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Adherence with self-administered treatment of latent tuberculosis infection in Auckland

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The aims of this study were to determine the level of adherence to self-administered treatment of latent tuberculosis infection with isoniazid, client understanding of treatment and their knowledge of the symptoms and signs of hepatotoxicity. Seventy-six people were interviewed. Findings included a high level of understanding of the drug regimen and reasons for treatment, a high level of adherence (compared to other studies) ranging from 72% to 89% (using various definitions of adherence) and a low level of knowledge of the side effects of isoniazid. Clinicians prescribing treatment of latent tuberculosis infection should be alert to the possibility of non-adherence, ensure client understanding of the signs and symptoms of hepatitis and inform the client's general practitioner when treatment is commenced.

Tuberculosis is a relatively common communicable disease in New Zealand, with an average annual rate during 1995-99 of 10.3 per 100 000, and the rates are not declining.¹ Most people infected by tuberculosis have latent tuberculosis infection (LTBI), are non-infectious and feel well but can be identified by Mantoux testing. People with LTBI have widely varying risks of progression to active tuberculosis disease (TBD) depending upon their age, inhaled dose, time since infection, degree of immunosuppression and other factors. Isoniazid (INH) is effective in preventing TBD in people with LTBI.^{2,3} Ministry of Health guidelines recommend INH treatment for people at risk of TBD, usually for a duration of six months (see box).⁴ INH causes hepatitis in up to 2.3% of those treated.⁵ Non-adherence or partial adherence results in reduced efficacy^{2,3,6} and wasted health care resources. Overseas studies have found that adherence to treatment of LTBI ranges from 60-80%.⁷⁻¹³ There are no published New Zealand data on adherence.

During 2000, 501 courses of INH treatment for LTBI were prescribed in New Zealand, mostly for contacts of TBD cases or for immigrants (ESR surveillance data). In Auckland, treatment is supervised by public health nurses (PHNs). Medication for clients who self-administer treatment is delivered three-monthly

by their PHN who visits monthly and monitors adherence by pill counting or syrup volume estimation. Clients with risk factors for non-adherence or unsatisfactory pill counts or syrup volume estimation receive directly observed therapy (DOT) or have their treatment discontinued.

The aims of this study were to determine the level of adherence to self-administered treatment of LTBI with INH and client understanding of treatment and knowledge of the symptoms and signs of INH-related hepatitis.

Methods

Consecutive clients who had started daily self-administered INH treatment between May and November 1999 were identified

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Current guidelines for treatment of latent tuberculosis infection (LTBI)

These guidelines are based on the *Guidelines for tuberculosis control in New Zealand*.⁴ Revision of the *Guidelines* is planned for 2002.

Treatment for LTBI is especially important among the following groups:

- Children under five years who are close contacts of infectious cases
- People aged 0-34 years who have had a Mantoux conversion (ie, 10mm increase in the diameter of induration) within the last two years
- People aged 0-34 years with a positive Mantoux test and one or more risk factors for infection progressing to disease (recent infection, exposure to high doses of bacilli, large Mantoux reaction, immunosuppression, concurrent predisposing medical conditions, low body weight)
- Mantoux-positive untreated people with a risk factor for reactivation of disease, who have evidence of minor old, inactive tuberculosis on chest X-ray (CXR), after investigation for active disease. The extent of the CXR

abnormality should be discussed with a chest physician – preventive treatment with more than one drug may be appropriate

- HIV-infected people with low CD₄ counts (<500 cells/mm³) and Mantoux result >5mm.

Tuberculosis disease (TBD) must be excluded before treatment of LTBI. Liver function must be tested before treatment (and during treatment for adults). Absolute contraindications to isoniazid treatment include TBD (which requires multi-drug treatment) and acute liver disease. Relative contraindications include increasing age over 35 years, interacting drugs (eg, phenytoin), regular alcohol use (especially if excessive), peripheral neuropathy, major concerns about compliance, and pregnancy.

If treatment is contraindicated or declined both patient and doctor must have a low threshold for investigation of symptoms of TBD, such as cough lasting more than two weeks or other persistent systemic symptoms. Serial CXR monitoring may also be appropriate in management.

from the notifiable disease register held by Auckland Healthcare (now Auckland District Health Board). A completion rate was calculated for all clients. Completion was defined as receiving six months' supply of medication from the PHN and reporting to the PHN at the end of treatment that all medication had been taken.

Clients who were in their last three months of treatment or had completed treatment within the past month were enrolled in a detailed study of adherence, because anecdotal experience within the service suggests that adherence is hardest to maintain towards the end of treatment. Clients were excluded if they were on DOT, had stopped during the first three months of their course of treatment, or were considered by the PHN to be unsuitable for interview because of their individual circumstances.

Participants' self-reported adherence was assessed by face-to-face interviews using a standardised questionnaire administered by two healthcare students. Written informed consent was obtained prior to interview. Interpreters were used if needed. If participants' medication was administered by a caregiver, the caregiver was interviewed instead. To encourage accurate reporting of adherence the interviewer stressed that the study was an audit of the effectiveness of the public health service and that the participant's information would not be shared with the PHN. The PHN responsible for each case was also asked to make an assessment of the participant's adherence.

Adherence was also assessed objectively in some participants. A pill count or syrup volume estimation was made if medication was available at interview. In addition, five participants whose adherence was doubted by the PHN had medication containers fitted with electronic drug exposure monitors (lids fitted with a microchip which records each date and time the lid is removed) to provide another measure of adherence.

