Low prevalence of *Chlamydia trachomatis* infection in asymptomatic young Swiss men

David Baud¹,², Katia Jaton¹, Claire Bertelli¹, Jean-Pierre Kulling² and Gilbert Greub*¹

Address: ¹Institute of Microbiology, University Hospital Centre and University of Lausanne, Lausanne, Switzerland and ²Recruitment Centre of the Swiss Army, Lausanne, Switzerland

Email: David Baud - david.baud@chuv.ch; Katia Jaton - Katia.Jaton-Ogay@chuv.ch; Claire Bertelli - Claire.Bertelli@chuv.ch; Jean-Pierre Kulling - Jean-Pierre.Kulling@vtg.admin.ch; Gilbert Greub* - gilbert.greub@chuv.ch

* Corresponding author

Abstract

**Background:** Prevalence and risk factors for *Chlamydia trachomatis* infection among young men in Switzerland is still unknown. The objective of the present study was to assess prevalence and risk factors for *C. trachomatis* infection in young Swiss men.

**Methods:** 517 young Swiss men were enrolled in this cross-sectional study during their compulsory military recruitment. Participants completed a questionnaire and gave urine samples which were screened for *C. trachomatis* DNA by PCR. Genotyping of positive samples was done by amplification and sequencing the *ompA* gene.

**Results:** The prevalence of chlamydial infection among young Swiss male was 1.2% (95% confidence interval [95%CI], 0.4–2.5%). *C. trachomatis* infection was only identified among the 306 men having multiple sexual partner. Although frequent, neither unprotected sex (absence of condom use), nor alcohol and drug abuse were associated with chlamydial infection. Men living in cities were more frequently infected (2.9%, 95%CI 0.8–7.4%) than men living in rural areas (0.5%, 95%CI 0.1–1.9%, *p* = 0.046). Moreover, naturalised Swiss citizens were more often positive (4.9%, 95%CI 1.3–12.5%) than native-born Swiss men (0.5%, 95%CI 0.1–1.7%, *p* = 0.003).

**Conclusion:** In comparison with other countries, the prevalence of chlamydial infection in men is extremely low in Switzerland, despite a significant prevalence of risky sexual behaviour. *C. trachomatis* infection was especially prevalent in men with multiple sexual partners. Further research is required (i) to define which subgroup of the general population should be routinely screened, and (ii) to test whether such a targeted screening strategy will be effective to reduce the prevalence of chlamydial infection among this population.

**Background**

*Chlamydia trachomatis* infection is the commonest sexually transmitted bacterial disease in European countries [1,2] and in the United States [3,4]. Although the major impact of disease is on the female genital tract [1,2], men may suffer from urethritis, prostatitis, infertility and Reiter's syndrome [1].
The most frequent risk factors associated with chlamydial infection are related to sexual behaviour, i.e. early age of first intercourse, multiple partners, and inconsistent condom use [1]. Since most infections caused by C. trachomatis are asymptomatic, the establishment of screening programs, as already done in some developed countries, is necessary to control the disease [5].

The studies carried out in Europe on C. trachomatis infection among young males have shown high rates ranging from 7.8–13.3%[1,6-11]. Similar prevalence were observed in other developed (3.7–5.3% [4,12-14]) and developing countries (3.1–7.9% [15,16]).

However, no data are available from Switzerland. The present cross-sectional study is intended to determine the prevalence of and risk factors for C. trachomatis infection among young healthy Swiss males.

**Methods**
In this study approved by the ethical committee of the University of Lausanne (n° 177/06), we included all 18–26 years-old Swiss men who presented for their medical entry examination at the Army Recruitment Centre of Lausanne, Switzerland during winter 2006–2007 and who gave written consent for urinary C. trachomatis screening. The volunteers completed a questionnaire on sociodemographic, sexual and behavioral risk factors. Our questionnaire was adapted from questionnaires used in previous published studies measuring sexually transmitted infections [6,12,17-19]. Completion of the questionnaire was accurately done, since answers to similar and complementary questions formulated in different ways were 97% and 95% congruent for demographic questions and for questions on their sexual activities, respectively. DNA was extracted from centrifuged first-void urine and analyzed by real-time Taqman PCR, as described [20]. This PCR exhibited an excellent analytical sensitivity of 1 copy per reaction, good intrarun and interrun reliability, and a specificity of 100% when considering Cobas AmpliCor as gold standard [20]. Positive samples were then genotyped using ompA sequencing [21]. Statistical analyses were performed using STATA (College-Station, USA). Confidence Intervals were calculated using the Daly method [22].

