THYROID FLYER

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Mother and Child

Information Day

Sunday 2 October
Camberwell Civic Centre
9.00am to 4.30pm

Fully Catered

Full Conference Documentation

Easy Public Transport

Plenty of Parking

$45 for members
$50 non-members

Speakers

Dr Christine Rodda: The impact of thyroid disease on the baby during pregnancy and post partum.

Prof Duncan Topliss: The impact of thyroid disease on the mother during pregnancy and post partum.

Dr Richard Arnott: Understanding thyroid tests.

Dr Robert Hanner: Diet and nutrition in relation to hypo- and hyperthyroidism.

Our conference this year aims to provide good practical information for everyone on the two most common issues raised - namely thyroid testing and diet. It also focuses on the very important problems of the impact of thyroid disease on mothers and their babies. Come along and hear excellent speakers in their fields - and ask them those questions you have been dying to ask.

Autoimmune Thyroiditis and Pregnancy

By **Alex F Muller and Arie Berghout**

1. Introduction

Thyroiditis is characterised by thyroid inflammation.[1] Such inflammation can be due to several causes notably autoimmunity. However, other factors involved are radiation, trauma, micro-organisms and environmental factors (e.g. Iodine).[1] Thyroid autoimmune disorders can have marked influence on the chances of successful conception, on the course of pregnancy itself and on the postpartum period. On the other hand, pregnancy has a profound influence on the expression of thyroid autoimmune disorders.

2. Thyroid antibodies and pregnancy loss

2.1 Background

As the human fetus expresses huge amounts of paternal histocompatibility antigens it can be easily understood that pregnancy has a profound effect on the immune system of the mother. Indeed, in pregnancies in which these immune adaptations are impaired there is an increased prevalence of miscarriage.[2] During pregnancy several mechanisms converge which collectively downregulate the cytotoxic/cytolytic arm of the cell-mediated immune system.[3] First, the trophoblast expresses a special paternally imprinted MHC-class I molecule called HLA-G which may serve as a ligand for the natural killer (NK) cell receptor thus deviating a NK cell attack away from the fetus.[4] Second, under the influence of corticotrophin releasing hormone the expression of apoptotic Fas ligand (FasL) on trophoblast and maternal decidual cells at the fetal-maternal interface is stimulated. The apoptosis of activated T lymphocytes through FasL induction is also stimulated by corticotrophin releasing hormone. Thus at the placental level activated maternal lymphocytes are more likely to die through apoptosis (cell suicide). Taken together these processes increase the likelihood of successful implantation and early pregnancy tolerance.[5]

Besides adaptations at the local feto-maternal level, more systemic adaptations take place as well. These systemic adaptations are at least in part regulated by the local production of progesterone, estrogen and hCG.[2,6,7] Collectively, these hormones redirect maternal immunity away from the damaging T-helper subset 1 (TH1) cell-mediated immunity toward humoral T-helper subset 2 (TH2) mediated immunosuppression.[3]

2.2 Spontaneous pregnancy loss in unselected pregnancies

Stagnaro-Green et al studied 552 consecutive euthyroid women in the first trimester of pregnancy and found that the presence of thyroid peroxidase (TPO) and/or thyroglobulin (Tg) antibodies in the first trimester of pregnancy is a risk factor for spontaneous fetal loss (17% vs. 8.4% in controls).[8] These results were confirmed by Glinoer et al. who found a higher rate of spontaneous abortion in 45 euthyroid women with thyroid autoantibodies compared to 603 controls: 13.3% vs. 3.3%.[9] Since then several other reports have lend further support to the notion that the presence of thyroid antibodies – most notably anti-TPO antibodies are associated with spontaneous pregnancy loss [10-12] (Figure 1).

In a prospective study of 54 euthyroid women who conceived after in vitro fertilization (IVF) we were unable to find a significant association between the spontaneous abortion rate and the presence of TPO antibodies before pregnancy. Although miscarriages occurred in 33% of TPO antibody positive women and in only 19% of the TPO

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Figure 1 Thyroid antibodies and "incidental" pregnancy loss in euthyroid women

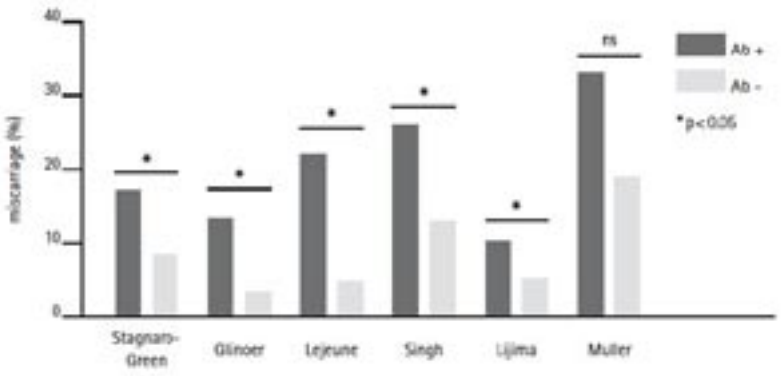
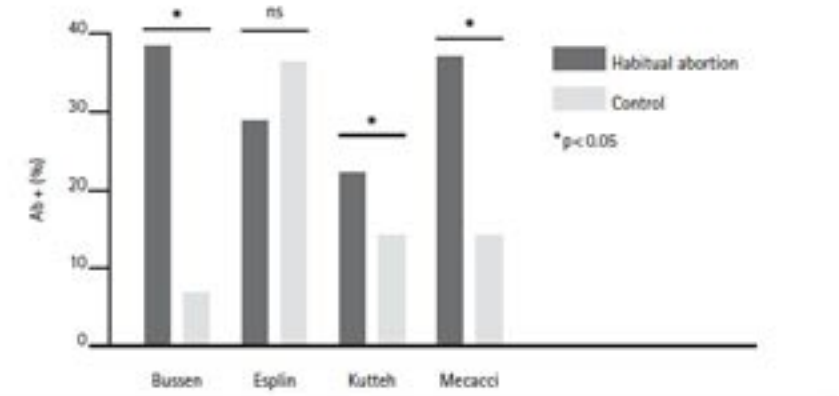


Figure 2 Thyroid antibodies and recurrent pregnancy loss in euthyroid women



antibody negative women, the difference was not statistically significant.[13] Our results thus contradict the results of the studies mentioned above and several biases can be proposed to explain this discrepancy.[14] Firstly, the prevalence of thyroid autoimmunity was low in our pregnant women and if present the severity of the thyroid autoimmune process was mild. Secondly, we determined TPO antibodies before pregnancy, while in the other studies antibodies were determined during pregnancy. In view of the immunologic changes that occur during pregnancy (see ref 15) these differences in study design have probably led to inclusion of women with less severe forms of thyroid autoimmunity which might – at least in part – explain the discrepancy. Also, we studied a population who conceived after in vitro fertilization whereas in the other studies spontaneous pregnancies were studied.

Taken together there are presently sufficient data showing an association between thyroid autoimmunity in early - as opposed to before - pregnancy and subsequent 'incidental' miscarriage.

2.3 Recurrent pregnancy loss

A history of three or more consecutive spontaneous miscarriages occurs in 0.5–3% of women.[16] In most cases the cause is not apparent despite extensive evaluation.[16]

In one of their studies Bussen and Steck compared the prevalence of thyroid antibodies in 28 euthyroid women with recurrent abortion with the prevalence of 28 control women: 39 vs. 7% ($p < 0.01$).[17] Kutteh et al. and Mecacci et al obtained similar results. (Figure 2).[18,19] However, Esplin et al were unable to find a difference in the prevalence of thyroid antibodies in women with a history of recurrent pregnancy loss vs. healthy non-pregnant controls.[20] This may be due to the high prevalence of thyroid antibodies in the control group.[20,21]

Two studies have investigated the effect of thyroid antibodies on pregnancy outcome in future pregnancy in euthyroid women with recurrent pregnancy loss (Figure 3). Pratt et al reported that in the women who had yet another miscarriage the prevalence of thyroid antibodies was significantly higher than in women who carried to term.[22] However, Rushworth et al found that the future risk for pregnancy loss in women with unexplained recurrent miscarriage was not affected by the presence of thyroid antibodies.[23]

In conclusion the association between the presence of thyroid antibodies and habitual abortion – defined as three or more subsequent miscarriages – is conflicting.

3. Autoimmune thyroiditis during pregnancy

3.1 Autoimmune hypothyroidism

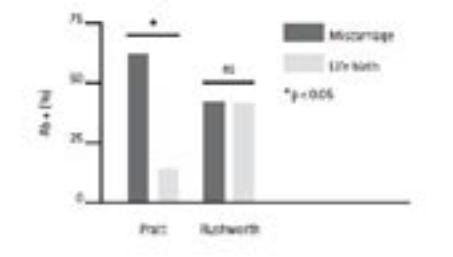
Of pregnant women 2 to 2.5% have elevated TSH levels.[24,25] In the western world autoimmune thyroiditis is the most common cause of elevated TSH levels in pregnant women.[26]

Hypothyroidism in pregnancy can lead to serious obstetrical complications of which pregnancy induced hypertension seems to be the most prevalent.[27] Other complications that have been described are abruptio placentae, postpartum haemorrhage, stillbirths, low birth weight and anaemia.[27]

Maternal hypothyroidism is also associated with impaired neuropsychological development in the offspring. In cases of combined maternal and fetal hypothyroidism the neurological outcome is most severely affected. Such a situation is most commonly caused by iodine deficiency;[28] however, TSH-receptor blocking antibodies can pass the placenta and are thus able to result in combined maternal and fetal hypothyroidism.[29] Recently, it has been shown that children born to women with maternal serum fT4 levels below the 10th percentile at 12 weeks gestation (irrespective of elevation of TSH and/or presence of TPO antibodies), had significantly lower neurodevelopmental scores compared to children of mothers with higher fT4 values.[30] Also, children born to mothers with hypothyroidism during the second trimester of pregnancy, as determined by an elevated TSH, have lower IQ-scores and more educational difficulties at age 7–9 than children born to mothers with normal TSH levels during pregnancy.[26]

From the above described data we conclude that every pregnant woman with hypothyroidism – even when mild – should be treated and carefully followed during pregnancy. It is important

Figure 3 Effect of thyroid antibodies on future pregnancy outcome in women with a history of recurrent pregnancy loss



to emphasize here that during pregnancy thyroid hormone requirements and thus the dose of L-thyroxine in women treated for hypothyroidism can increase substantially.[31]

3.2 Thyrotoxicosis

Gestational transient hyperthyroxinaemia (GTH) is the commonest cause of hyperthyroidism in pregnancy, with a frequency of 2–3% in European women and up to 11% in women of Asian origin.[32] It is due to the structural homology of TSH and hCG and their respective receptors whereby hCG can bind and activate the TSH receptor.[33] It is not of autoimmune origin and will thus not be discussed here.

