

5. Bartelds AIM. Continuous morbidity registration at Dutch sentinel stations 2003. Annual Report, NIVEL, Utrecht, the Netherlands, 2004.
6. Paget WJ, Meerhoff TJ, Rebelo de Andrade H on behalf of EISS. Heterogeneous influenza activity across Europe during the winter of 2002-2003. *Euro Surveill*. 2003 Dec 1; 8(12):230-9.
7. Aymard M, Valette M, Lina B, Thouvenot D, the members of Groupe Régional d'Observation de la Grippe and European Influenza Surveillance Scheme. Surveillance and impact of influenza in Europe. *Vaccine*. 1999; 17:S30-S41.
8. Fleming DM, van der Velden J, Paget WJ. The evolution of influenza surveillance in Europe and prospects for the next ten years. *Vaccine*. 2003; 21: 1749-1753.
9. European Commission Directorate-General 'Health & Consumer Protection'. Decision 2119/98/EC of the European Parliament and of the Council of 24 September 1998: Setting up a network for epidemiological surveillance and control of communicable disease in the community. *Official Journal of the European Commission* 1998; 8: L268/1-L268/7.
10. Fleming DM, Chakraverty P, Sadler C, Litton P. Combined clinical and virological surveillance of influenza in winters of 1992 and 1993-4. *BMJ*. 1995 Jul 29; 311(7000):290-1.
11. Meerhoff TJ, Meijer A, Paget WJ on behalf of EISS. Methods for sentinel virological surveillance of influenza in Europe - an 18-country survey. *Euro Surveill*. 2004 Jan 1; 9(1):1-4.
12. Meijer A, Valette M, Manuguerra J-C, Pérez-Breña P, Paget J, Brown C, van der Velden K, on behalf of the Virology Working Group of the European Influenza Surveillance Scheme. Implementation of the Community Network of Reference Laboratories for Human Influenza in Europe. *Journal of Clinical Virology* 2005. (<http://dx.doi.org/10.1016/j.jcv.2005.02.005>).
13. Snacken R, Manuguerra JC, Taylor P. European Influenza Surveillance Scheme on the Internet. *Methods Inf Med*. 1998 Sep; 37(3):266-70.
14. ProMED-mail. Avian influenza A(H7N2) virus, human - USA (New York). ProMED-mail 2004; 20 Apr: 20040420.1104. (<http://www.promedmail.org>). Accessed 14 September 2004.
15. Stephenson I, Nicholson KG, Wood JM, Zambon MC, Katz JM. Confronting the avian threat: vaccine development for a potential pandemic. *Lancet Infect Dis*. 2004 Aug; 4(8):499-509.
16. Terebuh P, Adija A, Katz J, Jenkins S, Edwards L, Kleene J, et al. Options for the Control of Influenza V. *Abstr. W01P-72*, 2003.
17. Tran TH, Nguyen TL, Nguyen TD, Luong TS, Pham PM, Nguyen VC et al. Avian influenza A (H5N1) in 10 patients in Vietnam. *N Engl J Med*. 2004; 350:1179-1188.
18. European Influenza Surveillance Scheme. Annual report: 2000-2001 influenza season. Utrecht, the Netherlands: NIVEL, December 2001. ([http://www.eiss.org/documents/eiss\\_annual\\_report.pdf](http://www.eiss.org/documents/eiss_annual_report.pdf)).
19. Paget WJ, Meerhoff TJ, Meijer A, van der Velden J. Five winters of influenza activity in Europe: an evaluation of the indicators used to measure the activity and an assessment of the timing, length and spread of influenza. Poster 4, Ninth European Programme for Intervention Epidemiology Training (EPIET) Scientific Seminar, Mahón, Menorca, Spain (14-16 October 2004). ([http://www.eiss.org/documents/eiss\\_epiet\\_poster\\_oct\\_2004.pdf](http://www.eiss.org/documents/eiss_epiet_poster_oct_2004.pdf)).
20. Gregory V, Bennett M, Orkhan MH, Al Hajjar S, Varsano N, Mendelson E, et al. Emergence of influenza A H1N2 re-assortant viruses in the human population during 2001. *Virology*. 2002 Aug 15; 300(1):1-7.
21. CDC. Assessment of the effectiveness of the 2003-2004 influenza vaccine among children and adults - Colorado, 2003. *MMWR* 2004; 53(31): 707-710.
22. Health Protection Agency. Current influenza activity in the UK. *Commun Dis Rep CDR Wkly* 2003; 13 (45): news. (<http://www.hpa.org.uk/cdr/PDFfiles/2003/cdr4503.pdf>).
23. WHO. Recommended composition of influenza virus vaccines for use in the 2004-2005 influenza season. *Wkly Epidemiol Rec*. 2004 Feb 27; 79(9):88-92.
24. The European Agency for the Evaluation of Medicinal Products. EU recommendations for the influenza vaccine composition for the season 2004/2005. London, 2 March 2004 [see: <http://www.emea.eu.int/pdfs/human/bwp/110404en.pdf>].

