



Thyroid Cancer Canada
Cancer de la thyroïde Canada

Thry'vors News

Volume 9, Issue 1
Spring 2011

In this issue:

Tour of the Biochemical Laboratory at Toronto General Hospital.....1
 Thyroid Cancer Patients Prefer Thyrogen to Thyroid
 Hormone Withdrawal.....5
 Poem.....6
 Ask Thry'vors.....6
 LID Recipe Box – Winter Minestrone7
 Happenings at *Thyroid Cancer Canada*.....8



Tour of the Biochemical Laboratory at Toronto General Hospital

by Rita Banach, Ginette Herald and Bonnie Lee

As thyroid cancer patients, most of us go to a laboratory to have our blood drawn on a regular basis as requested by our endocrinologist or family doctor. We know that the tests include Thyroid Stimulating Hormone (TSH) and Free T3/T4 (and often our Thyroglobulin [Tg] is tested as well). We also know that we have targeted measures that we strive for. The next time we see our doctor she has the report from the lab and she lets us know how close we came to our target, and if necessary our hormone replacement prescription is updated.

For most of us, that is the sum total of our understanding of the process of measuring our blood chemistry.

The Toronto General Hospital (TGH) biochemistry laboratory is used by patients of 20 hospitals including the University Health Network (UHN). What happens in between the drawing of your blood sample and the receipt of the report is a very specialized, highly automated and fascinating process.

Blood Requisition

Most of us are familiar with a blood requisition form given to us by our doctor, which is checked-off at the appropriate places indicating which blood tests are to be performed. In contrast, the system at the UHN family of hospitals is paperless and is interconnected with the electronic patient chart system. The patient's doctor enters a request for required blood tests into the hospital's computer system, and from that point onward much of the testing process is covered by their automated systems. The patient merely reports to the phlebotomist in the Diagnostic Test Centre with their patient number or order number. The correct coloured tubes are at the ready, labels for the tubes have been printed, and all the data has been entered into the system. Each patient has unique 'identifiers' recognized by the database to be sure the system knows exactly which patient is being tested, for example to avoid

This is the 30th in a series of seasonal newsletters, from *Thyroid Cancer Canada*. Your comments and suggestions are most welcome.

Please direct your comments to the Newsletter Committee at newsletter@thyroidcancercanada.org

Editor's Note:

Greetings!

In this season's newsletter, read about Rita, Ginette and Bonnie's tour of the Biochemical Laboratory at Toronto General Hospital. They learned the procedures involved in analyzing patient's blood, from the point blood work is requested, through to the delivery of the lab results to the patient's doctor.

Also below, Charna Gord summarizes a German study that examines why most thyroid cancer patients prefer the use of Thyrogen® to thyroid hormone withdrawal. You will find that the patient's reasons for preferring Thyrogen® are not limited to physical discomfort.

Until next time,
Stephanie Wylie, Editor.

www.thyroidcancercanada.org

Thyroid Cancer Canada

PO Box 23007
550 Eglinton Ave. West
Toronto, ON M5N 3A8

Voice: 416.487.8267
Fax: 416.487.0601
Email: info@thyroidcancercanada.org



confusion when more than one patient has the same name and birthday. There is also a 'Delta' system in place that looks at trends in results of individual patients, comparing the results to those previously obtained. If a new result looks out-of-place according to the trend in that patient, the system will red flag it so that it is brought to the technologists' special attention.

Did you know?

Colour-coded caps, on empty blood tubes, not only identify which general type of test will be performed, but also indicate which tubes include pre-added special additives. For example, although the green-topped tube may look empty, it actually has an invisible film of an anti-coagulant in it.

The blood samples arrive soon thereafter at the Core

Laboratory for biochemistry and haematology testing. They jokingly refer to it as the 'beehive', not only because it's a busy place, but also because the machinery literally buzzes — especially in the largest of the set of rooms. Four biochemists oversee the 30-40 technologists working there on a typical weekday.

The unique IT infrastructure and machinery at this lab is set up with verification checks so that every order placed in the system has a response and/or is fulfilled. Each tube of blood has a specimen identification number assigned to it which appears on the barcode on its label. In that way no test is 'forgotten' to be run or lost in the system, as can sometimes happen via human error in labs where data is transcribed from the requisition form and entered by hand. The TGH system also helps to prevent other such errors. For example, it would recognize that the Tg Antibody test must be run if a Tg test was performed.