**Results**
Among 521 eligible men, four did not complete the questionnaire and were excluded. The sociodemographic characteristics of the 517 remaining volunteers are shown in Table 1. The mean age was 20.6 years (standard deviation ± 1.4 years). A total of 87% of the participants reported being sexually-experienced and 59.9% of the participants reported having more than two sexual partners in their life span. The consistent use of condoms for all sexual rela-

| C. trachomatis infection in young Swiss men. In Switzerland, previous studies mainly focused on women and evaluated highly selected study populations [23]. A 2.8% prevalence was recorded among asymptomatic sexually active Swiss women in 1998 [23]. However, studied women were mainly from urban area, where the prevalence is higher. Moreover, age of first sexual intercourse is lower for women or occur with older partner [24], likely also contributing to increased prevalence in women. C. trachomatis is a reportable disease in Switzerland. Since 1999, there has been a significant increase (64%) in the number of official reports of C. trachomatis infection in Switzerland [25,26]. However, among the 517 asymptomatic young Swiss men we investigated, the prevalence was only 1.2%. This Chlamydia prevalence is much lower than that reported for young asymptomatic males in Norway (7.8%) [6], Scotland (9.8%) [8] and the entire UK (13.3%) [1]. In USA, prevalence is also higher

The prevalence of chlamydia infection was 1.2% (95%CI 0.4–2.5%) among all 517 volunteers and of 1.3% (95%CI 0.3–2.4%) among the 450 sexually-experienced men. No participants without or with only a single lifetime sexual partner were diagnosed with chlamydial infection. Conversely, 1.9% (95%CI 0.7–4.2%) of those with multiple sexual partners were C. trachomatis positive. Two men who tested positive for Chlamydia reported having consistently used condoms during all sexual relations. Among the 9 men who reported having had a male sexual partner, none had a positive Chlamydia test. When considering only Swiss born men, the prevalence was 0.5% (95%CI 0.2–2.1%). Conversely, among foreign born naturalized men who originated from Europe, the prevalence was 2.4% (95CI 0.1–13.3%). For those originated from foreign countries outside Europe, a prevalence of 7.5% (95%CI 1.5–21.9%) was observed. Young men living in cities more than 10'000 inhabitants and/or earning more than 2000 SFrs (1600 US$) were at increased risk of C. trachomatis infection (Table 1). Alcohol, cigarette, cannabis and illegal drug consumption were frequently recorded, but were not associated with chlamydial infection. Chlamydial serotypes were E (n = 3), J, Ia and D (n = 1 each).

**Discussion**
Our cross-sectional study provides, for the first time, prevalence data of C. trachomatis infection in young Swiss men. In Switzerland, previous studies mainly focused on women and evaluated highly selected study populations [23]. A 2.8% prevalence was recorded among asymptomatic sexually active Swiss women in 1998 [23]. However, studied women were mainly from urban area, where the prevalence is higher. Moreover, age of first sexual intercourse is lower for women or occur with older partner [24], likely also contributing to increased prevalence in women. C. trachomatis is a reportable disease in Switzerland. Since 1999, there has been a significant increase (64%) in the number of official reports of C. trachomatis infection in Switzerland [25,26]. However, among the 517 asymptomatic young Swiss men we investigated, the prevalence was only 1.2%. This Chlamydia prevalence is much lower than that reported for young asymptomatic males in Norway (7.8%) [6], Scotland (9.8%) [8] and the entire UK (13.3%) [1]. In USA, prevalence is also higher
Table 1: *Chlamydia trachomatis* prevalence according to various demographic and behavioural variables

