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## **This Issue in the Journal**

### **Use of inappropriate titles by New Zealand practitioners of acupuncture, chiropractic, and osteopathy**

Andrew Gilbey

When acupuncture, chiropractic, and osteopathy practitioners refer to themselves as Doctor, it may imply that they are registered to practise medicine. The NZ telephone Yellow Pages shows that some practitioners of acupuncture, chiropractic, and osteopathy use the title Doctor but are not registered medical practitioners. This misleading using of the title of Doctor appeared to be far more common among chiropractors (73%) than acupuncturists (27%). This practice may also fall foul of the Health Practitioners Competence Assurance Act 2003.

### **Inpatients' use, understanding, and attitudes towards traditional, complementary and alternative therapies at a provincial New Zealand hospital**

Amanda Evans, Bruce Duncan, Patrick McHugh, John Shaw, Craig Wilson

In this study a sample of inpatients at Gisborne Hospital was interviewed concerning their use and attitudes towards traditional, complementary and alternative medicines and therapies (TCAM). The great majority had used one or more such therapies and indicated that they intended to continue using them. The main therapies used were massage, vitamins, chiropractic, and herbals; many Māori respondents had used *Rongoa* (traditional Māori) remedies. Patients were generally not telling their doctors about these therapies, mainly because they were not being asked, and because they believed they are safe and free of risk. The authors suggest that patient care could be enhanced by better understanding of these issues by orthodox health practitioners.

### **The potential direct impacts on human health resulting from the establishment of the painted apple moth (*Teia anartoides*) in New Zealand**

José G B Derraik

There seems to be no evidence of human health effects as a result of exposure to the painted apple moth (*Teia anartoides*) in the field, despite this species common presence in urban and suburban gardens in Australia. There are, however, rare accounts of laboratory exposure in that country and New Zealand. Allergic and toxic reactions following exposure to arthropods are common occurrences, and exposure to any insect hairs may cause adverse reactions in susceptible people. Therefore, it is likely that some people would experience adverse reactions following exposure to the hairs on *Teia anartoides* caterpillars, and the possibility that more sensitive persons could experience more severe reactions cannot be discarded. However, in contrast to previous claims, the direct impacts on human health (as a result of the establishment of the painted apple moth in New Zealand) are likely be minor.

### **Testing and detection trends of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* in Waikato, New Zealand: 1998–2006**

Jane Morgan

High levels of testing and detection of sexually transmitted infections occur in the Waikato. It is unknown how many of those most at risk—i.e. sexually active young people under-25 years of age—are tested each year. Rising numbers of gonococcal infections in recent years suggest ongoing sexual risk-taking behaviour. This study supports calls for better laboratory reporting and surveillance. More information on all tests, not just positive cases, would enable better data interpretation and more appropriate public health action.

### **A school and community outbreak of tuberculosis in Palmerston North, New Zealand**

Lester Calder, Jane Rivers, Michael Hayhurst, Jeff Brown, Andrea Forde, Lou Gallagher, Patrick O'Connor

A 14-year-old boy was diagnosed with infectious tuberculosis (TB) in Palmerston North in 2006. Initial contact tracing showed a high rate of infection among family contacts and among classmates at his secondary school. Testing of contacts was extended to the whole school as well as to some outside school. In all, 1828 contacts were Mantoux tested; 16 were diagnosed with TB, and a further 235 with latent TB infection. The cases all completed full treatment. The latent infection can cause disease in future, so treatment was offered to these 235 people; 232 started treatment and 227 (97.8%) finished. Students treated for latent infection took antibiotics twice a week for 4 months under supervision. This experience taught us the importance of early diagnosis of TB. The initial case was infectious for long enough to cause significant spread of the infection at school. The response was major and cost about \$279,000. The very high compliance rates for testing and treatment are due to cooperation from family and school. Other key factors in the success of the response were communication with parents, teamwork between public health and clinical staff, school-based assessment and delivery of medication, and the choice of a twice-weekly 4-month course of isoniazid and rifampicin for treatment of latent infection

### **Border control measures in the influenza pandemic plans of six South Pacific nations: a critical review ((review article))**

Melissa McLeod, Heath Kelly, Nick Wilson, Michael Baker

This study reviewed the border control strategies in the publicly available pandemic preparedness plans for the South Pacific Islands, New Zealand, and Australia. There was a substantial difference in the quality of the border control components of the six plans available. Some of this difference could be explained by the necessity to rationalise the range of border control strategies to match available resources. Plans from the more developed countries such as New Zealand and Australia had a greater level of detail than plans from smaller and less resourced island countries, but these plans could still benefit from further improvements.



## Doctor Who? Inappropriate use of titles by some alternative “medicine” practitioners

David Colquhoun

Who should use the title ‘doctor’? The title is widely abused as shown by Gilbey<sup>1</sup> in this issue of the *NZMJ* in an article entitled *Use of inappropriate titles by New Zealand practitioners of acupuncture, chiropractic, and osteopathy*. Meanwhile, Evans and colleagues,<sup>2</sup> also in this issue, discuss usage and attitudes to alternative treatments.

Gilbey finds that the abuse of the title doctor is widespread and that chiropractors are the main culprits. An amazing 82% of 146 chiropractics used the title Doctor, and most of them used the title to imply falsely that they were registered medical practitioners. Although it is illegal in New Zealand to do that, it seems clear that the law is not being enforced and it is widely flouted.

This is perhaps not surprising given the history of chiropractic. It has had a strong element of ruthless salesmanship since it was started in Davenport, Iowa by DD Palmer (1845–1913). His son, BJ Palmer, said that their chiropractic school was founded on “...a business, not a professional basis. We manufacture chiropractors. We teach them the idea and then we show them how to sell it” (Shapiro 2008).

It is the same now. You can buy advice on how to build “build high-volume, subluxation-based, cash-driven, lifetime family wellness practices”

<http://www.teamwlp.com/about-wlp/index.html>

In her recent book, Rose Shapiro comments on the founder of chiropractic as follows:

...By the 1890s Palmer had established a magnetic healing practice in Davenport, Iowa, and was styling himself ‘doctor’. Not everyone was convinced, as a piece about him in an 1894 edition of the local paper, the *Davenport Leader*, shows...

A crank on magnetism has a crazy notion hat he can cure the sick and crippled with his magnetic hands. His victims are the weak-minded, ignorant and superstitious, those foolish people who have been sick for years and have become tired of the regular physician and want health by the short-cut method...he has certainly profited by the ignorance of his victims...His increase in business shows what can be done in Davenport, even by a quack

DD Palmer was a curious mixture: grocer, spiritual healer, magnetic therapist, fairground huckster, religious cult leader—and above all, a salesman. He finally found a way to get rich by removing entirely imaginary ‘subluxations’. Over 100 years later, it seems that the “weak-minded, ignorant, and superstitious” include the UK’s Department of Health, who have given chiropractics a similar status to the General Medical Council.

The intellectual standards of a 19th Century Mid-Western provincial newspaper leader writer are rather better than the intellectual standards of the UK’s Department of Health, and of several university vice-chancellors in 2007.

## Do the treatments work?

Neither Gilbey nor Evans et al really grasp the nettle of judging efficacy. The first thing one wants to know about any treatment—alternative or otherwise—is whether it works. Until that is decided, all talk of qualifications, regulation, and so on is just vacuous bureaucratese. No policy can be framed sensibly until the question of efficacy has been addressed honestly.

It is one good effect of the upsurge of interest in alternative treatments that there are now quite a lot of good trials of the most popular forms of treatments (as well as many more bad trials). Some good summaries of the results are now available too.

Cochrane reviews set the standard for good assessment of evidence. New Zealand's Ministry of Health commissioned the Complementary and Alternative Medicine website to assess the evidence, and that seems to have done a good job too. Their assessment of chiropractic treatment of low back pain is as follows:

There appears to be some evidence from one systematic review and four other studies, although not conclusive, that chiropractic treatment is as effective as other therapies but this may be due to chance. There is very little evidence that chiropractic is more effective than other therapies.

(<http://www.cam.org.nz/Treatment%20Methods/Chiropractic/Chiropractic.htm>)

And two excellent summaries have been published as books this year, both by people who have had direct experience of alternative treatments, but who have no financial interest in the outcome of their assessment of evidence. The book by Singh and Ernst<sup>3</sup> summarises the evidence on all the major alternative treatments, and the book by Bausell<sup>4</sup> concentrates particularly on acupuncture, because the author was for 5 years involved in research in that area,

Both of these books come to much the same conclusion about chiropractic. It is now really very well-established that chiropractic is (at best) no more effective than conventional treatment. But it has the disadvantage of being surrounded by gobbledygook about “subluxations” and, more importantly, it kills the occasional patient. Long (2004)<sup>6</sup> said “*the public should be informed that chiropractic manipulation is the number one reason for people suffering stroke under the age of 45.*”

The chiropractors of Alberta (Canada) and the Alberta Government are now facing a class-action lawsuit.<sup>7</sup> The lead plaintiff is Sandra Nette. Formerly she was a fit 41 year old. Now she is tetraplegic. Immediately after neck manipulation by a chiropractor she had a massive stroke as a result of a torn vertebral artery.

Acupuncture comes out of the assessments equally badly. Bausell (2007) concludes that it is no more than a theatrical placebo.

## Are the qualifications even real?

It is a curious aspect of the alternative medicine industry that they often are keen to reject conventional science, yet they long for academic respectability. One aspect of this is claiming academic titles on the flimsiest of grounds. You can still be held to have misled the public into thinking you are a medical practitioner, even if you have a real doctorate. But often pays to look into where the qualifications come from.

A celebrated case in the UK concerned the ‘lifestyle nutritionist’, TV celebrity and multi-millionaire, Dr Gillian McKeith, PhD. A reader of Ben Goldacre’s excellent blog (<http://www.badsience.net>) did a little investigation. The results appeared in Goldacre’s Bad Science column in the *Guardian*.<sup>8</sup>

She claimed that her PhD came from the American College of Nutrition, but it turned out to come from a correspondence course from a non-accredited US ‘college’. McKeith also boasted of having “professional membership” of the American Association of Nutritional Consultants, for which she provided proof of her degree and three professional references.

The value of this qualification can be judged by the fact that at Goldacre sent an application and \$60 and as a result “*My dead cat Hettie is also a "certified professional member" of the AANC. I have the certificate hanging in my loo*”.

### **Is the solution government regulation?**

In New Zealand the law about misleading the public into believing you are a medical practitioner already exists. The immediate problem would be solved if that law were taken seriously, but it seems that it is not.

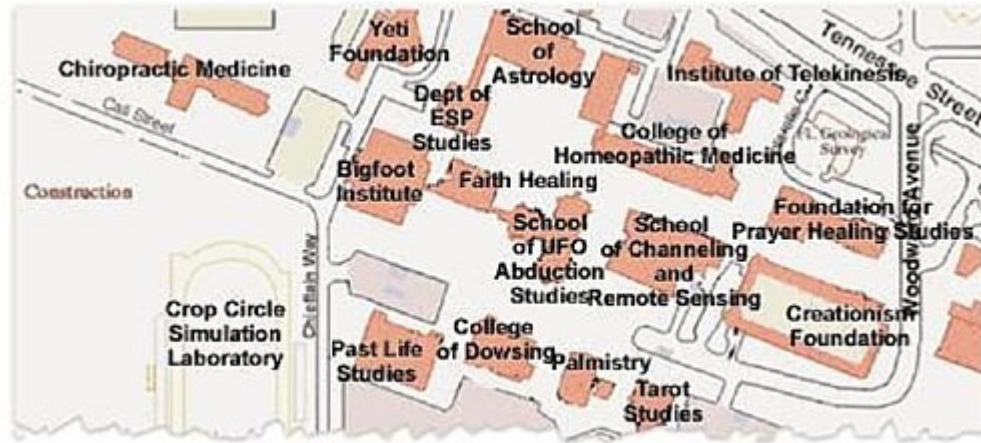
It is common in both the UK and in New Zealand to suggest that some sort of official government regulation is the answer. That solution is proposed in this issue of *NZMJ* by Evans et al. A similar thing has been proposed recently in the UK by a committee headed by Michael Pittilo, vice-chancellor of Robert Gordon’s University, Aberdeen.

I have written about the latter under the heading *A very bad report* (<http://dcscience.net/?p=235>). The Pittilo report recommends both government regulation and more degrees in alternative medicine. Given that we now know that most alternative medicine doesn’t work, the idea of giving degrees in such subjects must be quite ludicrous to any thinking person.

The magazine *Nature*<sup>5</sup> recently investigated the 16 UK universities who run such degrees. In the UK, first-year students at the University of Westminster are taught that “amethysts emit high yin energy” <http://dcscience.net/?p=227>. Their vice chancellor, Professor Geoffrey Petts, describes himself as a geomorphologist, but he cannot be tempted to express an opinion about the curative power of amethysts.

There has been a tendency to a form of grade inflation in universities—higher degrees for less work gets bums on seats. For most of us, getting a doctorate involves at least 3 years of hard experimental research in a university. But in the USA and Canada you can get a ‘doctor of chiropractic’ degree and most chiropractic (mis)education is not even in a university but in separate colleges.

Florida State University famously turned down a large donation to start a chiropractic school because they saw, quite rightly, that to do so would damage their intellectual reputation (<http://dcsience.net/?p=231#fsu>). This map, now widely distributed on the Internet, was produced by one of their chemistry professors, and it did the trick.



Other universities have been less principled. The New Zealand College of Chiropractic [President “Dr Brian Kelly”, B. App Sci (chiro)] (<http://www.nzchiro.co.nz>) is accredited by the New Zealand Qualifications Authority (NZQA). Presumably they, like their UK equivalent (the QAA), are not allowed to take into account whether what is being taught is nonsense or not. Nonsense courses are accredited by experts in nonsense. That is why much accreditation is not worth the paper it’s written on.

Of course the public needs some protection from dangerous or fraudulent practices, but that can be done better (and more cheaply) by simply enforcing existing legislation on unfair trade practices, and on false advertising. Recent changes in the law on unfair trading in the UK have made it easier to take legal action against people who make health claims that cannot be justified by evidence, and that seems the best way to regulate medical charlatans.

## Conclusion

For most forms of alternative medicine—including chiropractic and acupuncture—the evidence is now in. There is now better reason than ever before to believe that they are mostly elaborate placebos and, at best, no better than conventional treatments. It is about time that universities and governments recognised the evidence and stopped talking about regulation and accreditation.

Indeed, “falsely claiming that a product is able to cure illnesses, dysfunction, or malformations” is illegal in Europe.<sup>9</sup>

Making unjustified health claims is a particularly cruel form of unfair trading practice. It calls for prosecutions, not accreditation.

**Competing interests:** None.

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## **Drug misuse in sport: what the future holds**

David Gerrard

As the Beijing Olympics approach, we await with excited anticipation a sporting spectacle that once every four years captures a global audience of millions. The Olympic Games is big business—and for some athletes, reputations and future livelihoods will be secured on the track, in the pool, or on the velodrome. This will be a 16-day frenzy of sport, hosted for the first time by the world's most populace nation in one of the planet's most polluted cities.

But behind the glitz of elite sport, the minds of many Olympic officials will turn to the mundanity of simply catching drug cheats, a sad but true commentary of modern sport.

In Beijing, an army of doctors, laboratory scientists, technicians, and administrators will work around the clock to ensure that athletes who infringe the World Anti-Doping Code, and use prohibited substances will be identified and appropriately sanctioned. In an Olympic tradition that has grown since the 1968 Games of Mexico City, medallists in every event plus a selection of other finalists will be tested. So too, will a random selection of athletes in preliminaries and heats.

In accordance with a strict set of anti-doping rules, the International Olympic Committee (IOC) has set out clear procedures for the collection of urine (and in some cases blood) from a pool of around 11,000 athletes. This will be the most extensive and stringent programme of drug testing ever carried out at an Olympic Games.

The Beijing Laboratory is one of only a handful of international facilities that have World Anti-Doping Agency (WADA) accreditation. Urine samples will be scrutinised for prohibited substances using gas chromatography (GC) and high-resolution mass spectrometry (HRMS). Blood samples will be analysed for evidence of exogenous human growth hormone, autologous blood transfusions ("blood boosting"), and artificial agents that enhance oxygen transport (HBOCS).

Laboratories meet strict annual criteria to maintain their accredited status solely for the purpose of sports drug detection. And the Beijing Laboratory will provide the most sensitive analyses ever undertaken at an Olympic Games.

Since the late 1990s, a need for consistent standards and clear drug-testing protocols spawned the formation of WADA.<sup>1-3</sup> International sport, the International Olympic Committee (IOC), and governments agreed to accept responsibility for developing lists of banned drugs,<sup>4</sup> accrediting testing laboratories, promoting drug education, considering the need for therapeutic exemption to use prohibited substances, and harmonising penalties for infringing this Code.

WADA is based in Montreal, is headed by a former Wellington barrister, and is funded equally by the IOC and governments. National anti-doping agencies like Drug Free Sport New Zealand (DFSNZ) are signatories to the WADA Code that binds sporting nations to consistent standards for testing athletes worldwide.

DFSNZ is funded by the New Zealand Government, governed by an Act of Parliament, and overseen by a dedicated core of fulltime staff and a Board appointed by the Minister. Each year, DFSNZ conducts approximately 1500 drug tests in and out of competition.

The use of performance-enhancing drugs in sport is not a recent phenomenon. It is as old as sport itself. What has changed, however, is the array of ergogenic aids and technologies available to modern gladiators seeking an illegal “boost”.

In the 1970s, sports doctors of the former German Democratic Republic (GDR) deviously administered androgenic agents to female track and field athletes and swimmers. Endorsed by GDR politicians, the remarkable performances of these women in Olympic and World Championship competition brought credit to the socialist doctrine but remain a blight on the record books.

Equally, the documented side-effects from their prolonged drug misuse reflect a dark chapter in the history of sport and exercise medicine.<sup>5</sup> Then in the early 1990s, China, a relative newcomer to international sport, employed similar tactics. In over 30 cases, Chinese swimmers and coaches were sanctioned for the use of androgenic anabolic agents and other “masking” substances.<sup>2</sup>

At the 1996 Atlanta Olympics, muscle-bound Irish swimmer Michelle Smith-de Bruin became the darling of the pool by unexpectedly becoming a triple gold medallist. Two years later she was banned from sport for life for the wilful contamination of an out-of-competition urine sample in an attempt to avoid drug detection. Ironically her husband-coach was a known field events steroid user. This fuelled speculation that her sudden rise to international fame had been drug assisted.

Recent sports drug cases include the widely reported disqualification of 2006 Tour de France winner Floyd Landis for testosterone use and the public fall from grace of American athlete Marion Jones implicated in the use of a designer steroid.

The revelation in 2004 that an undetectable “designer” steroid had been manufactured specifically for use by athletes was a turning point in the fight against drugs in sport. By manipulating the androgenic steroid *gestrinone*, chemists at the BALCO Laboratory in San Francisco produced *tetrahydrogestrinone* (THG) used with impunity by a number of profiled USA track stars—until a tip-off to the WADA-accredited laboratory in Los Angeles raised the alarm. Within months, the laboratory had confirmed a reliable urine-based test for THG. This was the first time a drug without clinical application, had been designed solely to enhance sports performance.

In the case of anabolic androgenic steroids, the potential for ergogenesis is very easy to understand.<sup>6–10</sup> These agents, modelled on testosterone, have gained notoriety in weight lifting, bodybuilding, power lifting, and field events where dosage regimes are reported to be as high as 10 to 100 times the accepted therapeutic range.<sup>11</sup>

They may be injected in the form of testosterone esters in an oily base that reduces its rate of absorption, or they may be taken orally as 17-alpha-alkyl substituted derivatives of testosterone. The desired side effects are increased muscle bulk, improved strength, and heightened competitiveness with associated aggression.<sup>3,9</sup> However these drugs are not without significant systemic side effects that implicate

the endocrine, hepatic, vascular, and musculoskeletal systems as well as the psychological state of the athlete.<sup>9–11</sup>

Amongst the group of banned glycoproteins are luteinising hormone (LH), human chorionic gonadotrophin (hCG), growth hormone (hGH), erythropoietin (EPO) insulin-like growth factor (IGF-1), mechano growth factors (MGF), insulin, and corticotrophins. Frequently these agents are used simultaneously with other anabolic agents. The action of hCG is similar to LH in stimulating testosterone production. hGH enhances protein synthesis and since biosynthetic forms of hGH became available, the underground market in cadaveric pituitary glands has evaporated. Earlier anecdotal reports of Creutzfeldt-Jakob Disease associated with supplies of human pituitary hormone did not diminish the popularity of hGH.<sup>3</sup>

When exposed to hypoxic stimuli, the renal production of EPO increases dramatically. High altitude and significant blood loss from trauma or surgery are such stimuli. Increased erythropoiesis infers an additional oxygen transport mechanism that translates into enhancement of aerobic sporting performance at between 10–15%.<sup>12,13</sup>

Recombinant DNA technology has made EPO readily available to wealthy professional athletes with improved performances that apparently justify its continued use. But the limiting effect of increasing the haematocrit is the relationship between blood viscosity and catastrophic thrombo-occlusive events that have been reported in Dutch and Belgium cyclists.<sup>2</sup> Nonetheless EPO appears to be the drug of choice by Tour de France competitors. Indeed, three riders have already been excluded from the 2008 Tour following positive tests for EPO.

The use of performance enhancing drugs has become possibly the most vexatious problem facing modern sport. However it is even more problematic to consider a future for “gene doping”, whereby the non-therapeutic use of cells, genes, or genetic elements is used to potentiate athletic performance.<sup>14</sup>

The modulation of gene expression is already poised to become a legitimate medical therapy. How long will it be before gene doping becomes firmly entrenched in sport, where its detection will be most difficult, if not impossible?

**Competing interests and current positions:** I am currently Chair of DFSNZ, represent the Minister on the Board of WADA, sit on the WADA Medical Committee, and will be in Beijing as a Medical Commissioner.

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## Use of inappropriate titles by New Zealand practitioners of acupuncture, chiropractic, and osteopathy

Andrew Gilbey

### Abstract

**Aim** This study aimed to explore whether practitioners of acupuncture, chiropractic, and osteopathy use the title 'Doctor' in a way which could imply that they are registered medical practitioners, when there is no evidence that they are, and if so, whether rates differ between practice types.

**Method** Secondary data, the New Zealand Yellow pages telephone directory, were analysed for potentially misleading use of the title 'Doctor'.

**Results** Some practitioners of acupuncture, chiropractic, and osteopathy appeared to use the title 'Doctor' in a way that could imply that they are registered medical practitioners, when there was no evidence this was in fact true. This occurred significantly more often among chiropractics than acupuncturists or osteopaths.

**Conclusion** Practitioners should be aware that if they are not registered medical practitioners, then using the title 'Doctor' whilst working in healthcare is unlikely to comply with the Health Practitioners Competence Assurance Act 2003. Misleading use of the title 'Doctor' should therefore be discontinued at the first available opportunity.

The use of complementary and alternative medicine (CAM) in Western society is both prevalent and increasing.<sup>1</sup> In New Zealand, rates of 38% in 2004 and 70% in 2007 have been reported.<sup>2,3</sup> Ernst's observation of "New Zealanders' love affair with 'alternative' medicine" may therefore be appropriate.<sup>4</sup>

Generally, CAM tends to be provided "through small private business financed by out-of-pocket payments made by privately paying clients", rather than by the state.<sup>5</sup> Accordingly, as with any business operating in a free-market, practitioners must compete for a finite pool of clients.

One way in which CAM practitioners may gain competitive advantage is through being better qualified in their area of practice. The New Zealand Yellow Pages telephone directory reveal a wide variety of qualifications are stated by practitioners, although as most qualifications are stated as acronyms it is not always clear to what qualification the acronym might refer. For example, the acronym DC or DO could indicate that the practitioner is a Doctor of Chiropractic/Osteopathy or, conversely, has a Diploma in Chiropractic/Osteopathy (either of which may or may not be accredited). Some acronyms may also indicate membership of an industry body, as opposed to a qualification *per se*, whilst others may indicate qualifications, but ones irrelevant to the advertised CAM practice.

In addition to their qualifications, some practitioners add the title 'Doctor' (Dr) to their name in their Yellow Page listings/advertisements.

The title 'Doctor' is not protected in New Zealand. It is therefore perfectly acceptable for people to use a play on words, such as 'The Car Doctor' or 'Hose Doctor', as their business name, or even, in principle, to refer to themselves as Doctor in everyday life. However, according to New Zealand's legislative framework relating to the provision of CAM, such play on words is not permissible for those who work in healthcare.

The Health Practitioners Competence Assurance Act 2003 (HPCAA) states that "a person may only use names, words, titles, initials, abbreviations, or descriptions stating or implying that the person is a health practitioner of a particular kind if the person is registered, and is qualified to be registered, as a health practitioner of that kind".<sup>6</sup>

In answer to a number of queries from the public, the Medical Council News sought to make clear the intent of the HPCAA by stating that practitioners of CAM should not "do anything to suggest that he or she practices or is willing to practice medicine unless he or she is a medical practitioner and holds a current practising certificate" and, "when the title 'Dr' is used in a health service provider environment, it is easy for the public to be misled and believe the person they are dealing with is a registered medical practitioner".<sup>7</sup>

When a CAM practitioner uses the title of 'Doctor' in the course of their business, if they are not a NZ registered medical practitioner, it is possible that, according to the Act, they commit "an offence punishable on summary conviction" by monetary fine.<sup>6</sup> Use of the title 'Doctor' by CAM practitioners who have a traditional non-medical doctorate (e.g. DSc, PhD, or DPhil) or other 'doctorate' (e.g., a first-degree doctorate from an un-recognised college or university) may also be misleading, according to the intent of the HPCAA, as explained in the Medical Council News.<sup>7</sup>

Ultimately, the HPCAA legislation concerning inappropriate use of the title 'Doctor' by a health practitioner would have to be tested in court of law. Currently, it may be that no complaint has so far been laid, but it may also be that the Act is ignored and is perceived to have little or no legal bite.

Aside from failing to comply with the HPCAA, if CAM practitioners advertise their services in a style that could imply that they are registered medical practitioners, it could be argued that they are guilty of self-aggrandizing behaviour (as they are using a prestigious title to which they are not truly entitled). In addition, implying oneself to be a registered medical practitioner, when there is no evidence that this is true, may deny prospective clients the ability to make an informed choice about their healthcare provision, which is a cornerstone of modern healthcare.