Specimen tubes can come directly through the window (delivered internally). In the case of urgent requests, tubes are delivered via a pneumatic tube system from the ICU or ER departments; others arrive by courier from outside hospitals. First the tubes get sorted in the specimen management section of the floor. Some specimens require processing before being tested. Included in the over 20 hospitals who send their specimens to the TGH lab, are large and small hospitals within the GTA and even as far as northern Ontario — who don't have sophisticated labs or are unable to perform specialized tests. The Tg test is an example of a

more specialized test which can be performed at TGH.

Automated Track System

Once the preliminary sorting is done, about one-third of the 3000 tubes go onto the 70 foot long highly automated track system each day, where they are not normally touched by hand again. (The tubes for more specialized tests are handled manually to some extent.) The system places each individual blood tube upright onto its own 'puck' (a small plastic carrier) that moves it along the sophisticated track with robotic

components. The track is similar to an assembly line, with each station completely mechanized. (Picture a miniature version of the scene with the travelling doors moving along the conveyer belt in the movie 'Monsters Inc'.) The track system reads the barcode on each label with an electronic eye or scanner and knows where each tube needs to go and which of a possible multiple number of tests will be performed on it. The specimens move along special laneways and robotic arms remove blood samples at the correct stations. Some barcodes are marked "STAT" (ie. high priority; usually from the ICU or ER department of the hospital). The track system can literally put the STAT tubes on the fast track, similar to a car being allowed on the priority lane of a highway. The computer also knows where any tube is in the system at any point in time, which is quite amazing considering that over 1000 tubes travel the track per day with some specimens needing as many as 20 tests at the same time!

One of the first stops along the track is a machine that removes the colour-coded cap. Next the tube moves along the track into the correct lane for the appropriate analyzer machine. Each analyzer system is about the size of a small car. During 'rush hour', traffic can back up at the more well-used analyzers, that is, tubes queue up for their sampling. Each tube in turn is sampled through its top with a long slender probe that withdraws a small volume from the tube. A robotic arm swings the probe around where it deposits the sample into the proper reaction cell of the analyzer to be tested. Once the deposit of blood has been made, the needle probe is

dipped into a cleaning solution so that it can be sanitized after each probing and made ready to be used again. While the analyzer starts its work on the sample, the tube moves further along the track to its next stop.

Some of the other analyzers not on the automated track are examining haematology, while still others are concerned with blood chemistry. Haematology looks at the blood cells; for example red and white blood cell counts and mutations. Those who have blood cancers such as leukemia would have their samples examined this way. In contrast, the measures of TSH, Free T4/T3 and Tg are performed by chemistry analyzers.

Thyroid Cancer Measurements

In the case of testing TSH, the blood sample is incubated and assessed in a special analyzer machine that uses immunoassays. As in all hospital laboratories, the UHN core laboratory at Toronto General makes use of analyzer systems from diagnostic companies which provide the reagents or assays that are used in testing blood samples. For example, in the case of testing TSH, an assay is able to detect its presence using antibodies extrapolated from mice (or sometime rabbits or other animal sources). This antibody is introduced into the patient's test sample and recognizes the target antigen to be measured and attaches to them. At the same time another antibody is added to act as a detection 'marker' which is chemi-luminescent (ie. lights up). The combination or complex of the antibody, the patient's own TSH, and the marker, creates a 'sandwich' which is in effect a 'label' that can be measured by the machine to produce a number expressed in mIU/L units. This measurement is determined by the computer assigned to that analyzer. The 'cooking time' of samples in the analyzers for this process could be up to 2 hours per sample depending on which test is run.

The same blood tube is also sampled for Free T3 and Free T4, but in a different way.

Once a specimen tube has made it around the track, it enters a small machine that covers and seals it with a foil sheath. After a tray of about 50 sheathed tubes are ready, the tray slides into a multi-floored storage unit that serves like a small apartment building for finished tubes. A computer screen shows the inventory and

where there are 'vacancies in the building', that is, where there is room to slide in a new tray by floor and by section. The refrigerated machine stores trays of blood samples for 5 days, and has built-in programming that knows which tubes are ready to be discarded. The tubes are made of plastic, and all of the containers are discarded as biohazard waste (and incinerated) once they are no longer required. During the storage time, if need be, a tube can be automatically withdrawn with a robotic arm from the 'apartment building' for retesting.