## ORIGINAL ARTICLES

### Outbreak report

# HEPATITIS A OUTBREAK AMONG MSM LINKED TO CASUAL SEX AND GAY SAUNAS IN COPENHAGEN, DENMARK

A Mazick<sup>1,2</sup>, M Howitz<sup>2</sup>, S Rex<sup>3</sup>, IP Jensen<sup>4</sup>, N Weis<sup>5</sup>, TL Katzenstein<sup>6</sup>, J Haff<sup>3</sup>, K Molbak<sup>2</sup>

During an outbreak of hepatitis A predominantly among men who have sex with men (MSM) in Copenhagen, Denmark, in 2004, we did a case-control study to determine risk factors for infection. A case was an MSM > 17 years, living in Copenhagen, with IgM positive hepatitis A infection diagnosed between June and August 2004, and without a household contact with a hepatitis A case before onset of illness. Controls were selected at the Copenhagen Pride Festival. The study included 18 cases and 64 controls. Sixteen of 18 cases and 36/63 controls had sex with casual partners (OR<sub>MH</sub> 5.6, 95% CI 1.2-26.9). Eleven of 18 cases and 14/62 controls had sex in gay saunas (OR<sub>MH</sub> 4.2, 95% CI 1.5-11.5). Sex at private homes appeared to be protective (OR<sub>MH</sub> 0.2, 95% CI 0.1-0.7). Casual sex including sex in gay saunas was an important risk factor for the spread of HAV among MSM in Copenhagen. The results are in accordance with findings in other European outbreaks. As the general immunity to hepatitis A decreases and the outbreak potential increases, we recommend health education and hepatitis A vaccination to all MSM not living in monogamous relationships, especially if they visit gay saunas or other places with frequent partner change. To stop spread of hepatitis A among MSM in Europe, a European consensus on prevention and control measures may be required.

*Euro Surveill* 2005; 10(5): 111-4

Published online May 2005

**Key words:** Case-control study, hepatitis A, homosexuality, male; sexual behaviour

## Introduction

In Denmark, anti-HAV IgM positive hepatitis A virus (HAV) infection is notifiable by clinicians. HAV is not regarded as endemic in Denmark and susceptibility in the population is high. The majority of infections are imported by children of foreign origin returning from visits to friends and relatives in endemic countries [1]. Subsequent secondary spread in childcare institutions is a common cause of small outbreaks. Outbreaks of hepatitis A among men who have sex with men (MSM) have been reported from several cities in Europe and worldwide. In Copenhagen, outbreaks among MSM occurred in 1977 [2] and in 1991 [3]; with 21 and 17 reported cases of hepatitis A respectively. Studies have shown that hepatitis A is a sexually transmitted infection (STI) in MSM. The main risk factors identified are oral-anal sex (rimming) or digital-anal sex [4,5], visiting certain bars or saunas [6,7,8], having sex with anonymous partners or group sex [4,5]. Social contact of a non-sexual nature and contaminated food [7] also contribute to infection.