Inappropriate use of the title 'Doctor' in telephone directories is less likely to occur in the United Kingdom due to tighter control over the wording of advertisements placed in the UK Yellow Page directories. In contrast to the New Zealand Yellow pages,<sup>8</sup> where no similar guideline could be found, the General Advertising Guidelines of the UK Yellow Pages explicitly states that, "The title 'Doctor' or 'Dr' may be used provided the Advertiser is a qualified medical practitioner".<sup>9</sup>

This study aimed to explore whether practitioners of acupuncture, chiropractic, and osteopathy in New Zealand use the title 'Doctor' in a way which could imply that they are registered medical practitioners, when there is no evidence that they are, and if so, whether such rates differ between practice types. (Of the CAM practices

currently advertised in the New Zealand Yellow Pages, acupuncture, chiropractic, and osteopathy practices were selected for analysis as only these practice types appeared to have practitioners who used the title ‘Doctor’.)

## Methods

The source of the secondary data analysed, the New Zealand White and Yellow Pages telephone directory, was freely available in the public domain (e.g., in any public library). The data were analysed to identify whether practitioners of acupuncture, chiropractic, and osteopathy, used the title ‘Doctor’ in a way that could imply they were registered medical practitioners when there was no evidence that they were.

The following inclusion/exclusion criteria were used. Data collection was restricted to the Auckland, Christchurch, and Wellington area Yellow Pages available during the first week of October 2007. These three directories covered an area where approximately 54.7% of New Zealand’s population lived, according to the 2006 New Zealand census data.<sup>10</sup>

To test whether a practitioner using the title ‘Doctor’ was actually a registered medical practitioner, the names of all CAM practitioners using the title ‘Doctor’ were cross-checked against the list of registered medical practitioners in the corresponding New Zealand White page directories and also the NZ Medical Council register of medical practitioners (as at 6 Nov 2007).<sup>11</sup>

If a practitioner used the prefix ‘Doctor’ and the suffix DO, DC, or PhD they were not counted as using the title ‘Doctor’ in a way intended to imply they were a registered medical practitioner, as they could potentially have the qualification Doctor of Chiropractic/Osteopathy or Doctor of Philosophy and [wrongly, but genuinely] believe they may use the title. (It should be noted, however, this criterion is lenient, as these qualifications refer to a ‘doctorate’ they would only provide at best a technical excuse for use of the title ‘Doctor’ in CAM practice—if they refer to diplomas, then they offer no justification whatsoever, technical or otherwise.)

If a practitioner practiced in more than one area (e.g. chiropractic and osteopathy), they were counted twice (so rates of misleading use of the title ‘Doctor’ were represented evenly across practice types). When a practitioner advertised twice under the same practice type, they were counted once (so as not to artificially inflate the rates for any practice type); the listing most likely to mislead was the one retained (e.g., if the title ‘Doctor’ is used in one advertisement, but not another, then the former was entered for analysis, whilst the latter was not).

No practitioner was approached in person, or contacted by phone, facsimile, email, or conventional mail.

## Results

120 (82%) chiropractics, 27 (21%) acupuncturists, and 9 (6%) osteopaths were found to use the title ‘Doctor’ in their NZ Yellow Pages advertisement/listing. This difference was highly significant,  $\chi^2(2, N=156)=136.50, p<0.001$ . Table 1 shows the number of practitioners using the title ‘Doctor’, by practice type.

**Table 1. Practitioners using the title Doctor, by practice type**

| Practice type | Is the prefix 'Doctor' or 'Dr' used? |            | Total      |
|---------------|--------------------------------------|------------|------------|
|               | Yes                                  | No         |            |
| Acupuncture   | 27                                   | 100        | 127        |
| Chiropractic  | 120                                  | 26         | 146        |
| Osteopath     | 9                                    | 134        | 143        |
| <b>Total</b>  | <b>156</b>                           | <b>260</b> | <b>416</b> |

107 (73%) chiropractics, 16 (13%) acupuncturists, and 8 (6%) osteopaths appeared to use the title ‘Doctor’ in a way that could imply they were registered medical practitioners, when there was no evidence this was true; the difference in use of titles between practice types was highly significant,  $\chi^2(2, N=397)=202.54, p<0.001$ ; practitioners of chiropractic were 6.7 times more likely than acupuncturists and 13.4 times more likely than osteopaths to use the title of ‘Doctor’ in this way.

There were 17 practitioners for whom there was a ‘technical excuse’ for using the prefix ‘Doctor’ as they also added the qualification suffix of DC, DO, or PhD, meaning they may be a Doctor of Chiropractic/Osteopathy or Philosophy. It was not possible to determine whether two CAM practitioners were registered medical practitioners due to vagueness in the wording of their Yellow Page listings/advertisements. Practitioner count by practice type and use of title is shown in Table 2.

**Table 2. Use of title, by practice type**

| Practice type | Does the title imply the practitioner is a medical practitioner when there is no evidence that they are? |            |                  |                     | Total      |
|---------------|----------------------------------------------------------------------------------------------------------|------------|------------------|---------------------|------------|
|               | Yes                                                                                                      | No         | Technical excuse | Unable to determine |            |
| Acupuncture   | 16                                                                                                       | 105        | 4                | 2                   | 127        |
| Chiropractic  | 107                                                                                                      | 27         | 12               | 0                   | 146        |
| Osteopath     | 8                                                                                                        | 134        | 1                | 0                   | 143        |
| <b>Total</b>  | <b>131</b>                                                                                               | <b>266</b> | <b>17</b>        | <b>2</b>            | <b>416</b> |

## Discussion

Strong evidence was found that practitioners of chiropractic, and to a lesser extent acupuncture and osteopathy, respectively, sometimes use the title ‘Doctor’ in a way likely to imply that they are registered medical practitioners when there was no evidence that this was true.

Using a title that could imply to prospective clients that they are consulting a registered medical practitioner, when in reality they are not, is both misleading and illegal.<sup>6</sup> Such practice also denies clients the ability to make informed consent about their treatment and could potentially lead to delays in seeking out mainstream medical care due to confusion over the status of the practitioner.

So why might the title ‘Doctor’ hold such an attraction to those who work in healthcare but who are not registered medical practitioners? Five possible explanations are:

- To gain competitive advantage over practitioners not using the title;
- To confer both prestige and a sense of credibility to practices for which the both scientific rationale and evidence-base are not as strong as for mainstream medicine (which is why such practices are complementary and/or alternatives to mainstream medicine);
- CAM practitioners have not read, or have chosen to ignore, the HPCAA and are unaware what they are doing is potentially illegal;

- Practitioners who have been conferred with the degree of Doctor of Chiropractic/Osteopathy or higher degree, such as PhD, genuinely (albeit wrongly) believe that they are entitled to use the title 'Doctor' in the course of their CAM practice; and
- Some CAM practitioners refuse to accept there are theoretical and evidential differences between CAM and mainstream medicine and intentionally flout the HPCAA legislation.

It was difficult to speculate why the rate of misleading use of title differed significantly between practice types. It was, however, interesting that misuse of the title 'Doctor' occurred 6.7 times more often among chiropractics than acupuncturists, and 13.4 times more often among chiropractics than osteopaths.

No evidence could be found to suggest that that an organisation representing each practice type (New Zealand Chiropractors' Association, Osteopathic Society of New Zealand, and New Zealand Register of Acupuncturists) either encouraged or discouraged use of the title 'Doctor' amongst its members.<sup>12-14</sup>

If the New Zealand Yellow Pages were to adopt the criterion with regard to use of the title 'Doctor' that is currently used in the General Advertising Guidelines of the United Kingdom Yellow Pages, then much of the current confusion would cease. As such, it is recommended that the New Zealand Yellow Pages should be made aware (e.g. by communication from the Medical Council of New Zealand) that current practice of allowing CAM practitioners to use the title 'Doctor' in their advertisements may encourage an activity, the legality of which is highly dubious.

It is further recommended that CAM practitioners who are not medically registered practitioners must accept that in New Zealand they are not entitled to use the courtesy title 'Doctor' and cease to do so at the earliest available opportunity. It is suggested that a 'period of grace' be allowed (e.g. until the NZ Yellow Pages have been notified of the implications of this practice and the subsequent print-run has occurred) prior to the legality of this behaviour being challenged.

Although it is recommended that inappropriate use of the title 'Doctor' should cease, it may be interesting to explore whether the use of the title 'Doctor' in CAM affects the size of any placebo effect that may occur.

It should be noted that although all possible efforts were taken to determine if any CAM practitioner using the title 'Doctor' was also a registered medical practitioner, it is possible that due to inconsistencies in records available, some such cases were not identified.

**Competing interests:** None known.

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## Inpatients' use, understanding, and attitudes towards traditional, complementary and alternative therapies at a provincial New Zealand hospital

Amanda Evans, Bruce Duncan, Patrick McHugh, John Shaw, Craig Wilson

### Abstract

**Aim:** To assess the use and attitudes towards traditional, complementary and alternative medicine and therapies (TCAM) by inpatients of a provincial hospital.

**Methods:** Ninety-two Gisborne Hospital inpatients were interviewed face-to-face over a 4-week period using a standardised questionnaire.

**Results:** Of the 92 people interviewed, 84 patients (91%) had used an average of 6.4 TCAM modalities. Most common therapies used were massage (n=62), vitamins (n=5), chiropractor (n=45), and herbal therapies (n=41). Of the 84 people who have used TCAM, 79 (94%) used more than one therapy. Nineteen patients (23%) used 10 or more different therapies. Māori and Non-Māori respondents used the majority of TCAM modalities equally apart from a few notable exceptions. Only 10 (11%) of the 92 patients in this study recalled having been asked by a doctor if they were using TCAM. Fifty-five (65%) of those who use TCAM believed that it is safe.

**Conclusion:** This study of in-patients interviewed at Gisborne Hospital had the highest rate of TCAM use published to date. Most of these patients intend to continue using TCAM (86%), seek pluralistic care for their maladies and select from a broad array of modalities rooted in the community. Patients are not telling their doctors about this use, not because patients fear disapproval, but they are simply not being asked. Patients do not volunteer this information because they believe that TCAM use is safe and are unaware of its potential risks. There are ethnic trends in the selection of TCAM modalities and potential exists to reach some hard to reach populations through integrated care. The high prevalence of TCAM use in an in-patient population and patients' naivety regarding risks and interactions underscores the need for greater cooperation between orthodox and complementary practitioners, effective regulation with emphasis given to public safety, the need for new funding for TCAM research, increased undergraduate and postgraduate medical TCAM education, and better information made available to the public.

Traditional, complementary and alternative medicines or therapies (TCAM) are widely used by members of the public.<sup>1,2</sup> A growing body of evidence confirms the widespread use of TCAM, although this evidence is largely gained from questionnaire-based studies in larger centres or for specific groups (e.g. cancer patients).<sup>3</sup>

There are few published studies, and none in New Zealand, of TCAM use in an inpatient setting, or in a provincial or rural population where over 45% of people identify as Māori.<sup>4,5</sup> In addition, relatively little is known about reasons for use.<sup>6</sup>

It appears from recent studies that the majority of people use TCAM as a complement to conventional medicine and not as an alternative.<sup>7</sup> Complementary and alternative medicine has been defined as ‘a broad domain of healing resources that encompasses all health systems, modalities, and practices and their accompanying theories and beliefs, other than those intrinsic to the politically dominant health system of a particular society or culture in a given historical period.’

CAM includes all such practices and ideas self-defined by their users as preventing or treating illness or promoting health and wellbeing’.<sup>8</sup> We have added “T” to CAM to include all forms of Traditional healing systems.

Many TCAM modalities are not actually classified as medicines under existing legislation in New Zealand and there is little regulation over what people use and from where they obtain them.<sup>9</sup> In spite of the growing scientific evidence that some TCAM therapies may be effective for specific conditions, many of these therapies may have unanticipated negative consequences or are known to interact with conventional medicines.<sup>10–13</sup>

It is also widely acknowledged nationally and internationally that disclosure of patients’ usage to health professionals is limited.<sup>4,14</sup> This makes it difficult for health professionals to know how to advise patients on the use, risks, and benefits of TCAM because they simply do not know who is taking what, at what time, and what interactions pharmaceuticals may have.

Even if conventional healthcare providers are aware that their patients are using TCAM modalities, they ought to also have an understanding of the scientific literature [evidence base] on potential interactions, risks, and efficacy. Understanding the prevalence and reasons for using TCAM are a first step in improved, best practice patient care for those patients selecting TCAM in addition to conventional treatment.

This study sought to investigate the prevalence of TCAM use in an inpatient setting, through one-on-one interviews with a small representative sample of patients at Gisborne Hospital.

## Methods

Gisborne Hospital is a 120-bedded provincial hospital on the east coast of New Zealand’s North Island. It has a catchment population of approximately 45,000 people with 47% identified as Māori in the 2006 census.<sup>15</sup>

Patients in the following areas were included in the study: general surgical, general medical, rehabilitation, maternity, and day ward.

Patients were not approached if they were being ventilated, were severely breathless, in severe pain, heavily medicated, had any condition that impaired adequate communication, or if they could not communicate comfortably.

Two healthcare assistants were utilised to approach patients admitted to the medical, surgical, and maternity wards. The healthcare assistants were in regular discussion with senior nursing staff to determine which patients were appropriate to participate. The healthcare assistants asked patients whether they wished to participate in a survey of TCAM use. Those patients willing to participate were approached by the interviewer. To reduce variation in approach of questioning, only one interviewer was involved.

The survey took place face to face, either at the bedside or in an alternative, suitable place.

A standardised questionnaire was developed to include basic demographic-, disease-, and treatment-related data. The core of the questionnaire was a list of 25 therapies that the interviewer would list one-

by-one and the patient would name whether they had “heard of” or “have used” the therapy. If the patient had not used any TCAM in their lifetime they were asked “would they use them in the future?” and “if therapies were available in the hospital would they use them?” If they had heard of therapies they were asked “how they learnt about them?”

Patients who reported using TCAM were asked about their reasons for its use; if they thought they were helpful; if they considered them safe; if they had experienced any side effects; and if they were aware of interactions between orthodox treatments and TCAM. They were asked their opinion about whether TCAM should be regulated and questioned about how comfortable they felt talking to hospital staff about TCAM use; if they had ever been asked by doctors what alternative methods they may use and whether they felt “judged” if they admitted to their use.

The final question asked if TCAMs were available in hospital would they use them and, if so, which ones they would like to use.

The questionnaire took a minimum of half an hour to complete and data was entered into an Excel spreadsheet and analysed using SPSS v13.0 software.

This study was approved by the Northern Y Regional Ethics Committee, with Locality Assessment by the Clinical Board of Gisborne Hospital. Further consultation was completed with local Māori health providers.

## Results

The interviews were held in hospital wards during January and February 2006. Hospital staff considered 51 patients too sick to participate. Of the remaining 156 suitable adult admissions for the period, 92 patients were eventually interviewed: 25 had been discharged between the healthcare assistants obtaining their interest and the interviewer managing to get to them; 24 people declined to be interviewed; and 15 were not available on the ward on the day of the scheduled interview.

**Demographics**—The average age of the patients interviewed was 54 years, ranging from 18 to 89. Table 1 summarises the demographic features of the 92 participants.

**Table 1. Demographic characteristics of participants (N=92)**

| Age (years)      | Number | Percentage |
|------------------|--------|------------|
| <30              | 9      | 10         |
| 31–45            | 17     | 18         |
| 46–60            | 33     | 36         |
| 61–74            | 17     | 18         |
| >75              | 16     | 17         |
| Gender           | Number | Percentage |
| Male             | 38     | 41         |
| Female           | 54     | 59         |
| Ethnicity        | Number | Percentage |
| Māori            | 40     | 44         |
| Non-Māori        | 51     | 55         |
| Pacific Islander | 1      | 1          |
| Employment       | Number | Percentage |
| Full time        | 26     | 28         |
| Part time        | 7      | 8          |
| Retired          | 27     | 29         |
| Unemployed       | 2      | 2          |
| Homemaker        | 8      | 9          |
| Sickness benefit | 15     | 16         |
| Other            | 7      | 8          |

The participants had a wide range of clinical conditions that were categorised into Acute or Chronic from the information that the patient provided the interviewer and not based on their medical records. Acute conditions represented 40%, Chronic conditions 51%, and the maternity ward represented 9% of all participants. The patients surveyed were considered representative of the hospital's general population in age, gender, ethnicity, and clinical condition.

**Utilisation of TCAM**—Of the 92 patients interviewed, only 4 (4%) reported no knowledge or use of TCAM. Of the remaining 88 patients, 79 (90%) reported the use of two or more TCAM modalities—4 had reported knowledge only and none used vitamins or spiritual healing only.

Most respondents used more than one modality (Table 2) and the average number of modalities used by all patients was 6.4 (SE=0.472). Women averaged eight and men five modalities used. The variety and usage of TCAM modalities is summarised in Tables 2 and 3.

**Table 2. Number of modalities used by respondents who had some knowledge to TCAM (N=88)**

| Number of modalities used | Number (% cases) |
|---------------------------|------------------|
| 0                         | 4 (5%)           |
| 1–3                       | 20 (23%)         |
| 4–9                       | 45 (51%)         |
| 10–15                     | 16 (18%)         |
| >16                       | 3 (3%)           |

The majority of the 25 modalities listed were used proportionately equal by ethnicity; however, Māori did have higher usage of Rongoa Māori/traditional Māori medicine [*Rongoa*: take care of, look after, medicine, remedy for sickness],<sup>16</sup> hypnotherapy, spiritual healing, and imagery/visualisation.

Non-Māori had higher adoption proportionately of yoga, chiropractic, homoeopathy, osteopathy, and acupuncture. The single Pacific Islander used traditional Fijian medicine. These outliers can be seen in Figure 3 and Table 4.

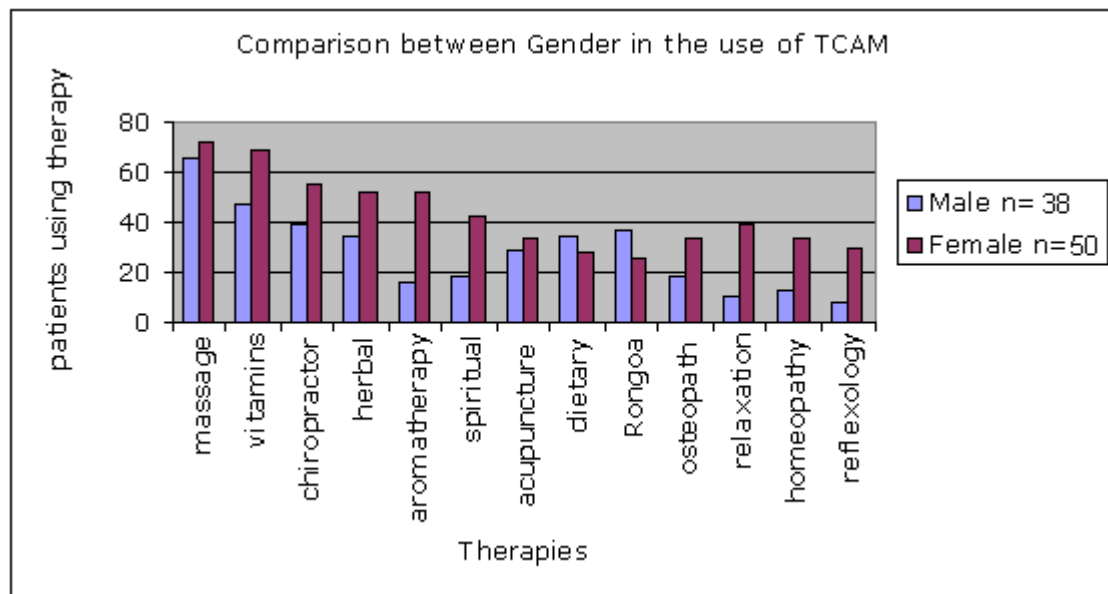
The four patients who had not used TCAM but had some knowledge, were not distrustful of TCAM, but had never felt the need to use it.

**Table 3. TCAM modalities ranked by patient use (N=88)**

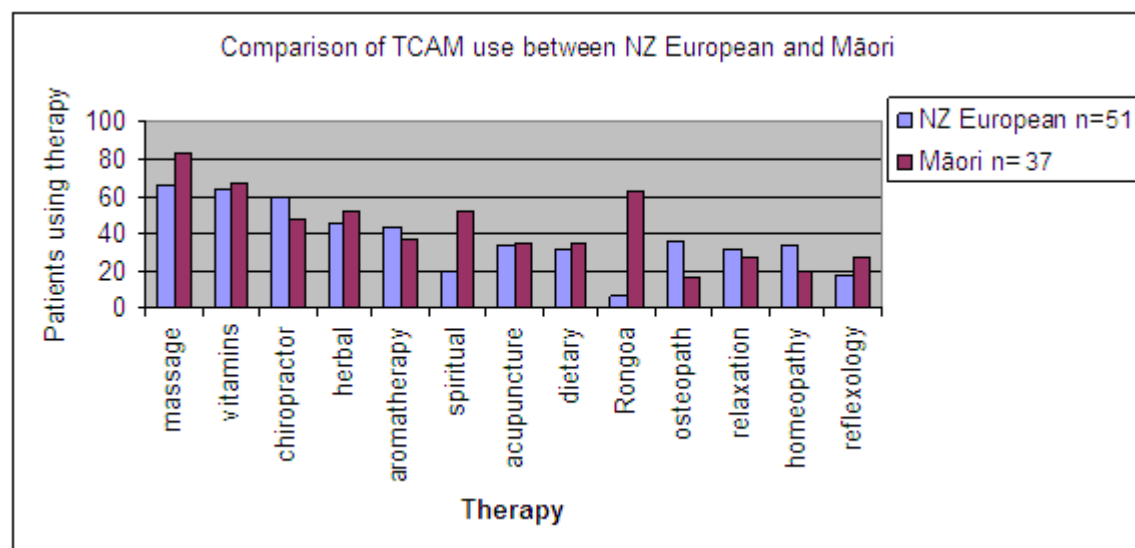
| Modality                      | Not heard of, nor used | Heard of this TCAM  | Used this TCAM      |
|-------------------------------|------------------------|---------------------|---------------------|
|                               | Responses (% cases)    | Responses (% cases) | Responses (% cases) |
| Massage (Romi Romi)           | 1 (1%)                 | 25 (28%)            | 62 (70%)            |
| Vitamins                      | 5 (6%)                 | 28 (32%)            | 55 (63%)            |
| Chiropractic                  | 7 (8%)                 | 36 (41%)            | 45 (51%)            |
| Herbal therapies              | 9 (10%)                | 38 (43%)            | 41 (47%)            |
| Aromatherapy                  | 9 (10%)                | 45 (51%)            | 34 (39%)            |
| Spiritual healing             | 9 (10%)                | 49 (56%)            | 30 (34%)            |
| Acupuncture                   | 1 (1%)                 | 58 (66%)            | 29 (33%)            |
| Dietary therapy               | 11 (13%)               | 49 (56%)            | 28 (32%)            |
| Rongoa Māori (Māori medicine) | 17 (19%)               | 43 (49%)            | 28 (32%)            |
| Osteopathy                    | 19 (22%)               | 44 (50%)            | 25 (28%)            |
| Relaxation techniques         | 6 (7%)                 | 57 (65%)            | 25 (28%)            |
| Homeopathy                    | 26 (30%)               | 39 (44%)            | 23 (26%)            |
| Reflexology                   | 33 (38%)               | 36 (41%)            | 19 (22%)            |
| Shark cartilage               | 44 (50%)               | 27 (31%)            | 16 (18%)            |
| Colour therapy                | 26 (30%)               | 46 (52%)            | 16 (18%)            |
| Detoxification programmes     | 17 (20%)               | 55 (63%)            | 15 (17%)            |
| Antioxidants                  | 22 (25%)               | 51 (58%)            | 15 (17%)            |
| Naturopathy                   | 39 (45%)               | 34 (39%)            | 14 (16%)            |
| Bach flower remedy            | 65 (74%)               | 10 (11%)            | 13 (15%)            |
| Yoga                          | 2 (2%)                 | 73 (83%)            | 13 (15%)            |
| Iridology                     | 57 (65%)               | 19 (22%)            | 12 (14%)            |
| Electro/biomagnetic therapy   | 46 (52%)               | 32 (36%)            | 10 (11%)            |
| Imagery/visualisation         | 12 (14%)               | 66 (75%)            | 10 (11%)            |
| Hypnotherapy                  | 5 (6%)                 | 75 (85%)            | 8 (9%)              |
| Bowen                         | 52 (59%)               | 23 (28%)            | 6 (7%)              |

Figure 1 shows the variation of TCAM use by gender while Figure 2 shows TCAM use by ethnicity.