Stand-alone Analyzers

Tg testing (and Anti-Tg), is a more specialized test. Tubes of blood for this analysis are taken manually in trays to a special machine designed for this purpose, which also runs 15 other similar 'esoteric' tests). This analyzer runs tests in batches. Similar to the track system, the standalone analyzers read the barcode on the tube and are interfaced to the computerized system.

The 'beehive' is kept humming 24 hours a day, 7 days a week, although routine tests would only be done during the day. There is a 'command centre' in the lab where at least 2 people are working at any one time, to monitor and read all the computers related to all the individual sections of the track, the analyzers and the off-track machinery. For example, they are watching to be sure that there is a supply of a significant amount of reagents needed by each corresponding analyzer at any point in time. They keep supplies of all the agents in a very large glass-door fridge, which because of its resemblance to supermarket fridges, is nick-named the "Costco" fridge.



The Future - Mass Spectrometry

In a separate (quieter) lab room, one finds an even more specialized and futuristic diagnostic testing area. This room contains the instruments for mass spectrometry. This cutting edge technology is capable of measuring blood components even at very low levels. It does not make use of immunoassays, therefore its tests are not affected by antibody interference. Rather it has the ability to identify and measure molecules in the blood, based on their weight and structure. So far this technology is limited to specialized testing via assays currently developed in-house rather than those obtained commercially. Some thyroid-related tests can be performed but is usually for research purposes. It seems we can look forward to a broadening of the scope of this type of testing and that the trend will be towards this more exact analysis in the future.

Record Keeping & Delivery

In the case of blood samples and tests, the data collected is kept on the lab computers for at least two years, and almost indefinitely in the patient's own hospital record system if they are a UHN patient. The lab results go full circle, interfacing once again with the electronic patient record that called for the tests to be run in the first place. The patient's doctor accesses the patient's record in order to view the results, and create a printout if he or she so desires. At the three UHN hospitals (Toronto General, Toronto Western and Princess Margaret Hospital) the TSH and Tg results are usually available in the patient's record within a few hours.



Thyroid cancer patients are amongst those in need of regular analysis of our individual blood samples. Our blood is examined not only periodically in regards to measures of our Tg cancer marker, but also more regularly to

stay informed as to maintenance of suppressed TSH levels. Maintaining a suppressed TSH level is a primary form of treatment to safeguard against recurrence of our cancer. We are therefore very dependent on the expertise of the teams of clinicians that work in labs such as the one at the Toronto General Hospital.

We consider ourselves very privileged to have had a look at this state-of-the-art laboratory. Through our tour, we learned that the lab clinicians are interested in being viewed as much more than just a support system. Although almost always invisible to us, the laboratory clinicians invite us to consider them part of the patient's treatment team.



L-R: Drs. Paul M. Yip, Sylvia L. Asa and Eleftherios P. Diamandis

We extend our great thanks to Paul M. Yip, PhD, FCACB, DABCC, Clinical Biochemist, who gave us a detailed tour of the blood laboratory at Toronto General Hospital in November 2010. We also sincerely thank Eleftherios P. Diamandis, MD, PhD, FRCP(C), FRSC, Head of Clinical Biochemistry at Mt. Sinai Hospital and University Health Network; and Sylvia L. Asa, MD, PhD, Pathologist-in-Chief and Medical Director, Laboratory Medicine Program, University Health Network, who most generously took the time to give us an extensive introduction to the tour with valuable background information.

Thyroid Cancer Patients Prefer Thyrogen to Thyroid Hormone Withdrawal

An article review by Charna Gord, MEd, RD

Charna Gord is a Registered Dietitian working as an Education Coordinator in an Ontario public health unit. She underwent a total thyroidectomy for thyroid cancer in December 2007. This is the twelfth in a series of thyroid cancer related journal articles and other resource reviews that Charna has undertaken for Thy'vors News.

In this review, Charna summarizes the findings of the following journal article:

Dueren C, Dietlein M, Luster M, Plenzig F, Steinke R, Grimm J, Groth P, Eichhorn W, Reiners C. The use of thyrogen in the treatment of differentiated thyroid carcinoma: An intraindividual comparison of clinical effects and implications of daily life. *Experimental and Clinical Endocrinology and Diabetes*. 2010 Aug;118(8):513-9.

Journal Article Main Message:

Patients in this study demonstrated a clear preference for using Thyrogen® (rhTSH) in preparation for I-131 radioactive iodine therapy (RAI) instead of going hypothyroid from thyroid hormone replacement withdrawal.