Autoimmune thyrotoxicosis – i.e. Graves' disease – is encountered in approximately 1 of 1000–2000 pregnancies.[34,35] It is associated with significant obstetrical complications such as low birth weight, prematurity and eclampsia.[35] From a practical point of view it is important to note that the risk of such complications seems to be directly related to the severity of the thyrotoxicosis.[35,36]

Methimazole has been related to an increased prevalence of aplasia cutis and therefore propylthiouracil has traditionally been the preferred treatment for Graves' disease during pregnancy. However, in two studies the association between methimazole and aplasia cutis could not be confirmed,[37,38] weakening the rational basis for preferring propylthiouracil in favour of methimazole. Treatment should be with antithyroid drugs solely at the lowest dose possible, aiming at a fT4 at – or slightly above – the upper limit of normal.[39] To this aim varying maximal and minimal doses of propylthiouracil (median 450 mg and 100 mg daily, respectively) and methimazole (median 40 mg and 10 mg daily, respectively) are reported.[40] However, if necessary the dose of antithyroid drug should be increased in order to control the thyrotoxicosis.[35]

4. Postpartum thyroiditis

Postpartum thyroiditis is a syndrome of transient or permanent thyroid dysfunction occurring in the first year after delivery and based on an autoimmune inflammation of the thyroid.[3] The prevalence of postpartum thyroiditis varies widely, from 1.1–21.1%. Postpartum thyroiditis is closely associated with the presence of antibodies to thyroid peroxidase (TPO) and certain MHC genes.[3]

The thyroid dysfunction of postpartum thyroiditis classically runs a biphasic course: a thyrotoxic phase is followed by a hypothyroid phase. The disease can also present as either transient thyrotoxicosis or hypothyroidism.[3] Symptoms are generally nonspecific and a high index of suspicion is required, especially in women with postpartum depression as postpartum depression is significantly associated with postpartum thyroid dysfunction regardless of the thyrotoxic or hypothyroid phase.[3] The differential diagnosis of the thyrotoxicosis comprises primarily Graves' disease. Because management and follow-up of postpartum destructive thyrotoxicosis and Graves' disease differ it is important to establish a causal diagnosis. The presence of ophthalmopathy and TSH receptor antibodies point to a diagnosis of Graves' disease. In cases of doubt thyroid scintigraphy should be performed.[3]

Considering treatment it is important to realize that the thyrotoxic phase of postpartum thyroiditis is due to leakage of thyroid hormones from destroyed thyrocytes and is, therefore, self-limiting. The hypothyroid phase develops approximately 4 to 8 months postpartum and usually lasts 4 to 6 months. Permanent hypothyroidism is the most important sequel of postpartum thyroiditis and occurs in 12–61% of patients.[3] Hypothyroidism should always be treated with L-thyroxine replacement therapy. Spontaneous recovery of thyroid function should not be awaited. Instead, it is reasonable to stop thyroxine after two to six months to see whether remission has occurred. If so, we advise discontinuation of treatment followed by yearly assessment of thyroid function. A pragmatic approach to maintain the thyroxine replacement therapy and postpone the cessation of therapy until completion of the family has also been suggested.[3]

5. Conclusions

Autoimmune thyroiditis and pregnancy loss: The presence of thyroid peroxidase antibodies is associated with spontaneous pregnancy loss in women without a history of habitual abortion. In women with habitual abortion – defined as three or more subsequent miscarriages – this association is uncertain.

Autoimmune thyroid dysfunction: As the risk to mother and child seems to be correlated with the severity of the thyroid dysfunction it is clear that – depending on the fT4 level at presentation – treatment should be instituted immediately. Thus, when a woman is diagnosed with hypothyroidism during pregnancy full replacement with thyroxine (1.9 µg/kg ideal body weight for autoimmune hypothyroidism [and 2.3 µg/kg ideal body weight for patients after thyroid ablation][24]) should be started immediately. In view of the expected increase in thyroxine requirement during gestation regular clinical and laboratory follow-up is essential, with periodic determinations of TSH and free T4 concentrations. Women diagnosed with hyperthyroidism during pregnancy should be treated with antithyroid drugs exclusively, aiming at a fT4 at – or slightly above – the upper limit of normal.[39]

Postpartum – autoimmune – thyroiditis: Postpartum thyroiditis occurs in 1.1–21.1% of women in their first postpartum year. There is a clear association with the presence of thyroid peroxidase antibodies. Postpartum thyroiditis classically presents as a thyrotoxic phase followed by a hypothyroid phase after which euthyroidism restores. Permanent hypothyroidism ensues in 12–61%.[3]

References

1. Berghout A, Muller AF. Multinodular goiter, toxic adenoma and thyroiditis. In: Harris PE, Bouloux P-MG, Biller BMK, editors. *Endocrinology in Clinical Practice*. London: Martin Dunitz Ltd, 2003: 269–285.
2. Szekeres-Bartho J, Par G, Szereday L, Smart CY, Achatz I. Progesterone and non-specific immunologic mechanisms in pregnancy. *Am J Reprod Immunol* 1997; 38(3):176–182.
3. Muller AF, Drexhage HA, Berghout A. Postpartum thyroiditis and autoimmune thyroiditis in women of childbearing age: recent insights and consequences for antenatal and postnatal care. *Endocr Rev* 2001; 22(5):605–630.
4. Khalil-Daher I, Riteau B, Menier C, Sedlik C, Paul P, Dausset J et al. Role of HLA-G versus HLA-E on NK function: HLA-G is able to inhibit NK cytolysis by itself. *J Reprod Immunol* 1999; 43(2):175–182.
5. Makrigiannakis A, Zoumakis E, Kalantaridou S, Coutifaris C, Margioris AN, Coukos G et al. Corticotropin-releasing hormone promotes blastocyst implantation and early maternal tolerance. *Nat Immunol* 2001; 2(11):1018–1024.
6. Dealtry GB, O'Farrell MK, Fernandez N. The Th2 cytokine environment of the placenta. Int Arch Allergy Immunol 2000; 123(2):107–119.
7. Saito S. Cytokine network at the feto-maternal interface. *J Reprod Immunol* 2000; 47(2): 87–103.
8. Stagnaro-Green A, Roman SH, Cobin RH, el Harazy E, Alvarez-Marfany M, Davies TF. Detection of at-risk pregnancy by means of highly sensitive assays for thyroid autoantibodies. *JAMA* 1990; 264(11):1422–1425.
9. Glinoer D, Soto MF, Bourdoux P, Lejeune B, Delange F, Lemone M et al. Pregnancy in patients with mild thyroid abnormalities: maternal and neonatal repercussions. *J Clin Endocrinol Metab* 1991; 73(2):421–427.
10. Iijima T, Tada H, Hidaka Y, Mitsuda N, Murata Y, Amino N. Effects of autoantibodies on the

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Graves' Disease and Hypothyroidism: Pregnancy and Fertility

GRAVES' DISEASE

Graves' disease is the commonest cause of hyperthyroidism and may complicate pregnancy. A woman may have Graves' disease but not be thyrotoxic because she has been treated previously and rendered euthyroid.

Prior to pregnancy

In hyperthyroidism there is alteration in menstruation (usually reduced) and fertility is impaired. However, when a woman is returned to normal thyroid function, conception may result very quickly. If pregnancy is not desired after treatment with antithyroid drugs, contraception should be used. If a woman complains of infertility and other causes are excluded, thyroid disease must be excluded as a possible factor.

In men, hyperthyroidism may cause a marked reduction in sperm count, resulting in infertility. When a man becomes euthyroid after treatment the sperm count usually returns to normal at this time.

Women with Graves' disease should inform their obstetrician as soon as possible during early pregnancy of their hyperthyroidism. Once this is done, it is to be expected that the pregnancy will proceed normally to a successful outcome.

In summary, there is no contraindication to being pregnant when you have Graves' disease with or without hyperthyroidism. However, it is important that you inform your obstetrician and consult with your doctor looking after your thyroid.

Pregnancy

During pregnancy the immune system is somewhat depressed, including antibody production. Thus the activity of Graves' disease usually declines, but treatment is still necessary if there is active hyperthyroidism. Antithyroid drugs (propylthiouracil is now the preferred drug but carbimazole is also effective), given in the lowest doses to produce a normal thyroid state, are the mainstay of treatment. These drugs do cross the placenta and may be dangerous to the baby if given in large doses. Antithyroid drugs may need to be continued throughout labour. Thyroid surgery can be done usually only during the middle third of pregnancy. Radioiodine therapy is never used during pregnancy. 'Block and Replace' therapy (i.e. blocking the thyroid from working with carbimazole and then preventing it going underactive with thyroxine) should not be used in pregnancy.