From January 2004 an outbreak of hepatitis A affecting predominantly MSM occurred in Copenhagen [9]. In April, active case finding in collaboration with laboratories was set up. Awareness of hepatitis A diagnosis and the need for reporting was raised among clinicians. Apart from ordinary precautions in a hepatitis A outbreak, such as increased hygiene and immunoglobulin for close contacts, vaccination was recommended for MSM not living in monogamous relationships. Further information for MSM was provided by a national STI campaign carried out by the Danish gay organisation STOP AIDS and the Danish National Association for Gays and Lesbians. The outbreak continued, and in August 2004, the Statens Serum Institut (SSI) and STOP AIDS carried out a case-control study to determine risk factors for hepatitis A infection in this outbreak in order to inform targeted preventive measures.

1. European Programme for Intervention Epidemiology Training (EPIET).
2. Department of Epidemiology, Statens Serum Institut, Denmark.
3. STOP AIDS, Denmark.
4. Department of Virology, Statens Serum Institut, Denmark.
5. Department of Infectious Diseases, H:S Hvidovre Hospital, Copenhagen, Denmark.
6. Department of Infectious Diseases, Rigshospitalet, Copenhagen, Denmark.

**Methods**

A case was defined as an MSM > 17 years, living in Copenhagen, in whom hepatitis A infection with positive anti-HAV IgM was diagnosed between 1 June and 14 August 2004, and who did not have contact to a hepatitis A case in his household in the six weeks before onset of illness. Cases were selected from the notifications received.

Controls, frequency matched to the cases date of onset of illness, were selected at the annual Copenhagen Gay Pride Festival on 14 August 2004 from MSM resident in Copenhagen. Based on the result of a saliva antibody test (Methods: see [10]) only persons susceptible to hepatitis A were included as controls. Data on exposure was collected for a six week period before illness onset and for the same period in controls using piloted self-administered questionnaires. To protect privacy, patients were contacted by their physician who obtained informed consent before posting a questionnaire to them. Information collected included: eating in restaurants/cafes/bars, shellfish consumption, whirlpool use, travel abroad, contact with hepatitis A cases, number of regular and casual sexual partners, venues for sexual contact, sexual contacts abroad or arranged via internet, oral-anal and digital-anal sex practices, history of STIs. Additionally, controls were asked about their attitude towards vaccination.

Data analysis was performed in STATA 8.0. Matched odds ratios and 95% confidence intervals were calculated for each exposure factor. Adjusted odds ratios were calculated using conditional logistic regression analysis. Exposure factors with P values < 0.20 and confounding variables such as age were included. The final model was build by backward elimination of variables above the threshold of P = 0.10.

**Results**

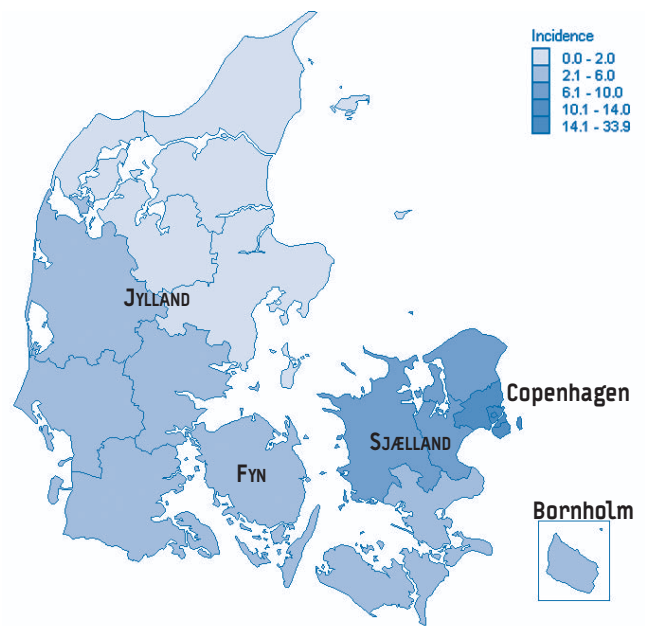
In 2004, 163 cases of hepatitis A in men > 17 years were notified to the Department of Epidemiology, SSI. In the past five years the median number of annually reported cases of hepatitis A among men of this age group was 13 (range 7-25). Of the 163 cases, 107 were from Copenhagen, 56 from the rest of Denmark. The incidence rate in Copenhagen was 23 per 100 000 and declined with increasing distance from the capital [FIGURE 1].