Participants were also questioned on their understanding of tuberculosis infection, their drug regimen and their recall of the symptoms and signs of hepatitis (feeling sick, itchy skin, stomach ache, dark urine, pale stools, yellow eyes or skin). Interviewers were trained to assess the responses and decide if the response was correct or incorrect. After their recall of side effects had been tested, each participant received an explanation of the side effects. They were then asked what they would do if they experienced any of the side effects.

Various definitions of adherence were developed for this study because there is no internationally accepted standard definition. Several definitions used in this study (missing no more than

one dose per week, lid monitoring, pill count suggesting that at least 80% of medication had been taken) were designed to identify those who took at least 80% of their medication doses. This threshold was chosen because several studies have reported that prophylaxis is most effective if associated with at least 80% adherence.^{2,3} Risk factors for non-adherence were examined using a composite measure that identified participants as adherent if they satisfied all adherence definitions at interview and by PHN assessment.

Categorical and continuous variables were tested for statistical significance using χ^2 and t-tests respectively. The ethics committee considered that the study was an audit and ethics approval was not required.

Results

Study participants: Of 161 people who started treatment during the study period, 29 were on DOT, 13 stopped treatment during their first three months of treatment and two were considered by the PHN to be unsuitable for interview due to life stresses at the time. Of the 13 who stopped treatment, reasons for treatment cessation were: non-adherence (6), becoming pregnant (2), drug side effects (2) and unknown (3). Files for a further 12 cases were received too late for inclusion in the study. Thus, 105 clients were eligible for inclusion. Of these, 20 could not be located for interview and nine refused to participate, leaving 76 participants and giving a response rate of 72.4%.

Table 1. Treatment completion among 161 consecutive clients commencing self-administered isoniazid in Auckland, 1999

Outcome of allocation for study of isoniazid adherence	Number commenced on treatment	Number completing treatment	
		n	%
Did not meet inclusion criteria for interview	Managed by DOT ¹	29	100
	Stopped treatment during first 3 months	13	0
	PHN ² considered unsuitable for interview	2	100
	Files received too late for inclusion in study	12	91.7
Met inclusion criteria for interview	Could not be located for interview	13	65.0
	Refused interview	7	77.8
	Interviewed	67	88.2
All clients	161	129	80.0

Notes: 1 DOT, directly observed therapy
2 PHN, public health nurse

Participants ranged in age from 1 to 52 years (median 24 years). Of the study participants, 6.6% were Maori, 11.8% were Pacific Islands people, 34.2% were Asian, 2.6% were European and 44.8% were of other ethnicity (predominantly from Africa, Iran, Iraq or Afghanistan). Participants did not differ in gender ($p = 0.4$), age ($p = 0.5$) or ethnicity ($p = 0.9$) from the 41 non-participants who declined to take part, who could not be contacted or whose files could not be found in time for the study.

Completion rates: The completion rate for all those treated is shown in *Table 1*. The overall rate for the 161 people who started daily self-administered INH treatment between May and November 1999 was 80.0%.

Adherence rates: The rates of adherence for the 76 study participants, using various definitions, are shown in *Table 2*. Adherence rates for objective measures (pill count or syrup volume estimation, electronic monitor) and subjective measures (participant self-report at interview, PHN assessment) all yielded similar estimates ranging from 80.0% to 89.5%. Agreement between the measures was 80-85% but with low kappa scores.

Table 2: Adherence to treatment among 76 clients taking self-administered isoniazid in Auckland, 1999

Assessment of adherence	Definition of adherence	Number adherent	Total number	Percentage adherent (95% CI)
Assessment by client self-report at interview	Missed ≤ 1 dose per week in the first month	68	76	89.5 (80.3-95.3)
	Missed ≤ 1 dose per week in the last or most recent month	66	76	86.8 (77.1-93.5)
	Did not miss > 7 daily doses consecutively	67	76	88.2 (78.7-94.4)
Assessment by PHN ¹	PHN considered client was adherent	65	76	85.5 (75.6-92.6)
Objective assessment of adherence	Pill count or syrup volume estimation indicated $\geq 80\%$ of doses taken	49	55 ²	89.1 (77.5-95.9)
	Electronic lid monitor removed on $\geq 80\%$ of days prescribed	4	5	80.0 (28.4-99.5)
Composite measure of adherence ³		55	76	72.4 (60.9-82.0)

Notes: 1 PHN, public health nurse

2 Pill count was not possible for 21 participants because they had completed treatment or did not have their medication available at interview.

3 Participant adherent according to all definitions except lid monitoring and pill count or syrup volume estimation.

The reasons given for interrupting self-treatment were (in order of frequency) forgetting, feeling unwell, running out of medication, developing symptoms of hepatitis, being scared of overdosing, wanting to drink alcohol, syrup crystallising in the fridge, pregnancy, or child refusal to take medication.

Risk factors for non-adherence: Ethnicity was significantly associated with adherence. Maori or Pacific Islands participants were more likely to be non-adherent according to the composite measure than European or other ethnic groups (odds ratio 7.3, 95% confidence interval [CI] 1.6-32.9). No significant association with adherence was found by gender, proportion with English as a second language, alcohol intake, reason why the participant came to clinical attention, level of participant understanding of reason for taking INH, level of infectivity of the source case, and level of satisfaction with information provided about tuberculosis and INH.