After the baby is born

There is a tendency for the hyperthyroidism to recur in the postpartum period. Women who are not on antithyroid drugs should be aware of this and check with their doctor if symptoms occur. The time of recurrence or re-activation of Graves' disease is about 3-4 months after the birth of the baby. This hyperthyroidism is not the short-lived thyroid overactivity that some women develop due to postpartum thyroiditis.

In the early stages of pregnancy, if the mother is hyperthyroid, there is, unfortunately, an increased risk of miscarriage. During pregnancy the thyroid hormones from the mother do not cross the placenta during the later stages of pregnancy, but the substance producing the hyperthyroidism (thyroid stimulating antibodies) does, and rarely the baby's thyroid may be overstimulated, producing hyperthyroidism. If the mother is receiving antithyroid drugs the baby's thyroid function will be controlled. However, if the dose of antithyroid drugs is too high they will cause the baby's thyroid to become underactive and the baby may develop a goitre. Sometimes the thyroid stimulators may cause hyperthyroidism in the baby after birth. The paediatrician will be able to recognise this; the disease only lasts about 6 weeks and is treatable with antithyroid drugs. It is important to note that even if the mother has been treated for Graves' in the past, there is still a possibility of the baby developing temporary thyroid disease. Measurement of thyroid stimulators in the mother at about 36 weeks by a simple blood test can help predict if the baby will be affected.

Mothers with Graves' disease receiving no antithyroid drugs can safely breast feed.

Only small amounts of antithyroid drugs cross into breast milk. Some physicians may however advise against breast feeding in this case. It is reasonable to breast feed if the dose of anti-thyroid drugs taken by the mother is small. If breast feeding is planned for a long time a blood sample from the baby can be obtained to check thyroid function.

HYPOTHYROIDISM

The impact of the thyroid gland and pregnancy can be viewed in three stages.

Prior to pregnancy

Untreated or undertreated patients are known to be relatively less fertile than normal for many reasons. At its most extreme the menstrual cycle may be severely disrupted or even disappear. This is occasionally because hypothyroid patients secrete excessive amounts of a pituitary gland hormone called prolactin. In excess, prolactin interferes with the regulating hormones concerned with the ovaries, effectively abolishing their activity.

It is well known that hypothyroid women have a tendency to heavy and prolonged periods which may sometimes lead to anaemia.

In the absence of any other conditions, there is no reason why the various factors which impair fertility should not respond fully to proper replacement therapy this thyroxine.

Pregnancy

When a woman becomes pregnant, adequate treatment of hypothyroidism is necessary to secure the health of the baby, its safe gestation to term and the health of the mother.

Recent evidence casts doubt on the long-held view that providing the baby's thyroid develops normally, the maternal state is relatively unimportant. We now believe that small, but probably critically important amounts of thyroxine pass across the placenta

from mother to child. This is especially important during the earliest weeks of pregnancy before the foetus has developed its own thyroid and thyroid-regulating system. The maternal health obviously requires optimal replacement with thyroxine during pregnancy. Several groups have now documented that many hypothyroid women need to increase their thyroxine dosage markedly to remain fully replaced during pregnancy. This may necessitate doubling or even trebling the dose, judging the correct level by the measurement of TSH and thyroid hormone in the blood. The reason for this necessary increase is not clear. Probable increases occur in the rate at which the body disposes of the thyroxine entering the system - so more needs to be taken to achieve a balance. Thus all pregnant women should have their blood tests monitored fairly closely during the time they are carrying. It should also be noted that these changes seem to reverse very quickly so that previous adequate smaller doses can be resumed.

After the baby is born

Babies with congenitally defective or absent thyroids are detected by a screening programme applied to all new-born infants in the UK. These babies can expect a pretty good outlook if treated from their earliest days with thyroxine.

Probably the most common thyroid disease now seen in Britain is that of postpartum thyroiditis and occurs especially in women with thyroid auto-antibodies. Thus usually occurs about four months after the birth and the symptoms of thyroid deficiency respond well to treatment with thyroxine. Many women can discontinue treatment with thyroxine after a period of six to twelve months but are liable to relapse after subsequent pregnancies.

Thyroxine, being a natural hormone, in no way interferes with breastfeeding or its safety.

Autoimmune Thyroiditis *from Page 3*

course of pregnancy and fetal growth. *Obstet Gynecol* 1997; 90(3):364–369.
11. Lejeune B, Grun JP, De Nayer P, Servais G, Glinoer D. Antithyroid antibodies underlying thyroid abnormalities and miscarriage or pregnancy induced hypertension. *Br J Obstet Gynaecol* 1993; 100(7):669–672.
12. Singh A, Dantas ZN, Stone SC, Asch RH. Presence of thyroid antibodies in early reproductive failure: biochemical versus clinical pregnancies. *Fertil Steril* 1995; 63(2):277–281.
13. Muller AF, Verhoeff A, Mantel MJ, Berghout A. Thyroid autoimmunity and abortion: a prospective study in women undergoing in vitro fertilization. *Fertil Steril* 1999; 71(1):30–34.
14. Glinoer D. Thyroid autoimmunity and spontaneous abortion [letter; comment]. *Fertil Steril* 1999; 72(2):373–374.
15. Formby B. Immunologic response in pregnancy. Its role in endocrine disorders of pregnancy and influence on the course of maternal autoimmune diseases. *Endocrinol Metab Clin North Am* 1995; 24(1):187–205.
16. Li TC, Makris M, Tomsu M, Tuckerman E, Laird S. Recurrent miscarriage: aetiology, management and prognosis. *Hum Reprod Update* 2002; 8(5):463–481.
17. Bussen SS, Steck T. Thyroid antibodies and their relation to antithrombin antibodies, anticardiolipin antibodies and lupus anticoagulant in women with recurrent spontaneous abortions (antithyroid, anticardiolipin and antithrombin autoantibodies and lupus anticoagulant in habitual aborters). *Eur J Obstet Gynecol Reprod Biol* 1997; 74(2):139–143.
18. Kutteh WH, Yetman DL, Carr AC, Beck LA, Scott RT, Jr. Increased prevalence of antithyroid antibodies identified in women with recurrent pregnancy loss but not in women undergoing assisted reproduction. *Fertil Steril* 1999; 71(5):843–848.
19. Mecacci F, Parretti E, Cioni R, Lucchetti R, Magrini A, La Torre P et al. Thyroid autoimmunity and its association with non-organspecific antibodies and subclinical alterations of thyroid function in women with a history of pregnancy loss or preeclampsia. *J Reprod Immunol* 2000; 46(1):39–50.
20. Esplin MS, Branch DW, Silver R, Stagnaro-Green A. Thyroid autoantibodies are not associated with recurrent pregnancy loss. Am J Obstet Gynecol 1998; 179(6 Pt 1):1583–1586.
21. Abramson J, Stagnaro-Green A. Thyroid antibodies and fetal loss: an evolving story. *Thyroid* 2001; 11(1):57–63.
22. Pratt DE, Kaberlein G, Dudkiewicz A, Karande V, Gleicher N. The association of antithyroid antibodies in euthyroid nonpregnant women with recurrent first trimester abortions in the next pregnancy. *Fertil Steril* 1993; 60(6):1001–1005.
23. Rushworth FH, Backos M, Rai R, Chilcott IT, Baxter N, Regan L. Prospective pregnancy outcome in untreated recurrent miscarriers with thyroid autoantibodies. *Hum Reprod* 2000; 15(7):1637–1639.
24. Glinoer D. Potential repercussions for the progeny of maternal hypothyroxinemia during pregnancy. *Thyroid* 2000; 10(1):59–62.
25. Klein RZ, Haddow JE, Faix JD, Brown RS, Hermos RJ, Pulkkinen A et al. Prevalence of thyroid deficiency in pregnant women. *Clin Endocrinol* (Oxf) 1991; 35(1):41–46.
26. Haddow JE, Palomaki GE, Allan WC, Williams JR, Knight GJ, Gagnon J et al. Maternal thyroid deficiency during pregnancy and subsequent neuropsychological development of the child. *N Engl J Med* 1999; 341(8):549–555.
27. Brent GA. Maternal hypothyroidism: recognition and management. *Thyroid* 1999; 9(7):661–665.
28. Dunn JT, Delange F. Damaged reproduction: the most important consequence of iodine deficiency. *J Clin Endocrinol Metab* 2001; 86(6):2360–2363.
29. Dussault JH, Fisher DA. Thyroid function in mothers of hypothyroid newborns. *Obstet Gynecol* 1999; 93(1):15–20.
30. Pop VJ, Kuijpens JL, van Baar AL, Verkerk G, van Son MM, de Vijlder JJ et al. Low maternal free thyroxine concentrations during early pregnancy are associated with impaired psychomotor development in infancy. *Clin Endocrinol* (Oxf) 1999; 50(2):149–155.
31. Mandel SJ, Larsen PR, Seely EW, Brent GA. Increased need for thyroxine during pregnancy in women with primary hypothyroidism. *N Engl J Med* 1990; 323(2):91–96.
32. Yeo CP, Khoo DH, Eng PH, Tan HK, Yo SL, Jacob E. Prevalence of gestational thyrotoxicosis in Asian women evaluated in the 8th to 14th weeks of pregnancy: correlations with total and free beta human chorionic gonadotrophin. Clin Endocrinol (Oxf) 2001; 55(3):391–398.
33. Hershman JM. Human chorionic gonadotropin and the thyroid: hyperemesis gravidarum and trophoblastic tumors. *Thyroid* 1999; 9(7):653–657.
34. Davis LE, Lucas MJ, Hankins GD, Roark ML, Cunningham FG. Thyrotoxicosis complicating pregnancy. *Am J Obstet Gynecol* 1989; 160(1) :63–70.
35. Mandel SJ, Cooper DS. The use of antithyroid drugs in pregnancy and lactation. *J Clin Endocrinol Metab* 2001; 86(6):2354–2359.
36. Millar LK, Wing DA, Leung AS, Koonings PP, Montoro MN, Mestman JH. Low birth weight and preeclampsia in pregnancies complicated by hyperthyroidism. *Obstet Gynecol* 1994; 84(6):946–949.
37. Momotani N, Ito K, Hamada N, Ban Y, Nishikawa Y, Mimura T. Maternal hyperthyroidism and congenital malformation in the offspring. *Clin Endocrinol* (Oxf) 1984; 20(6):695–700.
38. van Dijke CP, Heydendael RJ, De Kleine MJ. Methimazole, carbimazole, and congenital skin defects. *Ann Intern Med* 1987; 106(1):60–61.
39. Muller AF, Berghout A. Thyroid autoimmunity and pregnancy outcome. *Hot Thyroidology* – Journal owned by the European Thyroid Association [2]. 2002. www.hotthyroidology.com
40. Wing DA, Millar LK, Koonings PP, Montoro MN, Mestman JH. A comparison of propylthiouracil versus methimazole in the treatment of hyperthyroidism in pregnancy. *Am J Obstet Gynecol* 1994; 170(1 Pt 1):90–95.

