Diagnostic Efforts for the Detection of *Chlamydia trachomatis* Infections in Iceland 1982–1994

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The results of diagnostic testing for the detection of Chlamydial infections in Iceland during the years 1982 to 1994 were reviewed. During those 13 years 123,461 laboratory tests were performed in 101,574 examinations. These examinations were positive in 14,462 instances. The first diagnostic test to be introduced was cell culture in 1982. From then on the number of examinations and the number of positive examinations increased steadily until 1988, when positive examinations reached a peak at approximately 570 cases per 100,000 inhabitants. In 1990 a sharp decline in both the total number of examinations and positive results was observed. The percentage of positive examinations declined during the study period. In 1991 and 1992 the number of examinations, the number of positive examinations and the percentage of positive examinations increased but the number of positive tests declined again in 1993. In 1994 the polymerase chain reaction assay (PCR) replaced the much less sensitive Chlamydiazyme® assay and the number of positive examinations rose again although the number of tests declined. The dramatic reduction in prevalence experienced in Sweden does not seem to have taken place in Iceland.
In Sweden a substantial effort was made to screen asymptomatic populations. In Iceland the screening of asymptomatic patients increased from the beginning of the study period until 1988 but declined thereafter. Screening of asymptomatic populations as well as contact tracing may be important for bringing about a significant reduction of the prevalence of sexually transmitted infections caused by *Chlamydia trachomatis*.

Introduction

Genital *Chlamydia trachomatis* infections are a major health care problem world-wide (1,2). Accurate figures on the prevalence of these infections, on a national scale, are not available except in a few countries, and comparisons between different communities are difficult. Sweden led the field in providing nation-wide diagnostic facilities for *Chlamydia* infections. Recent reports (3,4) have shown a significant decline in the number of cases diagnosed, indicating a decrease in the prevalence of *C. trachomatis* infections. Since the introduction of diagnostic facilities for these infections in Iceland, a substantial effort has been made to diagnose and treat them. The number of diagnosed cases has declined since the peak in 1988 but the dramatic reduction (40%) reported from Sweden (3) has not been observed in Iceland. Contact tracing and screening of

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asymptomatic patients have been shown to be important for the control of these infections (5,6) but their relative importance is unknown. In this study the results of diagnostic tests for infections caused by *C. trachomatis*, performed in Iceland from 1982 to 1994 were reviewed.

Materials and methods

The population of Iceland increased during the study period, from 231,958 in 1981 to 266,786 in 1994. Diagnostic tests were only available in the Department of Microbiology, at the National University Hospital in Reykjavík until December 1990, when antigen detection tests (Chlamydiazyme®) became available in the Department of Laboratory Medicine, the Regional Hospital, Akureyri, a facility serving a population of approximately 15,000. All records of test results for Chlamydial infections performed in Iceland, from January 1982 to the end of 1994, were reviewed. Cell culture for *C. trachomatis* became available in Iceland in December 1981, the enzyme linked immunoassay, Chlamydiazyme® in 1985 and the polymerase chain reaction (PCR) was introduced in 1994.

The records were kept in hand-written logbooks. Test results from 1990–1994, and for limited periods prior to that, were recorded on computer and were available for a more detailed analysis. The origin, the type of specimen, type of test performed and the test results were noted in all instances. The examinations performed in two clinics, the Sexually Transmitted Diseases (STD) Clinic and the Department of Obstetrics and Gynecology were reviewed. The number of examinations per annum and the rate of positive examinations for each location were recorded. If specimens for two or more tests were obtained at the same time, the tests were considered one examination. If culture and Chlamydiazyme® were performed simultaneously and culture was negative, the examination was considered negative, even if Chlamydiazyme® was positive. The reason for submitting the specimens was unknown in the majority of instances. Specimens submitted to laboratories were identified with a code number in order to assure anonymity of patients. The age and sex of the patient were usually recorded.

Specimens for culture for *C. trachomatis* were collected on cotton swabs (Medical Wire Co.), immediately placed in transport medium, cooled and transported to the laboratory within three hours. In the laboratory the specimens were frozen at -70°C until cultured on McCoy cell monolayers (7). Each specimen was cultured in two vials. After 72 hours one was stained with iodine and examined. If the result was inconclusive, or Chlamydiazyme® had been performed and was positive, a subculture was performed from the second vial. Blind subcultures were not performed. Chlamydiazyme® was performed according to the manufacturer's (Abbott Laboratories) instructions. Blocking assays were utilised from 1990. The Amplicor® PCR was performed on a Perkin Elmer thermocycler according to the manufacturer's (Roche Molecular Systems) instructions.