Knowledge of treatment regimen and side effects: Responses to questions regarding knowledge of LTBI, INH treatment and side effects are shown in *Table 3*. Thirteen clients (17.1%) could not explain why INH had been prescribed for them, and six (7.9%) reported that they either did not know or did not believe that they were infected with tuberculosis. Sixty-six participants (86.8%) reported taking INH before food, five (6.5%) reported taking INH on a full stomach and five (6.5%) took INH either before or after food. When asked what they would do if they experienced any side effects, 89.5% of

Table 3: Knowledge of latent tuberculosis infection, treatment regimen and side effects among 76 clients taking self-administered isoniazid in Auckland, 1999

Question topic	Percentage of participants with correct response to question (95% CI)
Daily dose of isoniazid (INH)	98.7 (92.9-99.9)
Daily dose of pyridoxine	98.3 (90.6-99.9)
Relationship of INH to food	86.8 (77.1-93.5)
Purpose for which INH given	82.9 (72.5-90.6)
Whether infectious to others	77.6 (66.6-86.4)
Whether able to take alcohol while taking INH	87.0 (66.4-97.2)
Nominated at least one symptom of hepatitis	30.3 (20.3-41.9)
Nominated jaundice as a symptom of hepatitis	9.2 (3.8-18.1)

participants said that they would seek advice, mostly from a general practitioner or PHN. Six (7.9%) said that they would continue taking INH, one person said he would stop taking INH and one participant indicated he would use home remedies to treat the side effect.

Discussion

We found a higher level of adherence with self-administered INH treatment than others have reported.⁷⁻¹³ There are several possible reasons for this. Firstly, there may have been bias in the information collected about adherence. Self-report and pill counts have been shown to overestimate adherence.¹³ Recall bias will have affected the accuracy of responses among those who were being asked about adherence to medication completed up to seven months earlier. The participants may also have overestimated their compliance out of a desire to please the interviewer. We tried to minimise this source of bias by emphasising that the survey was an audit of the effectiveness of the service, and by giving assurance that their responses were confidential and would not be reported to their caseworkers.

Secondly, adherence among study participants may not have been representative of overall adherence among all clients receiving INH. We did not include thirteen people who had started INH but had failed to complete three months of treatment. Of these, six were considered non-adherent by the PHN. We also did not include clients placed on DOT who were considered at high risk for non-adherence. Finally, adherence among those who were eligible for inclusion in the study but did not participate may have been less than that of study participants. The rate of treatment completion among the twenty clients who could not be traced and the nine who refused interview was lower than that for the interviewed clients.

It has been suggested that multiple measures of adherence are necessary to estimate true adherence.¹⁴ We found only modest agreement between the measures used, with low kappa scores because of small numbers. We recommend that adherence to treatment among self-medicating clients with LTBI should be monitored by more methods than just self-reporting. All clients should have pill count or syrup volume estimation at least monthly. More rigorous methods of monitoring should be used for those whose adherence is doubtful. Electronic drug exposure monitors record the time and date when medication container lids are removed.¹⁵ While this does not prove that the medication was ingested, research shows close correlation between lid monitoring and desired clinical response in treatment of HIV infection,¹⁵ hypertension¹⁶ and depression¹⁷ An alternative is to prescribe Vitamin B₂ (riboflavine) with INH. Urine of people who have taken Vitamin B₂ in the past 48 hours will fluoresce when illuminated against ultraviolet or torch light.¹⁸ Clients who agree to random urine testing can be inexpensively monitored using this approach. DOT is necessary for clients at high risk of both non-adherence and progression to TBD.¹⁹

In this study, the only factor found to be associated with non-adherence was ethnicity. More effort will be required to determine reasons for non-adherence among Maori and Pacific Islands clients

and to support them during treatment. Methods of improving adherence include the use of DOT, blister packaged medications, electronic drug exposure monitors, short course regimens, culturally appropriate client information, ethnic outreach workers and incentives and enablers.^{14,19,20}

Most people understood the reason and details for their treatment. However, a few clients did not know or believe that they were infected with tuberculosis, could not explain why INH had been prescribed for them or did not know that they were not infectious to others. Client understanding of the rationale for treatment and the details of the treatment plan is associated with improved adherence.²¹

Hepatitis is the most common serious side-effect of INH therapy. Most cases of INH-related hepatitis that result in death or lead to liver transplantation occur in people who continue to take INH after hepatitis symptoms, including jaundice, become apparent.^{22,23} The poor knowledge in this study population of hepatitis signs and symptoms is cause for concern. At present, clients are informed of hepatitis symptoms by the PHN when they commence INH. Repeated education (using translated material) about hepatitis signs and symptoms is needed throughout treatment.

Clinicians prescribing treatment for LTBI should be alert to the possibility of non-adherence, ensure client understanding of the signs and symptoms of hepatitis and inform the client's general practitioner when treatment is commenced. Medical practitioners need to be aware of INH-related hepatitis and ask about drug treatment in people presenting with hepatitis.