Alex F. Muller *of Department of Internal Medicine, Diakonessenhuis Utrecht, Utrecht, The Netherlands*
Arie Berghout *of Department of Internal Medicine, Medical Centre Rijnmond Zuid, Rotterdam, The Netherlands*

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A Long Road

On 2nd March 2001, my husband and I were blessed with the arrival of our second beautiful baby girl. We were so elated. All our dreams and hopes had been fulfilled. Nothing could destroy our happiness. Well … so we thought. Little did we know what lay ahead!

Mild symptoms - the first 4 months

The next few months were nothing out of the ordinary. My husband went to work. I stayed home and looked after our 2 year 10 month toddler and our new born. Life was as to be expected in such a situation - "busy" and no time to rest.

But, it did not worry me. Life was good. In fact life was great! We were going out seeing friends, going for walks, enjoying life. I had *so much energy*. I *coped easily - nothing was too much for me*. I was *always happy*. I was always laughing; in fact sometimes I could not *stop laughing*. Then at night my *heart would race*. Also, I was *always hot*.

Little did I know it, but all these symptoms were because I was actually hyperthyroid.

At my baby's 4 month check up my health nurse asked me how I was going. "Fantastic!" I replied. Hmmmm … famous last words.

Serious symptoms – 4½ months after birth

What happened next was the most bizarre onset of symptoms I had ever experienced in my life to date. They happened within days of each other – an incredible *sudden onset of fatigue and the craziest thoughts*.

The fatigue came first. It started gradually. At first I thought I was just over-tired. Walking up our stairs became a huge effort. Folding washing was exhausting. Then finally one morning I could not lift my body out of bed. What was suddenly wrong with me?

The next day came and I felt worse. Then to top it off in the evening the weirdest thoughts flashed into my head. I asked my husband if this was "normal". No it was NOT and yes the very next day I was at my doctor's surgery.

Little did I know it, but I had suddenly become hypothyroid.

First visit to GP – my symptoms described

I described my symptoms to my GP – incredible tiredness, heavy bones, weird thoughts plus an immense feeling of hopelessness, constant teariness and an overall lack of joy in life.

He knew this was not me and decided to take some blood tests. Thank goodness he included a thyroid test! My initial blood test revealed my TSH was 31.19mIU/L – way out of the reference range.

Further tests revealed an extremely high level of thyroid peroxidase antibodies (6,400) and borderline high thyroglobulin antibodies (100). A subsequent ultrasound of my thyroid confirmed my diagnosis – Hashimoto's Thyroiditis. Interestingly, my T4 was still inside the normal reference range.

I was prescribed 50ug/day thyroxine (Oroxine). Initially I did not take my tablets. I thought I could cure myself by positive thinking. To date, I had always tackled problems head on with a "positive mental attitude." I was to find out the hard way this was a wrong move. Unfortunately, I had no idea what I really had or how serious my condition really was - so I attempted to keep on "soldiering on".

But now everyday events were absolutely exhausting me. But I did not tell anyone – I did not want people to know I was not coping – everyone else was! In hindsight I do not know why I did not ask for help?

During this period a thick blanket of fog rolled into my mind. I had trouble remembering simple tasks. I had to write everything down. I could not even remember my husband's mobile number which I rang daily. I was once an A student but now I needed a calculator to add a few numbers. My deterioration in my memory and mental capacity was so great that I either broke down in tears or became furious. My husband dared not ask me where anything was in the house anymore.

My hair was falling out constantly. My nails deteriorated. The smooth and radiant skin on my face was dull, lifeless and dry. My mother sent me special moisturiser and told me to stop breastfeeding - it was "ageing" me!

I still carried extra weight but that would have to wait. I was so exhausted just trying to get though the day to even contemplate exercising. Hanging one load of washing was enough to have me collapsing on the lounge with exhaustion.

I am not sure if I was really aware of it - but my mood was changing. My bright bubbly self was not so bright and not so bubbly. Life started to lose its glow. I felt so flat. On top of all that, despite my chronic tiredness, I suffered extreme insomnia which I had never suffered in my entire life!

I thought it might be the extra demands of my toddler; or was it my baby going through the normal regime of sleepless nights and breastfeeding; or was it the lack of physical support as I was often on my own for days on end as my husband had a very demanding job and was interstate almost every week? I never suspected it could be my thyroid condition … how could it cause all this?

Finally I saw an endocrinologist. He advised me I had to take my tablets; my thyroid was being under attack and was slowly being destroyed!

Thyroxine – My Miracle Cure

So I took my thyroxine and MIRACULOUSLY within days all my symptoms DISAPPEARED! I was feeling well again – in fact I felt FANTASTIC! I had discovered my MIRACLE CURE. There was no way I would EVER forget my tablets!

Major shock

But unfortunately my period of "wellness" was short lived. Within a few weeks I suffered several major shocks and stressful events including September 11th 2001. Out of the blue all my symptoms returned plus a few more. I now started having *panic attacks* and suffering *extreme anxiousness*. But, I did have my good days so I tried not to dwell on my bad days!

Anyway, a few weeks later I was told by my endocrinologist that according to my thyroid blood test results I was now "OK". My TSH was now down to 3.8mIU/L.

At fist I was elated by the news, I had been "cured". But as each day went by I became more and more unwell. I was **not** OK. My *extreme fatigue returned* and with it *my brain fog". I suffered memory problems again, the inability to organise things, forget fullness, extreme irritability, mood swings with bouts of immense rage or extreme teariness and intolerable insomnia.*

I explained to my specialist that I was worried about all these "weird" symptoms. But he waved my concern away by his reply, "This is how you are meant to feel, you are a mum with two young children!"

The darkest period in my life

A few weeks went by but now my panic attacks and extreme anxiousness became part of my everyday life. I was also now so fatigued I no longer wanted to be part of every day life. All I wanted to do was sleep. In fact my quest for sleep consumed me yet I couldn't sleep due to my intolerable insomnia. I have no idea how I managed to carry out the "role of a mother" during this time, let alone want to be alive?

Finally the charade ended and my fatigued mind and body crashed - I suffered a nervous breakdown. I do not know what my TSH was just before my breakdown, but two weeks after constant bed rest my TSH was 4.71mIU/L.

At this stage I was hospitalised in the most amazing mother baby unit in Melbourne. During this time my thyroxine dose was increased – my psychiatrist felt my TSH was TOO high!!! He explained that ALL my symptoms were because my mind and body had been starved of thyroid hormone. He also prescribed me a low dose anti-depressant (Zoloft). He felt my mind had suffered such a major trauma it needed help to recover. He also told me my symptoms were identical to those of PND. There were a lot of mums in hospital with PND. I considered myself lucky; I knew what had caused mine.

A new beginning

I left hospital nearly three weeks later a new woman. I was very battle scarred by my ordeal, but despite this I actually felt quite well. While in hospital I had learnt Cognitive Behavioural Therapy (CBT) and meditation. I credit these techniques for helping me identify and remove all those unnecessary "stressors" in my life. I never knew how negative my self talk was! Also, I identified my high expectations were not helping my situation. I believe these techniques were invaluable in my recovery and I still use them today.

During the next few months I felt well. I tackled life pro-actively and took risks. I was almost completely symptomless. I also had a new attitude to life. I had learnt how to say "NO" and not feel guilty! I knew that I had to pace myself. I was responsible for me! A few months later my TSH was retested - it was now 2.84mIU/L.

2002

During the next year, I had regular tests and saw my psychiatrist and endocrinologist regularly. They showed me my test results and told me I should now be well. Initially I did feel well. But as the year rolled by I started complaining that I started suffering from *extreme morning tiredness and memory problems*. I had to be reminded I was a mum and still had a baby who was waking me at nights. However, unbeknown to me, during this time my TSH was gradually rising to 3.32 then 3.57 then 4.46mIU/L. This last result was virtually the same as after I had my nervous breakdown. But this time no-one flinched an eyelid?

2003

Over the second year, I had no more tests. My thyroxine dose had supposedly been "optimised". But during this year I just kept feeling worse and worse. As the year progressed I noticed I was *putting on weight*, my *face and hands were always swollen* and I started *suffering severe joint pains and stiffness in my knees and hips* – getting out of bed in the mornings was a major ordeal. My *morning tiredness extended into the afternoon* - I now needed two to three hour naps in the afternoons. Worse still my *eyesight and hearing deteriorated*. Also, I started suffering *dyslexia* for the first time in my life! Was age finally catching up with me? To top it off I became *extremely clumsy* which culminated in me slipping and breaking a rib!