The following results are restricted to cases in Copenhagen. Of the 107 patients, 68 (64%) were reported to be MSM and five to be heterosexuals. For 34 patients, the sexual orientation was not known [FIGURE 2].

Patient ages ranged between 19 and 73 years with a median of 41. Ninety seven (91%) patients were residents in Denmark. Thirty seven (35%) patients were admitted to hospital.. Forty nine (46%) cases were reported by general practitioners and 58 from hospital in- or outpatient departments.

**FIGURE 1**

**Incidence rate (per 10<sup>5</sup>) of reported cases of hepatitis A among men > 17 years by county in Denmark, 2004**



**Case-control study**

The case-control study conducted among MSM included 18 cases and 64 controls. Physicians of 36 notified cases were asked to recruit their patients for the study; 30 patients agreed to participate and 24 of these (80%) returned questionnaires. Six patients did not fulfil the case definition (four self-identified as heterosexual, one was infected by a household contact and one did not live in Denmark during the exposure period). Saliva samples were taken from 105 MSM visiting the Copenhagen Pride Festival: 86 (82%) had no detectable antibodies against HAV; 15 (14%) were IgG positive, two of these were also IgM positive; four samples were inconclusive. Of the 86 without detectable antibodies, 17 reported having been vaccinated against hepatitis A, three were not in Copenhagen during the period required and two refused to participate. Therefore, 64 (61%) of the participants were included as controls.

Case patients and controls were similar with regards to residence within Copenhagen, but patients were older than controls [TABLE 1]. The proportion of HIV-infected people was higher among patients than controls. Neither patients nor controls reported a previous syphilis infection.

**FIGURE 2**

**Reported cases of hepatitis A among men >17 years living in Copenhagen, (n=107), by week of onset of illness and sexual orientation, Denmark, 2004**

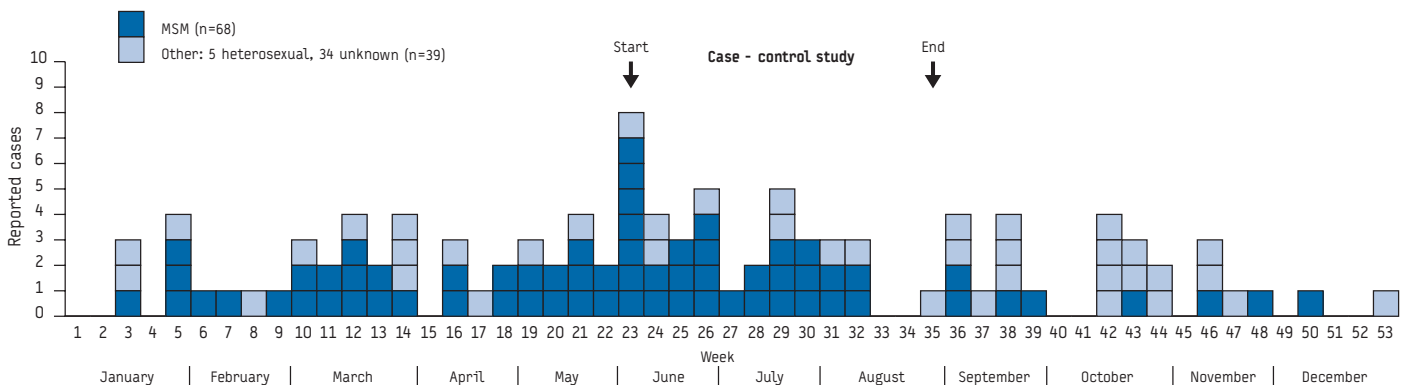


TABLE 1

### Characteristics of HAV infected study cases and controls, Copenhagen, Denmark, 2004

Characteristics	Study cases (n=18)	Controls (n=64)	p-value
Age in years: median (range)	41.5 (19-73)	33 (18-66)	0.04*
Residence:			
Copenhagen Commune	10/18	40/63	
Frederiksberg	2/18	9/63	0.62
Copenhagen County	6/18	14/63	
HIV-positive	4/14	2/42	0.02
History of STI	2/18	3/61	0.34
History of syphilis	0	0	
History of gonorrhoea	1	1	
No of sexual partners, median (range)	3 (0-10)	2 (0-50)	0.18*
No of casual partners, median, (range)	2 (0-10)	1 (0-48)	0.11*
Disclosed sexual preference to GP	38/61 (62%)		

\* Kruskal-Wallis test.