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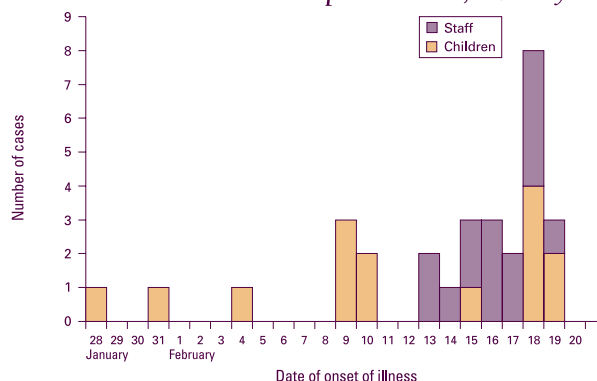
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Surveillance and control notes

Molecular subtyping links geographically separate shigellosis outbreaks

Simultaneous outbreaks of *Shigella sonnei* gastroenteritis occurred in February 2001 at a health camp for children in Auckland and at an elderly care facility on the other side of the city (40 km away). At the camp, 15 (37%) students and 15 (28%) staff met case criteria. The epidemic curve for these cases is shown in *Figure 1*. A case-control study of the camp outbreak found that contact with human faeces (odds ratio [OR] 4.0; 95% confidence interval [CI] 1.0-16.3; $p = 0.05$) and, for staff, eating camp food (OR 6.9; CI 1.0-50.0; $p = 0.06$) were independent risk factors for illness. An investigation at the elderly care facility found that 4 (19%) residents and 4 (25%) staff met case criteria, and all cases subsequent to the index case could be explained by person to person transmission. Molecular subtyping confirmed that the outbreaks were related to each other and to other cases in travellers returning from Samoa to Auckland

Figure 1: Date of illness onset among 30 cases of gastroenteritis associated with a camp in Auckland, February 2001



and other New Zealand cities over a four month period. Intensive interviews with the index cases of each outbreak found that the only shared source of potential exposure was consumption of fruit from a single fruit shop situated equidistant between the two outbreak sites. The fruit shop owner declined to participate in the investigation.

This outbreak investigation illustrates the potential of molecular subtyping for identifying common sources of outbreaks. With expanded technological capability New Zealand could perform routine molecular subtyping of selected organisms to improve the specificity for detecting dispersed outbreaks with a common source, enhancing the effectiveness of outbreak investigation and management (Reported by Dr Philip Hill and Dr Greg Simmons, Auckland Public Health Protection).

Sexually transmitted infections in 2000

Surveillance of sexually transmitted infections (STIs) in New Zealand has been based on data supplied by sexual health clinics. The 32 sexual health clinics record anonymous monthly data on new STI cases (ie, cases not previously seen at the clinic) and forward this data to ESR on a monthly basis. Clinic-specific STI rates are expressed as a percentage of the total number of clinic visits per month for any reason (first and follow-up inclusive). Since the surveillance is limited to sexual health clinics, the results may not be representative of the epidemiology of STIs in the New Zealand general population.

In 2000, the 32 sexual health clinics reported 8084 new STI cases, 11.1% of the 73 135 clinic visits. The majority of sexual health clinic attendees were aged 15-24 years (53.3%) and female (59.2%). The STIs diagnosed in each clinic in 2000 are shown in *Table 1*. Genital warts continue to be the most common STI among sexual health clinic attendees, diagnosed in 3198 patients, 3% more than the 3100 cases reported in 1999. The rate of genital warts among attendees in 2000 was not significantly different to the rate in 1999 (4.4% vs 4.5%; $p = 0.3$). Rates of genital warts were highest in attendees aged 20-24 years (5.6%). Rates of genital warts did not vary by ethnic group.

A total of 2871 confirmed chlamydia cases were reported by sexual health clinics in 2000, 23% more than the 2331 cases reported in 1999. The rate of confirmed chlamydia cases in 2000 (3.9% of patients) was significantly higher ($p < 0.01$) than in 1999 (3.4%).

This increase may be partly attributable to increased use of nucleic acid amplification tests (NAAT) for diagnosis. Rates of chlamydia were highest among clinic attendees aged 15-19 years (6.3%). Rates of chlamydia among sexual health clinic attendees were higher among Pacific Islands peoples (9.5%) and Maori (8.1%) than in Europeans (2.8%).

Confirmed gonorrhoea was reported in 492 sexual health clinic patients in 2000, 28% more than the 384 cases reported in 1999. The rate of confirmed gonorrhoea in 2000 (0.7%) was significantly higher ($p < 0.01$) than in 1999 (0.6%). Rates of gonorrhoea in sexual health clinic attendees were highest among those aged 15-19 years (1.2%), and were higher among Pacific Islands peoples (3.3%) and Maori (1.9%) than among Europeans (0.3%).

A total of 684 genital herpes cases were reported in 2000, three less than the 687 cases reported in 1999. The genital herpes rate among sexual health clinic patients in 2000 (0.9%) was not significantly different ($p = 0.2$) than in 1999 (1.0%). Rates of genital herpes diagnoses among sexual health clinic attendees were highest among those aged 30-39 years (1.3%). Rates of genital herpes were higher in Europeans (1.1%) than in Maori (0.6%) and Pacific Islands peoples (0.3%).

A total of 826 cases of non-specific urethritis (NSU) in males were reported in 2000, 5% less than the 874 reported in 1999. The rate of NSU among male clinic attendees in 2000 (2.7%) was slightly lower than the rate in 1999 (3.0%). Rates of NSU were similar in all age groups and in all ethnic groups.

Thirteen syphilis cases were reported in 2000, 43% less than the 23 reported in 1999. The rate of syphilis at sexual health clinics in 2000 (0.02%) was not significantly ($p = 0.07$) lower than in 1999 (0.03%). There were no reported cases of lymphogranuloma venereum, granuloma inguinale or chancroid reported in 2000.