Research Background:

Thyroid cancer is treated with surgery, often followed by whole body scans reliant on RAI. With RAI, physicians use whole body scans and thyroglobulin (Tg) measurements to detect any left-over or recurrent thyroid cancer. However, in order for the scans to work, the patient must first stop taking their thyroid hormone replacement. Thyroid hormone withdrawal, results in elevated TSH levels (thyroid stimulating hormone) and increased sensitivity to the diagnostic procedure. Discontinuation of thyroid hormone replacement also leaves patients feeling hypothyroid; with the associated physical and emotional discomfort that can affect quality of life and reduce the ability to work. In contrast, taking Thyrogen allows patients to provide TSH stimulation without experiencing thyroid hormone withdrawal.

What was the research objective?

This observational study of 125 patients conducted in 25 centres in Germany was designed to measure both the clinical and socio-economic differences in the patients when using these two sets of conditions. The researchers were interested in determining if there was a measurable clinical difference (health survey) and/or a patient preference for one condition over the other.

How was the research conducted?

The researchers gathered patient information, clinical data and asked questions about aspects of quality of life such as employment and days off work. The majority of these patients were women in their mid-fifties who had early stage papillary thyroid cancer. Most of the patients also had another illness such as cardio-vascular disease.

What were the research findings?

The hypothyroidism that results from preparation for RAI is "often not only uncomfortable for the individual, but costly for society". For example, about half of the patients in this study missed about 10 working days as a result of going hypothyroid. Also, most of the patients drove their cars while hypothyroid, despite being told by their physicians that it was not safe to do so. And nearly all of the patients preferred Thyrogen® over thyroid hormone withdrawal, with only one patient undecided.

What were the final recommendations?

Using Thyrogen® in preparation for RAI resulted in an improvement in clinical symptoms and aspects of managing daily life as compared to patients who become hypothyroid as a result of thyroid hormone replacement withdrawal.

Editor's Note:

A recent study by Tuttle et al. found that preparation with Thyrogen resulted in successful ablations of metastatic tumours in 70% of patients, as compared to 55% of patients prepared with hormone withdrawal.
http://www.thyroid.org/professionals/publications/clinthy/volume22/issue12/clinthy_v2212_3_5.pdf

POEM

Released

by: Janice Veri

A Geiger counter clicks-
 Permission-
 All clear to emerge
 Out of the darkness

I am freed from prison-
 Changed-
 I drink in the air
 As the house shrinks away

The wretch of this illness-
 Lingering-
 Noticed by no one
 Remains in my nostrils

No desire to look back-
 Repulsion-
 My once beloved room
 Holds dark memories

'Radioactive Monkey'-
 You are dead-
 No humour remains
 Lost in isolation

I am now a newborn-
 The first breath-
 In this normal air
 No breath deep enough

Life above ground is sweet-
 Gratitude-
 Small joys once ignored
 Now feel miraculous

**TCC welcomes you to send your poetry to
newsletter@thyroidcancerCanada.org**

Ask Thyroids

by Melanie Thomson

The members of *Thyroid Cancer Canada's* Medical Advisory Panel are available to answer YOUR general questions about every aspect of thyroid cancer. A list of our Medical Advisory Panel members appears on our website at:

www.thyroidcancerCanada.org/medical-advisory-panel.php

In This Issue:

We ask about how much water a patient should drink with their hormone replacement pill?

Q1:

In regards to taking thyroid replacement pills (Synthroid or Eltroxin) some patients have been advised to take the daily pill with a large glass of water, and some have been advised to take it 'with a sip of water'. Some of our members are now concerned about the possible implication in regards to this contradiction. That is, if it is advisable to take it with a small amount of water, does a large amount of water dilute or reduce the dose? Since thyroid cancer patients are often aiming to achieve a very precise (often very suppressed) TSH range, is there a risk of not receiving the full benefit of the ingested dose by 'watering it down'? Or reversely, does a small sip of water impede the uptake of the dose by possibly allowing the pill to 'stick in the throat'?

A 1:

Absorption of thyroid hormone is increased by fasting. Therefore, patients are usually advised to take it in the morning on an empty stomach and wait at least 1/2 hour to 1 hour before eating. As far as the amount of water they should use to ingest the pill, I cannot see any clinical significance if patient is just ingesting their medication with anything between a sip to a full glass of water. We usually ask patients to take medications with sips of water before any procedures or surgeries which involve general anesthetics because patients may be vomiting and aspirate the stomach content including water into the lung and cause infections.