TABLE 2

### Selected exposure factors of HAV infection among MSM cases and controls, in 6 weeks before illness onset in cases, Copenhagen, Denmark 2004

Factor	Number exposed among		OR <sub>MH</sub> *	95% CI	P
	cases (%)	controls (%)			
Eaten out (restaurants, etc)	14/17 (82)	55/59 (93)	0.4	0.1-2.4	0.35
Eaten seafood	9/16 (56)	28/60 (47)	2.0	0.6-6.6	0.25
Travel abroad	3/18 (17)	21/63 (33)	0.4	0.1-1.6	0.19
Contact with hepatitis A case**	5/18 (28)	7/61 (11)	2.8	0.8-10.2	0.09
Sex in gay saunas	11/18 (61)	14/62 (23)	4.2	1.5-11.5	0.003
Sex in private homes	8/18 (44)	50/62 (81)	0.2	0.1-0.7	0.004
Sex at cruising ground & public toilets	0/18	8/62 (13)	0		
Sex with casual partners	16/18 (89)	36/63 (57)	5.6	1.2-26.9	0.02
Sex with >1 partner	12/15 (80)	31/61 (51)	3.6	0.9-14.2	0.06
Sex with partner met on the internet	6/17 (35)	22/63 (35)	1.1	0.3-3.5	0.91
Digital-anal sex (finger-sex)	14/17 (82)	43/61 (70)	1.8	0.5-6.8	0.33
Oral-anal sex (rimming)	9/16 (56)	28/62 (45)	1.7	0.5-5.5	0.36
Group sex	3/18 (17)	3/64 (5)	5.6	0.9-36.6	0.06

\* Mantel-Haenszel odds ratio (matching variable: onset of illness in cases).

\*\* Defined as contact with hepatitis A case since January 2004 and is thus a proxy measure for contact with a community where hepatitis A is prevalent, not an indicator for person-to-person transmission.

After adjusting for confounding, sex with casual partners (adjusted odds ratio (aOR) 8.7; 95% CI 1.6-48.9) and sex in private homes (aOR 0.1; 95% CI 0.0-0.5) seem to respectively increase and decrease the risk of infection. Because of the time dependency, sex in gay saunas did not prevail as an independent risk factor in the multivariate analysis.

Two thirds of controls disclosed their sexual orientation to their general practitioner. Of 36 controls, who had had casual sex, 11 had been recommended hepatitis A vaccination (gay campaigns (5), an STI clinic (4), and general practitioners (2)). Among controls, 53 (83%) were willing to be vaccinated against hepatitis A. However, of these, only 14 (26%) were willing to pay for the vaccination.

### Discussion

The study suggests that sexual activity was the major mode of transmission in this hepatitis A outbreak among MSM. Sex with casual partners and sex in gay saunas contributed to the spread of hepatitis A among MSM.

Matched univariate analysis of exposure factors [TABLE 2] suggests that HAV infection was not associated with consumption of seafood or eating outside home. There was no evidence of a cluster of cases linked specific food outlets or restaurants. Travelling abroad was less frequent for case patients than controls. Patients had a median of three sexual partners in the six weeks before illness and controls, a median of two.

Patients were more likely to have had sex with casual partners than controls. One third of both patients and controls had sex with partners they met via the internet. HAV infection was associated with sex in gay saunas. This association was very strong in May and June, when 9 of 10 patients were exposed (OR<sub>MH</sub> 129.2, 95% CI 7.6-2197.5), but not in the later part of the study. No single sauna was implicated. Sex at cruising grounds and toilets was not associated with infection. Sex at private homes appeared protective. Participation in group sex was reported by 17% of the patients and 5% of controls. High risk practices such as oral-anal and digital-anal sex were common among both cases and controls, and were not associated with increased risk of HAV infection.