**Figure 1. Gender and TCAM use (N=88)**



**Figure 2. Ethnicity and TCAM use (N=88)**

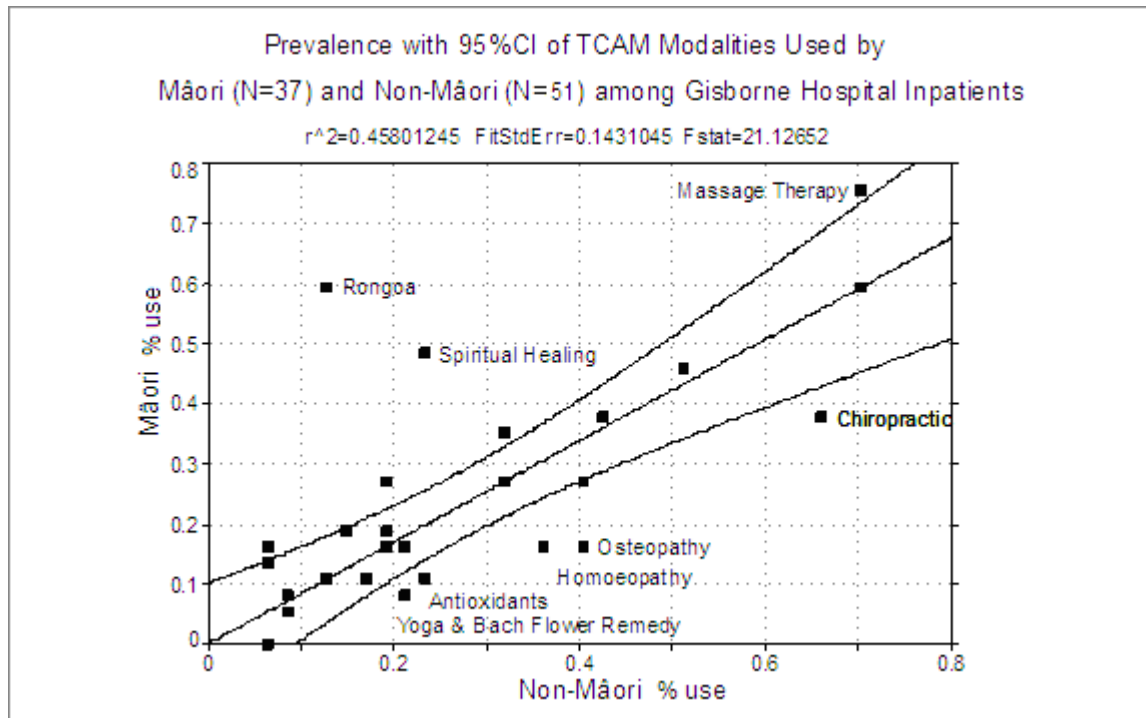


**Table 4: Modalities of TCAM reported used by 88 Patients at Gisborne Hospital**

| Therapy                      |                          | Percent Patients Using TCAM  |                          |                        |
|------------------------------|--------------------------|------------------------------|--------------------------|------------------------|
|                              |                          | Non-Māori Respondents (N=51) | Māori Respondents (N=37) | All Respondents (N=88) |
| Traditional systems          | Rongoa Māori             | 13%                          | 59%                      | 33%                    |
|                              | Acupuncture              | 40%                          | 27%                      | 35%                    |
| Mind-body therapies          | Spiritual healing        | 23%                          | 49%                      | 35%                    |
|                              | Relaxation technique     | 32%                          | 27%                      | 30%                    |
|                              | Colour therapy           | 21%                          | 16%                      | 19%                    |
|                              | Imagery/visualisation    | 6%                           | 16%                      | 11%                    |
|                              | Hypnotherapy             | 6%                           | 14%                      | 10%                    |
|                              | Reiki*                   | 9%                           | 8%                       | 8%                     |
|                              | Yoga                     | 21%                          | 8%                       | 15%                    |
| Manual-based therapies       | Crystal*                 | 6%                           | 0%                       | 4%                     |
|                              | Massage (Romi Romi)      | 70%                          | 76%                      | 73%                    |
|                              | Chiropractic             | 66%                          | 38%                      | 54%                    |
|                              | Reflexology              | 19%                          | 27%                      | 23%                    |
| Biologically-based therapies | Bowen technique          | 9%                           | 5%                       | 7%                     |
|                              | Vitamins                 | 70%                          | 59%                      | 65%                    |
|                              | Herbal therapies         | 51%                          | 46%                      | 49%                    |
|                              | Aromatherapy             | 43%                          | 38%                      | 40%                    |
|                              | Dietary therapy          | 32%                          | 35%                      | 33%                    |
|                              | Shark cartilage          | 19%                          | 19%                      | 19%                    |
|                              | Detoxification programme | 19%                          | 16%                      | 18%                    |
| Alternative systems          | Antioxidants             | 23%                          | 11%                      | 18%                    |
|                              | Bach flower remedy       | 21%                          | 8%                       | 15%                    |
|                              | Naturopathy              | 15%                          | 19%                      | 17%                    |
|                              | Homoeopathy              | 36%                          | 16%                      | 27%                    |
|                              | Osteopathy               | 40%                          | 16%                      | 30%                    |
|                              | Electro/biomagnetic      | 13%                          | 11%                      | 12%                    |
|                              | Iridology                | 17%                          | 11%                      | 14%                    |

\*Crystal and Reiki therapies were added due to the several specific mentions given by respondents.

**Figure 3. Use of TCAM by ethnicity (N=88)**



**Table 5. How did you learn about TCAM?**

| Response       | % of cases |
|----------------|------------|
| Friends        | 83         |
| Family         | 76         |
| Magazines/news | 51         |
| Books          | 45         |
| Other patients | 37         |
| GP             | 34         |
| Radio/TV       | 24         |
| Pharmacist     | 21         |
| Nurse/Midwife  | 18         |
| Internet       | 9          |

**TCAM adoption and motivation**—Patients who reported knowledge or use of at least one TCAM (N=88) were asked how they learnt about these therapies (Table 5), what their reasons were for using them (Table 6), and what factors influenced their choice of TCAM used (Table 7).

**Table 6. Reasons for using TCAM**

| Response                                        | % of cases |
|-------------------------------------------------|------------|
| Symptom relief                                  | 98         |
| Improve quality of life                         | 95         |
| Hope of cure                                    | 83         |
| Disease control/management                      | 75         |
| Prevent recurrence of disease                   | 73         |
| Energy boost                                    | 64         |
| Primary prevention                              | 60         |
| Like them                                       | 55         |
| Physical training                               | 40         |
| Improve side effects of conventional treatments | 37         |
| Assist with other treatments                    | 35         |

**Table 7. Factors influencing TCAM choices**

| Response                         | % of cases |
|----------------------------------|------------|
| Recommendation of benefit        | 87         |
| Control over one's health        | 75         |
| Safety                           | 69         |
| Previous positive experience     | 69         |
| Cost                             | 58         |
| Ease of access                   | 58         |
| Personal preference              | 57         |
| Failure of conventional medicine | 38         |
| Difficulty talking with doctor   | 22         |

Seventy percent thought that TCAM was not at all helpful for their present condition although 64% reported it was helpful in the past and 86% would use TCAM in the future. Ninety-seven percent would use them in the hospital if available. Forty-eight patients named therapies that they would like to use. The most popular suggestions were massage (48%), followed by Rongoa Māori (23%) and herbal medicines (19%).

**Safety and regulation of TCAM**—93% of respondents believed TCAM was safe: only one person thought not; the remainder were undecided. Ninety-three percent of respondents denied experiencing side-effects from TCAM therapies; 30% thought that TCAM could interact with pharmaceutical drugs, and 67% believed no interactions would take place. Only two patients said they didn't know and five people didn't express a view. However, when asked, 78% believed that TCAM should be regulated. (To define regulation the interviewer said; “for example like pharmaceuticals drugs, you have to have a consultation with a qualified person first before purchasing any TCAM medicines”.)

The main reasons stated for regulation were: a belief that “it could be dangerous to take something that you knew little about”, because “it may not be safe”, that regulation may give consumers more access to information about the products, and better informed choice.

The most popular reasons for not making it regulated were: loss of freedom of choice, lack of control over one's own health, and that regulation would probably make it too expensive.

**Talking about TCAM**—10% of TCAM users reported they would be uncomfortable talking to hospital staff about their use of TCAM. Very few respondents reported a difficulty talking with the doctor (3 patients), perceiving a lack of interest (5 patients), or fearing disapproval or ridicule (5 patients).

Only 10 (11%) of all patients reported being questioned by their doctor on TCAM use and only 6 patients felt telling a health professional about TCAM use would affect their treatment. Of those willing to discuss TCAM use, 88% of participants believed they would never be treated differently by their doctors for disclosure.

**TCAM use prior to this admission**—43% of patients had consulted with a TCAM practitioner prior to medical evaluation in the past, and 14% acknowledged seeing a TCAM practitioner for their current problem.

## Discussion

Our study reports the highest prevalence (91%) of TCAM use published to date in New Zealand. It differs from other reported studies in its selection of hospital in-patients and interview technique. Our findings must be qualified by the fact that this was a small sample using a select group of patients, so it is difficult to generalise the results. Overseas studies have described 9% to 70% prevalence of complementary/alternative medicine use with wide differences in study methodologies and many critical factors poorly controlled.<sup>3</sup> However, it is clear that data suggests TCAM therapies are used frequently and increasingly even with considerable uncertainties. New Zealand studies are consistent with these international results.<sup>17,18</sup>

Prayer, exercise, and daily vitamin use are often excluded from prevalence studies.<sup>19</sup> Our study did not distinguish between daily vitamins versus mega vitamin use, nor did it distinguish between prayer and spiritual healing. However, no patient in the Gisborne study group reported vitamin or spiritual healing use exclusively and omitting these modalities would not change our results.

The high prevalence of Māori traditional healing (Rongoa) does not account for the overall high TCAM prevalence. As found here patients appear to adopt pluralistic healthcare decisions.

Our study to explore TCAM use is the first in New Zealand to use face-to-face interviews and to interview hospitalised patients. While face-to-face interviews have their own bias—participants may seek to please interviewers—the method enables richer qualitative data, flexibility, and clarification. We tried to minimise bias from the single interviewer through non-committal replies and encouragement for the participant to talk on their personal opinion and experience during the interview. Face to face technique would be expected to encourage a response: while the potential for over-estimation of factors exists, this needs to be placed against the risk of under-reporting known to arise from written questionnaires, especially when literacy is a factor.

Although subgroup numbers are small in this study and subjects were not randomly selected, some TCAM modalities may have significant differences in use when considered by ethnic group. Most of the TCAM modalities were fairly evenly utilised by Māori and Non-Māori with the few exceptions seen in Figure 3: most notably, Māori use traditional Māori medicine (Rongoa Māori) over four times more frequently than Non-Māori. This rate is far higher than published in New Zealand to date.<sup>17</sup>

In our study, over 90% of Maori women reported using traditional Māori medicine. Traditionally, Māori women have been difficult to access in conventional healthcare. The potential exists to reach underserved or groups with health inequalities through culturally integrated care.<sup>20</sup>

This research carried out in Gisborne Hospital is typical of the current health seeking environment, where the majority of the population seek out TCAM. This popularity of TCAM is reflected in the variety of modalities used by our inpatient population. There is a further need however to distinguish between obtaining “over the counter” modalities and consulting a TCAM practitioner to further delineate patient's behaviour.

Many studies have looked at predictors of TCAM use and have found that younger age, female sex, higher education, and income were associated with greater TCAM use.<sup>3,18,21</sup> While this study did not pursue socioeconomic detail, we did find that age and gender trends were comparable to other research.

As described previously, ethnicity did not emerge as a determining factor for TCAM use in general but ethnicity was linked to select types of TCAM—people identifying as Māori were more likely to use Rongoa Māori, spiritual healing, hypnotherapy, and imagery/visualisation. We consider this direction a major priority in future TCAM research.

Most of the people interviewed seemed happy with the orthodox system and sought TCAM for general wellbeing and to make them feel good, rather than as a secondary use being disappointment in the current medical system. However, this may have been influenced by their current use of the orthodox system at the time of questioning or the failure of TCAM to prevent their hospital admission.

Lack of disclosure by patients of TCAM follows experience elsewhere. In the absence of doctors or other professionals asking, the potential for problems exists. Guidance in 2005 from the MCNZ makes this clear, and our research confirms a gap between policy and practice.<sup>22</sup> This was also found in the 2003 Wanganui study where 82.6% said they would talk to their doctor but 62.5% said their doctor did not ask them.<sup>23</sup>

Because the patients do not get this “prompting” from their health practitioner, they do not say anything, probably (as our study suggests) because most believe that TCAM therapies are perfectly safe. Only a small number of patients in this study (7%) felt uncomfortable discussing TCAM use—broadly similar to the findings from the Wanganui study. The majority of patients using TCAM are clearly willing to discuss TCAM use and doctors should be asking.

Knowledge of the inherent potential for interactions between orthodox and herbal remedies is not new. However, this fact is not reflected in behaviour of either the

public or the professionals. The public appears unaware and professionals uninquisitive. Besides drug interactions (for example, St John's Wort and many 'mainstream' medicines) and bodily manipulation, risks arising from TCAM are not only those directly due to the therapies themselves, but indirect risks due to limitations in the TCAM therapists' diagnostic and clinical knowledge creating inappropriate treatment delays or mismanagement.

These are presumably less likely to occur with medically qualified practitioners, who therefore have an essential role in the development and delivery of integrated TCAM services. Those medically qualified practitioners who do practice some form of TCAM ought to have appropriate training, skill, and oversight in the TCAM modalities they do use.

However, as it appears that most patients consult complementary practitioners concurrently with conventional medical doctors, it may underscore the need for greater cooperation between orthodox and complementary, alternative, and traditional health professionals. This improved communication will hopefully result in better risk/benefit analysis and informed choice for patients.

The results of this study also suggest that effective regulation with emphasis given to public safety, new funding for TCAM research, increased undergraduate and postgraduate medical education about TCAM, and better information available for the public are needed in New Zealand.<sup>24,25</sup>

We recommend, as do other studies, that physicians and other health practitioners become more aware of TCAM, make better use of communication styles that can foster patient self-disclosure, and enable better multidisciplinary communication.<sup>1,4,14,17,20,21,26</sup>

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## The potential direct impacts on human health resulting from the establishment of the painted apple moth (*Teia anartoides*) in New Zealand

José G B Derraik

### Abstract

This article examined the available evidence on the potential adverse reactions to human health associated with exposure to the painted apple moth (*Teia anartoides*; Lepidoptera: Lymantriidae). There seems to be no evidence of human health effects in the field, even though this species appears to be common in urban and suburban gardens in Australia. There are, however, rare accounts of laboratory exposure in that country and New Zealand. Allergic and toxic reactions following exposure to arthropods are common occurrences, and exposure to any insect setae may cause adverse reactions in susceptible people. Therefore, it is likely that some people would experience adverse reactions following exposure to the setae on *Teia anartoides* caterpillars, and the possibility that more sensitive persons could experience more severe reactions cannot be discarded. However, in contrast to previous claims, the direct impacts on human health as a result of the establishment of the painted apple moth in New Zealand would likely be minor.

The painted apple moth (Figure 1) *Teia anartoides* (Lepidoptera: Lymantriidae) was discovered in West Auckland in 1999.<sup>1</sup> An aerial spraying programme was subsequently carried out, which seems to have led to the eradication of this moth from New Zealand.<sup>1,2</sup>

The MAF Biosecurity New Zealand (this country's lead biosecurity agency and a division of the Ministry of Agriculture and Forestry—MAF) website states in regards to human exposure to *T. anartoides* caterpillars that “some people may also be allergic to the hairs on the caterpillars”.<sup>2</sup> However, in contrast, in a recent radio interview regarding the eradication campaign, Jim Anderton (New Zealand's current Minister for Biosecurity) stated that the painted apple moth “caterpillar has a very toxic effect on human beings” and “if you have contact with it, it has a toxic reaction [*sic*], quite a serious one”.<sup>3</sup>

A MAF report from 2000 stated that “both the number of people likely to be affected [*by exposure to T. anartoides*] and the probability of severe reaction are low” (p.5).<sup>28</sup> Interestingly, a different view, but similar to that expressed by the current minister, was given by MAF to the public at the time of the eradication programme. What could be seen as scare-tactics were employed to gain public support for the controversial aerial spraying. This included the broadcast of 30-second radio advertisements portraying the moth as a dangerous and scary creature, and media releases stating for example “we [MAF] strongly advise anyone who thinks they have come in contact with a Painted Apple Moth [*sic*] to seek medical attention”.<sup>4</sup>

**Figure 1. Painted apple moth caterpillar (*Teia anartoides*)**



**Source:** Alan Flynn (MAF), [www.forestryimages.org](http://www.forestryimages.org)

A media release from Jim Sutton (Biosecurity Minister at the time) also stated that “it was clear from overseas experience that about 95% of the population was allergic to the hairs on the painted apple moth”.<sup>5</sup>

It seemed important, therefore, to examine the issues.

### **Evidence for adverse reactions**

Such claims of human health effects associated with exposure to *T. anartoides* might have originated from a MAF commissioned health impact assessment report. The document contained a section entitled *Risk Assessment of Exposure to the Painted Apple Moth*, which examines “the potential for adverse health effects resulting from establishment of the painted apple moth in Auckland, should eradication efforts fail” (p.50).<sup>6</sup> The report states that:

Contact with larval stages of the painted apple moth is known to cause adverse health effects, including skin lesions, eye irritation, and respiratory reactions. In extreme situations, surface water can be so contaminated with frass (larval excrement) that it affects water quality. This may be enhanced by degradation of the vegetative canopy leading to an increase in water runoff.

The above claims however, were not substantiated, and the only reference provided refers to an impact assessment on gypsy moth (*Lymantria dispar*) prepared by the United States Department of Agriculture (USDA).<sup>7</sup> The gypsy moth is a member of the same Lepidoptera family (Lymantriidae), but no other connections to *Teia anartoides* seem to exist.

The document states that “adverse effects on human health from contact with moth larvae or their hairs entrapped in shed pupa have been reported in the following literature” (p.51). The literature referred to encompasses 10 references, 8 of which were articles from peer-reviewed journals. An examination of these references shows that the human health effects discussed were associated with Douglas fir tussock moth (*Orgyia pseudotsugata*),<sup>8,9</sup> gypsy moth,<sup>10–12</sup> and tussock moth (*Euproctis bipunctapex*).<sup>13,14</sup> Another reference refers to unidentified species of Australian caterpillars,<sup>15</sup> while a USDA report cited refers to gypsy moth.<sup>16</sup> These, or the text in pages 51 and 52, make no direct references to *Teia anartoides*. Nonetheless, the report discusses further potential impacts such as the effects of heavy infestation on water quality, but it mentions neither the source of the claim nor the species involved.

Although unpublished, there seems to have been adverse human health reactions to exposure to *T. anartoides* in the laboratory in New Zealand.<sup>4</sup> The same media release also states that “the hairs cause a nasty reaction resulting in painful and itchy rashes in the majority of the human population”. However, since *T. anartoides* seems to be a common pest in suburban orchards and on urban garden plants,<sup>17–19</sup> if the claims of widespread human susceptibility and consequent adverse reactions were indeed accurate, one would expect case reports of human exposure in Australia.

A 86-page monograph written by Southcott is probably the most complete work available on the human health effects associated with exposure to Lepidoptera in the Australian-New Zealand region.<sup>20</sup> However, this report contains only a brief reference (two paragraphs) to *T. anartoides* (referred to by its synonym *Orgyia anartoides*), which states that (p.149):

Mr ED Edwards, Division of Entomology, CSIRO, has advised (pers. comm., 1978) that the cast final instar larval skins of this species [*Orgyia anartoides*] “have caused mild skin irritation on soft skin of wrists and between fingers in the laboratory here. I have not heard of it causing irritation in the field”.

Southcott makes no other references to any adverse human health impacts associated with exposure to *T. anartoides*.<sup>20</sup> In comparison, the section concerning another Australian moth species introduced to New Zealand (*Uraba lugens*, gum leaf skeletoniser) and its associated human health effects is approximately 9 pages long. In a later publication, Southcott re-emphasised the issue regarding exposure to *T. anartoides*, stating that “contact with this larva [*Orgyia anartoides*] in the laboratory has resulted in mild skin irritation” (p.251),<sup>21</sup> with no mention of adverse consequences to human health having been observed in the field. Such a lack of evidence was also supported by an extensive search of online databases (CAB Abstracts, Current Contents, PubMed, and Web of Science) and search engines (Google, Scirus, and Yahoo), all of which failed to yield published accounts on this matter.

There are anecdotal reports of *T. anartoides* affecting the health of forestry workers in *Pinus radiata* plantations in South Australia, but there is however no confirmation of the species involved (Charlma Phillips, pers. comm. 2008). Southcott described outbreaks of another lymantriid *Acyphas leucomelas* in *P. radiata* plantations in the region, whose health effects on forestry workers meant that many were “unable to work due to [the adverse] reactions”.<sup>20</sup> Therefore, although it is possible that the south Australian cases might have been a result of exposure to *T. anartoides*, the

involvement of other lymantriids cannot be disregarded. Especially since *T. anartoides* appears to be rare in those plantations, and it seems difficult to distinguish its larvae from those of *A. leucomelas* and *Orgyia australis* in the field (Charlma Phillips, pers. comm. 2008).

It is worth mentioning that the extent of the possible physiological differences between apparently closely related Lepidoptera taxa may be inferred for example, from studies on insecticide susceptibility. The lethal concentration values as a result of caterpillar exposure to insecticides may vary over 100-fold between genera<sup>22</sup> or even strains of the same species.<sup>23</sup> In the same way biochemical differences seem to account for such different caterpillar susceptibility to exposure to foreign compounds,<sup>23</sup> extensive antigenic differences may occur between moth species, leading to contrasting effects on human health.

Therefore, based on the available evidence, it appears that the human health impacts associated with exposure to *T. anartoides* were mistakenly estimated to be equivalent to those resulting from exposure to gypsy moth and other lymantriids. Although these moth species are systematically allocated to the same Lepidoptera family, there seems to be no evidence that their biochemical profiles are similar to an extent so as to cause equivalent adverse reactions in humans. The published evidence indicates the opposite.

## Conclusion

Allergic and toxic reactions following exposure to non-stinging arthropods are common occurrences.<sup>24</sup> Exposure to any insect setae may cause adverse reactions in susceptible people.<sup>25</sup> Therefore, it is likely that some people would experience adverse reactions following exposure to the setae of *Teia anartoides* caterpillars. As with any human exposure to arthropods, the possibility that some people may be more sensitive and experience severe reactions cannot be discarded.

However, the direct consequences to human health resulting from the establishment of the painted apple moth in New Zealand would likely be minor, and lesser than for example the likely impacts resulting from exposure to *Uraba lugens* (recently discussed in this journal,<sup>26,27</sup> and widely established in the Auckland region). This is likely to be the case, as there seems to be no published evidence of adverse reactions to human health as a result of field exposure to *Teia anartoides* in Australia, despite, as already stated, its apparently common presence in urban and suburban gardens in that country.

**Competing interests:** The author worked for two and a half years for MAF Biosecurity New Zealand, having recently resigned from his position as Human Health Senior Advisor.

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## Testing and detection trends of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* in Waikato, New Zealand: 1998–2006

Jane Morgan

### Abstract

**Aim** To examine influences on testing and detection trends of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* in the Waikato, 1998–2006.

**Methods** Testing data for *Chlamydia trachomatis* and *Neisseria gonorrhoeae* undertaken within the Waikato District Health Board was collated from 1998 to 2006. National or local issues and interventions felt likely to be influential were identified.

**Results** Annual testing for *Chlamydia trachomatis* rose from approximately 18,000 tests in 1998 to 23,338 tests in 2002 and remained around this level for the rest of the period. Percent positive tests rose from 7.7% in 1999 to 11.3% in 2005, before a decline to 9.6% in 2006. Annual testing for *Neisseria gonorrhoeae* doubled over the study period with a peak of 52,199 tests in 2005 that coincided with a nationwide safer sex media campaign. From 1999–2004, about 0.4% of *Neisseria gonorrhoeae* tests were positive, with a peak of 0.9% in 2006, whilst fewer percent positive tests were noted during increased testing in 2005. For both conditions, fluctuations were noted in the volume of tests and positive tests by quarter but it was not possible to establish causality for these changes.

**Conclusion** High levels of testing and detection of sexually transmitted infections are evident in the Waikato. Testing rates amongst those most at-risk are unknown. Rising numbers of gonococcal infections in recent years suggest ongoing sexual risk-taking behaviour. This study augments calls for laboratory surveillance to be upgraded, with more detailed information on all tests, not just cases, to improve data interpretation and facilitate appropriate public health action.

Sexually transmitted infections (STIs) are associated with serious maternal and neonatal morbidity, preventable subfertility, anogenital cancers, and transmission of HIV.<sup>1</sup> Increasing reports of STIs in recent years in New Zealand have led to efforts to encourage condom use, raise awareness of sexually transmitted infections, and improve access to sexual health care, particularly at a primary health level.<sup>2</sup> However, the relative successes or failures of such interventions are difficult to quantify; ongoing increases in STI diagnoses may represent both greater case finding and continued disease transmission.

This makes understanding the true epidemiology of STIs in New Zealand a challenge, with a lack of prevalence studies and significant gaps in currently reported surveillance data.<sup>2,3</sup> Yet, whatever the limitations, surveillance data is important as it is likely to continue to influence future policy decisions.

Generally, New Zealand surveillance reports focus on the amount of detected disease, with less detail provided on population testing coverage. This study describes trends

in population testing as well as detection of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* within one region of New Zealand for the period 1998 to 2006. The aim is to assess any temporal relation on both testing and detection trends from noteworthy local and national interventions that might better explain regional STI surveillance trends.

## Methods

Data for all *Chlamydia trachomatis* and *Neisseria gonorrhoeae* tests undertaken by all the laboratories within Waikato District Health Board (WDHB) were provided quarterly to the Institute of Environmental Science and Research Limited (ESR) from early 1998, when voluntary laboratory reporting began, to December 2006. The total number of tests undertaken was provided but age or sex data was not reported for negative results. Anonymised data on all laboratory-confirmed cases of *Chlamydia trachomatis* by age and sex was provided. Ethnicity data was not available.

Laboratories reported all specimens received from within the region. Positive test data was de-duplicated as a patient may have more than one positive specimen on the same date, for example if several anatomical sites were tested.<sup>3</sup>

During the study period, all laboratories used standard culture methods to detect *Neisseria gonorrhoeae*. The diagnostic tests used for *Chlamydia trachomatis* differed. From 1998, two of three laboratories introduced Nucleic Acid Amplification Techniques (NAATs) for all *Chlamydia trachomatis* testing, namely polymerase chain reaction (PCR, Roche Cobas Amplicor). A third laboratory continued to test with non-NAATs as well as offering NAAT testing with PCR until the end of 2004. In 2005, all testing at this laboratory changed to Strand Displacement Amplification (SDA, BD Probetec), another NAAT test.

Statistics New Zealand census population data for WDHB from 1996, 2001, and 2006 was obtained. Relevant local and national initiatives and issues thought likely to impact on large numbers of the locally resident population were identified, by reviewing documentation kept by experienced sexual healthcare workers who have been employed continuously within the region for nearly two decades.

## Results

**Population**—From 1996 to 2006, the total resident WDHB population has increased by approximately 26,000 (8%) to 339,195. In all age groups, the WDHB population remains similar to the national age structure; those aged 15–24 years account for 14.5%, those aged 15–39 years for 32%, and those aged 15–65 years account for 65% of the resident population.

**Identified interventions or issues**—More sensitive *Chlamydia trachomatis* detection methods, using NAAT tests, were introduced in early 1998 in two of three WDHB-based laboratories. However, although NAAT testing was also available at the third laboratory, a substantial number of chlamydia tests continued to be processed using less sensitive non-NAAT techniques until the end of 2004.

On 1 December 1999, the legalised drinking age in New Zealand was lowered from 20 years to 18 years.

In 2001, television hosts, Mikey Havoc and Jeremy Wells, from a popular youth show *Havoc Luxury Suites & Conference Facility* were invited to have a sexual health screen at a WDHB sexual health clinic. Although the episode emphasised the ease of urine-based testing for *Chlamydia trachomatis*, it also sensationalised the issue and began an urban myth of Hamilton being the chlamydia capital of New Zealand.

In July 2003, some primary care practices within WDHB were selected non-randomly for a sexual health access-to-care funding initiative that enabled those practices to

offer free sexual health consultations for registered under-25 year olds. Practice selection was based on a range of factors including demographic data of the practices' registered populations and rural location. The initiative was phased in over a 12-month period.