I wrote to my endocrinologist and asked her what was wrong with me – was this all due to my thyroid again? She replied "Unlikely…That was life!" It was twelve months since my last test so I had my thyroid tested. A few days later my endocrinologist rang me urgently. She wanted to know my current thyroxine dose. She wanted me to increase it immediately because my TSH had risen to 6.58mIU/L!!!

Within days of increasing my thyroxine dose I could not believe it, but one by one my symptoms miraculously disappeared! **All my symptoms HAD BEEN due to my thyroid!!!** Within weeks of increasing my dose - I FELT FANTASTIC!!! I even decided to return to work and stop taking anti depressants.

2004

A new year and I was finally me again - "SUPER MUM" was back! I felt so FANTASTIC! My TSH was retested and it was now down to 1.34mIU/L - the LOWEST it had ever been during my treatment! My feeling of "wellness" lasted for months during which time I was completely symptomless - I was cured!

But, as the year rolled on, out of the blue some of my old symptoms started sneaking back into my life. I started feeling "unwell" again. I noticed in photos that my *face was swollen* - again. Also, I was becoming more irritable – again! And then out of the blue I suffered a *panic attack*. What was happening to me? Was it my thyroid again?

This is when I embarked on the most amazing journey of self discovery I have ever been on. This is when I discovered all the information I now know. If only I had known this from the start!

Armed with this information the first thing I did was have another blood test and checked my thyroxine tablets. I was horrified. The expiry date was Nov 2004. It was then Oct 2004. How active were they? I immediately sourced new tablets from my chemist and believe it or not … within days of taking my new fresh thyroxine tablets ALL my symptoms disappeared! They WERE ALL due to my thyroid – AGAIN!!

Also, my test result came back. My TSH was 2.39mIU/L. I screamed with excitement. I am sure my doctor thought I was going mad. Why would "anyone" be so excited about a TSH blood test result? Well for me it was as it was outside of the magic 1.0-1.5mIU/L range which is where MOST of the healthy population is!

2005

It is now three months after my new tablets (Feb 2005) and I cannot begin to explain how WONDERFUL I feel. I still have a smile from ear to ear like a child who received the BEST Christmas present ever in her life! I now know how to stay well FOR LIFE!!!

Oh yes, I also had another blood test and guess what my TSH is now down to 1.75mIU/L. As a result I believe I have inadvertently discovered my own "personal" TSH reference range!

My only medication today is 150ug/day of thyroxine. I can now organise things with ease, my mind feels like it is free flowing, I can remember complex facts and figures. My fog has disappeared. I am also fun to have around. My husband is overjoyed at having me back and so are my children. I LOVE LIFE! I am a FUN MUM again!

Oh yes, on a more vain topic, I know have beautiful glowing skin, my nails are quite amazing, and I finally fit into ALL those pre-baby number two clothes again!

❀

When is this nightmare ever going to end...

As long as I can remember, I have always been a very tired person who loves to sleep. Naturally, as you grow up, you just assume that you love your sleep and this is pretty normal for you. But when lengthy hours of sleep become a part if your life, you realise something must be terribly wrong.

During my late twenties, I noticed that I needed a day to get over yesterday. Sometimes I would wake feeling "stiff and sore" and achy all over. My periods were always heavy, incredibly painful and very tiring. I had little motivation and suffered from severe anxiety and depression.

Soon after I got married, at age 32, my husband and I decided to start our family. After nearly twelve months of trying, with no success, I knew something was desperately wrong. Countless blood tests revealed I was on the borderline of anaemia. My blood pressure was always incredibly low - 90/60. My doctor told me to increase my consumption of iron.

I was exhausted – everyday - and would come home from work to sleep until it was time to get dinner ready. I missed out on tonnes of invitations - parties, days out, holidays - all because I was just "too tired".

After seeing an endocrinologist for my infertility problem, he found absolutely nothing wrong with me or my husband. I had several laparoscopies which revealed my tubes were clear and functioning normally.

In April 2000, I went on a course of Clomid (fertility drug) which resulted in a pregnancy just a few weeks later. I was stoked!! Over the moon - completely. Sadly, in the eighth week, I began to bleed and blood tests/ultrasound revealed my baby was dying. It was such a disappointment to us both.

My body was a complete mess. I had put on weight, felt incredibly bloated and looked terrible.

I managed to lose a little bit of weight - with much dieting and strenuous exercise, but quickly put it all back on. I couldn't figure out - I wasn't overeating or eating junk food. I had always been blessed with a great figure (always very slim) but now my body was changing - rapidly.

In 2002, my doctor put me on another course of fertility drugs. A few weeks passed. I felt dreadful. Every night I would wake up drenched - absolutely soaking. Panic began to set in. I thought I was going through an early menopause. (at age 35!!) I rang my fertility specialist and was horrified when he said, "yes, you probably are." I put the phone down and cried my heart out. Surely, this isn't menopause?

Every night, I would wake dripping with perspiration from head to toe. I was exhausted, irritable and very depressed. I would drag myself to work every morning wondering when this nightmare was going to ever end.

One morning, as I was getting out of my husband's car, I fell landing in the gutter. Onlookers thought I was drunk. I had no control over my muscles. That very same day, I found I could barely walk and would drag my leg when I did. I sat at my computer desk and forgot what year it was. Embarrassingly, I had to ask one of my co-workers.

My mind was a real blur. I couldn't concentrate and suffered from enormous bouts of anxiety. I was depressed and knew I was on the verge of a breakdown. My periods were late and very scanty leading me to believe menopause had arrived.

I went to the doctors in a real panic. Blood tests revealed my hormonal levels were extremely low. The doctor gasped when she read my report. My TSH was 49.5. She hadn't seen a test this bad in a long time. She didn't know whether to admit me to hospital or not.

I had absolutely no idea what these measurements meant or what part the thyroid played in the body. It was very frightening. Having no support from family and friends made it even worse. Then I remembered my girlfriend telling me she had this condition called Hashimoto's and it had something to do with the thyroid gland. A thyroid ultrasound revealed no nodules (thank goodness). It was just very enlarged. My doctor put me on a course of Oroxine 50mcg.

I still felt dreadful.

My endo ran a few blood tests and rang me a few days later. He was very concerned. He told me my antibody levels were extremely high (didn't get measurements) and to increase my Oroxine to 100mcg. He told me I was very ill and to have some time off work.

The night sweats continued. I would even sweat in the day. At night I suffered from severe fevers. I was so cold I slept with the electric blanket on - all night. The sweating made me colder. My body ached like I had the flu and my feet tingled every time I walked. Later on, my hands began to shake.

Prior to all of this, I had been on a waiting list for a cornea transplant to correct an eye disease (separate problem). My TSH levels were coming down slowly, but still, after two months they were still pretty high. I didn't feel up to surgery, but knew I had to have this done.

The doctors were concerned about my heart after finding an innocent murmur. I did notice that once I began thyroxine therapy, my chest would pain.

After surgery, I felt terrible and rang an ambulance one night fearing I was dying. I rang my husband's mobile and told him to come home quickly because I felt as though it was my last night on earth.

The surgery seemed to play havoc with my body. My palpitations were 100 beats per minute and doctors were telling me I was having panic attacks. My vision was very poor.

It was then I had a breakdown.....

Slowly, as the months went by I began to feel a little better. I did a course in anxiety management and learnt to control my breathing. One of the teachers had suffered with Graves' [Disease] and understood palpitations quite well.

Gradually my TSH, T3 and T4 levels came back to normal.

Three years later and I am feeling better, but still have days when I feel exhausted. My menstrual cycle is pretty much normal again. I have suffered another miscarriage, sadly, but haven't been able to bear a child. I still suffer with bouts of anxiety and depression.

I have changed my whole health regime. I walk approximately 30kms every week and have lost a lot of weight. I have changed my eating patterns also. The weight loss has been the hardest plight of all, but I am very determined to stay fit and healthy.

My best support is my husband, mum and girlfriend who has suffered with thyroid cancer. She really understands me. And of course, my faith which helps me to endure this condition.

On a facetious note, I would like to thank all those who never understood me and who continue not to understand me. I would like to thank the doctors who never took me seriously and some of my family members who still think I am a hypochondriac and should "get my act together".

If you happen to be a family member or friend of a sufferer reading this story, please don't ever give up on us or condemn us for being "lazy, lethargic, unmotivated, whinges or hypochondriacs". This is a real condition and one that is not easily cured by taking thyroxine. Auto-immune diseases are serious and can make one feel very ill at times.

Having the support from another sufferer can be one of the greatest supports of all. They understand exactly what you are going through. And of course, this foundation which is a real God-send.❀

Sue's Story

In the early hours of the morning on 17 December 2003 our beautiful daughter arrived. My world was complete, a loving husband, a son and now a daughter.

Things continued to be perfect. Our new treasure settled well into home life and was breastfeeding and sleeping well. Her big brother adored her. My husband and I adjusted very well to life with two kids.

At about 8 weeks things changed. I began to feel unwell, nothing specific just a little dizzy, had pins and needles in my arms as well as burning in my hands and feet. I just put it down to a bad diet lacking in vitamins and not enough sleep.

As the weeks progressed I began to add more symptoms to my list. Every time I breastfeed I broke out in a hot sweat, was very dizzy and tingled all over. I began to dread the next feed. I began to get nervous not only about breastfeeding, but life in general. I couldn't sleep and lay awake thinking about everything from the most simple to the absolute bizarre.

Days went by and it all got a bit much and I decided I couldn't keep breastfeeding when it made me feel so sick. It was time to introduce the bottle and relieve me of my symptoms. Contrary to my expectations, none of my symptoms disappeared, they just found different times to present themselves.

While walking down the hallway holding my daughter I had a dizzy spell that found me leaning on the wall, spinning – sweating profusely and trying desperately not to drop her. This was my wake up call. It was time to consult my GP.