However, as the study period encompassed only part of the outbreak, we must be cautious about extrapolating results to the whole period of the outbreak. The study may be further limited by a small sample size. Controls selected at the festival may not be representative of the total MSM population in Copenhagen. However, since it is impossible to select controls directly from the study population, we consider our approach the best possible way to represent a broad spectrum of MSM. Protecting privacy was considered to be extremely important in this outbreak investigation, and therefore access to information on the cases was limited due to the sensitive nature of the subject.

This was the largest recorded outbreak of hepatitis among MSM in Denmark and the first one in more than a decade. In Europe, cases of hepatitis A among MSM are reported with increasing frequency: since 1995 there have been outbreaks in major European cities on an almost annual basis. Venues for casual sex, such as gay saunas and darkrooms are frequently implicated [7,8,11,12]. The increased risk of infection is presumably related to the possibility of having several

partners within a short period of time. In Copenhagen, gay saunas are popular places for both Danes and visitors from abroad to have casual sex. There are at least seven saunas, they operate all year round and the largest sauna typically attracts approximately 700 to 1000 visitors per week. With increasing tourist traffic between European cities and increasing susceptibility to HAV in the population, gay saunas offer a perfect venue for endemic and epidemic spread of hepatitis A among MSM in Europe. The Copenhagen outbreak caused hepatitis A in at least 13 Swedish men [13]. Most of these men were from southern parts of Sweden, which is situated close to Copenhagen, and in some of them, infection could be directly linked to sex at gay saunas. The outbreak in Copenhagen is most likely also responsible for an outbreak among MSM in Norway. There, the same outbreak virus strain circulated among infected MSM that caused the Copenhagen and Swedish cases [14].

Hepatitis A is a relatively mild disease with a low case fatality. No death was recorded in Copenhagen. However, one third of cases were admitted to hospital. Costs associated with hospital admission and days off work could be avoided by vaccination. In HIV-infected individuals, HAV infection has been associated with prolonged HAV viraemia, which might lead to longer infectivity and increased risk of spread in this population [15]. Inactivated HAV vaccine is safe in HIV-infected individuals [16].

The prevalence of anti-HAV antibodies among MSM tested at the Copenhagen Pride Festival was 14%. This is low compared with a serological study in two gay saunas in Copenhagen conducted in 1984, where 36% of sauna attendees were immune to HAV – a figure three times higher than in the general Danish population at that time [17]. It is uncertain whether this reflects an overall decline of hepatitis A infections among MSM over the last 20 years, because sauna attendees may not be representative of the population of MSM attending the festival. However, it suggests that the population of MSM in Copenhagen is susceptible to hepatitis A infection and therefore need to be alerted of the risks of infection and how to prevent it.

Based on the results of the investigation we suggest recommending hepatitis A vaccination to all MSM who are not in a monogamous relationship, especially if they visit gay saunas or other places with frequent partner change.

Opportunities for vaccination could be visits to general practitioners (although not all MSM disclose their sexual orientation to their doctor), sexual health clinics or outreach campaigns at saunas or mobile clinics. Willingness to be vaccinated was high among MSM, but a considerable number were reluctant to pay for the vaccination. This attitude may be influenced by information about the importance of vaccination. As free hepatitis B vaccination is available for MSM in Copenhagen, exchanging the monovalent vaccine for the combined hepatitis A and B vaccine would make protection against hepatitis A available at little extra costs.

We further suggest that adequate hygiene should be ensured in saunas. An information campaign on risks and prevention of hepatitis A transmission should be targeted at sauna visitors (both Danish and international guests). To stop spread of hepatitis A among MSM in Europe, a European consensus on prevention and control measures may be required.

## Acknowledgements

We thank all physicians for their cooperation in recruiting their patients for the study and the volunteers who helped with control selection at the Pride Festival. We thank John V Parry from the Sexually-Transmitted & Bloodborne Virus Laboratory, Health Protection Agency, London, for analysing the oral fluid samples and for his valuable support in interpreting the results.