| Characteristics                        | C. trachomatis negative (%) | C. trachomatis positive (%) | p-value* | Odds Ratio | 95% CI | Prevalence of C. trachomatis Daly 95% CI |
|----------------------------------------|-----------------------------|-----------------------------|----------|------------|--------|----------------------------------------|
| **Total**                              | 511                         | 6                           | 1.2      | 1.2        | 0.4 – 2.5 |
| **Age (year ± SD)**                    | 20.6 + 1.4                  | 20.7 + 2.7                  |          |            |        |
| ≤ 20                                   | 276                         | 5                           | 83.3     | 0.23       | 0.03 – 2.02 |
| > 20                                   | 235                         | 46                          | 16.7     | 0.23       | 0.03 – 2.02 |
| **Nationality at birth**               |                             |                             |          |            |        |
| Switzerland                           | 433                         | 2                           | 33.3     | 0.003      | 0.5    | 0.1 – 1.7 |
| Europe                                | 41                          | 1                           | 16.7     | 5.3        | 0.47 – 59.5 |
| Other                                 | 37                          | 7.2                         | 3        | 17.6       | 2.84 – 108 |
| **Place of residence**                 |                             |                             |          |            |        |
| > 10'000 inhabitants                  | 134                         | 26.2                        | 4        | 66.7       | 0.046  | 2.9    | 0.8 – 7.4 |
| < 10'000 inhabitants                  | 377                         | 73.8                        | 2        | 33.3       | 0.17   | 0.5    | 0.1 – 1.9 |
| **Main occupation**                    |                             |                             |          |            |        |
| Work                                  | 265                         | 51.9                        | 4        | 66.7       | 0.74   | 1.5    | 0.4 – 3.8 |
| Studies                               | 231                         | 45.2                        | 2        | 33.3       | 0.53   | 0.9    | 0.1 – 3.1 |
| Declined to respond                   | 15                          | 2.9                         | 0        | 0          | -      | 0      | 0 – 20     |
| **Monthly income**                     |                             |                             |          |            |        |
| < 1000 Frs.                           | 301                         | 58.9                        | 1        | 16.7       | 0.064  | 0.3    | 0 – 1.8   |
| 1000 – 2000 Frs.                      | 69                          | 13.5                        | 1        | 16.7       | 4.4    | 1.4    | 0 – 8      |
| > 2000 Frs.                           | 112                         | 21.9                        | 4        | 66.7       | 10.8   | 3.5    | 0.9 – 8.8  |
| Declined to respond                   | 29                          | 5.7                         | 0        | 0          | -      | 0      | 0 – 10.3   |
| **Number of lifetime sexual partner**  |                             |                             |          |            |        |
| 0                                     | 67                          | 13.1                        | 0        | 0          | 0.26   | -      | -          |
| 1                                     | 125                         | 24.5                        | 0        | 0          | -      | -      | -          |
| ≥ 2                                   | 306                         | 59.9                        | 6        | 100        | -      | 1.9    | 0.7 – 4.2  |
| Declined to respond                   | 13                          | 2.5                         | 0        | 0          | -      | -      | 0          |
| **Sexual orientation**                |                             |                             |          |            |        |
| heterosexual                          | 386                         | 75.5                        | 4        | 66.7       | 0.66   | ref    | 1          |
| homo/bisexual                         | 9                           | 1.8                         | 0        | 0          | -      | -      | 0          |
| Declined to respond                   | 116                         | 22.7                        | 2        | 33.3       | 1.7    | 0.3 – 9.2 |
| **Condom use**                        |                             |                             |          |            |        |
| Always                                | 165                         | 32.3                        | 2        | 33.3       | 1      | ref    | 1.2        |
| Sometimes                              | 238                         | 46.6                        | 3        | 50         | 1.04   | 0.17 – 6.29 |
| Never                                 | 74                          | 14.5                        | 1        | 16.7       | 1.11   | 0.10 – 12.5 |
| Declined to respond                   | 34                          | 6.7                         | 0        | 0          | -      | -      | 0          |

* Fisher’s exact chi²
Multiple partners and inconsistent condom use are recognised as important predictors of *C. trachomatis* infection [1,6,16]. However, screening on the basis of condom use would have missed a substantial number of infections in the population we studied, since two of six infected men reported having always used condoms. The effect or no effect of condom use as a preventive measure should ideally be confirmed in a larger cohort. In our study, variables associated with *C. trachomatis* infection were "multiple sexual partners", "living in a large city" and "foreign born, naturalized". The higher prevalence observed in the latter subgroup, similar to that of other European and non-European countries, demonstrate that the overall low prevalence of 1.2% we observed was not due to a low sensitivity of the PCR, but rather reflects a true local difference in prevalence. Serotype E was more prevalent in Switzerland, as it is the case in other European countries [21,27].

## Conclusion
This is the first study of the prevalence of *C. trachomatis* infection conducted in young Swiss males. Since military service is compulsory for all Swiss men, the study population we screened corresponds to an unselected and unbiased representative sample of young healthy Swiss men. Despite a prevalence of sexual risk behaviour which is similar to that recorded in other countries [24], *C. trachomatis* prevalence in Swiss males is extremely low. In the future, in order to identify populations with a high prevalence that may benefit from mass screening, it will be important to more precisely identify risk factors associated with chlamydial infection.

## Competing interests
The author(s) declare that they have no competing interests.

## Authors' contributions
DB and GG initiated and designed the study, interpreted the results. DB, CB and GG performed the statistical analyses. DB and JPK were responsible for patient recruitment, clinical assessment, data management and blood sampling. KJ and GG did the laboratory analyses. The paper was written by DB and GG, and reviewed by all other contributors.

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