Results

The number of cultures performed was 41,985, the number of Chlamydiazyme® tests was 72,176 and the number of PCR tests 9300 (total 123,461). The total number of examinations was 101,574 with 14,462 positive results (figure 1). The usage of the different tests is shown in figure 2. The total number of examinations in the STD Clinic was 27,583 out of which 6,422 were positive (figure 3). The total number of examinations performed in the Department of Obstetrics and Gynecology was 27,066 with 2,257 positive examinations (figure 4). The clinic was the only one that consis-

Table I. *Median age and number of male patients examined in the STD Clinic 1990-1994.*

	Patients examined		Patients infected		
Year	N	Median age	N	Median age	(%) positive
1990	1452	24	250	22	(17.2)
1991	1515	23	319	22	(21.1)
1992	582	22	310	22	(19.6)
1993	1598	22	261	22	(16.3)
1994	1932	22	369	22	(19.1)

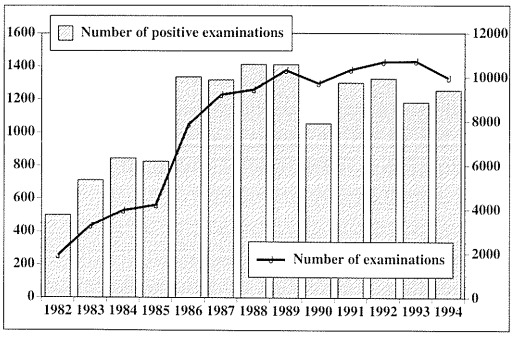

Figure 1. *The total number of examinations (right y-axis) and the total number of positive examinations (left y-axis) 1982–1994.*

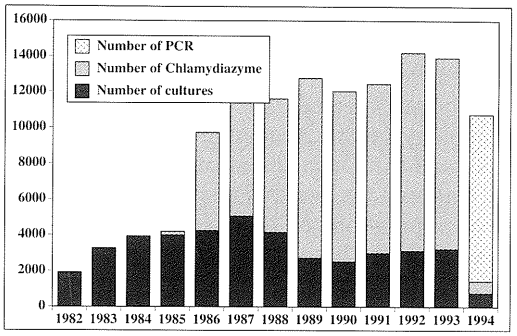

Figure 2. *The number of different tests performed 1982–1994.*

tently screened asymptomatic pregnant women and the screening peaked in 1987 when approximately 1000 women were screened. The screening declined steadily after that, and in 1992 the effort had all but stopped except in women seeking termination of pregnancy. Cell culture was used for diagnosis in the Obstetrics and Gynaecology Clinic until the end of 1988 when the use of Chlamydiazyme® was introduced. The percentage of positive tests is shown in figure 5.

The total number of patients examined in the STD Clinic from 1990 to 1994 and the number of positive examinations of males and females are shown in table I and table II.

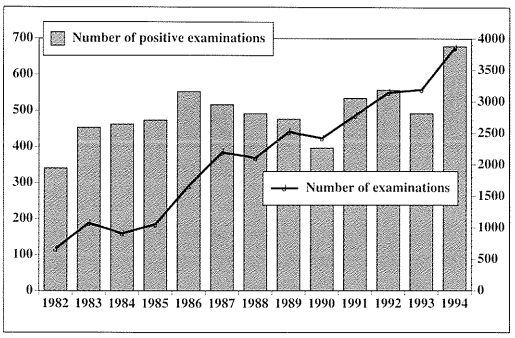

Figure 3. *The number of examinations (right y-axis) and the number of positive examinations in the STD Clinic (left y-axis) 1982–1994.*

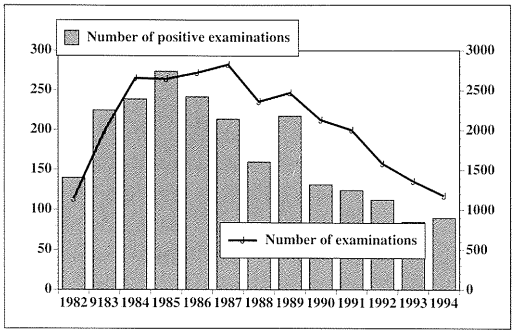

Figure 4. *The number of examinations (right y-axis) and the number of positive examinations in the Department of Obstetrics and Gynecology (left y-axis) 1982–1994.*