I feared going to my GP – not because I didn't trust her but I felt my symptoms were so non-specific she would just say a virus or I was depressed and send me away with some antidepressant medication. I knew this wasn't my problem and was going to fight this suggestion. I asked my husband to come with me and back me up.

We went to the GP and she listened to what I had to say but also to what I didn't say. She had three theories of what it might be:

1. Depression – I knew it, the only thing that's ever wrong with the mother of a newborn. "That's so not me", I told her.
2. Early menopause – Well, lucky I've had my two kids, and a bonus, no more period pain and messy monthlies.
3. Post partum thyroiditis – I'd never heard of this one but I certainly could identify with some of the symptoms she was suggesting.

The first step was to do some blood tests. A full blood count, some female hormone screenings and a thyroid function test. Returning to the GP for results a week later it was found that my TSH high at 5.5 (0.4 - 4.0) and my T4 was 12 (10 – 24), at the lower end of normal but still within normal limits. T3 was normal. There was nothing abnormal with my female hormones. With these results more thyroid tests were organised to test for thyroid antibodies and a retest of my TSH and T4. The results came back with the thyroid antibodies greater than their reference range. My TSH had risen to 6.3 and my T4 had remained the same.

It was decided a thyroid ultrasound was needed to see how inflamed and damaged my thyroid had become. It was booked for a couple of weeks later.

In the interim my hair had started to fall out. At first it wasn't that much, and then clump by clump. It worked it way along my part line and then it started on the top and back of my head.

My hands became so dry and coarse that no amount of moisturiser could help then. It burnt and irritated them. I stopped washing up, stopped washing the bottles and nappies and stopped placing my hands in any water if I didn't have to. The skin on my knuckles cracked so badly they were filled with blood. My fingernails all flaked and had as many divets in them as the Grand Canyon. My cuticles disappeared. I felt continual pain. Nurofen was my best friend

My dizzy spells continued. I began to decline offers to catch up with friends because I never used to know when they would occur. I feared driving in case I had a dizzy spell. I couldn't risk my kids so we stayed home. I feared going out but I feared being alone.

My weight started to increased. I hadn't lost any weight since three weeks after my baby was born. Weight loss was a concern for me but I wasn't going to do anything silly. Weight Watchers had worked for me in the past, and so I pulled out my books and started the program. I followed it to the letter – no cheating, I was serious about losing my weight. To my surprise I went up a kilo in the first week. I jumped on the scales madly. I changed the batteries and they still read the same - I couldn't understand how. I promised myself I would loss weight. I positively approached week two of the program. Again, I gained a kilo. I was ready to throw the scales. I was doing everything that was suggested, still with no results. I was so frustrated, angry and most of all FAT.

This was getting serious. I didn't want to be fat. I wanted to be in control, but I wasn't. I decided to stop eating. It was time to take the silly option. If I didn't eat, I couldn't get fat. I decided I was only going to drink coffee with a dash of milk and artificial sugar. My will power was strong. After 3 days I jumped on the scales and found I had gone up a kilo. "How", I asked - artificial sugar with a diuretic and a teaspoon of milk. NO-ONE DARE WALK IN MY PATH. I WAS ANGRY, FRUSTRATED AND FATTER.

The ultrasound showed my thyroid to be damaged. It wasn't enlarged, but it certainly wasn't normal. It was rather heterogeneous and there was increased vascularity. My GP was a bit puzzled with the results and referred me on for a thyroid consult.

The thyroid specialist reviewed my symptoms, blood tests and ultrasound results and told me I had Hashimoto's disease, a permanent autoimmune form of hypothyroidism which was bought on by my second pregnancy. It is quite common for this to occur post partum. He suggested I start thyroxine supplements to replace the missing T4 hormone in my blood. His prescribed dosage was 100mcg. I was told it would take a while for the drugs to take effect and that blood tests should be repeated in 6-8weeks.

Continued Page 10

Sue's Story *from Page 9*

The supplement initially helped and my symptoms seemed to diminish. However, it didn't take long for the symptoms to reoccur. I began gaining weight (I was almost as heavy as my I was when I delivered), had more dizzy spells and lost more hair. I wasn't quite bald yet, but it was certainly noticeable. I began to become very vague. I had to write feed times down so I would remember when she was last fed and how much she drank. I couldn't remember what day it was (I knew Saturday and Sunday as that's when my husband was home). In many ways, I was a bit of a danger to myself. My memory had failed me; I lost keys, left hotplates on and needed to write my husband's work and mobile numbers down as I couldn't even remember these numbers I call so often. Every part of me was so lethargic - my memory and my body.

I asked myself what had changed to decrease the effectiveness of the thyroxine that initially gave me so much relief. There was an answer. Since I stopped breastfeeding my periods returned - far too frequently for my liking. Some days I would spot, some days I would flood, and some days I would clot. My GP had advised that I start taking the combined oral contraceptive to give me some relief. It had given me menstrual relief but created a thyroxine deficit that saw me highly symptomatic.

Blood tests showed my TSH was increasing. It was now 10.3. The estrogen was affecting the absorption of the supplementary thyroxine. The current supplement wasn't enough to meet my body's requirements when combined with the oral contraceptive. My dosage was increase to 150mcg.

It took 8 months to get normal thyroid blood results. My symptoms disappeared slowly and I'm well on the road to recovery. My hair has grown back. My dizziness is gone. My periods are under control. My skin is still flaky but certainly improved. My memory has returned and so has my energy levels. I am full of life again.

I am grateful to my GP for listening and investigating what seemed to be non specific symptoms and to my supportive husband for his loving attention that saw me through my fearful times. Without them I may still be ill, or even worse, on anti-depressants for a thyroid condition. ❀

Ethos of Thyroid From Down Under Mate!

by Dr. Jack Wall

When asked to write an article about the differences in the way thyroid disorders are diagnosed and managed in Canada and Australia I jumped at the possibility of being able to point out some deficiencies in Australian health delivery as it pertains to the thyroid, which some of my colleagues think reflects my home-sickness for snow, hockey, ocean sailing and maple syrup. Nevertheless, these differences are real and translate into less than state-of-the-art management of thyroid patients in this country. Here, I discuss some of the more obvious differences and also take the opportunity to reflect on some attitudinal and social differences between the two countries with thyroid disease in the Deep North, eh and Down Under mate.

Lack of intermediate doses of thyroxine

The first problem that I confronted as I began to manage hypothyroid patients at The Geelong Hospital was that, to my surprise, there were no intermediate doses of thyroxine. You must be kidding me, I complained! In Australia, there are two generic forms of thyroxine (Oroxine and Eutroxsig) and for both, only in 50, 100 and 200 µg doses. At first I thought that these doses were reserved for private patients who could pay for them on a special script, but no, there are no other doses for anyone. This means that to arrive at a dose of 112 µg, the average replacement dose, one must take a 100-µg tablet each day and half of a 50-µg tablet each second day! Many patients forget which dose they took yesterday. Moreover, the tiny tablets are not easily broken and tend to blow away in a light breeze. For convenience, most patients are treated with 100 µg, which means that about one third are under replaced, one third over replaced and, by chance, one-third about right, based on serum free T4 and TSH levels and symptoms. As you have guessed, the generic versions available are not colour coded as they are in Canada.

Technetium for thyroid uptake testing

In Canada [and the US], thyroid uptake measurement is performed using the iodine isotopes iodine ^{123}I or ^{131}I and scanning is carried out with technetium (99Tm pertechnetate). In Australia, technetium is used for both uptake and scanning. However, technetium uptake is not as sensitive or specific as ^{131}I uptake and the normal range at 15 min is 2-5% while, for ^{131}I, the normal uptake is around 20-35% depending on the local iodine levels. If I ask for it, and I often do, our Nuclear Medicine Department will keep a little ^{131}I aside for uptake testing. Of course, they do use ^{131}I uptake for thyroid cancer assessment, treatment and post treatment whole body scans, as in Canada.

FNAT

In Australia, there is no private fee schedule for doing fine needle aspiration of the thyroid (FNAT), which means that endocrinologists normally do not do this test, which is state-of-art in Canada. Where a thyroid nodule needs to be assessed by the GP, the options, for most, are to refer to a thyroid surgeon who, guess what, takes out some or all of the thyroid, or to the ultrasonography (US) department where US-guided FNAC is carried out by a radiologist, at a cost of about $200. This annoyed me a great deal but I have been able to find a schedule for FNAT and I do the test in patients with a single thyroid nodule or dominant nodule in a multi-nodular goitre, often saving them from unnecessary and expensive thyroid surgery.

Treating patients with Graves' disease

I was told that, in Australia, we do not treat with radioiodine very much, since the patients would not accept it. This conservative approach was not too dissimilar from that which greeted me in Halifax, but in both places anti thyroid drugs do not work except in about 15% of stress-free patients with small goitres, negative TSH receptor antibodies and mild autoimmunity. With time I have been able to change

the culture and now the % breakdown of the three main treatments for Graves' hyperthyroidism are: total thyroidectomy 5%, radioiodine 60% and anti thyroid drugs (for one year, as initial treatment) 35%. In my institution we have the services of an excellent academic thyroid surgeon who does total thyroidectomy for Graves' disease with a low rate of permanent hypoparathyroidism. By the way, in Australia, surgeons are called Mister to distinguish them from physicians, an old English custom.

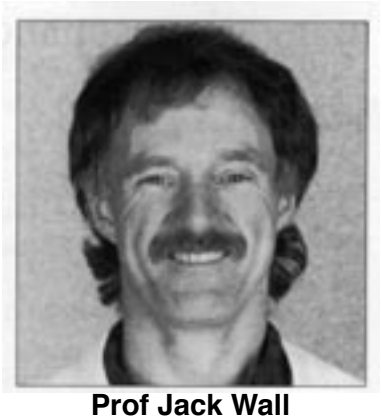
General approach to thyroid disease

As in Canada there are few true thyroid specialists in this country, defined as an endocrinologist who sees mainly patients with thyroid disease and carries out thyroid research and/or education, in an academic setting.