In late 2004, a Ministry of Health *No Rubba, No Hubba Hubba* campaign used television, radio, cinema, magazine, outdoor advertising at youth events and the internet ([www.hubba.co.nz](http://www.hubba.co.nz)) to convey a 'no condom, no sex' message. The campaign ran for 3 months from 22 November 2004 and again for 6 weeks until the end of June 2005. The key goal was for at least 80% of the priority audiences (15 to 19 year old New Zealanders with emphasis on Māori rangatahi and Pacific youth) to be aware of the campaign. A health objective of the campaign was to reduce the incidence of STIs through increased condom use among this target group.

***Chlamydia trachomatis***—Laboratory data for the 1<sup>st</sup> quarter of 1998 was incomplete so the annualised total is adjusted to reflect this. Annual testing for *Chlamydia trachomatis* rose from approximately 18,000 tests in 1998 to 23,338 tests in 2002 (Table 1) and has remained around this level over the last 5 years. The annualised percentage of positive tests rose from 7.7% in 1999 to 11.3% in 2005, with a subsequent decline to 9.6% in 2006. More detailed data about age and sex of these detected cases with population-based denominators are reported in quarterly ESR surveillance reports.<sup>4</sup>

**Table 1. Annualised testing data for *Chlamydia trachomatis* and *Neisseria gonorrhoeae***

| Year  | <i>Chlamydia trachomatis</i> |                  |                           | <i>Neisseria gonorrhoeae</i> |                  |                           |
|-------|------------------------------|------------------|---------------------------|------------------------------|------------------|---------------------------|
|       | Annualised tests             | Annualised cases | Percentage positive tests | Annualised tests             | Annualised cases | Percentage positive tests |
| 1998* | 18,167                       | 1283             | 7.1                       | 19,047                       | 33               | 0.2                       |
| 1999  | 18,521                       | 1425             | 7.7                       | 21,326                       | 95               | 0.4                       |
| 2000  | 19,247                       | 1417             | 7.4                       | 21,294                       | 102              | 0.5                       |
| 2001  | 21,525                       | 1637             | 7.6                       | 21,379                       | 71               | 0.3                       |
| 2002  | 23,338                       | 1831             | 7.8                       | 32,073                       | 102              | 0.3                       |
| 2003  | 24,459                       | 2274             | 9.3                       | 34,955                       | 141              | 0.4                       |
| 2004  | 23,399                       | 2262             | 9.7                       | 36,311                       | 177              | 0.5                       |
| 2005  | 24,539                       | 2768             | 11.3                      | 52,199                       | 251              | 0.5                       |
| 2006  | 24,469                       | 2343             | 9.6                       | 41,750                       | 374              | 0.9                       |

\*Laboratory data for the 1<sup>st</sup> quarter of 1998 was incomplete so the annualised total is adjusted to reflect this.

**Figure 1. Totals by quarter of all *Chlamydia trachomatis* tests and percentage positive tests by quarter, WDHB, 1998–2006. The arrows indicate when identified issues or interventions occurred**

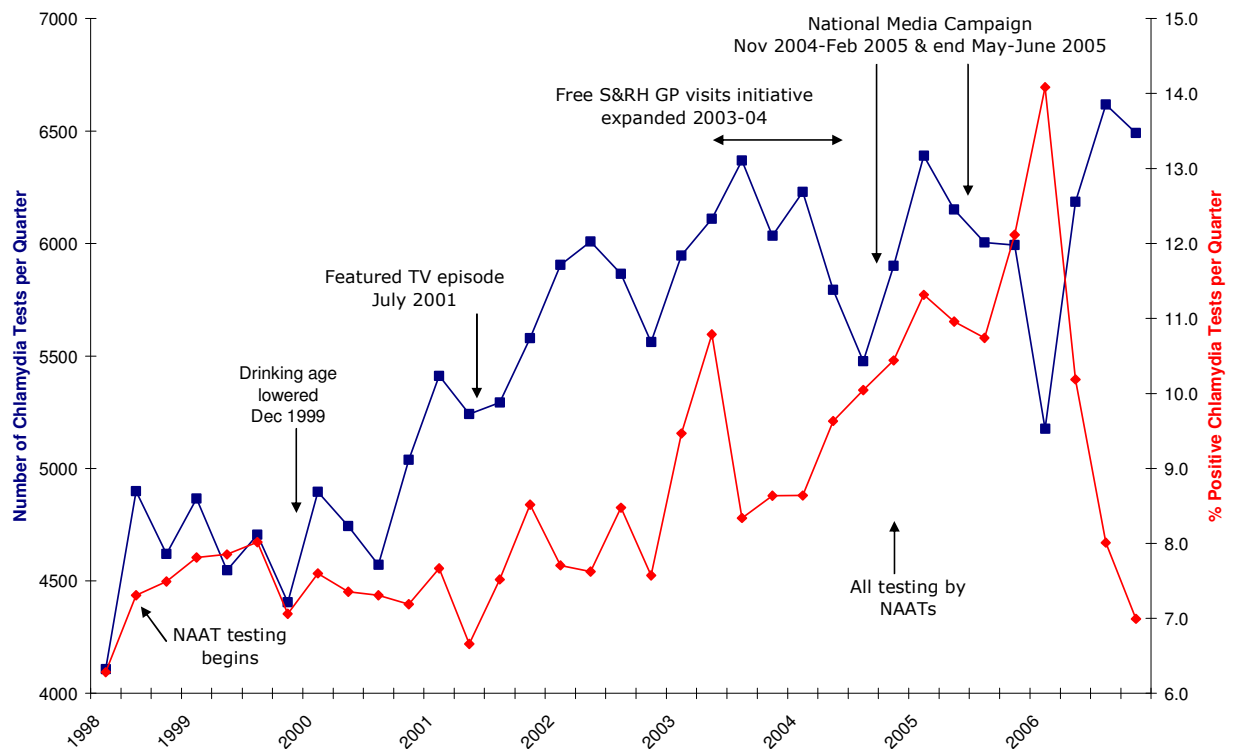
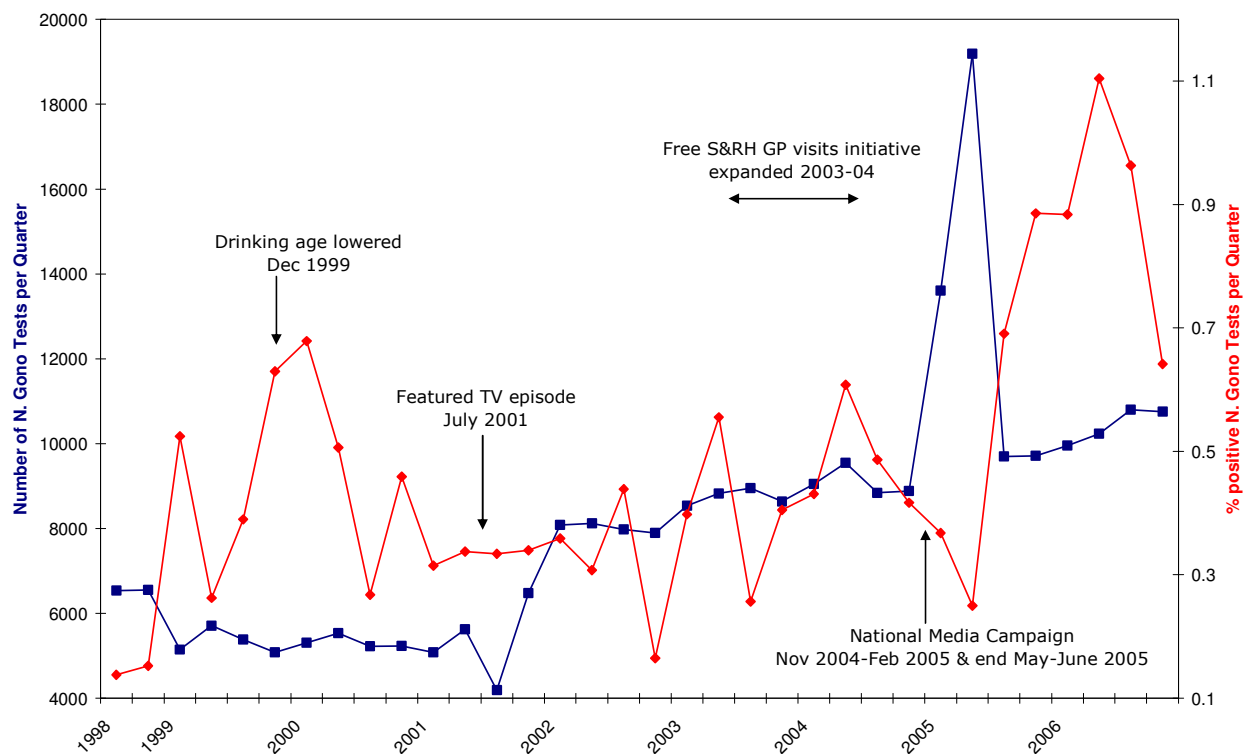


Figure 1 presents the number of tests by quarter within year and the rate of positive results by quarter within year. Fluctuations are noted in the volume of quarterly tests and the percentage of positive tests and these do not appear to follow a seasonal pattern. There is no clear impact on the positivity rate from the introduction of more sensitive Chlamydia NAAT testing. Some of the fluctuations in testing and positivity rates appear to correspond to the introduction of local and national targeted initiatives. However, large fluctuations also occur without clear association to coinciding events.

*Neisseria gonorrhoeae*—Laboratory data for the 1<sup>st</sup> quarter of 1998 was incomplete so the annualised total is adjusted to reflect this. Annual testing for *Neisseria gonorrhoeae* has continued to rise from approximately 19,000 tests in 1998 to a peak of 52,199 tests in 2005 (Table 1).

Figure 2 presents the number of tests by quarter within year and the rate of positive results by quarter within year. Fluctuations are noted in the volume of quarterly tests and the percentage of positive tests and again these do not appear to follow a seasonal pattern. Testing peaked in 2005, which coincides with the nationwide safer sex media campaign. From 1999–2004, about 0.4% of tests were positive. Increased testing in 2005 corresponds with fewer percent positive tests during the same period. Since late 2005, testing has fallen but percent positives have risen to a peak of 0.9% in 2006.

**Figure 2. Totals by quarter of all *Neisseria gonorrhoeae* tests and percentage positive tests by quarter, WDHB, 1998–2006. The arrows indicate when identified issues or interventions occurred**



## Discussion

***Chlamydia trachomatis***—The continued increases in percent positive yield for most of the study period support other reports that, for chlamydial infections, ‘the more you look, the more you find’.<sup>5,6</sup> However, in this study, there is a notable decline in yield in the third and fourth quarters of 2006. This coincides with a peak in testing volumes and so suggests a point of diminishing return in opportunistic screening of this population may have been reached.

Using total population as a denominator, New Zealand’s regional chlamydial rates are much higher than reported elsewhere. In 2006, WDHB’s laboratory-based detection rate was 691 per 100,000 population, Auckland region was 722 per 100,000 and the Bay of Plenty region was 991 per 100,000 compared to national rates for Australia, UK, and Ireland of 282 per 100,000 in 2006, 183 per 100,000 in 2005, and 86 per 100,000 in 2007, respectively.<sup>3,7</sup> However, New Zealand’s regional chlamydia test percent positivity rates, with WDHB data ranging from 7.1 to 11.3% over this study period and similarly reported rates in other regions, are more comparable with overseas data with the UK reporting a 10% positivity rate in 2006, Australia 8.5% in 2001, and Ireland 5% in 2007.<sup>7,8</sup>

Because most infections occur in those under 25 years, the UK Chlamydia Screening Programme has set a target of 50% coverage of all sexually active 15–24 year olds in the UK. However, this target has not yet been achieved, with most areas reporting coverage of less than 15%.<sup>9</sup>

Only 7% of Australian women aged 16–24 years were tested in 2004,<sup>10</sup> with one of the highest reported testing rates being 30% of Swedish women aged 20–24 years.<sup>11</sup> Chlamydia testing rates of WDHB's sexually active population by age is unknown. However, as nearly all laboratory-reported WDHB chlamydia cases are under-40 years of age, using a denominator of 32% (all 15–39 year olds) of the total WDHB population gives an estimated testing coverage of up to 21%.

Further, in 2006, WDHB chlamydia cases were two and half times more common amongst females than males with overseas evidence also showing most chlamydia tests are from females.<sup>3,9</sup> Hence, one factor in WDHB's reported high population rates for *Chlamydia trachomatis* may be greater detection of infection amongst females than has been achieved in other jurisdictions.

***Neisseria gonorrhoeae***—Routine culture for *Neisseria gonorrhoeae* is performed on any genital swab, regardless of why the swab was taken, which may contribute to the larger number of specimens tested and the lower percent positive compared to *Chlamydia trachomatis* data. Genital swab testing volumes, and hence *Neisseria gonorrhoeae* testing, doubled during the study period.

Gonococcal infection is much less vulnerable to testing factors; infection is more likely to be symptomatic, particularly amongst males, so more likely to lead to diagnosis. Hence, trends in gonorrhoea rates are considered to reflect changes in incidence and serve as a surrogate marker of sexual risk-taking behaviour.<sup>12</sup> Recent increases in cases and percent positivity occurring without any change in local laboratory testing methods is therefore of concern.

Overall, the data has many limitations that make it impossible to establish the effect of any single factor of interest. There are many un-measured confounding factors that may be occurring over time such as a true change in disease prevalence, changing population demographics, for example there are a large number of tertiary students in the region, increases/decreases in risk behaviours such as unprotected sexual intercourse and having multiple sexual partners, or having greater access to more effective treatment and testing, for example, through recent primary-care access initiatives. Other social and health issues, for example, antibiotic consumption,<sup>13</sup> and alcohol usage<sup>14</sup> may play a role.

As it is often an asymptomatic condition, chlamydia statistics are particularly vulnerable to factors that influence testing. Others have reported a significant impact on chlamydia detection from introducing NAATs, partly from the direct effect of using more sensitive tests but also an indirect effect where the greater ease of specimen provision, such as urine and self-swabbing, is thought to have led to an increase in the proportion of those with a higher likelihood of infection being tested.<sup>15</sup>

WDHB NAAT testing began in 1998 but, although available at all laboratories, only became the region's predominate testing method during 2004 to early 2005. This gradual transition further limits interpretation of trends on reported chlamydia cases and percent positive yield. The notable decline in percent positive test yield in 2006

raises a concern about a variant strain of *Chlamydia trachomatis* that is undetectable using some PCR-based tests; this was identified in Sweden following a similar decline in yield but sample testing has not yet found any evidence of this strain in New Zealand or in Melbourne, Australia.<sup>16,17</sup>

Since 2005, the laboratory undertaking most WDHB testing has been using SDA NAAT testing which is able to detect this variant, making the variant's presence an unlikely explanation.

Reducing the prevalence of undetected chlamydia infections means testing those most at-risk, namely those under-25 years who account for over 70% of reported infections.<sup>3</sup> This study shows that WDHB regional chlamydial and gonococcal testing volumes have increased markedly over the last decade. However, the lack of demographic data on negative test results means it is not possible to assess the appropriateness of testing, for example to identify if more occurs among older lower-risk age groups. The simple addition of age and sex for all tests would enhance interpretation of STI surveillance data and help ensure resources are targeted to higher risk populations.

Whilst WDHB laboratory data cannot provide a true biological marker for the *No Rubba, No Hubba Hubba* marketing campaign, the temporally related increases in chlamydia and gonococcal testing are noteworthy, with a suggestion of greater detection of *Chlamydia trachomatis* and a coincidental drop in percent positive of gonococcal tests. One possible interpretation is increased awareness leading to more testing and, in turn, greater detection of an asymptomatic infection such as *Chlamydia trachomatis* but, not surprisingly, lower yield of *Neisseria gonorrhoeae*, as asymptomatic carriage of this infection is less common.

Chen et al report increased population chlamydia testing rates and increased notification rates during a 2002 chlamydia awareness media campaign in Victoria, Australia, although overall testing rates remained very low, with only 4.3% of women and 1.9% of men aged 16–30 being tested.<sup>18</sup> Few other studies have examined the effect of media campaigns on STI testing, although a recent Cochrane review found mass media campaigns affect HIV testing.<sup>19</sup> However, media campaigns are very expensive and Chen et al question if this is a cost-effective way of increasing testing.<sup>18</sup>

Public health management and control for STIs is an important issue and necessitates quality surveillance data to monitor trends and plan public health initiatives. Ideally, periodic population-based prevalence studies should be used to assess the effectiveness of any interventions. Surveillance trends are a poor substitute but are less expensive and therefore likely to continue to be the mainstay for New Zealand policy decisions. Analysis of time trends in reported STIs is therefore important but interpretation of currently available data, particularly for *Chlamydia trachomatis*, is problematic.

Others have already emphasised that New Zealand STI surveillance needs to be upgraded to include a greater mix of explanatory variables for cases such as age, sex, and geographical location.<sup>2,3,20,21</sup> This study emphasises that more detailed information is required on all performed tests, not just cases, to improve interpretation of trends, assess population coverage, and ensure better targeting of resources.

Although unable to establish causality between initiatives and testing or detection rates, high levels of testing and hence detection of sexually transmitted infections is evident in the Waikato region. Whether testing is appropriate, and therefore could be better targeted to those most at-risk, is unknown. Further, rising numbers of gonococcal infections in recent years emphasise there is little room for complacency.

**Competing interests:** None known.

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## A school and community outbreak of tuberculosis in Palmerston North, New Zealand

Lester Calder, Jane Rivers, Michael Hayhurst, Jeff Brown, Andrea Forde, Lou Gallagher, Patrick O'Connor

### Abstract

**Aim** To describe a secondary school outbreak of tuberculosis in Palmerston North, New Zealand in 2006.

**Methods** Case and contact management was conducted by MidCentral District Health Board according to national guidelines.

**Results** The index (and source) case was a school student. Delayed diagnosis led to extensive transmission. Contact investigation detected fifteen secondary cases, from six of whom *Mycobacterium tuberculosis* organism was cultured which was identical to that found in the index case. Latent tuberculosis infection was diagnosed in 235 of 1828 contacts. Following logistic regression, risk of infection was significantly associated with age, exposure setting (household and school vs other settings) and duration of exposure. Large numbers of contacts were infected who had no known contact with the index case, thus indicating probable tertiary transmission from the 7 infectious secondary cases. The secondary healthcare cost of the outbreak was estimated at \$279,481. Findings from school tuberculosis (TB) outbreaks since 1990 are summarised.

**Conclusion** This was the largest tuberculosis outbreak described in New Zealand and one of the largest school outbreaks reported in the published literature.

A 14-year-old boy was diagnosed with smear-positive pulmonary tuberculosis (TB) in August 2006 in Palmerston North. The case attended a large secondary school. This report describes the active cases, contact investigation, secondary infections, and control measures adopted.

### Methods

Cases were diagnosed and treated at Palmerston North Hospital on the basis of national guidelines.<sup>1</sup> DNA fingerprinting was performed according to the standard method of van Embden et al.<sup>2</sup>

Students were asked to take home explanatory letters and forms for informed parental consent for Mantoux testing (and chest X-ray if needed). The return rate was 100%.

Household, social, and school contacts were tested by the Public Health Service of MidCentral District Health Board (DHB) with 5 tuberculin units of purified protein derivative using the Mantoux method, and, if indicated, by a chest X-ray.

School staff and students were screened at school clinics held over 3 days, staffed by general practitioners and hospital medical and nursing staff. A respiratory physician, paediatrician, or infectious diseases physician were at the clinic at all times to answer queries. Mantoux tests were placed and read by public health nurses.

Before each morning clinic, an information session was held between parents and students, and a respiratory physician, a paediatrician, and a public health nurse. Blood was taken on site for liver

function tests prior to initiating treatment for latent tuberculosis infection (LTBI). Prescriptions were dispensed in blister packs by a local pharmacy.

Contacts were defined as someone who had been in the same room as the case and were categorised by exposure setting and duration of exposure (“contact level”) to the index case as shown in Table 1. The definition of a positive Mantoux test followed national guidelines.<sup>1</sup> The cutting point was  $\geq 10$  mm for household and close social contacts and for staff and students in contact level 1. For all other contacts the cutting point was  $\geq 15$  mm if there was a BCG scar and  $\geq 10$  mm if there was no scar.

It takes up to 8 weeks for an infected person to develop a positive Mantoux reaction.<sup>3</sup> Because contacts were all tested within 8 weeks of notification, it was decided to re-test students at highest risk, as indicated by the initial Mantoux positivity rate. At this early stage of the investigation, year 9 and 10 students had higher positivity rates on the first test than other students. They were retested, along with students whose first Mantoux was  $\geq 5$  mm.

Data on each contact screened were collected on an Excel spreadsheet. Statistical analyses were carried out using PC SAS (version 9.1.3) software. Unadjusted relative risks were calculated using the Cochran-Mantel Haenszel statistic. Logistic regression analysis was conducted of risk factors for Mantoux test positivity.

The direct costs of the outbreak were estimated as follows. Computerised work activity records were used to count hours spent by DHB staff. For the minority of staff who did not use computerised record keeping, a form was used to estimate the hours retrospectively. To prompt recall the form was arranged into domains of work including clinical care, clinical meetings, administration, meetings, training, telephone work, and media work. The hours were then multiplied by an estimated hourly rate of pay for the various occupational groups who participated (\$80 for doctors, \$60 for managers, \$32 for public health nurses, \$14.48 for clerical, \$53 for pharmacists, \$40 for communications).

The exact cost of supplies of medication, disposables, stationary, and other support needs were obtained from DHB records. The hospitalisation costs of two patients admitted to hospital for a total of 8 days were calculated from the diagnosis related group for an uncomplicated case of pulmonary disease (DRG E62C, ICD10 A150), including overheads. Laboratory and radiology costs were calculated from price-volume schedule information.

A literature search for English language reports on school TB outbreaks published since 1966 was conducted in Medline Full Text combining the keywords “school” and “outbreak” and “tuberculosis”.

## Results

**The index case**—The index case was a 14-year-old Asian-born boy who had been legally resident in NZ for 4 years and began coughing in February 2006. He saw a general practitioner in March complaining of sore throat, fever, and rigors. He was prescribed amoxycillin. Between March and August he became progressively unwell, with cough, weight loss (9 kg), sweats and chills, worsening fatigue, nausea, and eventually vomiting most food ingested. His last day at school was 10 August.

He next sought medical assistance on 13 August from an after-hours clinic. A presumptive diagnosis of TB was made by a chest X-ray on 14 August which showed patchy consolidation in the left lung and a large pleural effusion. He was admitted to isolation in hospital under paediatric care. His sputum was smear-positive (2+ AFB) and culture-positive for a strain of *Mycobacterium tuberculosis* of which the restricted fragment length polymorphism (RFLP) pattern (LabPlus code number 10/093) was previously unknown in New Zealand (NZ) and which was fully susceptible to all first-line antituberculosis drugs. On 16 August 2006 he was notified to the Public Health Unit.

**Mantoux testing of contacts**—The results of contact investigation are shown in Table 1. On 21 August, 15 household and other close contacts were tested and all found to be Mantoux positive. On 1 September class contacts were tested and 28/31

(90%) were positive. The contact investigation was extended to the entire school (including staff and students) on 8 September and then to a chess club, a language school, and a Kung Fu class.

In total, 1828 contacts were identified, of whom only 5 were not Mantoux tested: 3 students with known past LTBI, 1 who declined owing to a history of multiple allergies, and 1 who declined owing to past BCG vaccination. Excluded from Table 1 are the index case, 2 students who declined testing and 10 with previous known positive Mantoux reactions.

As noted, repeat Mantoux tests after 8 weeks were done on all year 9 and 10 students, along with students whose first Mantoux was  $\geq 5$  mm. Only one conversion (10 mm increase in Mantoux reaction) was detected. However three students had increases of 6–9 mm which made them clearly Mantoux positive and, because they had no history of BCG vaccination to explain this, they were treated for LTBI.

Of 30 Group 2 students who used the classroom 5 or more times per week immediately after the source case, 23 (77%) were positive. Five cases of tuberculosis disease (TBD) and 112 cases of LTBI were found among contact level 3 contacts who reported no contact with the index case.

Relative risks for exposure settings were based on unadjusted comparison with school contacts in contact level 3 (no known contact). Relative risks for age groups were compared to those aged 18 and older. Odds ratios for exposure settings were calculated by adjusting for age group and previous BCG vaccination. Odds ratios for age groups were calculated by adjusting for previous BCG vaccination and contact level.

Logistic regression analysis was used to test the impact of age, year at school, exposure setting, ethnicity, contact level, and previous BCG vaccination on Mantoux status. Age, exposure setting, and contact level all remained significantly associated with Mantoux positivity, while adjusting for other above variables in the model.

Korean and Other Asian ethnicity (but no other ethnicities) were significantly associated with Mantoux positivity, but this association disappeared when contact level was included in the regression model.

Odds ratios for each school year decreased with increasing grade from 1.44 associated with year 9, down to 0.385 for year 13. Only the last year was statistically significant ( $p=0.047$ ). Age groups were similarly related but with a stronger correlation; a decreasing incidence of positivity was observed with increasing age (see Table 1). The age group most strongly correlated with Mantoux positivity was 14 years (the same age as the index case).

Of those tested, 110 (6%) had received prior BCG vaccination. They had a higher observed Mantoux positivity rate than the non-vaccinated (16% vs 14% respectively among all contacts and 23% vs 15% among school contacts) but these differences were not statistically significant. Among those at school, prior BCG rates were lower among students than staff: 2% vs 31%, ( $p<0.0001$ ). Non-vaccinated staff were significantly less likely to be Mantoux positive than nonvaccinated students (5% vs 23% respectively,  $p=0.01$ ).