Correction

Figure 1 of the surveillance and control note *Outbreak of Salmonella typhimurium phage type 160 in Auckland linked to an umu function* in the June 2001 issue (volume 8, page 44) has a publication error. The time-range labels indicating hours from meal to onset of illness have been transposed one column to the right of their correct positions. The leftmost column should be labelled '0-8', the next should be labelled '9-16', and so on.

Table 1: Sexually transmitted infection cases and rates by sexual health clinics, 2000

Disease	STI cases ¹ and current rates ² (%) by clinic																												
	Whangarei	Auckland	Hamilton/Tokoroa	Tauranga	Rotonia	Whakatane	Taupo	New Plymouth	Gisborne	Wairarapa	Napier	Hastings	Wanganui	Palm North/Levin	Wellington	Lower Hutt	Poniuia	Nelson	Blenheim	Greymouth	Christchurch	Ashburton	Timaru	Dunedin	Invercargill/Gore	Total			
Genital warts	46	1016	371	123	82	32	24	132	4	4	9	4	25	177	341	51	31	73	44	16	336	6	16	151	84	3198			
	3.4	4.7	4.8	2.9	6.7	3.7	2.7	6.4	0.1	0.8	1.3	0.8	2.9	4.8	1.6	6.2	4.6	6.5	7.9	7.0	3.7	3.5	3.6	6.6	6.5	6.5			
Chlamydia ³	68	787	394	191	88	67	58	128	108	8	71	63	41	143	176	30	36	40	11	3	176	7	24	59	94	2871			
	5.1	3.6	5.1	4.6	7.1	7.7	6.6	6.2	3.7	1.6	10.6	13.0	4.7	3.9	2.4	3.6	5.4	3.6	2.0	1.3	2.0	4.1	5.3	2.6	7.2	3.9			
Gonorrhoea ³	0	223	48	17	11	19	6	21	31	0	17	16	4	12	27	5	5	7	0	0	7	0	12	4	0	492			
	0	1.0	0.6	0.4	0.9	2.2	0.7	1.0	1.1	0	2.5	3.3	0.5	0.3	0.4	0.6	0.7	0.6	0	0	0.1	0	2.7	0.2	0	0.7			
Genital herpes	3	179	72	34	5	7	7	23	2	7	14	2	7	38	131	15	11	8	0	5	81	1	7	17	8	684			
	0.2	0.8	0.9	0.8	0.4	0.8	0.8	1.1	0.1	1.4	2.1	0.4	0.8	1.0	1.8	1.8	1.6	0.7	0.0	2.2	0.9	0.6	1.6	0.7	0.6	0.9			
Syphilis	2	1	3	1	1	1	0	1	0	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	13			
	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0	0	0	0.2	0.1	0	0	0	0	0.1	0	0	0	0	0	0	0	0.0			
NSU (males) ⁴	0	370	40	26	2	4	0	61	0	0	1	7	26	125	43	0	1	17	1	0	81	2	0	0	19	826			
	0	3.5	1.4	2.8	0.4	1.6	0	7.7	0	0	0.4	2.9	8.4	8.1	1.2	0	0.5	3.5	0.4	0	1.8	2.4	0	0	2.6	2.7			
Total clinic visits	1345	21656	7759	4172	1231	872	875	2078	2951	497	667	486	872	3682	7381	824	670	1125	554	228	8997	171	450	2293	1299	73135			
Total male clinic visits	464	10524	2885	920	451	243	235	789	308	64	231	245	309	1536	3688	357	211	486	229	64	4626	85	269	737	740	30696			

Notes: 1 Data based on diagnoses made at sexual health clinics
 2 Based on cases diagnosed, expressed as a percentage of all patient visits
 3 Confirmed cases only
 4 Rate expressed as a percentage of male clinic visits only
 5 Based on data from four Auckland clinics
 6 Based on data from two Wellington clinics

Surveillance data

National surveillance data - May 2001

Disease ¹	Current year - 2001 ²			Previous year - 2000			Trends - May 2001
	May 2001 cases	Cumulative total year-to-date	Current rate ³	May 2000 cases	Cumulative total year-to-date	Previous rate ³	
AIDS	5	14	0.7	4	15	1.0	
Campylobacteriosis	524	3497	222.4	566	3879	243.9	***
Cholera	0	0	0	0	0	0	
Creutzfeldt-Jakob disease	0	1	0.1	0	0	0.1	
Cryptosporidiosis	93	459	31.2	26	107	17.2	***
Dengue fever	0	1	0.2	1	2	0.1	
Gastroenteritis ⁴	44	315	21.4	32	274	18.3	**
Giardiasis	175	671	44.5	177	747	44.9	
<i>H influenzae</i> type b disease	0	4	0.3	1	5	0.2	
Hepatitis A	7	26	3.0	2	24	2.0	**
Hepatitis B (acute) ⁵	6	29	1.9	11	39	2.5	
Hepatitis C (acute) ⁵	6	23	2.1	7	31	2.3	
Hydatid disease	0	1	0.1	0	0	0.1	
Influenza ⁶	13	30	7.5	4	8	19.4	
Lead absorption	13	60	3.7	9	51	3.8	
Legionellosis ⁶	7	36	2.2	4	25	2.1	
Leprosy	1	1	0.1	0	1	0.1	
Leptospirosis	11	43	2.7	7	46	2.4	
Listeriosis	1	7	0.5	1	12	0.7	
Malaria	5	29	3.2	5	26	1.4	133
Measles	3	21	1.4	4	33	2.9	***
Meningococcal disease	46	189	14.6	37	140	14.4	
Mumps	4	20	1.3	6	23	1.6	
Paratyphoid	2	7	0.7	2	5	0.4	
Pertussis	109	838	101.3	285	1312	63.2	***
Rheumatic fever	7	20	2.9	3	23	1.6	***
Rubella	5	14	1.0	2	5	0.7	
Salmonellosis	154	951	52.4	212	855	47.0	**
Shigellosis	14	79	4.0	11	51	3.4	
Tetanus	1	2	0.1	1	1	0.1	
Tuberculosis	39	163	10.2	31	146	11.4	
Typhoid	2	14	0.7	2	11	0.4	
VTEC/STEC infection	11	36	1.8	5	37	1.8	
Yersiniosis	26	184	10.7	24	193	12.5	