There is also well documented evidence of a decreased absorption if thyroid hormone is taken with certain foods such as soybean infant formula, cotton seed meal, walnuts and dietary fibre it may bind and decrease the absorption of the hormone from the GI tract. In addition, there is a list of drugs which may alter T4 and T3 metabolism. Therefore, I usually advise patient to take their thyroid hormones first thing in the morning and wait 1/2 hour before eating or taking other

medications. If any patient is concerned about other medications interfering with their thyroid hormones, they should consult their pharmacist and doctor.

 With thanks to Wendy Chui, Pharmacist, Canada Chemists, Toronto North Medical Arts Centre, and member of Thyroid Cancer Canada's Medical Advisory Panel.

LID RECIPE BOX

Winter Minestrone - Servings: 6

This delicious winter soup tastes even better reheated the next day!

1 1/2	cups	chopped onions
5		garlic cloves, minced
1	cup	diced celery
2	Tbs	red wine (or sherry)
1	tsp	non-iodized salt
1	cup	diced carrots
1	cup	diced parsnips
1	cup	chopped fennel bulb
1 1/2	cups	cubed sweet potatoes
2	tsp	ground fennel seeds
2	tsp	dried oregano
1/4	tsp	dried red pepper chilli flakes
1	tsp	freshly ground dried rosemary OR
1		fresh rosemary sprig
3	cups	fresh tomatoes -- chopped or pureed
2-3	cups	water
1/2	cup	dry red wine -- (optional)
3/4	cup	chopped fresh parsley
1 1/2	cups	cooked drained kidney beans

(optional – note most canned beans have salt added and are not suitable for the LID. If you use beans in this recipe, you must prepare and cook them yourself)

Procedure

- In a large soup pot, sauté the onions, garlic, and celery in wine on low heat for 8 minutes. Stir in the non-iodized salt, carrots, parsnips, and chopped fennel bulb. Cover and continue to cook for 10 minutes.
- Add the sweet potatoes, ground fennel, oregano, red pepper flakes, and rosemary and simmer for about 5 minutes.
- Add the tomatoes, water, and the wine. Cover and simmer for 20 minutes or until all vegetables are tender.
- Add the cooked beans at the end, if using and top with parsley.



Thyroid Cancer Canada has recently assembled all recipes that have been shared with us by patients, in a new document on our website. View the Low Iodine Diet section of the website at www.thyroidcancercanada.org.

Happenings at *Thyroid Cancer Canada*

As always, the volunteers at *Thyroid Cancer Canada* are busy supporting the over 2,100 members of our organization and the 6,000 new patients who will be diagnosed with thyroid cancer this year. Here are some fast facts to bring you up to date about recent TCC activities:

- our website has about 2400 visits a month, and 60% of those visitors are new to our site
- our Online Forum now has over 400 members and about 340 messages are posted per month
- our Facebook page has over 520 'friends', and about 2/3 of them are active monthly users
- 62 people are following us on our Twitter page
- since May 2010, we have mailed out over 260 Welcome Packages to new members
- since May 2010, 70 clinicians have placed bulk orders of our publications, including over 3200 copies of our Patients Guide booklet.

To find out more about our activities, or to learn how you can volunteer with TCC, join us for our monthly Business Meetings (held in Toronto). Also, we invite all to join us for our Annual General Meeting to be held on May 28, 2011 (location TBA). Please contact us at: info@thyroidcancercanada.org or 416-487-8267 for more information.



Thyroid Cancer Canada thanks Thorne Mill on Steeles, a Sunrise Canada facility, for graciously providing a venue for our Business Meetings held once a month. Thorne Mill has been a warm host to our meetings for more than two years. To learn more about the Sunrise Senior Living centres, visit www.sunriseseniorliving.ca



Thyroid Cancer Canada thanks Ursula Gallagher and Litmus Design (www.litmusdesign.ca) who generously has been providing design services for Thyrvors News for the past 5 years as an in-kind donation. TCC is most grateful for this service and we wish her well in her future endeavours.



Hold This Date. You are welcome to attend a Patients Forum on May 28, 2011 in the Greater Toronto Area (location and details available soon on our website)

Like you, we have been touched by thyroid cancer. We are a non-profit organization and we are all volunteers. If you would like to donate or to become a volunteer please visit www.thyroidcancercanada.org.

Donation cheques may be made payable to: Thyroid Cancer Canada

Mail to: Thyroid Cancer Canada

PO Box 23007, 550 Eglinton Ave. West

Toronto, ON M5N 3A8