2; 17.7)	1–70	8.2 (6.2; 10.3)	0–167	55.3 (51.0; 59.6)	1–209	140 (61)

CI, Confidence interval.

[a] Based on 256 patients with information on primary tumor diameter.

[b] Normalization of postoperative calcitonin levels based on 231 patients with pertinent information at a mean follow-up of 54.4 months.

[c] Based on the ELSA-hCT assay (CIS Bio International; used between September 1995 and May 2004; normal range <10 pg/ml) and the Immulite 2000 calcitonin assay (Diagnostic Products Corp.; used after May 2004; normal range <5 pg/ml for women and <8.4 pg/ml for men), respectively.

[d] Number of patients in the respective calcitonin bracket (base are 268 patients after exclusion of 23 patients with basal calcitonin levels ≤10 pg/ml and nine patients whose preoperative calcitonin levels were not determined with the ELSA-hCT or Immulite 2000 calcitonin assay).

[e] No nodes involved among 63 removed nodes (basal calcitonin level 17,511 pg/ml).

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TABLE 5. Frequency and pattern of lymph node metastases by serum level of basal calcitonin

Basal calcitonin level (<5–10 pg/ml)[b]	n[c]	Lymph node metastasis[a] n (%)	Involvement of lymph node compartments: Ipsilateral neck, Central n (%)	Ipsilateral neck, Lateral n (%)[d,e]	Contralateral neck, Central n (%)	Contralateral neck, Lateral n (%)[e,f]	Upper mediastinum n (%)[e,g]	Distant metastasis n (%)
10.1–20	23	0	0	0	0	0	0	0
20.1–50	35	4 (11)	3 (9)	3 (9)	0	0	0	0
50.1–100	23	4 (17)	2 (9)	3 (13)	1 (4)[h]	0	0	0
100.1–200	26	9 (35)	7 (27)	4 (15)	1 (4)	0	0	0
200.1–500	29	13 (45)	10 (34)	11 (38)	3 (10)	4 (14)[i]	0	0
500.1–1,000	34	20 (59)	16 (47)	17 (50)	7 (21)	4 (12)	4 (12)[j]	2 (6)
1,000.1–2,000	34	18 (53)	13 (38)	14 (41)	6 (18)	6 (18)	4 (12)	5 (15)
2,000.1–10,000	39	31 (79)	27 (69)	29 (74)	14 (36)	17 (44)	5 (13)	6 (15)
Greater than 10,000	25	24 (96)	20 (80)	24 (96)	19 (76)	20 (80)	13 (52)	18 (72)
Total	268	123 (46)	98 (37)	105 (39)	51 (19)	51 (19)	26 (10)	31 (12)

[a] Any location; [b] based on the ELSA-hCT assay (CIS Bio International; used between September 1995 and May 2004; normal range <10 pg/ml) and the Immulite 2000 calcitonin assay (Diagnostic Products Corp.; used after May 2004; normal range <5 pg/ml for women and <8.4 pg/ml for men), respectively; [c] number of patients in the respective calcitonin bracket (base are 268 patients after exclusion of 23 patients with basal calcitonin levels ≤10 pg/ml and nine patients whose preoperative calcitonin levels were not determined with the ELSA-hCT or Immulite 2000 calcitonin assay); [d] based on 218 patients with systematic lateral lymph node dissection in the ipsilateral neck; [e] counting undissected compartments as node negative; [f] based on 211 patients with systematic lateral lymph node dissection in the contralateral neck; [g] based on 42 patients with transsternal systematic lymph node dissection in the upper mediastinum; [h] level 91.4 pg/ml; [i] minimum level 205 pg/ml; [j] minimum level 515 pg/ml; miliary lung metastases (histologically confirmed).

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Refining Calcium Test for the Diagnosis of Medullary Thyroid Cancer: Cutoffs, Procedures, and Safety

Caterina Mian, Michela Perrino, Carla Colombo, Elisabetta Cavedon, Gianmaria Pennelli, Stefano Ferrero, Simone De Leo, Cristiano Sarais, Chiara Cacciatore, Gloria Irene Manfredi, Uberta Verga, Maurizio Iacobone, Loredana De Pasquale, Maria Rosa Pelizzo, Leonardo Vicentini, Luca Persani, and Laura Fugazzola

- Sowohl bCT als auch sCT (Kalziumstimulation) zeigen gleiche Trennschärfe bei der präoperativen Diagnose eines medullären Schilddrüsenkarzinoms

- Die besten Grenzwerte waren

  bCT > 26 bzw. > 68 pg/ml für Frauen und Männer

  sCT > 79 bzw. >544 pg/ml für Frauen und Männer

J Clin Endocrinol Metab, May 2014, 99(5):1656–1664

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