**Table 1. Outcome of the contact investigation**

| Exposure setting                                    | Number contacts tested | Number (%) Mantoux positive | RR (95% CI)        | OR (95% CI)        | TBD number (%) | LTBI number (%) |
|-----------------------------------------------------|------------------------|-----------------------------|--------------------|--------------------|----------------|-----------------|
| <b>Contact level 1 (5 or more hours per week)</b>   |                        |                             |                    |                    |                |                 |
| Household and close social contact                  | 15                     | 15 (100)                    | 11.63 (9.76-13.85) | 328 (19.50-5517)   | 2 (13)         | 12 (80)         |
| School students and staff                           | 116                    | 62 (53)                     | 6.21 (4.87-7.93)   | 12.20 (8.08-18.40) | 6 (05)         | 56 (48)         |
| <b>Contact level 2 (less than 5 hours per week)</b> |                        |                             |                    |                    |                |                 |
| School students and staff                           | 228                    | 55 (24)                     | 2.84 (2.13-3.79)   | 3.44 (2.41-4.92)   | 2 (01)         | 55 (24)         |
| Chess club member                                   | 1                      | 1 (100)                     | –                  | –                  | 0              | 0               |
| <b>Contact level 3 (no known contact)</b>           |                        |                             |                    |                    |                |                 |
| School students and staff                           | 1325                   | 114 (9)                     | 1.00               | 1.00               | 5 (0.4)        | 108 (08)        |
| Chess club                                          | 78                     | 1 (1)                       | 0.15 (0.02-1.05)   | 0.13 (0.02-1.00)   | 0              | 0               |
| Kung Fu club                                        | 13                     | 2 (15)                      | 1.08 (0.86-1.36)   | 1.93 (0.42-8.82)   | 0              | 1 (08)          |
| Language school                                     | 28                     | 4 (14)                      | 1.66 (0.66-4.18)   | 1.77 (0.60-5.19)   | 0              | 3 (11)          |
| Not exposed but requested testing                   | 12                     | 0 (0)                       | 0.41 (0.03-6.80)   | 0.42 (0.02-7.19)   | 0              | 0               |
| Total                                               | 1816                   |                             |                    |                    | 15             | 235             |
| <b>Age group</b>                                    |                        |                             |                    |                    |                |                 |
| 14 and under                                        | 579                    | 138 (24)                    | 3.12 (2.10-4.65)   | 3.79 (2.43-5.91)   | 11 (02)        | 129 (22)        |
| 15                                                  | 368                    | 55 (15)                     | 1.96 (1.26-3.05)   | 2.13 (1.30-3.48)   | 3 (01)         | 53 (14)         |
| 16                                                  | 306                    | 17 (6)                      | 0.73 (0.40-1.32)   | 0.71 (0.38-1.34)   | 0              | 17 (06)         |
| 17                                                  | 218                    | 17 (8)                      | 1.02 (0.57-1.84)   | 1.02 (0.54-1.94)   | 1 (0.5)        | 15 (07)         |
| 18 and older                                        | 341                    | 26 (8)                      | 1.00               | 1.00               | 0              | 20 (06)         |
| Total                                               | 1816*                  | 254 (14)                    | 0.92 (0.88-0.95)   | –                  | 15 (01)        | 235 (13)        |

RR=relative risk; OR=odds ratio; TBD=tuberculosis disease; LTBI=latent tuberculosis infection;

\*Four participants did not have a date of birth recorded.

**Tuberculosis disease**—15 secondary cases of active tuberculosis disease (TBD) were detected, 13 among school contacts and 2 among family contacts. Both family cases and three of the school cases were confirmed by cultures of *Mycobacterium tuberculosis* all of which had the same RFLP pattern as the index case. Nine cases were diagnosed on the basis of chest X-ray abnormality without any clinical symptoms or signs. Radiologic findings included pulmonary opacities, pleural

disease, and mediastinal/hilar lymphadenopathy. Limited chest CT scanning was used on two occasions to confirm mediastinal lymphadenopathy.

Of the school-based cases, all were born in NZ, except for one from Samoa and one from Korea, neither of whom were confirmed by culture. Both family cases were born in Korea. Eight of the school cases, and all the culture-confirmed school cases, were in year 9 (the same as the index case).

Cases were treated with 2 months of daily rifampicin, isoniazid, and pyrazinamide (with daily pyridoxine), then 4 months of rifampicin and isoniazid twice weekly (total 6 months treatment). This was supervised in hospital paediatric and respiratory medicine clinics. All cases completed treatment, largely by directly observed therapy (DOT).

**Latent tuberculosis infection**—A respiratory physician reviewed all Mantoux results  $\geq 5$  mm. The diagnosis of LTBI and the decision to offer treatment were based on clinical factors, not on the Mantoux test result alone. Thus the numbers in Table 1 with a positive Mantoux result do not equate to the numbers with TBD and LTBI.

235 people were diagnosed with LTBI and offered treatment. 232 (99%) accepted. The 3 people who declined were all in contact level 2 or 3. Five people who started treatment discontinued it: 3 because of elevated liver function tests; 1 student because he developed glandular fever; and 1 for reasons unknown. The remaining 227 people (98%) completed treatment.

The regimen used to treat LTBI was 4 months of rifampicin and isoniazid administered twice weekly. Treatment was parent-administered during the first 2 weeks because it coincided with school holidays; for next 9 weeks it was administered by DOT at school and for the remaining 5 weeks by DOT (20%) or parent-administered (80%) depending upon PHN assessment of adherence level.

**The cost of the outbreak**—The healthcare costs of the outbreak are shown in Table 2. Electronic records (such as staff work activity records and supplies inventory) were able to be used for 85% of the costs. The remaining 15% were estimated by a retrospective survey of staff who did not record their time electronically.

**Table 2. Secondary healthcare costs of the tuberculosis outbreak**

| Service               | Cost (NZ\$)    | Includes                                                                                                                                                                                                                                         |
|-----------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Public health nursing | 131,074        | Clinical medical time<br>Management, public health medicine specialists, communications, clerical<br>Disposables, cleaning, meals, transport<br>TB drugs and dispensing<br>Laboratory, radiology, pharmacy<br>Two patients for a total of 8 days |
| Medical               | 13,280         |                                                                                                                                                                                                                                                  |
| Administration        | 37,532         |                                                                                                                                                                                                                                                  |
| Supplies              | 14,866         |                                                                                                                                                                                                                                                  |
| Medication            | 39,574         |                                                                                                                                                                                                                                                  |
| Clinical support      | 39,047         |                                                                                                                                                                                                                                                  |
| Hospitalisation       | 4108           |                                                                                                                                                                                                                                                  |
| <b>Total</b>          | <b>279,481</b> |                                                                                                                                                                                                                                                  |

**Communication**—Media (local and national) and community interest in the outbreak was intense and this was managed effectively by regular information bulletins to parents, by close communication between the school, the DHB, and the Ministry of Health (MoH) and by proactive, coordinated, and regular media releases. An

education session on clinical awareness of TB was held for general practitioners after the outbreak.

**Table 3. School TB outbreaks published since 1990 (English language only)**

| Setting                                     | Definition of tuberculin positive†<br>(Mx=Mantoux ) | No. tested              |      | Tuberculin positive |     | TBD |      | Ref |
|---------------------------------------------|-----------------------------------------------------|-------------------------|------|---------------------|-----|-----|------|-----|
|                                             |                                                     |                         |      | No.                 | %   | No. | %    |     |
| Ireland, high school, 1986                  | Heaf grade 2-4                                      | Students                | 1160 | 416                 | 40% | 15  | 1%   | 4   |
|                                             |                                                     | Staff                   | 78   | nr                  | nr  | 2   | 3%   |     |
| Missouri (USA), elementary school, 1990     | Mx= $\geq$ 5mm                                      | Students                | 343  | 176                 | 51% | 32  | 9%   | 5   |
|                                             |                                                     | Staff                   | 49   | 13                  | 27% | 0   | 0%   |     |
| Italy, high school, 1992-3                  | 3+ Tine test                                        | Students                | 3188 | 277                 | 9%  | 14  | 0.5% | 6   |
|                                             |                                                     | Bus riders              | 168  | 63                  | 37% | 1   | 0.6% |     |
| California (USA), high school, 1993         | Mx= $\geq$ 10mm                                     | 2191                    |      | 386                 | 18% | 13  | 1%   | 7   |
| England, high school, 1996                  | Heaf grade 2-4                                      | 15*                     |      | 1                   | 7%  | 1   | 7%   | 8   |
| NZ, high school, 1997-8                     | Mx= $\geq$ 10mm                                     | 490                     |      | 40                  | 8%  | 9†† | 2%   | 9   |
| North Dakota (USA), elementary school, 1998 | Mx= $\geq$ 5mm                                      | Classroom               | 24   | 19                  | 79% | 0   | 0%   | 10  |
|                                             |                                                     | School bus              | 32   | 11                  | 34% | 0   | 0%   |     |
|                                             |                                                     | Day-care                | 61   | 10                  | 16% | 0   | 0%   |     |
| Israel, boarding school, 1998-9             | Mx= $\geq$ 5mm                                      | Close contacts          | 154  | 99                  | 64% | 6   | 4%   | 11  |
| Missouri (USA), high school, 2001           | Mx= $\geq$ 5mm                                      | All students            | 559  | 58                  | 10% | 0   | 0%   | 12  |
|                                             |                                                     | School bus              | 27   | 7                   | 26% | 1   | 4%   |     |
|                                             |                                                     | Shared $\geq$ 3 classes | 13   | 7                   | 54% | 0   | 0%   |     |
|                                             | Mx $\geq$ 10mm                                      | Remote contacts         | 244  | 75                  | 31% | 0   | 0%   |     |

†mm=mm of induration in response to a 5 TU Mantoux test; TBD=tuberculosis disease; nr=not reported;

\*193 children were unscreened because they had been vaccinated; ††Six cases presented with symptoms to a doctor, only three were detected following Mantoux testing.

**Other school outbreaks**—In the last 10 years there have been four other NZ school TB outbreaks reported to EpiSurv, the ESR national surveillance database. Two were in South Auckland, one in Hawke's Bay, and one in Wanganui. A total of 56 cases (33 of whom were LTBI) were reported (personal communication: Trevor Margolin 12/9/2006).

A summary of published school TB outbreaks since 1990 is presented in Table 3. Rates of LTBI and TBD vary widely depending on the tuberculin test used and contacts' degree of exposure.

## Discussion

We have described a large school TB outbreak in which 16 cases of TBD and 235 cases of LBTI were identified.

Five cases of TBD and 112 cases of LTBI were found among contact level 3 contacts who reported no contact with the index case. Reasons for this could include infection by a secondary case (6 of whom were culture positive) or misclassification of exposure (by misreporting of their degree of contact). The correlation we found between risk of infection and duration of exposure has been demonstrated in other school outbreaks.<sup>13,6,12,7,11</sup>

Our decision to repeat Mantoux testing only for the highest exposure group was based on trade-off of risk against likely yield. Only 5/60 (8%) close contacts in an Israel school outbreak converted their Mantoux test on retesting.<sup>11</sup>

To maximise compliance with treatment of LTBI we administered as much medication as possible by DOT at school. The usual regimen used in NZ is 6 months' isoniazid self-administered daily.<sup>1</sup> Since community-based DOT for all students was beyond our staffing resources during the summer vacation, we adopted an alternative regimen to complete treatment before the school year ended. Evidence for the effectiveness of shorter regimens has been published.<sup>1</sup>

In this outbreak, 99.7% of contacts completed Mantoux testing and 97.8% of the 232 people who commenced treatment for LTBI completed it (none defaulted on treatment). These percentages well exceed the objectives recommended by the Centers for Disease Control<sup>14</sup> and the performance in other published accounts.<sup>12</sup>

Gastrointestinal side-effects were common but students were encouraged to continue treatment by extending the interval between doses and changing to bedtime administration. Maintaining communication with school and parents throughout treatment was important in achieving completion.

No further cases were discovered during 5 years of follow-up following the Israel school outbreak, in which 91% of infected contacts completed preventive chemotherapy,<sup>11</sup> or during 2 years of follow-up in the California school outbreak (treatment completion rate not reported)<sup>7</sup>. Therefore there is reason for confidence that the Palmerston North outbreak will have been successfully controlled.

Schools were the most common site reported for community-based TB outbreaks in an American review.<sup>15</sup> Many accounts have been published worldwide of outbreaks in primary and secondary schools.<sup>4,5,13,16–29,6–9 11,12</sup> Source cases are often adult, but have been reported as young as 14<sup>8</sup> and 9 years old.<sup>10</sup> We did not find a source of infection for the adolescent index case in this outbreak: he may have been infected prior to arrival in NZ 4 years earlier.

Immigrating children aged under 11 are not Mantoux tested for LTBI or radiologically screened for active disease in NZ. When the index case entered NZ he would have been only 10 years old. Entry CXR screening may not have detected disease at that stage. Entry screening for LTBI and subsequent chemoprophylaxis may have prevented the outbreak. However, border screening for LTBI with the Mantoux test would be an inefficient policy because of the large number of positives, the low specificity of the Mantoux test and the relatively low risk of development of disease following remote past infection.

The school's routines were disrupted by the public health investigation and follow-up. And intense local and national media attention stretched the resources of the school

and the public health service during the outbreak. Community understanding was helped and hindered by information sources ranging from Internet searches to neighbourly advice.

To give consistent and credible information, the school, DHB, and MoH collaborated so that parents were kept informed with regular newsletters, school assemblies, and open discussion meetings with health professionals. Very few contacts were lost to follow-up; take-up of (and adherence to) treatment were extremely high.

There was a large workload for the Public Health Unit in managing this outbreak. Some of this can be costed but many extra hours above and beyond normally expected work were given up to manage the individual contacts, the communications, the organisational logistics, and meeting the requirements of various agencies. There was also a considerable burden on hospital staff. They took on extra duties including organising and staffing school-based clinics and seeing cases in hospital clinics.

The clinical history, examination, discussion, informed consent, and prescribing of treatment were carried out by specialists in paediatrics, respiratory medicine—and by general practitioners (GP), geriatricians, oncologists, and resident medical officers. Considerable support was provided by laboratory, pharmacy, and radiology services.

BCG vaccination of secondary school students is not considered a cost-beneficial intervention in NZ at present, because of the low incidence of TB, the low efficacy of vaccination against pulmonary TB, the high cost of mass vaccination (including pre-vaccination Mantoux screening), and the confounding impact of vaccination on future Mantoux reactivity (which reduces the diagnostic value of the Mantoux test for LTBI).<sup>1,30</sup> In this outbreak, the diagnosis of LBTI was uncomplicated for most Mantoux-positive people because routine vaccination of school students in NZ was phased out 20–30 years ago.

A factor in this large outbreak was delayed diagnosis of the source case. There have been numerous reports of delayed diagnosis of TB, which can be caused by a combination of delayed help-seeking by patients, doctors' lack of clinical awareness or timely investigation, and delayed hospital evaluation of referrals.<sup>7,31–51</sup>

In a series of 100 cases in Auckland, the median number of times the patient was seen by a doctor before the initiation of antituberculous treatment was four (range 1–25).<sup>52</sup> The index case in this outbreak saw a GP twice with initial symptoms, but not again until significantly unwell. Following the third GP visit hospital admission and treatment occurred immediately.

This outbreak highlighted the potential value of a lymphocyte stimulation assay. Such tests are less prone to interobserver error than the Mantoux test, are more specific, and are of particular value in reducing false positives from those who have had a BCG.<sup>53–56</sup>

The United States Centers for Disease Control now recommends that QuantiFERON®-TB Gold (QFT-G, Cellestis Limited, Carnegie, Victoria, Australia) may be used in all circumstances in which the tuberculin skin test is currently used, including contact investigations, though they point out that caution should be used in the case of immunosuppressed people and children since it has not been validated under 18 years of age.<sup>57</sup>

Although this test could not have been used to screen the majority of students in this outbreak, it is time for the MoH to re-examine the value of these tests, which were not recommended for screening contacts in the NZ guidelines in 2003.<sup>1</sup>

The substantial estimated cost of the outbreak is fairly reliable since 85% of it is based on accurate computerised DHB records of staff time, services, and disposable supplies. It underestimates the true cost of the outbreak as it does not include primary care costs, the many hours devoted by school staff, or the opportunity costs to students and parents involved in testing and treatment. Approximately 50% of the estimated cost is due to public health nurse time, which emphasises the importance of their contribution to this exercise.

A clear lesson from this experience is the importance of early diagnosis of tuberculosis. As well, a distinguishing feature of this response was the number of cases and latent infections identified, and the very high rate of compliance with medication. The factors allowing for such compliance include: collaboration with the school; communication with parents; teamwork between public health and clinical staff; school-based assessment clinics for those with positive Mantoux tests; support from laboratory, pharmacy, and radiology services; choice of a twice-weekly 4-month course of isoniazid and rifampicin for treatment of latent infection; and regular contact with those on treatment through supervised medication at the school.

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## Border control measures in the influenza pandemic plans of six South Pacific nations: a critical review

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### Abstract

**Aims** This study aimed to review the border control strategies included in the publicly available pandemic preparedness plans for the South Pacific Islands, New Zealand, and Australia.

**Methods** Based on plausible public health control measures, we developed a checklist of 10 important criteria relating to border control strategies. This checklist was applied to each of the pandemic preparedness plans for which copies were publicly available with each of the 10 criteria rated on a 0 to 3 scale (giving a detail rating out of 30).

**Results** Six pandemic plans were identified for the South Pacific Islands, New Zealand, and Australia, from a search for 24 possible countries/territories. The least detailed plans were from Palau and Tonga, both with a detail score of 9/30. Nauru, the island with the smallest population and lowest GDP, presented a plan with a detail score of 22/30. The most detailed plans were from the larger and more developed countries, New Zealand (29/30), and Australia (27/30).

**Conclusions** There was a substantial difference in the quality of the border control components of the influenza pandemic plans examined. Some of this difference could be explained by the necessity to rationalise the range of border control strategies to match available resources. Plans from the more developed countries such as New Zealand and Australia had a greater level of detail than plans from smaller and less resourced island countries, but these plans could still be enhanced. Pacific islands could benefit from additional support to improve the depth of their pandemic planning. Future research on this topic could include broadening the assessment criteria used here and applying them to a larger number of plans, preferably as part of a constructive dialogue with the countries concerned.

### Introduction

With the threat of an influenza pandemic, which may be related to the current H5N1 avian influenza epizootic ([http://www.who.int/csr/disease/avian\\_influenza](http://www.who.int/csr/disease/avian_influenza)) the World Health Organization (WHO) recommends the development of national pandemic preparedness plans by each member state. WHO has developed a checklist and identified pandemic phases to assist with this process.<sup>1,2</sup> In addition, the International Health Regulations (IHR) came into force on 15 June 2007.<sup>3</sup>

The IHR 2005 includes detailed obligations for member states covering public health surveillance, response, management of borders and national public health emergency planning (<http://www.who.int/csr/ihr/en/>). The IHR have important implications for pandemic preparedness. They specify “Human influenza caused by a new subtype” as

a condition that member states are required to notify to the WHO within 24 hours of detection.

Border control may potentially be an important part of a country's pandemic response plan, especially for smaller island countries that are more able to control entry points and may have relatively low traveller numbers. Previous modelling work has been fairly dismissive of the potential for border control measures such as entry screening to prevent or delay the entry of pandemic influenza in settings such as the United Kingdom.<sup>4</sup> Others have suggested that border control in the form of extreme restrictions on air travel would be needed to delay pandemic spread between countries.<sup>5–7</sup> However, we have identified no modelling work that relates specifically to the border control for pandemic influenza in small island nations.

On the other hand there are historical precedents for the success of border control in island nations during the 1918–19 pandemic. Strict maritime quarantine, with facility quarantine on land, appeared to reduce the impact of the 1918–19 pandemic in some Pacific island jurisdictions.<sup>8</sup> Quarantine or “protective sequestration” also appears to have protected some remote Canadian towns,<sup>9</sup> parts of Iceland,<sup>10</sup> as well as various communities in the continental US and Alaska.<sup>11–13</sup>

There is also historical evidence that social distancing measures (including isolation and quarantine) were partly effective in reducing the impact of pandemic influenza during 1918/1919 in the US cities<sup>14–16</sup> and in Australia.<sup>17</sup> More generally, a systematic review has also reported evidence that interventions that included quarantine (2 studies) and isolation measures (10 studies) provide some evidence for effectiveness in containing the spread of respiratory virus epidemics.<sup>18</sup>

Previous reviews have focused on the availability and quality of pandemic plans, and also prioritisation strategies for anti-viral and vaccine rationing.<sup>19,20</sup> There has been no review of pandemic plans that has focussed specifically on border control, or proposed a framework for evaluating border control strategies. This study aimed to evaluate the strengths and weaknesses of the border control strategies included in the publicly available pandemic preparedness plans for the South Pacific Islands, New Zealand, and Australia, using a checklist developed specifically for this review.

## Methods

Two authors (MM, HK) independently developed a checklist of important criteria related to border control based on:

- an historical review of what worked in island countries in 1918–19<sup>8</sup> (see *Introduction*)
- ideas in available current pandemic plans<sup>21–26</sup>
- and modelling studies of border control<sup>5,7,9,27–30</sup>

Differences in the initial checklists were reviewed, with the final checklist based on agreement of all investigators.

## Checklist for border control strategies in the pandemic plan

Each pandemic plan was evaluated against the following checklist of 10 items.

**Travel warnings**—These involve communication with the public, warning against travel to pandemic-affected countries. Such warnings are considered likely to reduce the numbers of returning infected residents by discouraging travel from the home country. The pandemic plans should identify when and who will issue travel warnings, and whether warnings will be extended should the pandemic progress.

**Travel restrictions**—Travel restrictions include restricting the travel of departing residents as well as restricting inbound travel. Modelling evidence indicates that restrictions need to be almost complete to significantly delay the arrival of influenza. However, travel restrictions of lesser volumes may reduce the burden on entry screening and any subsequent quarantine. Travel restrictions may still permit the return of citizens, or specifically focus on restricting or forbidding the entry of travellers from countries where human-to-human transmission of pandemic influenza has been established.

**Entry screening**—Entry screening measures are important to identify travellers potentially infected with pandemic influenza. A highly detailed pandemic plan will include the methods and timing of entry screening, as well as a detailed pathway for investigation of suspected cases. This pathway should include an arrangement for medical examination at the airport, the identification of isolation facilities (criterion 5) and a strategy for laboratory testing (criterion 9). Entry screening of all air and sea craft also requires a health declaration that no symptomatic individuals are on board, before passengers on the aircraft or ship are allowed to disembark. Exit screening is not included here as it is not generally possible for countries to manage this process within the scope of their domestic pandemic planning.

**Quarantine strategy**—Historical and modelling evidence suggests that border quarantine must be implemented early, prior to the arrival of infected cases in a country. Successful quarantine must be complemented by clear legislation providing a legal mandate, and facilities for quarantine, which may be voluntary or involuntary, at home or in designated facilities.

**Isolation strategy**—Successful isolation strategies require facilities that are operated by a critical mass of health workers, with high standard infection control practices.

**Contact tracing**—Quarantine will also require a contact tracing strategy. This involves the identification of individuals who may be infected as a result of “close contact” (a definition of close contact should be provided) with an infected person. As a border control measure, this strategy relates to the management of passengers on air and sea craft, where an infected individual has been identified.

**Anti-viral strategy**—The use of anti-viral medication is likely to improve existing border control strategies. Pandemic plans should acknowledge the worldwide shortage of anti-viral medication, and have developed a protocol to prioritise available doses from the national stockpile (including to health and other staff involved in border control).

**National stockpile**—To prepare for a pandemic a national stockpile should be arranged which could include anti-virals, antibiotics, and personal protective equipment such as masks.

**Laboratory testing strategy**—An effective laboratory testing strategy includes consideration of the type of laboratory test to be used for suspected cases, as well as the identification of national and international reference laboratory facilities for confirmation. Ideally there should be plans to stockpile relevant test kits (when available) as the appropriate use of these could reduce the burden on any quarantine facilities.

**Intersectoral approach**—This requires the identification of key stakeholders for each action identified above. Clear responsibilities among key agencies should be identified in advance.

**Criteria that were not included**—Several other elements that are likely to be important for the success of border control were not included in these criteria. Most were not detailed in any of the pandemic plan documentation. These criteria were:

- adequately trained staff
- adequate facilities
- a process of regularly testing the plan using simulation exercises
- a revision process for the plan, including use of evidence, evaluation, and external peer review
- a communication strategy
- attention to wider governance issues and evidence of bipartisan political support.

## Identification and scoring of publicly available pandemic plans

Searches of the Secretariat for the Pacific Community (SPC) (<http://www.spc.int/phs/pphsn/Outbreak/Influenza/Pand-Preparedness-plans-Pacific-countries.htm>) and WHO websites (<http://www.who.int/csr/disease/influenza/nationalpandemic/en/>) were performed to identify and obtain all publicly available pandemic plans for the South Pacific Islands (members of the Secretariat of the Pacific Community), New Zealand, and Australia.

The WHO website aims to maintain a current list of published pandemic plans. Further searches of Medline, Google, and Google Scholar revealed no other published plans and no other published plans were identified by WHO colleagues in the Pacific Islands Office in Suva, Fiji or colleagues from SPC in Noumea, New Caledonia.

The plans were then tabulated against the checklist of border control criteria, and ranked according to the level of detail included in the plan. The ranking was on a scale between 0 and 3 as listed below:

- 0 Border control measure not included in the pandemic plan
- 0+ Border control measure mentioned, with no detail on implementation
- 0++ Border control measure included with some detail on implementation
- 0+++ Border control measure included with a high level of detail on implementation. To be scored at level three, the plan must have included the methods and timing of intervention as well as the other necessary details as specified by the checklist.

## Results

### Pandemic plan identification

Six pandemic plans were identified for the South Pacific Islands, New Zealand, and Australia. To provide the context within which the pandemic plans have been prepared, it is important to consider the relative size of the country's population, and available resources (GDP per capita). The country's level of economic development will impact both the ability to plan and the ability to implement any plan. Nauru has the smallest population, for which a pandemic plan was identified, and has the lowest GDP per capita (Table 1). In contrast, New Zealand and Australia are much larger and more developed countries.

**Table 1. Population size and GDP of the countries in the South Pacific that have influenza pandemic plans available for review**

| Country       | Population | GDP per capita (\$US) |
|---------------|------------|-----------------------|
| Nauru         | 13,005     | 5000                  |
| Palau         | 19,949     | 9000                  |
| Tonga         | 102,000    | 7984                  |
| New Caledonia | 237,000    | 14,800                |
| New Zealand   | 4,200,000  | 27,797                |
| Australia     | 20,700,000 | 30,897                |

Source: Data from Wikipedia available at <http://en.wikipedia.org>

### Comparison of level of detail in pandemic plans

The highest level of detail was seen in the New Zealand Influenza Pandemic Action Plan (29 out of the 30 criteria met). The least detailed plans were from Tonga and Palau, both with 9/30 (Table 2).

**Table 2. Comparison of border control strategies across pandemic plans (see Methods for the grading system used)**

|                                   | Australia    | Nauru        | New Caledonia | New Zealand  | Palau       | Tonga       | Median grade          |
|-----------------------------------|--------------|--------------|---------------|--------------|-------------|-------------|-----------------------|
| Travel warnings                   | +++          | +            | +++           | +++          | +           | +           | 2.0                   |
| Travel restrictions               | +++          | +++          | +++           | +++          | ++          | +           | 2.5                   |
| Entry screening                   | +++          | 0            | +++           | +++          | 0           | +           | 1.7                   |
| Quarantine strategy               | +++          | +++          | ++            | +++          | +           | +           | 2.2                   |
| Isolation strategy                | +++          | +++          | ++            | +++          | +           | 0           | 2.0                   |
| Antiviral strategy                | ++           | +++          | ++            | ++           | +           | +           | 1.8                   |
| Contact tracing                   | +++          | ++           | +++           | +++          | +           | +           | 2.2                   |
| National Stockpile                | +++          | +++          | 0             | +++          | 0           | 0           | 1.5                   |
| Laboratory testing strategy       | ++           | ++           | ++            | +++          | +           | +           | 1.8                   |
| Intersectoral approach            | ++           | ++           | 0             | +++          | +           | ++          | 1.7                   |
| <b>Total (out of 30 criteria)</b> | <b>27/30</b> | <b>22/30</b> | <b>20/30</b>  | <b>29/30</b> | <b>9/30</b> | <b>9/30</b> | <b>Mean = 19.3/30</b> |

The Australian plan for pandemic influenza outlines border management strategies under section 3.3; *Slowing the spread of a pandemic in Australia*.<sup>24</sup> The Australian plan contains a reasonable level of detail on the measures of travel restrictions, travel warnings, entry screening, and quarantine.