## References

1. Howitz M, Mølbak K. Hepatitis A 2003 Denmark. *Epi-News* Nr. 38,2003. <http://www.ssi.dk/sw17132.asp>
2. Hoybye G, Skinhoj P, Hentzer B, Faber V, Mathiesen L. An epidemic of acute viral hepatitis in male homosexuals. Etiology and clinical characteristics. *Scand J Infect Dis.* 1980; 12(4):241-4.
3. Schmidt K. Øget forekomst af hepatitis A i Københavns kommune. [Increased frequency of hepatitis A in the municipality of Copenhagen] *EPI-NYT* 1991; 45.
4. Christenson B, Brostrom C, Bottiger M, Hermanson J, Weiland O, Ryd G, et al. An epidemic outbreak of hepatitis A among homosexual men in Stockholm. Hepatitis A, a special hazard for the male homosexual subpopulation in Sweden. *Am J Epidemiol.* 1982 Oct; 116(4):599-607.
5. Henning KJ, Bell E, Braun J, Barker ND. A community-wide outbreak of hepatitis A: risk factors for infection among homosexual and bisexual men. *Am J Med.* 1995 Aug; 99(2):132-6.
6. Leentvaan-Kuijpers A, et al. An outbreak of hepatitis A among homosexual men in Amsterdam, 1991-1993. *Int J Epidemiol.* 1995. 24(1): p. 218-22.
7. Bell A, Ncube F, Hansell A, Davison KL, Young Y, Gilson R, et al. An outbreak of hepatitis A among young men associated with having sex in public venues. *Commun Dis Public Health* 2001. Sep; 4(3):163-70.
8. Reintjes R, Bosman A, de Zo, Stevens M, van der KL, van den HK. Outbreak of hepatitis A in Rotterdam associated with visits to 'darkrooms' in gay bars. *Commun Dis Public Health.* 1999 Jan; 2(1):43-6.
9. Mølbak K. Increase in hepatitis A in MSM in Denmark. *Eurosurveillance Weekly* 2004; 8 (22): 27/05/2004. <http://www.eurosurveillance.org/ew/2004/040527.asp>
10. Parry JV, Perry KR, Panday S, Mortimer PP. Diagnosis of hepatitis A and B by testing saliva. *J Med Virol.* 1989 Aug; 28(4):255-60.
11. DeLarocque-Astagneau E. Epidemic of hepatitis A among homosexual men in Paris, 2000. *Eurosurveillance Weekly* 2001; 5(46): 15/11/2001. <http://www.eurosurveillance.org/ew/2001/011115.asp#4>
12. Mayans MV, Sanz B, Armengol P, Loureiro E. Outbreaks of infectious syphilis and other STIs in men who have sex with men in Barcelona, 2002-3. *Eurosurveillance Weekly* 2004; 8(44): 28/10/ 2004. <http://www.eurosurveillance.org/ew/2004/041028.asp#4>
13. Gieseke J, Martin S. Hepatit A-vaccination aktuell för män som har sex med män. *EPI-aktuellt* 2004; 3 (24): 10/06/2004. <http://www.smittskyddsinstytutet.se/upload/EPI-Aktuellt/EA-0424.pdf>
14. Blystad H, Kløvstad H, Stene-Johansen K, Steen T. Hepatitis A outbreak in men who have sex with men, Oslo and Bergen in Norway. *Eurosurveillance Weekly* 2004; 8(43): 21/10/2004. <http://www.eurosurveillance.org/ew/2004/041021.asp>
15. Ida S et al. Influence of Human Immunodeficiency Virus Type 1 Infection on Acute Hepatitis A Virus infection. *Clin Infect Dis.* 2002 Feb 1; 34(3):379-85.
16. Hess G, Clemens R, Bienzle U, Schonfeld C, Schunck B, Bock HL. Immunogenicity and safety of an inactivated hepatitis A vaccine in anti-HIV positive and negative homosexual men. *J Med Virol.* 1995 May; 46(1):40-2.
17. Kryger P, Hofman B, Pedersen NS, et al. Hepatitis blandt homoseksuelle i to københavnske saunaer [Hepatitis among homosexual men in two saunas in Copenhagen]. *Ugeskr Laeger* 1984; 146:1276-9.