There are some other differences in attitudes about thyroid disease between Canada and Australia apart from this, including the notion that thyroid disease is easy to treat, which I did not find in Canada. As we all know, while there are only a few common thyroid disorders, every patient is different with unique challenges and special skill is needed to return them to normal. Iodine deficiency is re-emerging here as contaminating iodophores are removed from the environment. Thus small goitres are common, perhaps more so than in Canada where iodised salt and bread have been available for many years.

Differences in general attitude and culture.

In Canada the medical system is socialized whereas here there are both public and private sections, so that patients have differing demands and expectations. For public patients in hospital requiring urgent or routine attention, the resident house staff doctors are first called, but for private patients, the consultant is called directly, at any time day or night, even to prescribe an analgesic. This is the two-tiered system of medicine that Canadians have been loath to accept. Australian patients are more informal than Canadians and about 50% will sooner or later call me by my (very nice) first name. the others call me professor whereas, in Canada,



Prof Jack Wall

we are all doctor. Mothers bring their children with them less often than in Canada so as not to bother the doctor (and others in the waiting room).

Ophthalmopathy and eye assessment

As everyone knows there is a lot of sun in Australia, although we don't see too much of it in Geelong. However, because of the fear of skin cancer about one third of people in Victoria are sufficiently covered up to be Vitamin D deficient and must be treated. Another effect of the sun in women is the development of small growths on the whites of the eyes, which tend to grow over the iris, called pterygia, due to sun damage. While women tend to look after their skin better than men, and do not suffer as much cancer, their eyes are unprotected. Thus, when I assess the eyes of patients with Graves' disease most have some swelling and redness due to the pterygia, and other manifestations of sun damage, rather than thyroid eye disease (ophthalmopathy). This makes it difficult to assess the eyes, in particular when we are trying to document any changes after radioiodine treatment of Graves' hyperthyroidism.

Resources for thyroid research

Australia is behind Canada in respect to understanding the importance of funding thyroid research. There is very little thyroid research being carried out here and no one – with the exception of myself and collaborators – seems to consider this to be a problem. However, as in Canada which is in many other ways similar to Australia, patients with thyroid disease and lay groups are gradually being encouraged to take a greater role in obtaining funds for thyroid research. Not surprisingly, the two thyroid foundations here are less focused on research than their older sister foundation in Canada, but at least one of them is committed to increased efforts in this area in the future.

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Dr Jack Wall has moved from Geelong and is now Professor of Medicine at the Western Clinical School of the University of Sydney in Penrith NSW.

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Research Funding

Thyroid Australia has decided to accumulate a special fund that will be dedicated to funding research into thyroid illnesses. If you would like to contribute to this fund, please send donations to Thyroid Australia and tell us that the donation is for research. Please help us to find new ways to help thyroid patients.

Refrigeration of Thyroxine Further Developments

By **Alun Stevens**

In the July 2004 edition of *Thyroid Flyer*, we published an article dealing with the then newly introduced requirement to refrigerate thyroxine. With over a year of experience of the new requirements, it is time to review their effect.

Thyroid Australia raised two concerns at the time that refrigeration was introduced for Australia's two brands of thyroxine – Oroxine and Eutroxsig. The first was that taking cold tablets from a cold bottle each day would inevitably lead to condensation inside the bottle and the remaining tablets becoming damp with consequent loss of potency. The second concern was that keeping the tablets in an inconvenient place like a fridge would make it more difficult to remember to take the tablets each day. It is clear that both of these concerns have been borne out in practice.

Prof Jim Stockigt in a letter to the *Medical Journal of Australia*[1] (*MJA*) in June this year raised a number of pertinent issues. He asked for instance whether there is something peculiar about the Australian formulation of thyroxine that makes it unstable at room temperature so that it alone amongst all thyroxine preparations worlwide requires refrigeration. He comments that there is no evidence that thyroxine in already opened, unsealed bottles is more or less stable at 4ºC than at room temperature, but that there is a clear need to keep the tablets dry. He then goes on to say:

"Consider the condensation that will occur during 200 daily openings of a refrigerated glass bottle, whatever it contains. If damp tablets lose potency, this would lead to apparent under-treatment. In the months since refrigerated storage was recommended in Australia, preliminary observations suggest that apparent under-dosage (ie, unexpected rises in serum TSH) may indeed occur in previously compliant patients (personal observation). If dosage were increased, the adjustment could result in over-treatment after a change to a fresh preparation."

Sigma Pharmaceuticals (the manufacturer of both brands) in replying to Prof Stockigt made some interesting comments. In their statements to us last year, they indicated that the changes were forced on them by the Therapeutic Goods Administration (TGA). In the MJA, however, they indicate that they introduced the changes themselves due to their testing finding a potency loss of up to 10% over 6 months with tablets stored unrefrigerated below 25ºC. They comment further:

"The new stability studies support the storage of Oroxine and Eutroxsig in the refrigerator; however, repeated in-use handling may result in an increase in condensation and microbial contamination. This may lead to changes in the physical characteristics of these products, including the growth of mould. There may be a further increase in condensation if the lid is not tightly closed."

This is an interesting comment given that there must of necessity be 'repeated in-use handling'. Users must open and close bottles and take tablets out every day. Sigma have effectively admitted that their storage and handling guidelines cause contamination and degradation of the tablets.

This has also been borne out by the experiences of Thyroid Australia members. We have received communications from a number of people who have noticed that their tablets have become soggy and have been concerned about using them. One member, who is particularly sensitive to her dose, felt that she was being under dosed and suspected her damp tablets. To confirm her suspicions she sent her soggy, opened bottle of tablets to Sigma for an assay together with an unopened bottle she also had in her fridge. Sigma found that the potency of the soggy tablets had declined to 88% of the label while the unopened bottle was still at 102% of the label. This is a greater decline than Sigma found for the unrefrigerated tablets.

The current situation is clearly unsatisfactory. The refrigeration of unopened bottles will undoubtedly prolong their self life and their potency, but the refrigeration of opened bottles that are in use is obviously problematic. It can and has led to a loss of potency, under dosing and the compromising of treatment, but there is no clear resolution in sight.

Prof Stockigt comments that the instruction to refrigerate unsealed bottles seems ill advised. He further comments that instructions from the manufacturer to refrigerate opened bottles should only be based on the results of tests of the thyroxine content of tablets which are in bottles being opened each day for months. Without this data, he believes that it is preferable to instruct patients not to store their opened bottles in the fridge and he in fact instructs his patients not to do so.

Sigma, not surprisingly, believe that the label instructions should be followed. However, in the *MJA*, they offer a 'solution' for patients which is to place up to four weeks supply of tablets in a previously used Oroxine or Eutroxsig bottle and store out of the fridge for current use while keeping the remainder in the fridge. They also indicate that they are looking at options to improve the packaging to minimise or eliminate these 'problems'. This statement further indicates that Sigma recognises that there is a 'problem' with the storage of opened bottles

Thyroid Australia is not in a position to advise one way or the other, but we are concerned that there is clear evidence that the current guidelines are inadequate and are compromising patients' health. The new guidelines were introduced by Sigma and the TGA. We believe that they now need to remedy the position as soon as possible and that patients who have followed the guidelines should be compensated when their thyroxine becomes soggy and unusable. Our position is therefore:

a. Ensure that any new bottles of thyroxine you buy are at least 12 months from their use by date.
b. Keep unopened bottles in the fridge.
c. Once a bottle is opened decide whether you wish to keep it refrigerated or follow Prof Stockigt's advice and remove it from the fridge.

d. If you do keep it refrigerated:
   - Use a 7 day dose pill box.
   - Place your tablets into the pill box once a week and keep it in a handy place.
   - Collect silica gel from other medications and place a sachet in the thyroxine bottle.
   - Keep the refrigerated bottle tightly closed.
   - Check your refrigerated medication regularly to ensure that it is not damp.

If the tablets become damp, they need to be replaced. You will need a new prescription. When you get the new prescription, tell your doctor that your tablets have become damp due to your following the storage guidelines. If he or she raises any questions refer to Prof Stockigt's letter to the *MJA* or this article.

Return the damp tablets to your pharmacist and also tell him or her that the storage guidelines have caused the problem. If necessary, refer to Jim Stockigt's letter to the *MJA* or this article.

You may also wish to write to Sigma expressing your views about their product and guidelines. You may even wish to seek compensation. Their address is 96 Merrindale Drive, South Croydon VIC 3136. Richard Treagus is the General Manager Sales and Marketing. Philip Marshall is the General Manager Scientific Affairs and is responsible for quality assurance.

The introduction of refrigeration for thyroxine has complicated its use by patients. It has also clearly not properly achieved its stated aim of ensuring the maintenance of potency. The effects of temperature have now been replaced by the effects of moisture.

It is unclear how long it will take to rectify this unsatisfactory situation. In the meantime, handle the medication sensibly and help inform the authorities of the problem and put some pressure on them to fix the problem.

Reference

1. Jim Stockigt, 'Should thyroxine tablets be refrigerated? Have we got it wrong in Australia?', *MJA* 2005; 182 (12):650

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The Dangers of Mixing Medication

Combining complementary medicines with prescription medication is becoming more and more common – but it can also be dangerous, Monash University pharmacy practice researchers warn. ***INGRID SANDERS*** *reports.*

Hidden dangers: Mr Johnson George and Dr Kay Stewart say doctors and pharmacists need to know what patients are taking.

Popping a multivitamin tablet or swallowing a herbal medication is a common practice – and particularly prevalent among older members of the community.