Travel restrictions will be placed upon affected countries, with priority given to Australian residents returning home. In phase 6 (pandemic established in many regions of the world), all non-essential travel to Australia will cease. The Department of Foreign Affairs and Trade (DFAT) is responsible for issuing travel warnings to affected areas from phase 3.

The quarantine of travellers from affected areas, and any close contacts, will be either home-based (with daily reporting) or in a designated facility for up to 1 week. Contact tracing includes the identification of household members for those on home quarantine, and others who have travelled with an infected person. Entry screening will include both health declaration cards and thermal scanning of arriving passengers. A clear pathway of assessment includes nurse assessment at the airport, and transportation to health facilities for suspected cases.

The Australian Government has a stockpile of anti-viral medication with 3.8 million courses of the anti-viral oseltamivir, at October 2006. Smaller quantities of zanamivir

have also been stockpiled. The Australian plan did not include a prioritisation protocol for the usage of vaccines and anti-virals.

The Nauru plan is a 13-page document, which includes border control strategies.<sup>22</sup> The strengths of this plan include the arrangements for quarantine and travel restrictions. From phase 6, passengers from affected countries will be denied access to Nauru. All vessels entering Nauru will be required to undergo a quarantine of up to 1 week, which will continue until cases are identified in Nauru. Nauru has a stockpile of 200 doses of anti-viral medication, with a prioritisation strategy for their distribution.

Less detail is available on laboratory testing and the implementation of an intersectoral approach. The plan identifies sectors involved, but fails to delegate tasks to specific agencies and individuals, although this omission is probably not such an important one given the small population of this island nation. Nauru does not include border screening in this pandemic plan and identifies travel warnings as the responsibility of the WHO.

The New Caledonian plan is only available in the public domain in the French language.<sup>21</sup> For this review, a translated version of the border control strategy was provided to us by Dr Martine Noel, New Caledonia Department of Health. The border control aspects of the New Caledonian plan are likely to be underestimated, as a copy of the full plan in English was not available. In particular, the border control strategy that was available for review lacked an intersectoral approach and details on this and laboratory testing may have been included elsewhere in the plan.

The border control strategy is presented as a flow diagram, with a clear pathway through entry screening, testing, isolation, and contact tracing. Key elements of the pandemic plan for New Caledonia include: entry screening with health declaration cards, thermal scanning and visual inspection by staff; advice against travel to affected areas from phase 4; closure of borders to passengers in phase 6, and the quarantine of close contacts, with home surveillance. There is a lack of detail on the location of quarantine for non-residents and the length of quarantine required.

The New Zealand plan was the most detailed of the identified plans.<sup>25</sup> The border control strategies are included in a 10-page appendix, with separate appendices covering laboratory testing, anti-viral medication, and isolation facilities and precautions. A real strength of this plan is the involvement of other sectors.

The Ministry of Health is the lead agency, but specific tasks have been delegated to the other agencies. Key elements of the border control strategy for New Zealand include the use of travel advisories and travel restrictions from affected countries from phase four; the quarantine of all arriving passengers from affected areas beginning in phase five, either at home or in designated quarantine facilities; and entry screening with health declaration cards. This plan also includes a clear laboratory testing strategy.

The pandemic plans for Tonga and Palau contain similar levels of detail. Both plans are vague about the implementation of border control strategies. The plan for Palau indicates an intention to discourage or disallow travel from affected areas.<sup>23</sup> Other strategies mentioned in this plan include travel advisories, isolation and quarantine, but with little detail on their implementation. The Palau plan involves the health

sector, with some higher government engagement but little involvement from other sectors. Both the testing strategy and anti-viral prioritisation plans are yet to be developed.

The Tongan plan identifies areas which require consideration prior to a pandemic, but contains little detail for most of the border control strategies.<sup>26</sup> The plan identifies the need for further work on establishing a legal framework, and to develop a prioritisation strategy for anti-viral medication. Poorly detailed border control strategies mentioned in the Tongan plan include entry screening, travel warnings, and quarantine. Although intersectoral agencies have been identified in the Tongan plan, there remain a number of unallocated action points. WHO is expected to guide any decisions on travel restrictions.

## Discussion

This review revealed considerable variation in the level of detail of the border control aspects of the pandemic plans across the South Pacific Islands, New Zealand, and Australia. The plans ranged from those which provided a strategic framework against which a pandemic response will be developed, to those which can be used as an operational guide. The most detailed plans were from the larger and more developed countries, New Zealand, and Australia. This finding is consistent with a previous survey of national pandemic plans from the Asia-Pacific region.<sup>20</sup>

The New Zealand Influenza Pandemic Action Plan is of high quality when compared with the other national pandemic plans. It has been repeatedly tested with exercises, the most recently being one in early 2007. Despite this, there are areas in this plan that probably require further development. For example, the plan does not adequately cover the prioritisation and ethical issues related to rationing of limited supplies of anti-virals and antibiotics (similar issues would apply for use of a pandemic strain vaccine).

A document on ethical issues is referred to in the New Zealand plan—but ideally there needs to be a well understood and explicit protocol that describes priorities for use of anti-viral medication and other limited supplies. There is also no evidence that the plan has been externally peer reviewed or that it has bipartisan political support. This is desirable to facilitate key decisions around issues such as border control, which may have large economic impacts on key sectors such as tourism.

For lesser resourced islands, a small number of carefully planned strategies at the border are likely to be more effective than a poorly planned but broad approach. This point was dramatically illustrated during the 1918–19 pandemic. American Samoa implemented strict maritime quarantine and had no deaths attributable to pandemic influenza. In contrast, neighbouring Samoa (then Western Samoa) had no border control measures implemented by the governing New Zealand authorities and suffered the loss of around 22% of the population.<sup>31</sup>

The timing and responsibility for releasing travel alerts and travel restrictions varied between the pandemic plans. The New Zealand plan covered the issues of travel warnings to affected areas from phase 4 and Australia planned to issue the same warnings from phase 3. Nauru identified the issuing of travel advisories as a responsibility of the WHO. Tonga plans to issue its own travel advisories, but

believed the WHO will issue the necessary travel restrictions. A limitation of all of the pandemic plans included in this study was the dependence upon the earlier phases to develop and implement a systematic response. This approach does not account for a pandemic which may develop rapidly or unpredictably.

The prioritisation of pharmaceutical interventions for pandemic influenza is an important part of any border control plan. Rationing of anti-viral medication and vaccines is likely to be required due to manufacturing limitations and cost.<sup>19</sup> From the six pandemic plans included in this study, only Nauru included a prioritisation plan for the distribution of anti-viral medication. This sub-optimal situation was also identified in a review of 45 national pandemic plans, where only 49% included a prioritisation strategy for anti-virals and 62% a strategy for vaccine rationing.<sup>19</sup>

Quarantine was included as a strategy in all of the pandemic plans, with considerable variation in the proposed implementation. The timing of quarantine measures is vitally important in the success of this strategy, yet despite this implementation varied from phase 4 to phase 6 in these plans. The length of quarantine also influences the effectiveness of this measure, the range of quarantine lengths in the pandemic plans varied from 3 to 8 days. Home-based quarantine was identified in all of the detailed plans, however the definition of a “close contact” varied in its inclusion of subsequent household contacts. The New Caledonian plan failed to indicate where non-residents requiring quarantine would be placed.

The checklist of important border control elements in this review was limited to those identified in pandemic plans, and therefore did not consider other important elements that are necessary for the practical implementation of the plan. As noted in the *Methods* above, these elements include adequately trained staff, facilities, a process of regularly testing and refining the plan, a communications strategy, and consideration of wider governance issues. There was also no consideration of the quality of other components of the pandemic plan.

The six plans included in this study were those available in the public domain. Although pandemic plans have been developed for most of the South Pacific Islands, these have not yet been included on the SPC website (T Kiedrzyński, SPC, personal communication, 20 April 2007).

There are several limitations associated with using the level of detail in the pandemic plans as a proxy for the quality of the border control plan. Pandemic plans with high levels of detail scored well regardless of the effectiveness of the proposed strategies. For example, four of the six islands included entry screening in their pandemic plans despite evidence that the use of entry for the control of influenza is limited by the poor sensitivity of available screening tools, and the inability to detect asymptomatic individuals.<sup>4</sup>

In the larger countries (Australia and New Zealand), regional and state adaptations of the national pandemic plans may provide more operational detail. Therefore a broad and less detailed national plan may not necessarily reflect the quality of the nation’s overall strategy.

The subjective scoring system used in this review required some thought in interpretation. In particular, pandemic plans which mentioned a border control strategy but provided no detail scored more than a plan which did not mention the

strategy at all. However, the intentional decision to not mention a particular border control strategy may in fact be more appropriate than mentioning a strategy that is poorly resourced and with no preparations made for its implementation.

The opportunity remains for South Pacific Islands to increase the detail of their influenza pandemic plans, and to revise and test these plans periodically. Specific recommendations to the Regional Health Agencies and donor nations with links to the South Pacific are outlined below:

- Further research is required to provide evidence to guide decisions around the inclusion and implementation of border control strategies for island nations against pandemic influenza (e.g. using historical studies and mathematical modelling).
- The WHO could provide more clarity to the South Pacific Islands over the role and assistance likely to be provided by the WHO before and during an influenza pandemic.
- Regional agencies such as WHO and SPC could further expand their work with island nations in the development of country influenza pandemic plans, and increase the detail in generic plans which can then be adapted to specific island nations. These efforts could be further resourced by donor nations (see the next recommendation). Regional agencies could also facilitate the sharing of plans and experience with plan testing between island nations.
- New Zealand and Australia as well as the other regional donors (e.g. Japan, USA, France, European Union) should consider providing additional assistance to South Pacific Island countries and territories in the development and testing of their influenza pandemic plans.

The analysis contained in this paper should be repeated in the future. Potential refinements would include: expanding the criteria to include additional important features; collecting information on important criteria that are not necessarily recorded in the plan itself; applying the criteria to a wider set of plans (when these become publicly available); and carrying out this process in a more interactive manner with the countries involved as a way of improving the quality of their pandemic planning.

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## **An alternative consideration in drug testing in elite athletes**

Michael Legge, Ruth Fitzgerald, Lynnette Jones

### **Abstract**

As vigilance increases for drug abuse in sport there is an increasing awareness of new technologies creating new possibilities of performance enhancement. One such example is the recent consideration of 'gene doping', which may enhance athletic performance. In this article we consider an alternative strategy not yet considered; the potential for a pharmacogenomics approach and the utility of information at the level of the protein rather than the gene.

The World Anti-Doping Agency (WADA) provides a comprehensive code of practice (World Anti-Doping Code 2003), a list of banned substances (The 2007 Prohibited List International Standard), and a list of therapeutic exemptions (International Standard for Therapeutic use Exemptions). This is an extremely comprehensive approach to the issues of performance enhancing drugs in sport and clearly sets out the rules regarding the use and abuse of therapeutic substances in sporting events.

In all sporting events this code of practice is adhered to rigidly. Random drug testing of athletes has, on occasion, altered the outcome of an event. There have also been occasions where elite athletes have tested positive for a banned substance and their denial upheld on retesting of the samples. In addition to the issues of recognised banned substances the natural substances, complementary medicines and other natural products will be an increasing issue as their active ingredients become purified and therefore more potent.

The technology associated with the monitoring of drugs of abuse in sport has become increasingly sophisticated, often with the capability of detecting abuse many weeks after cessation of the substance. Until recently there has been a tendency to view performance enhancement substances as an all or none phenomenon based on the analytical result.

In this article we explore an alternative consideration in light of information resulting from the human genome programme and the relevant linkages with population studies on drug metabolism.

### **Normal enzyme variation and performance drugs**

It has been recognised for some time that there are both individual and racial variations in the ability to metabolise therapeutic substances, with approximately 6.7% of hospital admissions in the USA being due to adverse drug reactions;<sup>1</sup> however it is only relatively recently that the genetic understanding for the mutations causing such abnormalities has been understood.

Drugs entering the body are either active in the form taken or are converted into an active form in the body (pro-drugs). In either case, the drug products from their metabolism need to be excreted to avoid toxicity. This is undertaken by a series of

enzymatic metabolic conversions of the drugs; defects in metabolism means that the process may be too slow or too fast or in some cases will not take place at all.

The xenobiotic-metabolising enzymes are responsible for the metabolism of drugs and other substances such as complementary medicines, and are the principle reason for people responding in different ways to the same medication.

A significant family of such enzymes are the cytochrome P450 superfamily with over 50, P450 genes (abbreviated to CYP then a code for the enzyme e.g. CYP2D6) identified. Three are primarily responsible for the metabolism of most drugs (CYP2C9, CYP2D6, and CYP2C19) and one of these, CYP2D6, metabolises approximately 25% of all drugs in the liver. All three genes coding for these enzymes are polymorphic and contribute to considerable variation in drug response between individuals and different ethnic groups.<sup>2</sup>

This genetically determined ability for the P450 enzymes to metabolise drugs has a profound effect on the drug concentration in an individual. This can create two extreme scenarios; in the first, alterations in the enzymes may result in people being unable to metabolise the drug or metabolise it slowly, which in this situation, drug levels will remain in the body for longer periods than normal; the second scenario is one where people have more than one copy of the specific P450 gene and therefore produce multiple copies of the enzyme. In this latter situation, the drugs will be metabolised so quickly that their detection or therapeutic effect is not possible.

An example of the spectrum of effects of variations in these genes is found in the European population where up to 10% are CYP2D6 poor metabolisers and will only weakly metabolise a wide range of drugs— including antiarrhythmics, antidepressants, neuroleptics, and some  $\beta$ -blockers and opiates. On the other hand, up to 3% of Central-Europeans and up to 20% of Ethiopians have the same gene duplicated and will therefore metabolise these drugs more quickly. In addition to this there are significant differences between males and females for activity of some of these P450 enzymes.<sup>3</sup>

Interactions between disease genes and the genes for drug metabolism is currently the focus for a pharmacogenomics approach to designing drugs, discovery of disease genes, and the pharmacogenetics of populations. We wish to raise another aspect of pharmacogenetics the use of pharmacogenetics information in sport and some of the issues it might raise.

In *The 2007 Prohibited List International Standard* (section M3 GENE DOPING) there is a clear statement ‘The non-therapeutic use of cells, genes, genetic elements, or the modulation of gene expression, having the capacity to enhance athletic performance is prohibited’.

Whilst this section is clear regarding gene activity there is no statement regarding enzyme activity. Why could this be a problem especially in international sport? The first issue relates to ethnicity and what constitutes normal, for example, the gene coding for the rapid acetylator enzyme NAT2 differs between Japanese (>90% of the population are rapid acetylators) and Europeans (~8% are rapid acetylators); similarly with the CYP2D6 enzyme (which alone will metabolise 25% of drugs) 4 to 7% of Europeans are rapid metabolisers but up to 29% of Ethiopians are rapid metabolisers and only approximately one per cent of Chinese are rapid metabolisers.<sup>4</sup>

Defining 'normal' in the context of natural genetic variability does therefore become a problem. The second issue relates to certain drugs inhibiting this group of enzymes; for example, CYP2D6 can be inhibited by a range of neuroleptic, antidepressants, antiemetics, and antihistamines—thereby reducing the ability of the enzyme to perform normal drug metabolism.<sup>4</sup>

The third issue relates to the influence of diet on these enzymes. Several studies have identified that diet can modify drug metabolising enzymes such as grapefruit juice will inhibit CYP3A4 and inhibit the metabolism of more than 25 drugs thereby prolonging their bioavailability.<sup>5</sup> Other reports indicate that high protein-low carbohydrate diets for 2 weeks increased metabolism of some drugs<sup>6,7</sup> and the eating of charcoal-broiled beef each day for 4 days also lowered drug concentrations,<sup>8–10</sup> and certain vegetables (Brussels sprouts, cabbage, broccoli, and cauliflower) all induced drug metabolising enzymes.<sup>11,12</sup>

Finally, there are marked gender differences in the expression of certain drug metabolising enzymes, which will either increase or decrease drug clearance in women compared with men, such as CYP2B6 which has approximately two-fold greater activity in women compared to men and UGT (uridine diphosphate glucuronosyltransferase) which is decreased in women compared to men.<sup>13</sup>

Overall, changes in the ability of the enzymes responsible for drug metabolism to respond normally to the drugs may both increase and decrease the pharmacological effect of the drug, may not initiate the activation of pro-drugs, or initiate metabolism by alternative metabolic pathways thereby producing a range of alternative metabolites.

Where then does pharmacogenetics fit with sport? First and most importantly in the present form it does not represent genetic modification but the identification of natural genetic variation to drugs in the population. This raises a number of critical issues that should be considered for future strategies in drug monitoring in sport.

As more knowledge of the genetic basis of drug metabolism becomes available, will it be possible to use this knowledge to select and improve an athlete's performance knowing that the administration of banned substances could be cleared from their body possibly within days or even hours before the event based on the being a 'fast responder'? Could knowing the P450 profile of an athlete provide sufficient information to 'mask' performance drug abuse by manipulating diet to up-regulate the P450 enzymes? Alternatively, could an athlete have a variation in their P450 enzyme system, which leads to a 'positive' test for a banned substance due to alternative metabolic pathways being utilised for an approved drug?

While we understand something about the interactions of the P450 system with modern drugs, the issue of the enzyme system metabolising natural compounds is still a largely unknown area and the range of metabolites based on ethnic variation of the P450 system is yet to be resolved. Looking slightly further into the future, might there be the opportunity to utilise nanotechnology to implant the enzymes to overcome or mask the performance-enhancing effects of a banned substance?

Notwithstanding the biological and technical issues mentioned above, other issues relating to the ethical considerations of the use of genetic information in sport should also be considered. Whilst in medicine there is a strong emphasis on genetic privacy

as well as ownership and control of results resulting from a genetic test (and the right to know), clearly the use of such information on the world public sports arena raises issues of individual confidentiality and protection of genetic information to avoid the potential of stigmatisation.

These scenarios are not currently identified by WADA, but as medicine and drug companies progress rapidly to utilise this information for therapeutic use the avenues become open for abuse.

**Competing interests:** None known.

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## Interferon-induced haemolytic anaemia in hepatitis C

Mohammed Al-Ansari, Frank Weilert, Graeme Dickson

Chronic hepatitis C viral infection (CHCV) is a worldwide problem. 20% of cases progress to liver cirrhosis within 20 years and 5% of these develop hepatocellular carcinoma.<sup>1</sup> Pegylated interferon alfa (peg-IFN) plus ribavirin (RBV) represent the most effective therapy for CHCV<sup>11</sup> with sustained viral response rates of up to 85%. However, haematological side effects often necessitate dose reduction or drug discontinuation.<sup>2</sup>

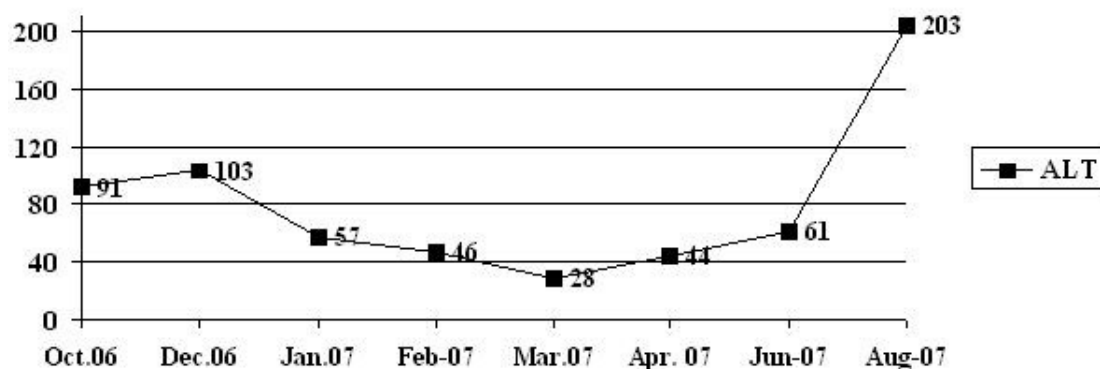
We report a case of severe autoimmune haemolytic anaemia during treatment with peg-IFN alfa-2a plus ribavirin.

### Case report

A 62-year-old African refugee was seen in clinic for management of CHCV, presumed to have been contracted from a blood transfusion following a gunshot wound in 1995. Other viral infections were excluded and she had no history or signs of immunologic disease. Investigations showed a raised ALT (91 u/L) and positive ANA (1:320, diffuse pattern) but negative tissue autoantibodies. She was genotype 4, with normal haemoglobin (146 g/L), white cell count, platelets, albumin, and bilirubin.

Liver biopsy showed moderate chronic inflammation (grade 3) with mild fibrosis (stage 1). She was commenced on peg-IFN 180 mcg weekly and RBV 1200 mg daily. Serum ALT significantly decreased during treatment (Figure 1), but at week 10 she developed a pruritic skin rash. Her RBV dose was decreased to 800 mg/day. By week 14, her viral load had fallen by 3 logs but she had developed pancytopenia (Hb 108 g/L, platelets  $116 \times 10^9/L$  and neutrophils  $0.4 \times 10^9/L$ ).

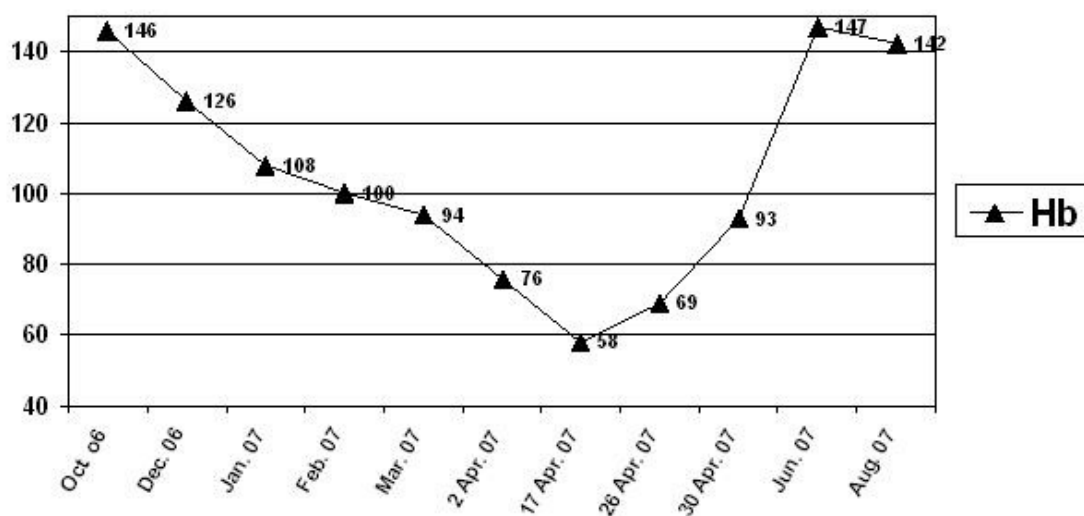
**Figure 1. Serum alanine aminotransferase (ALT) levels during treatment**



Her peg-IFN was reduced to 90 mcg /week. At week 18, her neutrophil count had increased to 1.1 but her Hb had fallen further to 94. The RBV dose was decreased further to 600 mg daily but subsequently discontinued when her Hb fell further to 76. Unfortunately, her Hb continued to drop, reaching 58g/L (week 26) and she became symptomatic requiring admission. All medication was stopped. Admission bloods showed normal platelet and WBC counts but her film contained many spherocytes and showed marked polychromasia. Her haemolysis screen showed a low haptoglobin (<0.06 g/L) with raised bilirubin (24 umol/L), LDH (722 u/L), and reticulocyte count ( $136 \times 10^9 / L$ ). Her Coomb's test was strongly positive for IgG, C3b, and C3d. RBC auto-AHG-antibodies were identified and no cross-matched blood could be found nationwide.

The diagnosis of autoimmune haemolytic anaemia (AIHA) was made and she was investigated to exclude underlying causes such as tumours, infectious diseases, immunodeficiency, and lymphoproliferative disease. She declined a bone marrow biopsy. After exclusion of other causes, it was felt that the peg IFN was the most likely precipitant due to the temporal association between antiviral therapy and the development of severe anaemia. She was started on prednisone 100 mg daily and stayed in hospital for 14 days before her Hb reached 93 and her symptoms resolved (Figure 2). She did not require erythropoietin. It took 4 months before her Hb returned to the normal range and her prednisone could be stopped.

**Figure 2. Haemoglobin (Hb) levels during treatment**



Unfortunately her ALT and HCV RNA rose again. She then returned to Africa.

## Discussion

Anaemia can occur in patients on treatment for CHCV for many reasons. RBV causes haemolysis in up to 32% of patients.<sup>3,4</sup> It is a synthetic nucleoside analogue that is

converted to its active triphosphorylated form inside red blood cells. This cannot return to the systemic circulation and accumulates in erythrocytes causing oxidative damage to the membrane and leading to extravascular haemolysis.<sup>5,6</sup> In high doses it has also been reported to cause myelosuppression. The conventional management of anaemia, during hepatitis C combination therapy, is to reduce the RBV dose for haemoglobin (Hb) levels of <100 g/L. In all patients, RBV is recommended to be discontinued if the Hb falls below 85 g/L<sup>2</sup>.

IFN is known to suppress bone marrow erythropoiesis<sup>7</sup> impairing the response to RBV-induced haemolysis. It causes thrombocytopenia and neutropaenia in 20%<sup>2,7</sup> of patients treated. However, IFN-induced haemolytic anaemia is very unusual. In a survey of adverse events occurring on IFN treatment, autoimmune haemolytic anaemia occurred in only 2 of 11,241 patients.<sup>8</sup> Otherwise there are only a few reported cases in the literature.<sup>9,10</sup> IFN can cause de novo autoimmune disease as well as aggravating pre-existing disease.<sup>11</sup> Autoantibodies occur in 40-65% of CHCV patients but are generally at low titre and do not appear to affect the presentation or course of the disease. However, autoimmune haemolytic anaemia has been described due to CHCV without interferon treatment.<sup>12,13</sup>

Our patient had no history of autoimmune disease but she did have non specific immune derangement (persistently high globulin and ANA) most likely due to her CHCV. Her anaemia was compounded by an inadequate bone marrow response to her haemolysis (poor reticulocyte count) probably due to treatment induced BM suppression. The positive Coombs test and response to steroids strongly suggest that her anaemia was predominantly autoimmune. We plan to recheck her Coombs test, when she returns from Africa, as a negative test would confirm that the AIHA was interferon related.