Notes: 1 Other notifiable infectious diseases reported in May: Ross River virus infection

2 These data are provisional

3 Rate is based on the cumulative total for the current year (12 months up to and including May 2001) or the previous year (12 months up to and including May 2000), expressed as cases per 100 000

4 Cases of gastroenteritis from a common source or foodborne intoxication eg, staphylococcal intoxication or toxic shellfish poisoning.

5 Only acute cases of this disease are currently notifiable

6 Surveillance data based on laboratory-reported cases only

7 Percentage change is the difference between the number of cases in the current year (12 months up to and including May 2001) and the previous year (12 months up to and including May 2000). This difference is expressed as a percentage of the number of cases in the previous year.

Surveillance data

Surveillance data by health district - May 2001

Cases this month Current rate¹

Disease	Cases for May 2001, ² and current rate ^{1,2} by health district ^{3,4}																								
	Northland	NW Auck	Central Auck	South Auck	Waikato	Tauranga	Eastern BOP	Gisborne	Rotorua	Tauapo	Taranaki	Ruapehu	HawkesBay	Wanganui	Manawatu	Wairarapa	Wellington	Hutt	Nelson-Marl	West Coast	Canterbury	South Cant	Otago	Southland	
AIDS ³	0		3		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
	0.7		1.6		0	0.9	0	0	0	0	0	0	0	0	0	0	0.5	0.9	0	0	1.0	0	0	0	
Campylobacteriosis	8	72	70	54	37	20	4	3	5	4	15	1	24	7	11	2	69	26	3	3	36	13	30	7	
	151.7	227.5	223.0	182.3	274.7	174.7	105.4	142.1	137.9	201.9	193.7	89.5	246.0	141.6	95.1	166.4	307.9	210.4	105.5	191.2	300.3	325.7	250.2	285.7	
Cholera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Creutzfeldt-Jakob disease	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	0	0	0.3	0	0	0	0	0	0	0	0	0	0.7	0	0	0	0	0	0	0	0.5	0	0	0	
Cryptosporidiosis	1	14	18	6	7	1	1	2	1	3	0	0	5	2	1	0	15	3	1	0	5	1	3	2	
	19.0	18.0	30.9	21.9	46.6	19.5	6.0	39.3	69.7	39.1	15.0	0	108.7	30.9	23.3	28.6	30.1	33.9	1.7	30.8	20.7	78.0	33.6	36.8	
Dengue fever	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	0	0	1.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0.8	0	0	0	0	0	0	
Gastroenteritis	1	9	5	2	0	1	0	0	0	0	1	0	0	0	2	0	0	0	1	2	0	18	0	1	
	9.5	22.1	24.9	13.5	2.6	16.0	8.0	6.6	20.1	39.1	35.6	0	1.4	3.3	33.9	28.6	5.8	9.8	26.6	21.6	60.8	64.1	13.9	6.3	
Giardiasis	2	23	21	9	15	15	2	0	4	1	9	1	7	4	8	1	16	5	2	2	23	2	3	0	
	35.7	47.9	70.3	38.6	57.5	71.8	33.8	24.0	62.0	39.1	22.5	11.9	74.6	17.9	23.9	20.8	67.9	30.9	14.6	89.4	34.4	35.2	22.6	19.8	
H influenzae type b disease	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	0	0.5	0	0.9	0.3	0.9	2.0	2.2	0	0	0	0	0	0	0	0	0	1.5	0	0	0.3	0	0	0	
Hepatitis A	0	2	1	3	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
	0	2.3	4.0	6.4	0.7	0.9	0	15.3	3.1	0	0	0	0	0	0	0	1.6	0	1.7	0	10.3	2.5	1.2	1.8	
Hepatitis B	1	0	1	1	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0	
	2.9	1.8	2.6	1.5	3.3	0.9	2.0	0	1.5	3.3	0	0	4.9	0	1.3	7.8	1.2	0	1.7	6.2	2.1	1.3	0.6	0.9	
Hepatitis C	0	0	0	0	0	3	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1	
	0.7	1.0	0.3	0.6	1.0	15.1	6.0	4.4	10.8	0	0.9	0	3.5	0	0	0	2.1	3.0	2.6	3.1	2.3	2.5	1.7	1.8	
Hydatids	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	0	0	0	0	0.3	0.9	0	2.2	0	0	0	0	0	0	0	0	0.4	0	0	0	0	0	0	0	