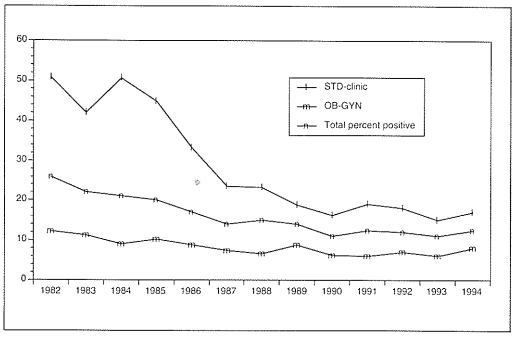

Figure 5. *The percentage of positive examinations in the STD and OB-GYN Clinics and the percentage of all examinations 1982–1994.*

Table II. *Median age and number of female patients examined in the STD Clinic 1990-1994.*

	Patients examined		Patients infected		
Year	N	Median age	N	Median age	(%) positive
1990	923	20	145	19	(15.7)
1991	1263	20	215	19	(17.0)
1992	1561	20	247	19	(15.8)
1993	1592	20	231	19	(14.5)
1994	1927	20	312	19	(16.2)

Discussion

Facilities for diagnosing infections caused by *C. trachomatis* were introduced for routine use in Iceland after a study had indicated that the prevalence might be significant (8). It soon became obvious that these infections constituted a significant health care problem (9,10). Diagnostic efforts where steadily intensified, with increasing number of cases diagnosed until 1988, when the number of cases began to level off. In 1990 the number of diagnosed cases dropped for the first time, raising hopes that the prevalence of the disease was decreasing (11). The drop in diagnosed cases may be explained in part by the introduction of the blocking assay which eliminates false positive Chlamydiazyme® tests. As can be seen in figure 4, there was a marked increase in diagnosed cases in the Department of Obstetrics and Gynaecology in 1988 when Chlamydiazyme® was introduced. This may have been caused in part by increase in diagnostic efforts but false positive tests undoubtedly contributed. False positive Chlamydiazyme® tests have been shown to be most common in specimens from asymptomatic low risk women (12). The number of positive cases dropped below the previous level when the blocking assay was introduced in 1990.

In 1991 and 1992 the total number of diagnosed cases increased again only to drop again in 1993. In 1994 the number of diagnosed cases rose again although the number of examinations declined (figure 1). The most likely explanation for this was the introduction of the PCR assay for routine use. The Amplicor® PCR has been shown to be significantly more sensitive than culture and vastly more sensitive than Chlamydiazyme® (13–15).

There has been a significant increase in patients diagnosed in the STD Clinic after 1990. The clinic moved to a new facility in the beginning of 1991 and contact tracing efforts were intensified and counselling for various youth organisations was initiated. There was also a significant change in the population attending the clinic. Women traditionally accounted for one third of the patients attending the clinic, but by 1992 they constituted 50% of the patient population. The number of diagnosed cases increased correspondingly to the increase in the number of tests but the positivity rate declined. In 1994 the number of examinations increased as did the number of positive tests and the positivity rate rose after the introduction of PCR. The reasons for this are unknown but an increased willingness to come to the clinic for examination has observed after the introduction a urine test in stead of the more invasive tests used previously.

Because of the changes in the diagnostic efforts and tests, care must be taken in interpreting the data. Little can be said with certainty about changes in the prevalence of Chlamydial infections in Iceland. However, it seems unlikely that the dramatic 40% decrease in prevalence reported from communities like Uppsala in Sweden (3) has taken place in Iceland. Judging by the experience in Uppsala, a major reduction in diagnosed cases in Iceland might have been expected. The Department of Microbiology at the Academic Hospital in Uppsala and the Department of Microbiology at the National University Hospital in Reykjavík serve populations of similar size. During the six year period between April 1985 and March 1991, 84,844 examinations were performed in Uppsala (3). During a six year period 1987 to 1993 the number of examinations performed in Iceland was 61,240. In Uppsala more emphasis was placed on screening asymptomatic individuals, such as those attending maternity and family planning clinics. The screening in youth clinics in Sweden has been credited for a significant proportion of the decline in prevalence (16). When diagnostic facilities became available, screening asymptomatic women in maternity clinics was recommended. The Department of Obstetrics and Gynecology at the National University Hospital, where approximately 60% of Icelandic children were born, started screening pregnant women, and the effort increased steadily until 1987. The prevalence of Chlamydial infections in this population was 3.9% (17) and a decision was then made to stop general screening of pregnant women but it was still recommended that women under 24 (prevalence 5.6%) be screened. However, screening decreased steadily after 1987 (figure 5), and in 1994 the only asymptomatic population that was consistently screened were women seeking termination of pregnancy, a group known to have a high prevalence rate of *C. trachomatis* infections (18).

Comparisons of the experiences observed in

Iceland and Sweden suggest that screening of asymptomatic populations is important for bringing about a significant reduction of the prevalence of sexually transmitted infections of *Chlamydia trachomatis*.

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