In conclusion, physicians need to be aware that haemolytic anaemia, in patients on treatment for CHCV, is usually ribavirin induced but can be autoimmune. As the management is different, prompt recognition of the underlying cause is important to avoid potentially life threatening anaemia.

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## **An unusual cause of a spontaneous bacterial peritonitis in a young healthy woman**

Lenneke E M van Lelyveld-Haas, Angela J E Dekkers, Bent Postma, David H T Tjan

Group A beta haemolytic streptococcus (GAS) is a common pathogen of the throat and skin. It can cause infection that may range from superficial uncomplicated to very invasive. The mortality rate of invasive GAS infections ranges from 25 to 48%, but the mortality of patients who develop shock is higher (30 to 70%).<sup>1,2</sup>

Primary GAS peritonitis is a rare condition occurring in patients without underlying causes such as a perforated viscus or pre-existing ascites.<sup>3</sup>

We report a case of young woman with a primary peritonitis and toxic shock syndrome (TSS) caused by GAS.

### **Case report**

A previously healthy 28-year-old Caucasian woman presented to the emergency room with a 24-hour history of increasing severe low abdominal pain. On admission she was ill. Vital signs were as follow: tympanic temperature 39.4°C, blood pressure 80/50 mmHg, and heart rate 120 beats per minute. Abdominal investigation showed moderate rebound tenderness, rectal and vaginal examination were uneventful. Cervical motion tenderness was not present and examination of the skin revealed no abnormalities. Patient did not have an intrauterine device.

The initial arterial blood gas showed pH 7.27 (7.37–7.45), pCO<sub>2</sub> 6.6 kPa (4.5–6.0 kPa), pO<sub>2</sub> 7.0 kPa (9.5–13.0 kPa), HCO<sub>3</sub> 19.4 mmol/L (22–26 mmol/L), BE -6.8 mmol/L (-2.0–2.0 mmol/L), and SaO<sub>2</sub> 86% (92–99%).

Laboratory examination showed a lactate 4.6 mmol/l (0.5–1.7 mmol/L), leukocytes 31.8/nl (4–11/nl) with toxic staining, haemoglobin 7.9 mmol/L (7.5–11 mmol/L), C-reactive protein (CRP) 497 mg/L (0–5 mg/L), and PCT >10 ng/ml (<0.5 ng/ml).

Patient developed all signs of severe sepsis with multi-organ dysfunction with septic shock, oliguric renal failure, and lactic acidosis. After fluid resuscitation, vasopressors were started.

She underwent an emergency diagnostic laparotomy which revealed intraperitoneal pus but no clear focus of infection. Peritoneal washout was performed with 2 litres of warm saline and patient was treated according to the Surviving Sepsis Campaign guidelines.<sup>4</sup> Piperacilline/tazobactam was initially started, but was changed to intravenous benzylpenicillin when GAS was isolated from the peritoneal cultures obtained perioperatively. Admission blood cultures recovered the same isolate. A throat culture was negative for GAS, but the vaginal swab revealed GAS.

Patient made a good clinical recovery within 48 hours and was discharged from the ICU on the third day. Intravenous antibiotic therapy was discontinued after 7 days and

oral amoxicillin was instituted for another 2 weeks. She was discharged home on the tenth day in an excellent clinical condition.

## Discussion

The diagnosis of peritonitis is a bit confusing. In the literature, there is some overlap between the definitions of primary peritonitis and spontaneous bacterial peritonitis and the definitions are used in an interchangeable way.<sup>5</sup> Multiple definitions for primary peritonitis are seen, like a peritonitis developing from a focus outside the peritoneal cavity.<sup>6</sup>

Jarvis et al suggest that an isolate-proven peritonitis in the presence of ascites from a pre-existing medical condition should be termed as spontaneous bacterial peritonitis and the peritonitis with a defined intraperitoneal source, such as a perforated viscus can be termed as secondary peritonitis. The remainder can be called primary peritonitis proper, but Jarvis suggests a further classification into gynaecological, haematogenous, respiratory, idiopathic, and indeterminate categories.<sup>7</sup> The streptococcal TSS is defined as GAS bacteraemia with the early onset of shock and organ failure.<sup>8</sup>

Primary GAS peritonitis is a rare clinical entity that is almost always associated with underlying disease. GAS commonly causes upper respiratory tract infections and cutaneous infections such as impetigo and erysipelas. It is also known to be associated with life-threatening infections as necrotizing fasciitis and TSS.<sup>9</sup> However, GAS has rarely been associated with gastrointestinal infections. An acute abdomen due to a primary peritonitis without underlying condition is uncommon.

GAS has been reported in the literature to cause primary peritonitis.<sup>10</sup> Haematogenous spreading from an oropharyngeal, pulmonary, or gynaecological source has been postulated to be the underlying mechanism. However the portal of entry often remains uncertain. Most patients with primary peritonitis are women, suggesting an ascending genital route.<sup>11</sup> Factors such as intrauterine contraceptive devices (IUD) or recent vaginal delivery or caesarean section seem to play a predisposing role. However, GAS does not commonly belong to the normal female vaginal flora (colonisation is less than 1%).<sup>12</sup>

Carriers usually are asymptomatic.<sup>13</sup> Cases have been reported with infections related with the use of IUD, but also cases of GAS peritonitis and salpingitis with no history of IUD use are known.<sup>14–16</sup> Puerperal sepsis due to GAS has been reported.<sup>17</sup> Other Gram-positive isolated related to primary peritonitis are pneumococci, beta-haemolytic streptococci, and staphylococci.<sup>18</sup>

Combined treatment with penicillin G and clindamycin is recommended, because GAS isolates with clindamycin resistance have been reported in Europe.<sup>19</sup> The length of therapy depends on the clinical response, but therapy is usually continued for a minimum of 2 weeks.

## Conclusion

This case concerns a previously healthy adult female who developed a primary GAS peritonitis with TSS. Diagnostic laparoscopy resulted in identification of peritonitis without an identifiable intra-abdominal source. Appropriate antibiotic therapy was

instituted. Culture of blood and vagina confirmed the presence of GAS. The patient made a complete recovery and was discharged from the hospital on oral amoxicillin.

GAS is a uncommon cause of primary peritonitis.<sup>20</sup> To the best of our knowledge cases of primary GAS peritonitis in patients without any significant past medical history are unusual. Cornerstone of treatment is early and adequate antibiotics.

The cause of the GAS peritonitis was likely due to an ascending genitourinary infection of GAS. Although GAS colonisation of the vaginal tract is not common, it may cause GAS invasion and dissemination, as in our case.

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## A rare location of Castleman's disease: parotid region

Fazli Erdoğan, S Altaş, E Altaş, O Yoruk, S A Ozmen

### Abstract

Castleman's disease in the parotid gland region is very rare. The most frequent site of involvement is the mediastinum. A 15-year-old female with Castleman's disease in the parotid region is herein reported.

Castleman's disease was first defined by Dr Benjamin Castleman in 1956 when he described a group of patients with large thymoma-like masses in the anterior mediastinum.<sup>1</sup>

The disease may be seen anywhere along the lymphatic chain but it usually occurs in the mediastinum, lung, neck, pelvis, and retroperitoneum.<sup>1</sup> There are two different types (hyaline-vascular and plasma-cell). The clinical presentation is varied, the diagnosis is difficult, and optimal management is still undetermined.<sup>1</sup>

### Case report

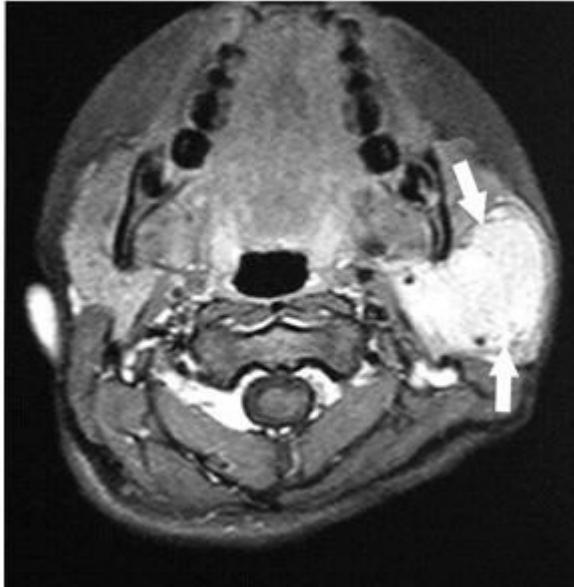
A 15-year-old female with a palpable mass located in front of the left ear was admitted to our hospital for further investigation. On physical examination, a non-pulsatile submucosal mass and swelling of the left parotid region (with a diameter of approximately 5 cm) were noted. On oropharyngeal examination, because of pressure inflicted by the mass, it was observed that the soft palate, uvula, tonsil, and glossopalatine arch were displaced medially. No other external palpable neck swelling and abnormalities were found on general examination.

Haematological and biochemical investigations were all within the normal limits. The chest X-ray was normal. No organomegaly was observed, and further investigations showed a normal level of gamma globulin.

T1 and T2-weighted magnetic resonance imaging (MRI) showed a well-defined hypointense and hyperintense mass measuring 48×37 mm in the left parotid space. In addition, MRI showed that the surrounding vital structures were not involved in this case (Figure 1). Aspiration biopsy was studied twice, but the results were negative.

It was decided to surgically resect the mass.

**Figure 1. T2-weighted axial MRI showing hyperintense mass. The mass extends from the basal cranium to the epiglottis inferiorly [a well-defined, high-attenuated, regularly oval-shaped mass of fat attenuation and hypovascularisation in the left parotid region (arrows)].**



**Surgical technique**—The mass in the deep lobe of the left parotid gland was removed completely with the patient under general anaesthesia. There was no evidence of any attachment to the surrounding structures. The gross specimen was an oval-shaped solid mass (measuring 5×4×4 cm) with a thin fibrous capsule (Figure 2).

**Figure 2. The gross specimen consisted of a regular, brownish oval-shaped solid mass (5×4×4 cm) with a thin fibrous capsule**

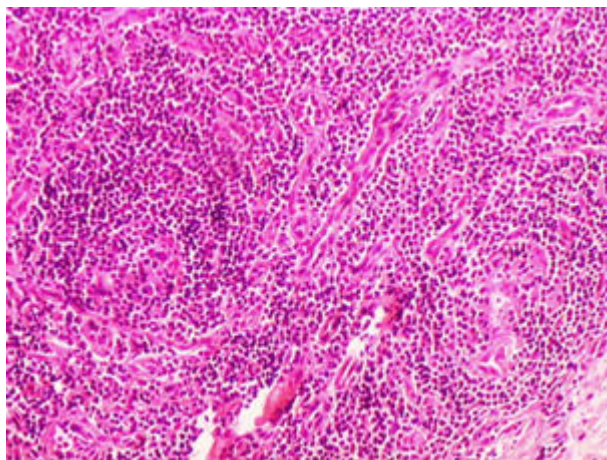


After the total resection of the tumour, based on the histopathological and immunohistochemical findings, the diagnosis was Castleman's disease.

Immunohistochemically, the tumour was hard and surrounded by a thin fibrous capsule. On sectioning, the cut surface showed as a well-defined homogenous brownish mass with multifocal whitish foci.

On histopathologic examination, this mass showed lymphoid follicles separated by bands of connective tissue with centrally located thickened blood vessels, and it was compatible with the hyaline vascular type of Castleman's (Figure 3).

**Figure 3. On histopathologic examination, lymphoid follicles with centrally located, thick blood vessels and interfollicular nodular hyalinising fibrosis were detected (H&E stain; ×100 magnification)**



## Discussion

Castleman's disease has also been termed as angiofollicular lymph node hyperplasia or giant lymph node hyperplasia.<sup>2,4</sup> The original report of this entity described solitary lesions confined to the mediastinum, which is still the most frequent site of involvement.

The disease has also been reported in other anatomic sites including the abdominal and retroperitoneal cavity (the second most common site), the pulmonary parenchyma, the axillary and cervical regions, the skeletal muscle, and rarely the kidney.<sup>2</sup> The disease is most commonly focal but rarely may be multicentric or systemic.<sup>3-6</sup>

Although the aetiology of Castleman's disease is unknown, there are several hypotheses involving chronic low-grade inflammation, a hamartomatous process, an immunodeficiency state, and autoimmunity pathogenetic mechanisms.<sup>1,7</sup>

The differential diagnosis of a parotid mass includes parotid or minor salivary gland tumours, neuromas, glomus tumours, chordoma, soft tissue chondroma,

chondrosarcoma, solitary fibrous tumour, lymph nodes, and lipomatous lesions.<sup>7-10</sup> Most of parotid space masses are benign.

In Dankle's<sup>1</sup> review of 318 para pharyngeal masses, 45% were parotid; 15% were lymph node, and 23% were neurogenous in origin, but only 5 cases (1.6%) were neurofibroma and 67 (21%) were malignant masses.

Focal Castleman's disease has two histologic patterns: hyaline vascular type and the plasma cell type.<sup>2</sup> Rarely, both types may occur concomitantly.<sup>8</sup> The two major forms of the disease vary not only in their histologic appearance but also in their clinical presentation. Another type, called as stromal-rich Castleman's disease, has also been reported.<sup>9</sup>

The hyaline vascular type of Castleman's disease has two prominent microscopic characteristics. Firstly, variably sized mantle zones, often arranged in concentric rings referred to as onionskin layers with regressively transformed, involuted, or atrophic germinal centers. The germinal centers are depleted of lymphocytes and predominantly made up of dendritic reticulum cells and some endothelial cells. Secondly, prominent interfollicular vascularity and with no sinuses which sometimes may result in profuse bleeding during operation.

The vessels are often hyalinised and can be seen as entering the germinal center from the interfollicular zone. The histologic picture is that of a 'lollipop,' with abnormal germinal centers and a hyalinised vessel entering at right angles to the follicle.<sup>2</sup> Small lymphocytes, some eosinophils, plasma cells and a few immunoblasts may be seen in the interfollicular areas.

Before the diagnosis of multicentric Castleman's disease is made, other disorders causing similar histologic changes must be excluded such as HIV-related lymphadenopathy, Kaposi's sarcoma, and some autoimmune disorders.<sup>3-5,10</sup>

The radiologic findings of Castleman's disease are non-specific, and the radiologic study without a pathologic report is not enough for a definite diagnosis. A computer-assisted tomographic scan will show a well-defined soft-tissue density, and the hyaline vascular type is more contrast-enhanced than the plasma cell type.<sup>11</sup>

Magnetic resonance imaging (MRI) indicates a low intensity mass on T-1 weighted images and higher signal intensity on T-2 weighted images.<sup>1</sup> The differential diagnosis (to distinguish it from lymphoma, leiomyoma, and leiomyosarcoma) must be performed.<sup>1</sup>

In conclusion, clinicians should be aware that Castleman's disease might involve the parotid gland, which leads to difficulties in arriving at a differential diagnosis. Surgical excision is both a diagnostic and curative method in managing of the disease.

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## Dog owner's disease

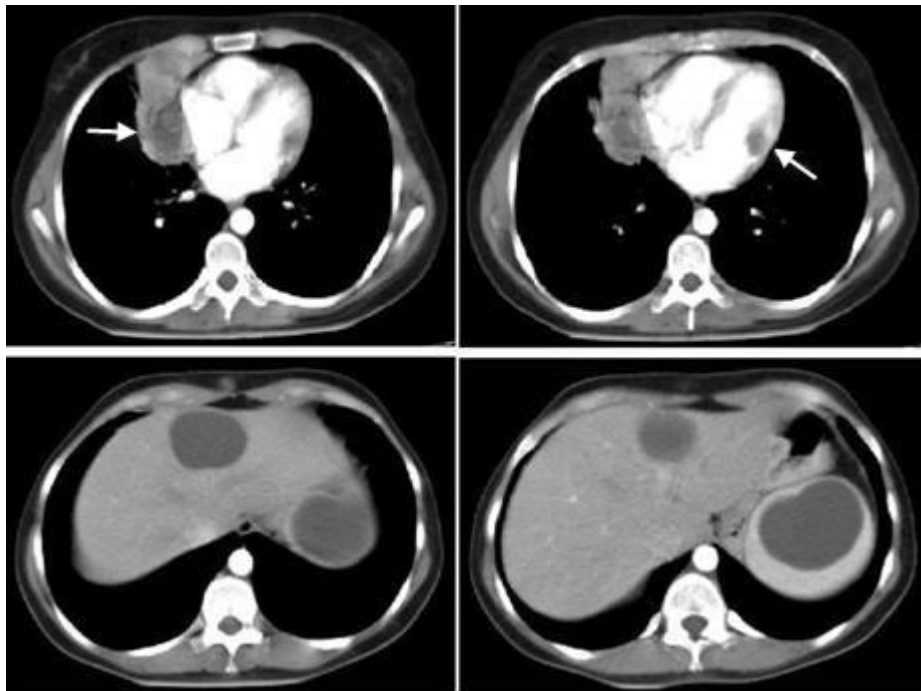
Ali Er, Erhan Turgut

A 37-year-old woman presented with a progressive history of cough unresponsive to medical treatment. She had no other complaint. The thoracic computed tomography (CT) examination showed a heterogeneous hypodense cystic mass in the middle lobe of the right lung with surrounding parenchymal consolidation (arrow) [Figure 1; top left image].

Beside, the CT scan shows hypodense area in myocardium of the left ventricle (arrow) [Figure 1; top right image].

Abdominal computerised scan revealed a large round cystic mass in the left lobe of the liver (5.4×4.0 cm in diameter) (Figure 1; bottom left image) and another cyst in the spleen (6.8×5.3 cm in diameter) with the same features [Figure 1; bottom right image].

**Figure 1. Computed tomography scan of the thorax and abdomen**



*What is the diagnosis?*

## Answer

The patient was diagnosed with multiorgan *hydatid disease* and surgical management was advised. The diagnosis was confirmed with serologic test and radiological examinations. The treatment option taken was complete removal of the cysts with medical treatment postoperatively.

## Discussion

Cystic echinococcosis is a parasitic zoonotic disease endemic in cattle-raising regions worldwide. Although cystic echinococcosis can affect any organ, the most frequent localisations are the liver and lung (80%). Cysts can also be found in the peritoneum (20%), spleen (0.7–8%), kidney (7%), skin and muscles (4%), nervous system (0.2–3%), bones (2%), and heart (0.2–2%).

Clinical history, serologic tests, and various imaging techniques such as ultrasonography (USG), computed tomography (CT) and magnetic resonance imaging (MRI) can help make the diagnosis. Surgical treatment is selected according to the localisation and the type of hydatid disease. Chemotherapy is usually performed because of the risk of recurrence.

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## **An outbreak of scarlet fever**

*Published in N Z Med J. 1909;7(30), and written by W. E. Gladstone, District Health Officer, Dunedin.*

The following brief notes on an outbreak of Scarlet Fever are interesting, as the whole subject of the spread of contagious diseases is one on which much light is needed :—

In investigating an outbreak of Scarlet Fever at a cottage in a country settlement a few miles from Dunedin, I found that seven years ago the mother had contracted Scarlet Fever. After the patient had recovered, the whole building (three small rooms) was fumigated with sulphur, and new wall-paper was pasted over the old wall-paper.

During a recent spell of wet weather, the roof of the cottage sprung several leaks, the water loosening some of the wall-paper to such an extent that the father thought it desirable to pull all the paper from the walls. The three children played with the paper, and four days later contracted Scarlet Fever. The children had not been visiting any family, nor had there been anyone visiting the cottage for some weeks.



## **Proceedings of the 193rd Scientific Meeting of the Otago Medical School Research Society, Thursday 3 July 2008**

### **Comparative proteome analysis of vancomycin-resistant *Enterococcus faecalis* grown under aerobic and anaerobic conditions in continuous culture.**

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*Enterococcus faecalis* is not only a common intestinal commensal of humans and animals, but ranks among the leading causes of nosocomial infections in humans. *E. faecalis* has an extraordinary ability to adapt and survive in different environments and this is an important feature in their transmission from host to host. However, the molecular and physiological adaptations underlying this ability remain largely unknown. The aim of the current study was to determine how *E. faecalis* responds to changes in oxygen tension using two-dimensional protein electrophoresis analysis and continuous culture to rule out the effects of variations in growth rate on protein expression.

A vancomycin-resistant *E. faecalis* isolate that is widely disseminated in New Zealand was chosen for this study using glucose-limited continuous culture (doubling time 6.9 h) and grown under oxygen tensions of <0.1% (anaerobic) and 14% (aerobic). Differentially regulated proteins were identified using mass spectrometry (peptide mass fingerprint). At low oxygen tensions, *E. faecalis* upregulated pathways involved in alternative acceptor utilisation (e.g. fumarate, 14-fold increase,  $P < 0.0063$ , two-tailed t-test) and enzymes required for arginine metabolism (e.g. arginine deiminase, 5-fold increase,  $P < 0.0331$ ). Under high oxygen tensions, *E. faecalis* mounted a response that was consistent with the cells being under oxidative stress with superoxide dismutase, thioredoxin, and nicotinamide adenine dinucleotide peroxidase (NADH peroxidase) all being upregulated. A novel finding was the upregulation of L-lactate dehydrogenase under aerobic conditions, a metabolic enzyme normally expressed solely under anaerobic conditions. We propose that the upregulation of this enzyme is a response that allows the cell to continue metabolising glucose to lactate, when other pathways (e.g. acetate production) are inhibited under conditions of oxidative stress. Other novel proteins that were also upregulated aerobically included SufC (2-fold increase,  $P < 0.0093$ ), a protein implicated in iron-sulfur cluster (SUF) assembly.

### **Development of testosterone-sensitive motor neurons in the absence of Müllerian inhibiting substance.**

Floriane Imhoff, I McLennan. Department of Anatomy and Structural Biology, Otago School of Medical Sciences, University of Otago, Dunedin.

Müllerian inhibiting substance (MIS) is a testicular hormone that is required for the early sexual development of male embryos. MIS is a neuronal survival factor and

male mice that lack MIS have female numbers of neurons in their lumbar lateral motor column (LMC). Testosterone and MIS both control the development of the testes, which raises the possibility that these hormones dually regulate motor neurons involved in primary sexual functions. Similarly, the reduced numbers of LMC-neurons in male *MIS*<sup>-/-</sup> mice could be secondary to disruption of the function of testosterone. If either possibility is occurring, then the number of motor neurons in the spinal nucleus of the bulbocavernosus (SNB), which innervates penile muscles, should be abnormal in *MIS*<sup>-/-</sup> mice. Therefore, we examined the number of SNB motor neurons in *MIS*<sup>+/+</sup> and *MIS*<sup>-/-</sup> male and female mice.

Adult C57/Bl6 mice were anaesthetised with ketamine and domitor, and then killed by transcardiac perfusion with 4% paraformaldehyde. Lumbar spinal cord sections were stained with cresyl violet and the number and size of the motor neurons from the SNB assessed. The *MIS* genotype had no effect on the number of motor neurons. The number of SNB neurons in male *MIS*<sup>+/+</sup> and *MIS*<sup>-/-</sup> mice was  $85 \pm 7$  (mean  $\pm$  SEM,  $n = 4$ ) and  $95 \pm 6$  ( $n = 6$ ), respectively, which was significantly greater than the wild-type female number of  $23 \pm 1$  ( $n = 4$ ) ( $p < 0.001$ ; one-way ANOVA). Furthermore, the size of the motor neurons did not vary between the *MIS*<sup>+/+</sup> and *MIS*<sup>-/-</sup> mice in males and females.

This indicates that MIS is not essential for the development of motor neurons involved in primary sexual function. It also suggests that MIS and testosterone regulate different populations of neurons.

### **Tin protoporphyrin provides neuroprotection following hypoxia-ischaemia by modification of nitric oxide synthase, cyclooxygenase and mitochondrial complex 1.**

Brad Sutherland, O Shaw, A Clarkson, I Winburn, I Sammut, I Appleton. Department of Pharmacology and Toxicology, Otago School of Medical Sciences, University of Otago, Dunedin, New Zealand.

Heme oxygenase (HO) is implicated in cerebral ischaemia pathophysiology. The aim of this study was to determine whether HO modulation attenuated hypoxia-ischaemia (HI)-induced brain damage and identify possible mechanisms involved.

HI was induced in 26-day-old male Wistar rats by left common carotid artery ligation coupled with 1 h of 8% oxygen. Thirty  $\mu\text{mol/kg}$  tin protoporphyrin (SnPP; HO inhibitor) or ferriprotoporphyrin (FePP; HO inducer), or vehicle were administered intraperitoneally daily from 1 day pre-HI until euthanasia 3 days post-HI ( $n = 6 - 8$ ). One-way ANOVA and Tukeys *post-hoc* test were used for statistical comparisons, and  $P < 0.05$  was considered significant.

SnPP significantly reduced infarct volume ( $62.3 \pm 12.3 \text{ mm}^3$ ) compared to saline ( $125.5 \pm 13.4$ ) while FePP had no effect ( $126.0 \pm 18.1$ ). In the ipsilateral hemisphere, HI + saline increased total nitric oxide synthase (NOS) activity ( $1428 \pm 98 \text{ pmol } [^3\text{H}]\text{-L-citrulline} / 30 \text{ mins} / \text{mg}$ ) compared to non-intervention controls ( $985 \pm 56$ ) which was augmented by HI + SnPP ( $2174 \pm 84$ ). Inducible NOS (iNOS) activity in the ipsilateral hemisphere was reduced by HI + SnPP ( $332 \pm 46 \text{ pmol } [^3\text{H}]\text{-L-citrulline} / 30 \text{ mins} / \text{mg protein}$ ) compared to HI + saline ( $662 \pm 128$ ). Cyclooxygenase (COX)

activity in the ipsilateral hemisphere was also decreased by HI + SnPP ( $84.5 \pm 15.4$  pg  $\text{PGE}_2$  / 30 mins / mg protein) compared to HI + saline ( $192.1 \pm 62.9$ ). Mitochondrial complex I activity was raised by HI + SnPP ( $720 \pm 111$  nmol NADH / min / mg protein) compared to HI + saline ( $452 \pm 60$ ) in the ipsilateral hemisphere.

Therefore, SnPP acts on many mechanisms to produce neuroprotection 72 h post-HI including total NOS, iNOS, COX activities and mitochondrial respiratory function, and may provide an attractive multimodal neuroprotective strategy.