But concealing this information from health practitioners can prove dangerous for certain people, says senior lecturer Dr Kay Stewart from Monash University's Victorian College of Pharmacy. Her doctorate student, Mr Johnson George, recently completed a study on the use of complementary medicines by chronic obstructive pulmonary disease patients.

"For the majority of people who complement their prescription medication with medicines such as multivitamins, minerals and herbal preparations, there is no risk," Dr Stewart says.

"But for some, there may be problems caused by mixing different types of medication. The reality is that some complementary medicines can cause problems in certain circumstances – for example, there have been reports of patients with asthma having severe reactions to royal jelly."

Mr George's study on the use of such medicines by chronic obstructive pulmonary disease patients found that a significant number were taking extra medicines without their doctor's knowledge.

"Almost half were using something other than their prescribed medication. The most commonly used were vitamins, minerals, garlic tablets and other herbal preparations, which are readily available from health food shops," Mr George says.

"Often patients with this condition have multiple health problems that require a range of prescription medications, but adding a mix of complementary medicines could jeopardise these patients' safety because of interactions between products."

Mr George said while the patients did not expect anything magical from the use of complementary medicines, they also did not believe they did any harm.

"But just because medication comes from a plant and is natural, it doesn't necessarily mean that it is safe," he says.

Dr Stewart says the research demonstrates the importance of patients consulting with a pharmacist or doctor before buying off-the-shelf medication.

"Health professionals can cross-check and by consulting them first, people can make sure the complementary medicine – whatever it may be – will be suitable to take in conjunction with their prescription medications."

Likewise, it is equally important for doctors and pharmacists to actively inquire about what complementary medicines the patient is taking and be open and accepting of this fact, she says.

"Our research shows that some patients feel they will be talked out of taking complementary medicines by health professionals so they deliberately hide the information," she says.

"But we know complementary medicines are widely used, so doctors and pharmacists can't simply forget about it. Instead, we need to encourage an environment where patients are comfortable talking about it and then doctors can make sure their patients are using them in the best way.

"We need more information and hard evidence about the efficacy of complementary medicines to help mainstream health professionals have a better understanding and knowledge about their use."

kay.stewart@vcp.monash.edu.au

Johnson.george@vcp.monash.edu.au

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Also available on the internet at http://www.monash.edu.au/pubs/monmag/issue14-2004/research/medication.html

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Getting a Good Night's Sleep

Most people have difficulty getting a good night's sleep at some stage in their lives. People often look to sleeping tablets to help them sleep. However, it is now realised that using these medicines for more than a few days at a time can cause major problems. It is usually better to deal with sleep difficulties using non-drug methods.

Sleeping tablets

Sleeping tablets disturb the natural rhythm of your sleep, so the sleep is not as deep or restful. They also cause side effects, such as drowsiness, dizziness, memory loss and poor concentration. The side effects often continue into the next day, particularly in seniors, and sometimes make people more likely to have falls and other problems.

Sleeping tablets can be addictive, and coming off them becomes harder the longer you take them. In addition, most people develop a tolerance to them after a few days, so they need increasingly larger doses to make them sleep.

Talk to your GP if you have been taking sleeping tablets for a while and want to come off them.

Non-drug tips

In the long term, overcoming sleep difficulties using non-drug methods is usually more successful than using sleeping tablets. The tips below have helped many people overcome insomnia, so it might be worthwhile trying some of them if you are having difficulty sleeping.

During the day

- Maintain a regular routine for meals, chores and activities.
- Spend 30–60 minutes outdoors in the late afternoon or early evening. Regular exposure to sunlight at this time will help you become sleepy in the late evening.
- Avoid having a daytime nap.
- Be as active as possible during the day.

In the evening

- Do 20–30 minutes of light exercise, such as walking or stretching, early in the evening. Exercise tends to make you sleep more deeply 4–6 hours later.
- Avoid drinks containing caffeine, such as coffee, tea, cola and cocoa, for at least 5 hours before bedtime. Caffeine makes it difficult to get to sleep and stay asleep.
- Avoid alcohol near bedtime. Alcohol will help you get to sleep more quickly, but it will also make your sleep lighter and more disturbed, and you will wake up more easily.
- Relax and get ready for sleep by winding down with an hour of television, reading or listening to music before bedtime.
- 'Switch off' from the day's activities and problems. If necessary, make a list of all the things on your mind, and decide to deal with them the next day.
- If you have trouble 'switching off' at night, learn a relaxation technique and practice it before using it to help you get to sleep.
- Make sure your bed and bedroom are not too hot nor too cold.

At bedtime

- Develop a bedtime routine (warm bath, snack, clean teeth, etc) and carry it out every night. Your body will learn to recognise that it is time for sleep.
- Go to bed only when you feel 'sleepy'.
- Don't read or watch television in your bedroom.
- Enjoy relaxing in bed even if you don't fall asleep immediately.
- If you can't fall asleep or get back to sleep, think of pleasant things.
- Get up at the same time each morning.

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Hypothyroid subjects treated with L-thyroxine

Dr. Mary Samuels and colleagues at the Oregon Health and Science University in Portland, Oregon compared quality of life, mood, and memory in treated hypothyroid and control subjects. They tested for general health, mood, and did a battery of cognitive tests targeted to different aspects of memory, including working memory, long-term memory, and motor memory. They found no significant difference between the groups in any of the cognitive measures, though quality of life seemd to be somewhat less in the individuals on thyroid hormone treatment. TSHs were slightly higher in this group (2.56 compared to 1.81) and they suggested that the change in quality of life might be due to under-replacement of thyroid hormone in the patients taking this treatment.

Extract from New Research: Reports from the Endocrine Society Annual Meeting, New Orleans, LA, June 16-19, 2004. Reproduced with permission from *The Bridge*, Fall 2004 (Volume 19, Number 3) – Quarterly publication of The Thyroid Foundation of America, Inc.

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Thank You
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Editorial

The first half of 2005 proved to be a trying one for us. Our kind benefactor, the Monash City Council, renovated the offices they provide for us. This unfortunately required closing our offices for 2 months. The effects are still being felt. A large backlog built up over this period and with all the new work coming in each week, we have still not managed to clear the backlog. Our response times are not as we would like them to be, but we are slowly making inroads. Please bear with us as we work through this difficulty.

The workload has also impacted the production of *Thyroid Flyer*. We were unable to make our scheduled May 2005 deadline and instead decided to make this edition larger – hence the 16 page format.

Megan Stevens, the founding President of Thyroid Australia resigned in April. She has laboured tirelessly since the establishment of Thyroid Australia in 1999 to develop a strong organisation with excellent service levels. For a long period, she worked up to 60 hours a week unpaid from her home office to keep the organisation going. She deserved a break. I am sure that you will all join me in recognising and thanking her for the significant effort she has made over many years. Thank you.

Our appeal for volunteers has yielded a good response, but as with all voluntary organisations, we still have plenty of opportunities for more volunteers. Our primary need continues to be for people to help in the office, but there are also tasks that can be performed elsewhere via email and the like. We would also welcome phone volunteers to answer questions from and share personal experiences with others.

Our annual Information Day will be on Sunday 2 October. This year we will be holding it at the Camberwell Civic Centre rather than Monash University. The venue is very conveniently situated for public transport and there is lots of parking. The Civic Centre also provides a full catering service for lunch and refreshments. We are hoping that this change will make it much easier for members to attend.

Our program this year is focused on thyroid testing and diet. These are the two most common topics on which we are asked questions. Richard Arnott is a thyroid specialist and excellent speaker who will be able to answer those tricky questions you have wanted to ask. Robert Hanner is a GP with a lot of experience in helping thyroid patients (including a number of Thyroid Australia directors) manage their conditions and their diets.

The other focus for the day is mothers and their babies. Thyroid conditions frequently strike during or soon after pregnancy. This is frightening and exhausting and is a significant contributor to post partum depression. Christine Rodda is a paediatric endocrinologist with an intimate and extensive knowledge of the impact of thyroid disease on babies. She will be supported by Prof Duncan Topliss, one of Australia's most respected endocrinologists, who will discuss the impact on mothers.

It will undoubtedly be a very informative day. So come along, talk to the experts, talk to us and help support the efforts of Thyroid Australia. Just call our office and make a booking. See you there.

I would also like to recognise the Morrison family of Queensland who have raised over $2,000 for research into Thyroid Cancer. Thank you very much for your particularly generous donation. It is appreciated.

This leads me to the issue of fund raising. We have moved some way to developing a fund raising committee, but have yet to undertake any formal fund raising. We still need more people to help us. This is an activity that can be carried out anywhere in Australia. You do not need to be in Melbourne to help us. If you are able to help with the preparation of submissions, or have contacts with potential donors or have fund raising ideas that you think would help us, please contact me at the address at the bottom of the page.

Raising enough funds to allow us to employ at least one full time staff member is absolutely critical for the continuation of the organisation. Your assistance and ideas are needed. I look forward to hearing from you.

The next edition of *Thyroid Flyer* will be published in November 2005.

Alun Stevens MSc FIAA

Please copy or detach and mail to the address below.

Request for Membership Application Form and Information

Date: .....

I am interested in learning more about my thyroid condition and about Thyroid Australia.

I have been diagnosed with the following thyroid condition (please specify): .....

Please send me a Membership Application Form and information about the following (please tick relevant boxes):

- ❑ General thyroid information
- ❑ Thyroid function tests
- ❑ Hypothyroidism (underactive thyroid)
- ❑ Hyperthyroidism (overactive thyroid)
- ❑ Thyroid eye disease
- ❑ Thyroid cancer
- ❑ Thyroid nodules
- ❑ Paediatric issues
- ❑ Fertility and pregnancy
- ❑ Other (please specify) .....☐
- ❑ Publications List & Order Form

Please send this information to:

Title: ..... Name: .....

A☐

.....☐

Ph☐

Signature: .....

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ACN 094 832 023 ABN 71 094 832 023