Influenza ⁵	0	0	5	0	6	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	
	0	0	20.5	0.3	13.6	0	0	0	0	0	0	0	0	0	0	0	8.6	0	0	0	34.4	0	2.3	0	
Lead absorption	0	1	2	2	2	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0	0	2	
	1.5	1.0	2.0	1.5	5.0	2.7	0	6.6	0	3.3	2.8	23.9	3.5	9.8	3.3	2.6	3.7	0	6.0	3.1	7.0	15.1	6.9	1.8	
Legionellosis ⁵	1	0	0	1	2	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	0	0	
	2.9	1.5	0.6	0.9	7.9	0.9	0	0	0	0	0.9	0	0	3.3	0.7	7.8	2.5	4.5	0	0	3.9	0	2.3	0.9	
Leprosy	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	0	0.3	0.3	0.6	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0	0	0	0	0	0	0	
Leptospirosis	4	0	0	1	2	0	0	2	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	
	5.1	1.0	0.6	0.6	5.9	4.4	0	19.7	1.5	0	3.7	6.0	6.3	1.6	3.3	2.6	0.8	0	4.3	3.1	1.0	12.6	1.7	1.8	
Listeriosis	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	0	0.8	0.6	1.5	0.3	0	0	0	0	0	0	0	0	0	0	0	0.4	0.8	0	0	0.8	1.3	0	0	
Malaria	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	
	0.7	0.5	1.2	2.0	3.0	0	0	2.2	0	3.3	1.9	23.9	0.7	0	36.6	0	2.9	2.3	2.6	0	1.6	5.0	0.6	2.7	
Measles	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	
	2.2	2.5	2.3	0.3	0	0	0	2.2	1.5	0	0	0	2.8	1.6	1.3	0	0.4	0.8	1.7	3.1	3.4	1.3	0.6	0.9	
Meningococcal disease	3	5	3	9	7	0	0	1	1	2	1	0	5	0	1	1	0	0	1	1	2	0	3	0	
	22.6	11.4	22.0	36.0	15.5	11.5	19.9	28.4	20.1	26.1	5.6	17.9	18.1	11.4	6.0	20.8	9.1	6.0	6.9	3.1	4.4	5.0	13.3	5.4	
Mumps	0	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
	2.9	0.8	2.3	1.2	0	0	2.0	0	3.1	0	0	6.0	3.5	1.6	1.3	0	2.9	0.8	1.7	0	0.8	2.5	0.6	0	
Paratyphoid	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	0	0.3	1.4	0.6	1.0	0	0	0	0	0.9	0	1.4	1.6	2.0	0	0	0	2.3	0	0	1.0	0	0	0	
Pertussis	3	5	4	9	17	5	0	0	1	0	2	0	0	1	0	0	4	22	5	0	18	2	5	5	
	73.7	35.5	46.3	40.4	166.2	65.6	93.5	80.9	77.5	52.1	6.6	83.6	52.3	14.7	8.6	184.6	63.0	143.3	347.3	626.0	219.1	100.6	154.0	60.2	
Rheumatic fever	1	0	0	0	0	0	3	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	
	7.3	1.3	6.7	8.5	3.6	1.8	21.9	4.4	3.1	0	0	0	2.8	0	0	0	1.6	2.3	0	0	0	0	0	0	
Rubella	0	0	0	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	1	
	0	0.5	0.6	0.9	0	0	0	0	0	0	0	0	4.9	0	0	0	1.6	2.3	1.7	0	2.3	0	1.2	0.9	
Salmonellosis	8	16	13	19	10	5	0	0	0	1	3	2	8	3	4	1	21	8	3	0	14	3	9	3	
	40.1	38.6	39.6	36.9	46.3	36.3	35.8	35.0	26.3	45.6	51.5	59.7	48.8	48.8	55.9	65.0	54.3	44.5	67.7	27.8	67.3	99.3	89.8	118.6	
Shigellosis	0	3	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	3	0	2	0	
	1.5	4.3	10.7	10.5	1.7	0	0	0	1.5	0	0	0	2.1	0	0	0	3.7	3.0	0.9	0	5.4	3.8	2.3	0	
Tetanus	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	
	0.7	0	0	0	0	0	0	0	0	0.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Tuberculosis	2	6	7	7	1	0	0	0	1	0	0	0	2	0	1	0	4	2	0	1	4	1	0	0	
	6.6	8.6	23.1	22.5	6.3	5.3	11.9	8.7	6.2	6.5	0.9	11.9	8.4	0	10.0	5.2	21.0	12.1	1.7	3.1	3.4	1.3	5.2	3.6	
Typhoid	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	0	1.0	1.7	1.8	0.3	0	0	0	1.5	0	1.9	0	0	0	0	0	0.4	0	0	0	0.5	0	0.6	0	
VTEC/STEC infection	0	3	0	2	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	2	0	1	0	
	0	1.0	0	0.6	4.3	4.4	4.0	6.2	0	5.6	6.0	2.8	3.3	0	0	0	0.4	0	1.7	0	1.3	5.0	4.6	2.7	
Yersiniosis	1	3	2	3	3	1	1	0	0	0	0	0	2	0	0	0	4	1	0	2	2	0	1	0	
	2.2	10.9	12.4	8.5	13.6	17.7	17.9	13.1	17.0	13.0	2.8	6.0	8.4	1.6	3.3	2.6	13.2	11.3	6.9	18.5	15.0	16.3	4.6	14.4	