### **The characterisation of orf virus chemokine binding protein using murine models.**

Zabeen Lateef, M Baird, L Wise, A Mercer, S Fleming. Department of Microbiology and Immunology, Otago School of Medical Sciences, University of Otago, Dunedin.

Orf virus (OV) causes acute pustular dermatitis in sheep and is transmissible to humans. The virus encodes a range of secreted immune modulators, which includes a chemokine binding protein (CBP). Chemokines are a large family of secreted proteins that regulate leukocyte trafficking during inflammation and the induction of the acquired immune response. In this study, the functional effects of OV CBP were characterised using murine models.

Protein binding affinity studies demonstrated that OV CBP binds murine inflammatory chemokines (CCL2, CCL3, CCL5) and constitutive chemokines (CCL19, CCL21) with high affinity and blocks the migration of cultured leukocytes in response to these chemokines using chemotaxis assays. The number of migrating cells was reduced to background levels in the presence of optimum concentrations of OV CBP ( $0.3 - 0.7$   $\mu\text{g}$ ;  $n = 4$ ,  $P < 0.01$ , unpaired  $t$ -test). In addition, murine models were established to study the *in vivo* effects of OV CBP on inflammatory cell recruitment induced with lipopolysaccharide (LPS) within skin and dendritic cell migration to peripheral lymph nodes. Co-administration of OV CBP ( $0.001$   $\mu\text{g}$ ) with LPS ( $1$   $\mu\text{g}$ ) caused a 50% reduction in infiltrating leukocytes at the site of injection ( $n = 9$ ,  $P < 0.01$ , ANOVA, Tukey test). Furthermore, OV CBP blocked the migration of mature dendritic cells from the skin to the lymph node in response to constitutive chemokines. The injection of OV CBP ( $1$   $\mu\text{g}$ ) into the skin of the lower abdomen resulted in reduced migration of mature dendritic cells to the inguinal lymph node by 75% ( $n = 9$ ,  $P < 0.05$ , ANOVA, Tukey test) and a subsequent reduction in T cell activation (87%;  $n = 9$ ,  $P < 0.05$ , ANOVA, Tukey test).

This work suggests that OV CBP aids the infectivity of OV by impairing the development of inflammation and acquired immunity during viral infection.

### **Thermosensitive chitosan hydrogels as potential sustained release vaccine delivery systems.**

Sarah Gordon, A Saupe, W McBurney, T Hennessy, T Rades, S Hook. School of Pharmacy, University of Otago, Dunedin.

Poor immunogenicity is a major disadvantage of many modern vaccines, necessitating multiple immunisations for effective immunity. Sustained release vaccine delivery

systems, such as hydrogels, offer a possible solution to this problem. In this study, the immunogenicity of a hydrogel made from the polymer chitosan incorporating the model antigen ovalbumin (OVA) was investigated.

Thermosensitive chitosan solutions (which transform into gels when heated to body temperature) containing 20 µg chicken egg-derived OVA were subcutaneously administered to C57Bl/6 mice (n = 3), resulting in formation of a gel depot (day 0). Control immunisations of 10 µg OVA in phosphate buffered saline (PBS) and in alum were also given (day 0, 14). Following OVA pulsing (day 28), mice were culled (day 30). T cell proliferation in lymph nodes and serum antibody production were determined by flow cytometry and enzyme-linked immunosorbent assay, respectively.

Single administration of OVA in chitosan gel resulted in higher percentages of cytotoxic (CD8<sup>+</sup>) T cells ( $10.5 \pm 2.1\%$ , mean  $\pm$  SD, n = 3) and helper (CD4<sup>+</sup>) T cells ( $2.3 \pm 0.5\%$ , n = 3,  $P \leq 0.01$ ; ANOVA) compared to prime and boost administered OVA in PBS ( $6.3 \pm 0.9\%$  CD8<sup>+</sup> production, n = 3;  $0.4 \pm 0.1\%$  CD4<sup>+</sup> production, n = 3). Production of significantly higher OVA-specific immunoglobulin G titres were also observed ( $50.8 \pm 33.0\%$ , n = 9,  $P \leq 0.05$ ) in comparison with OVA in PBS ( $11.0 \pm 12.2\%$ , n = 9), and approximately equivalent titres to OVA in alum ( $54.2 \pm 36.2\%$ , n = 9), an effective antibody inducer, were seen.

Formulation of antigen into chitosan gel therefore shows promise as a sustained release vaccine delivery system – a single administration of OVA in chitosan gel showed only modest activation of CD8<sup>+</sup> T cells, but was able to significantly activate CD4<sup>+</sup> T cells and stimulate antibody production.

### **Deregulation of cell cycle progression by a parapoxvirus mimic of anaphase promoting complex subunit 11.**

Min Mo, S Fleming, A Mercer. Department of Microbiology and Immunology, Otago School of Medical Sciences, University of Otago, Dunedin.

The anaphase promoting complex (APC) is an ubiquitin ligase that is an essential regulator of multiple steps in the cell cycle. The complex consists of at least 12 subunits with a catalytic core formed by a scaffold protein, APC2 and a RING-H2 protein, APC11. The parapoxvirus, orf virus, encodes a RING-H2 protein, B5L, with clear sequence similarities to APC11. The disruption of APC function leads to premature entry into S phase and a delayed M phase exit and, potentially, apoptosis. This investigation explored the functional significance of the similarity between B5L and APC11 and specifically sought to determine if B5L manipulates cell cycle regulation by targeting APC function.

Co-immunoprecipitation experiments from lysates of cells expressing a range of constructs revealed an interaction between B5L and APC2 in the same manner as seen with APC11. Furthermore, B5L was found to associate with endogenous APC. However, although APC11 promoted the formation of poly-ubiquitin chains in substrate-independent *in vitro* assays, B5L was inactive in this assay. In addition, cell lines expressing B5L showed an increased number of cells in G2/M phase ( $30 \pm 4\%$ , n = 3,  $P < 0.05$ , ANOVA, Tukey test), compared with cell lines expressing APC11 ( $11 \pm 2\%$ , n = 3), consistent with impaired APC function. Furthermore, transient hyper-

expression of B5L induced apoptosis in  $25 \pm 2\%$  ( $n = 3$ ,  $P < 0.05$ ) of the cell population compared with only  $6 \pm 1\%$  ( $n = 3$ ) apoptotic cells in APC11 transfection.

Our observations indicate that B5L is a non-functional mimic of APC11. It associates with APC, but lacks ubiquitin ligase activity, and hence disrupts APC function. These abilities may enable orf virus to induce a cellular environment that enhances viral replication.



## **More trouble for the National Health System (NHS) in the UK**

Alan Johnson, the Health Secretary, has announced a review of the 20-year-old rule forbidding patients from topping up NHS treatment by paying for additional expensive drugs. This followed a furore over patients in the last stages of cancer who wanted to pay for drugs not recommended for use in the NHS because of their cost. A 64-year-old female was refused further NHS treatment for bowel cancer after paying £11,000 for the drug Cetuximab. The issue revolved around the Ministry view that allowing patients to buy extra drugs would result in a two-tier service and damage the principles behind an NHS that is free at the point of access.

An ethical tangle somewhat similar to the Herceptin argument in New Zealand.

Guardian Weekly 27/06/08, p15

## **Walk-in clinics in US retail outlets**

Such clinics have proliferated in the US because of a serious doctor shortage. Also a visit to a walk-in clinic tends to cost less, because they are mostly staffed by nurse practitioners who can write prescriptions and treat minor ailments, rather than doctors. The cost of a visit is normally covered by a patient's insurance. However, the boom in walk-in health clinics located within large retail stores, supermarkets, and pharmacies is showing signs of slowing.

Why? One view put forward by an entrepreneur is that "you have to have a critical mass of stores seeing a high number of patients to get somewhere...new clinics need to spend a lot of money on marketing to build public awareness.

One could think of other reasons—public dissatisfaction for example.

BMJ 2008;336:1150–1

## **Gout and allopurinol**

Gout is a prevalent disorder affecting more than 2% of the population and allopurinol is very commonly used for the prevention of recurrent attacks of acute gout and treating tophaceous gout.

As with most effective agents, allopurinol has an adverse effects profile ranging from the trivial and extending up to a severe hypersensitivity syndrome and its feared dermatological manifestation, Stevens Johnson Syndrome.

Many gouty subjects have impaired renal function and the allopurinol dose should be lower in them. The range includes 100mg every 3 days up to 300mg daily. This topic is reviewed in this Australian report which utilised the Medicare Australia database. As there is a trend towards the use of 100 mg daily they conclude that dosing recommendations are effective in Australia. New Zealand prescribers take note.

Internal Medicine Journal 2008;38:388–95

## **And what about the treatment of acute gout?**

The authors of this Dutch paper point out that non-steroidal anti-inflammatory drugs and colchicine used to treat acute gout have gastrointestinal, renal, and cardiovascular adverse effects.

They hypothesise that corticosteroids might be equally effective and have compared 5 days of prednisolone (35mg) with 5 days of naproxen (500mg twice daily). As expected, the regimens were equally effective.

Adverse effect profiles were similar and minor. An editorial commends the study but also notes that it was small—120 patients and purist. Purist in the sense that all patients had urate crystals demonstrated in their synovial fluid before treatment. Also commented upon was the low incidence of gastrointestinal problems with naproxen. Not unexpected as patients with this risk were excluded.

Lancet 2008;371:1854–60 & 1816–7

## **A new anticoagulant—rivaroxaban**

Two reports have recently appeared in the *NEJM* on this topic. These trials, one concerning knee surgery and the other hip surgery, have compared the efficacy and safety of rivaroxaban, an oral direct inhibitor of factor Xa, with conventional subcutaneous enoxaparin thromboprophylaxis.

Over 7000 patients were involved. Half were given rivaroxaban 10mg orally daily after surgery, and the other half 40mg of subcutaneous enoxaparin the day before surgery and on subsequent days. Both trials reported that once-daily, 10-mg oral dose of rivaroxaban was significantly more effective for extended thromboprophylaxis than once-daily, 40-mg subcutaneous dose of enoxaparin in their patients. The two drugs had similar safety profiles. An editorial commentary is favourable but ruefully mentions that less than 60% of such patients receive thromboprophylaxis.

Clearly rivaroxaban promises a lot for all those at risk of thrombosis and we can expect to hear much more about it.

N Engl J Med 2008;358:2765–75 & 2776–86 & 2827–29



## Vulval skin condition

We were interested to see in the 4 July 2008 issue of the *Journal* an illustrated case reported to be genital lupus erythematosus in association with SLE and CREST syndrome (Darwish T. *Medical image. Genital lupus*.

<http://www.nzma.org.nz/journal/121-1277/3136>). Cutaneous lupus affecting the vulva is rare. Previous case reports have described mucosal erosions,<sup>1,2</sup> and irregular plaques of discoid lupus on the labia majora.<sup>3</sup>

Did Dr Darwish consider a diagnosis of lichen sclerosus?

Vulval lichen sclerosus is a very common skin complaint that often starts around the age of 50 years. Unlike cutaneous lupus, which tends not to be itchy, lichen sclerosus often causes intense pruritus. Clinical features include often-symmetrical white, and sometimes erythematous, atrophic, sclerotic and/or hyperkeratotic plaques affecting clitoral hood, labia minora, perineum, and/or perianal skin; associated with erosions and ulceration, haemorrhages, blisters, labial resorption, and adhesions.

Histology is often reported to show prominent hyalinisation of the upper dermis in association with interface dermatitis; it may be similar to scleroderma. The pathological description of 'dystrophy' is outdated. Direct immunofluorescence is negative, unlike cutaneous lupus in which there is deposition of IgG, IgM, and C3 along the basement membrane.

Lichen sclerosus is a chronic autoimmune sclerosing skin disease. It may coexist with localised scleroderma (morphoea),<sup>4</sup> systemic sclerosis, and CRST.<sup>5</sup> These conditions all involve the extracellular matrix; an autoantibody to extracellular matrix protein I is present in up to 80% of patients with lichen sclerosus.<sup>6</sup>

A study of 202 New Zealand women with vulval lichen sclerosus revealed other autoimmune disorders commonly coexisted, particularly thyroid disease (19%) and psoriasis (17%). Antinuclear factor titre was greater than 1:160 in 18% of 142 tested, but none had antibodies to double stranded DNA or other evidence of lupus erythematosus.<sup>7</sup>

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## Response from Dr Darwish

We appreciate Dr Oakley and Dr Rowan comments. We agree that these ivory-white lesions mimic lichen sclerosus (LS). However, the acuity of symptoms in our patient, in addition to the presence of systemic findings of SLE and CREST syndrome, favoured genital lupus over LS.

Although the deposition of IgG, IgM, and C3 along the basement membrane is diagnostic for cutaneous lupus, there are few reports documenting the morphological features of genital lupus.

Of note, the diagnosis can be established based on extragenital lesions and/or histopathological findings.<sup>1</sup>

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## Time to cry “enough”

Whilst circulating at a social function, I found myself chatting with a gynaecologist. Somehow (the fault may have been mine) the topic of general practitioner obstetrics arose. I was mildly surprised when the man took an oblique but stinging swipe at my own obstetric capabilities. It was not a subject on which he could pretend to be well informed, as I gave up midwifery 17 years ago. Having dealt with me, he broadened his gaze, and took a second swipe, this time at the whole of general practice, remarking that in a few years time the nurses would be doing it all.

Over the years, I heard more than one hospital doctor express the low esteem in which he held general practice. I recall one young locum who perceived my practice as a “sniffle mill.” He was the son of a specialist. I knew what his father was up to, and I would not have rated his contribution to medical practice as any greater than mine. I have departed the scene, and I am old enough to cope with the casual insults of a consultant, but the wider implications are alarming. For a senior doctor to anticipate the day when general practice is shovelled out the door is a new perspective, but judged against recent events this attitude does not surprise me.

The fact is that the collapse of general practitioner obstetrics is the worst disaster to occur in the history of medical practice in this country. It is a sorry chronicle of humiliation, treachery, gutlessness, and shame. The doctors of the 1930s were well aware of the dangers of a fixed-fee, State-run, maternity service. They had won most of the fights, but they could hardly have foreseen that a compromise here would lead to annihilation 60 years on. When battle was finally joined, a frenzied feminist attack linked the arms and hands of every actively engaged woman, from the lowliest trainee midwife to the highest political powers. They were surprised by the feebleness of the resistance.

Doctors aspire to be members of “Royal” colleges. These colleges promote their own interests, but they show no interest in the fortunes of others, nor in the advantages of mutual collaboration and support. If a single member of the Royal College of Obstetricians and Gynaecologists had made just one vigorous and publicly audible plea for the preservation of general practitioner obstetrics in the past decade, then I didn’t get to hear it—I may have been away from my desk at the time. What I do hear now is excuses and explanations for bungled obstetric cases from people whom I regard as the most dangerous apologists in New Zealand.

The cone of silence put in place by the doctors smarting from the ignominy of defeat is at last disintegrating, under attack by police and coroners, with even Ron Paterson, the Health and Disability Commissioner, pointing to divisions in maternity care (<http://www.stuff.co.nz/4612121a11.html>). The doctors fear the feminists and they dare not offend. Time after time, our cowardly spokespersons miss the opportunity to say it like it is—and how it was.

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## **A small investment**

The 1428 patients of the Quay Medical Centre Wanganui wish to thank the Minister of Health for the extra 30 cents a head per year investment in Primary Care announced on 7/7/2008. On top of the Ministry fixed fee increase of 50 cents a visit for the over 18s in very low cost access practices, the extra \$1800 per year will contribute insignificantly to the \$50,000 per annum needed to match the recent pay increases for nurses and doctors in the salaried public health service.

The RNZCGP has Aiming for Excellence as an accreditation tool for General Practice. The Minister and Ministry of Health have neither policy nor process for rewarding and remunerating for excellence, achievement, or experience in General Practice.

The Ministry have funded the DHBs \$30 million for the 3000 senior doctors' \$10,000 retention payments, \$1.6 million for rural midwifery retention, but only \$390,000 for General Practice.

What will it take for the Minister and Ministry to recognise the value it gets from General Practice and remunerate appropriately?

Bill Douglas  
General Practitioner  
Wanganui



## **Seroprevalence of HBsAg in females in a North India tertiary care hospital, with special reference to pregnancy**

Infection with hepatitis B virus (HBV) is of global importance. It is important not only because it is associated with acute and chronic hepatitis, liver cirrhosis, and primary hepatocellular carcinoma, but also because it carries the challenge of transmission of infection from mother to the children who more often develop chronicity and then represent the most important reservoir of infection in the community.<sup>1</sup>

Considering this fact, a retrospective analysis was done to determine the seroprevalence of HBsAg in the females over a 4-year period from September 2003 to September 2007 in a tertiary care hospital in North India.

161 out of 5065 females tested were found to be positive for HBsAg serology (ERBA LISA Hepatitis B Kit, Transasia Bio-Medicals Limited, Daman in technical collaboration with ERBA Diagnostics Mannheim GmbH, Germany) thus giving a seroprevalence of 3.17%.

Of these 161 females, 149 (92.54%) were in the reproductive age group (74 in 15–25, 59 in 26–35, and 16 in 36–45 year age groups, respectively). Ten were in the over 45 years age group and 2 were in the under 14 years age group. Out of these two, one was an asymptomatic 7-year-old girl and the other was clinically diagnosed as a case of hepatitis with deranged liver function tests.

Out of a total of 5065 females tested, 2933 had come for routine antenatal checkup. On screening, 51 (1.73%) of them were found to be positive for HBsAg. Though slightly lower, the rate is in accordance with the reported average prevalence of 2.2–7% of HBsAg in India which falls in the zone of intermediate endemicity for HBV infection.<sup>1</sup>

None of these females were symptomatic at any time during pregnancy or had deranged liver function tests. Thus, we assume that they were asymptomatic carriers. However, they had the potential to pass the seropositivity status to their babies.

Due to limited resources, we were unable to perform HBeAg detection in these females—the presence of which would have further consolidated the fact of high risk of maternal fetal transmission of infection. In the absence of immunoprophylaxis, perinatal transmission can occur in 10–20% of females who are HBsAg positive.<sup>2</sup>

Newborns born to such mothers remain at high risk of acquiring infection till the age of 5–6 years, even if they do not become infected at birth.<sup>3</sup>

In India, it is still debatable whether the chances of childhood infection is higher via the horizontal route or the vertical route. However, if vertical transmission is dominant, then it becomes especially important that the first dose of HBV vaccine is administered at birth along with compulsory prenatal testing of all pregnant females for the presence of HbsAg.<sup>4</sup>

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## **Increasing local global health awareness through medical aid**

We report the success of a new model of Medical Aid Project, conducted by two medical students prior to and during their elective. This project developed a relationship between a Brisbane high school and the Lady Willingdon Hospital in Manali, Northern India. Such a relationship can be replicated between hospitals in developing countries and local schools or community organisations.

New Zealand doctors and medical students have demonstrated their passion for sending aid to developing countries through Medical Aid Abroad New Zealand (MAANZ) and the Medical Aid Abroad Programme (associated with the New Zealand Medical Students' Association).

Similar global health organisations in Australia have also reported increasing active memberships and their associated medical aid projects are proving very successful.<sup>1,2</sup> These projects provide both short-term and long-term aid to developing communities and increase global health awareness amongst medical students.

Our project model extended this health awareness by building relationships between local high school students and a developing community.

This project was initiated through consultation with the social worker at The Lady Willingdon Hospital (LWH) and local priorities were also identified by two New Zealand-trained and registered doctors (Drs Jeph and Kaaren Mathias) who run the LWH peripheral clinic at Jibhi.

The aim of this project was to identify a number of small sub-projects which would allow sponsors to adopt a specific venture and develop with it. Ideally sponsors are requested to continue with their selected project on a recurrent basis. Projects included NZ\$300 for a health camp, \$350 to employ a community health worker for a year, or \$950 to vaccinate a school.

The small projects approach proved very successful; students being motivated to raise funds for these specific goals. Additional corporate support supplemented their fundraising, and contributions from Medical Insurance Group Australia, Johnson and Johnson, SDL Tridion Amsterdam, and many private donors are gratefully acknowledged.

Over \$13,000 in cash was raised, and medical supplies valued at \$4000 were donated. However, as mentioned, perhaps the greatest success was the awareness raised of the issues these projects addressed whilst the students were raising the funds.

Furthermore, feedback was then given to the school students following completion of the projects, both by the hospital and the returning elective students.

The enthusiasm generated has resulted in the Brisbane school (Gregory Terrace) recommitting to the project and it being joined by its sister school, All Hallows', in 2008. The project is being continued by a new cohort of elective students who will be visiting India for their elective this year.

Accountability of donated money is ensured by elective students witnessing its use. All monies were collected through and transferred from the school, for added transparency.

This project has demonstrated that a meaningful relationship can be established between a developing community and local school students. This model can be easily replicated between hospitals in developing countries and any type of local organisation, thus enhancing global medical awareness in the community.

University medical elective students are ideal ambassadors for such projects; their involvement also adding considerably to their experience.

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## Stephen Watson Taylor

1926–2008

Stephen graduated from Otago Medical School as a committed socialist in 1951.

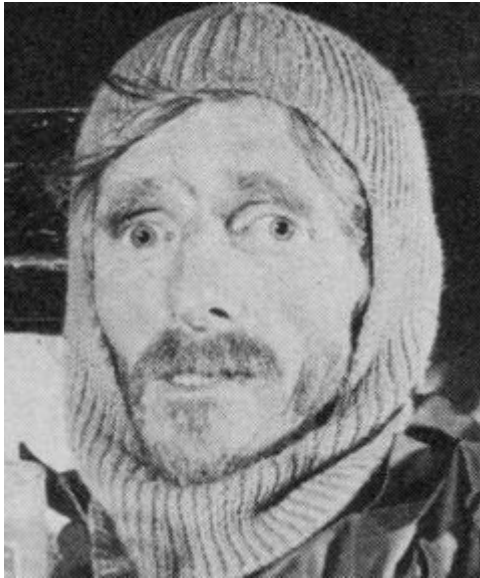


Photo from Tim Shadbolt's autobiography  
*Bullshit and Jellybeans* (1971)

He hung his plate in the new state housing developments of Mount Roskill in 1953.

In 1959 after the US Surgeons General Report on Smoking and Health, he called a public meeting at the Mount Roskill Council Chamber and became the founding patron of NASH—National Action on Smoking and Health. This small group later evolved into the worldwide network of anti-smoking charities (ASH). He campaigned hard for a legislative ban on the advertising of cigarettes and in 1963 New Zealand became the first country to withdraw tobacco advertisements from television and the print media.

He was to be a sole practitioner in Mount Roskill for 20 years.

With a long interest in natural childbirth and as a follower of Grantley Dick Read in the late 1970s, he commenced practise in Ponsonby as a home birth doctor. He became an advocate for reform of the legislation prohibiting home birth.

A well-known supporter of the political left, he fasted in Albert Park in 1970 for 40 days on a glass of water per day in a personal protest against New Zealand's involvement in the Vietnam War (see photo).

He was never content with the status quo, and by the 1970s had taken the view that medical intervention was often unhelpful and that the body would in time heal and solve its problems of (and in) itself. To the dismay of his patients, he was strongly against the use of drugs such as alcohol, tobacco, tea, coffee and the prescription of pain killers and antibiotics—unless absolutely medically necessary.

After his experience of the demands of sole practice he saw a need for out-of-hours medical services and with support from a business friend in the 1970s he opened the first out-of-hours emergency practice in the Khyber Pass in Auckland.

In the early 1980s he worked at the “front lines” in the Springbok Rugby Tour demonstrations, helping demonstrators who had been injured in the rioting by the famous Red and Blue Squad “crowd control” tactics.

He travelled the world, and in his later years lived in Brisbane having retired to write on philosophy, politics, childbirth, and mathematics. He developed a theory of number based on the circle (Circlemaths) to which he devoted many of his final years.

When faced with a respiratory illness in his last days he declined drugs and passed away on 5 July 2008 at the Cook Hospital in Gisborne with his family close at hand.

He is survived by his wife Carol, four sons and a daughter, and his older brother Dr Robert C Taylor of Napier.

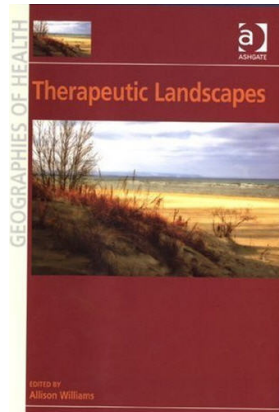
Peter Taylor (one of Stephen's sons), a solicitor in London England, wrote this obituary on the suggestion of Dr Bill Brabazon who attended Otago Medical School with Stephen in the late 1940s.



## Therapeutic Landscapes (Geographies of Health)

Allison Williams (ed). Published by [Ashgate Publishing Group](#), Dec 2007.

ISBN 9780754670995. Contains 400 pages. Price £49.50 (online)



Health researchers are increasingly recognising that various features of places are critical to the understanding of health outcomes and health-related experiences.

This edited collection contributes to this growing research agenda, and draws together 21 essays which adopt the concept of therapeutic landscapes.

Based on the original work by Gesler, therapeutic landscapes have recently emerged as a field of research endeavour in health geography, and are increasingly contributing to the wider field of population health.

Therapeutic landscapes are defined as providing ‘a framework for the analysis of natural, built, social and symbolic environments as they contribute to healing and well-being in places’.

The focus of early research was on ‘extraordinary’ places such as spas, gardens for the elderly, children’s health camps, and respite centres. As this collection of essays demonstrates, the research agenda has since widened to recognise that more mundane, everyday places such as the backyard, hospital room, or imagined landscapes can have similar properties.

It is argued that an appreciation of these therapeutic goods has the potential to contribute to key public health concerns such as addressing health inequalities, and providing health-sustaining environmental settings.

Structured into five sections, the first part of this book considers the health-related qualities of some more traditional therapeutic landscapes including a chapter on New Zealand beaches as simultaneously therapeutic and risky places.

Sections 2 and 3 are devoted to the therapeutic properties of landscapes for specific population groups (e.g. urban residents and addicts), and the therapeutic properties of health care sites including hospitals and assisted living homes.

A set of critical perspectives are provided in section 4, whilst the final section presents a set of novel anthropological contributions. The quantitative and qualitative methods adopted by the authors are diverse, and include approaches such as photovoice and documentary analysis that will be novel to many health researchers.

This is a well-organised book that reaches beyond the discipline of Geography and makes interesting synergies with other research themes including health inequalities or contextual/environmental determinants of health.

The book is an excellent introductory text for population health researchers from a range of disciplines who wish to broaden their theoretical frameworks and consider the multiple ways in which places influence health.

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