California's successful introduction of smokefree bars

Researchers have studied tactics used by health advocates and the tobacco industry in the policy debate around legislation to make California bars smokefree. The legislation was implemented in 1998 as an extension of 1994 legislation making workplaces smokefree. Strategies used by the tobacco industry to prevent, overturn and encourage non-compliance with the smokefree bar legislation included claims that it would devastate business, deny freedom of choice, and be difficult to enforce. Despite difficulties with promoting and publicising the legislation, health groups were able to uphold the law by framing it as a health and worker safety issue. This stance was reinforced by research showing an improvement in bar workers' health after the law took effect. A number of surveys also demonstrated public support for smokefree bars, and California's sales tax collection agency revealed increases in sales by the businesses involved. (Magzamen S, Glantz SA. The new battleground: California's experience with smoke-free bars. *Am J Public Health* 2001; 91: 245-52).

Editorial note: New Zealand research measuring biological markers of cigarette smoke exposure has shown that workers in hospitality premises without smokefree policies have significantly increased exposure to second-hand smoke (SHS). The Smoke Free Environments Act 1990 contains a provision allowing smoking in licensed premises, but a supplementary order paper to amend the legislation proposes that bars and restaurants should be smokefree while allowing proprietors the option to retain smoking in up to half of the venue's public area if that area is physically separate from the non-smoking area and meets certain ventilation standards. The Health and Safety in Employment Act 1992 requires owners to identify and monitor the risk from SHS to their employees and to eliminate such hazards where practicable. Surveys of New Zealanders' attitudes to SHS indicate support for some sort of restriction on smoking in bars, including 73% of hospitality workers in a recent Wellington School of Medicine study.

Disease eradication: could measles be next?

Six major international disease eradication initiatives were launched during the 20th century, against smallpox, yellow fever, yaws, malaria, polio and dracunculiasis. Of the four that have already been concluded, only the smallpox effort was ultimately successful. Progress against dracunculiasis continues, and polio eradication by 2005 is targeted. Much has been learned about the determinants of eradicability of an organism. The 1997 Dahlem Workshop proposed three disease eradication criteria: (1) biological and technical feasibility, (2) costs and benefits, and (3) societal and political considerations. Measles leads the list of candidate eradicable diseases, but despite compelling biological, technical, and cost-benefit arguments for eradication, securing societal and political support is now recognised as a substantial challenge, particularly in industrialised countries (Aylward B, Hennessey KA, Zagaria N, et al. When is a disease eradicable? 100 years of lessons learned. *Am J Public Health* 2000; 90: 1515-20).

Editorial note: The recent meeting of the Western Pacific Region of the World Health Organization (WPRO) immunisation Technical Advisory Group encouraged member countries to adopt a plan of accelerated measles control to reach the global target of 50% reduction in measles mortality from 1999 levels by 2005. Principal elements of the plan are to (a) improve measles vaccination coverage by implementing catch-up (mass immunisation), keep-up (high routine coverage) and follow-up (repeat catch-up) campaigns; and to (b) improve disease surveillance by emphasising laboratory confirmation of cases. New Zealand strategies consistent with the plan include the recent changes to the vaccination schedule to recommend measles vaccine doses at fifteen months and four years of age, the current MMR catch-up programme for children aged 5-10 years, and work towards establishment of a measles reference laboratory.

Travel health

Changing approaches to malaria prophylaxis

Malaria prevention guidelines for the United Kingdom have recently been updated. They note an increasing incidence of imported falciparum malaria, which has a case-fatality rate of 0.5-1.0% in the UK. Drug resistance of malaria parasites continues to rise, particularly to chloroquine. All travellers should be advised about preventing bites by mosquitoes and other insects. The risk of malaria, and benefits of antimalarial measures, need to be assessed for each traveller. Disease rates vary greatly with over 6% of travellers on no chemoprophylaxis acquiring malaria each month in rural humid parts of west Africa. While most adverse reactions to antimalarials occur within the first few doses, the cumulative risk of malaria is roughly proportional to the length of stay in malarious areas. Hence, longer stays require regimens with higher protective efficacy. Mefloquine, doxycycline and the newer combination of atovaquone/proguanil (Malarone) all offer similar levels of protection of approximately 90% for destinations where chloroquine-resistant malaria are present. The combination of chloroquine and proguanil appears to provide less effective protection for travel to such areas. It is important to observe contraindications to the use of specific antimalarials. Mefloquine should not be given to people with a history of epilepsy or psychiatric illness, including depression. Standby treatment should only be considered for travellers who will be going to remote places where they will be more than 24 hours from a doctor. Such treatment needs to be accompanied by written instructions on malaria symptoms, how to take standby treatment and the importance of swift follow-up by a medical professional. Travellers who develop fever or flu-like illness within 3 months after possible malaria exposure need prompt medical attention. (Bradley DR, Bannister B. Guidelines for malaria prevention in travellers from the United Kingdom for 2001. *Commun Dis Public Health* 2001; 4: 84-101. <http://www.phls.co.uk/publications/CDPHind.htm>).

Editorial note: Most of the general measures in these guidelines are equally applicable to New Zealanders travelling to malarious countries. Atovaquone/proguanil (Malarone) has recently been licensed for prophylactic use against malaria, though proguanil itself is not routinely available here.

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