demonstrate. The results reported here may thus underestimate the true pattern of OI in African patients. Although KS is endemic in central Africa our findings confirm that KS is associated with only 10–20% of African cases of AIDS.[1]

Characteristically, African AIDS affects women as well as men, a pattern very different from the sex ratio (15:1) described in the chronic form of KS that has for many years been seen in central Africa.[12] A similar low frequency of KS among AIDS patients has been reported recently in heterosexual intravenous drug abusers of both sexes,[13] suggesting that sexual lifestyle rather than racial or geographical factors could predispose to KS in AIDS.

The low sex ratio suggests that heterosexual contact is the most frequent mode of transmission in central Africa. None of the patients admitted to intravenous drug abuse (which is very rare in Rwanda). In addition, none had had blood transfusions or blood products. 2 patients had a history of scarification. Since the route of transmission of the AIDS agent closely resembles that of hepatitis B virus,[14] we cannot rule out scarification as a possible route for acquiring AIDS in central Africa. Poor hygiene during medical procedures might also play an important role in the transmission of a blood-borne agent in these countries,[15] where disposable materials are expensive and often unavailable. Indeed, serological markers of past or present infection with hepatitis B was present in 15 out of 26 patients. Homosexuality is uncommon in Rwanda, and none of the sexually active males admitted bisexuality or homosexuality. However, in 1 patient, a man who had been in prison for many years, such contact could not be excluded. Most of the adult males had had frequent heterosexual contacts with different partners. 11 out of 17 admitted to contacts with prostitutes and 3 out of 7 female patients were prostitutes, suggesting that sexual promiscuity could be a risk factor also among heterosexual patients with AIDS. Indeed, many patients had serological markers of sexually transmitted disease, including *N gonorrhoeae, C trachomatis* and *T pallidum* infections. The frequency of serological evidents of sexually transmitted diseases in our patients is similar to that reported in American homosexual men with AIDS.[16]

The African patients with AIDS reported in Belgium were of high socioeconomic status.[1] These data could have been biased by the fact that only privileged patients could afford to travel to Europe for medical care. However, many patients in our Rwandan series were also relatively well-to-do. Most of them were town-based professionals working in the private or public sectors. Although the 1978 census showed that more than 93% of the Rwandan population is rural, the patients reported here belonged to the minority of people in contact with Kigali and the chief towns of prefectures. Urban activity, a reasonable standard of living, heterosexual promiscuity, and contacts with prostitutes could be risk factors for African AIDS. Further studies on a larger scale are in progress to establish the public health importance of AIDS in central Africa.

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ACQUIRED IMMUNODEFICIENCY SYNDROME IN A HETEROSEXUAL POPULATION IN ZAIRE

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Summary 38 patients with the acquired immunodeficiency syndrome (AIDS) were identified in Kinshasa, Zaire, during a 3 week period in 1983. The male to female ratio was 1·1:1. The annual case rate for Kinshasa was estimated to be at least 17 per 100 000. Opportunistic infections were diagnosed in 32 (84%) patients, disseminated Kaposi's sarcoma (KS) with opportunistic infection in 5 (13%), and disseminated KS alone in 1 patient. Immunological characteristics of these patients were as reported for cases in the USA and Europe, but immunological abnormalities were also found in 6 controls with infectious diseases but no symptoms of AIDS. Female AIDS cases were younger than male patients with AIDS (mean ages 28·4 *vs* 41·1 years, respectively), and were more often single (14/18 *vs* 2/20). Homosexuality, intravenous drug abuse, and blood transfusion did not appear to be risk factors in these patients. The findings of this study strongly argue that the situation in central Africa represents a new epidemiological setting for this worldwide disease—that of significant transmission in a

P. VAN DE PERRE AND OTHERS: REFERENCES

1. Clumeck N, Sonnet J, Taelman H, et al. Acquired immune deficiency syndrome in African patients. *N Engl J Med* 1984; **310**: 492–97.
2. Downing RG, Eglin RP, Bayley AC. African Kaposi's sarcoma and AIDS. *Lancet* 1984; i: 478–80.
3. Baxby D, Blundell N. Sensitive, rapid, simple methods for detecting cryptosporidium in faeces. *Lancet* 1983; ii: 1149.
4. Mascart-Lemone F, Delespesse G, Servais G, Kunstler M. Characterization of immuno regulatory T lymphocytes during ageing by monoclonal antibodies. *Clin Exp Immunol* 1982; **48**: 148–54.
5. Wang SP, Grayton JT, Kuo CC, Alexander ER, Holmes KK. Serodiagnosis of *Chlamydia trachomatis* infection with the micro-immunofluorescence test. In: Hobson D, Holmes KK, eds. Non gonococcal urethritis and related infections. American Society for Microbiology, Washington DC, 1977: 234–48.
6. Tomizawa AT, Kasamatsu S. Hemagglutination test for diagnosis of syphilis: a preliminary report. *Jap J Med Sci Biol* 1966; **19**: 305–08.
7. Deacon WE, Lucas JB, Price EV. Fluorescent treponemal antibody-absorption (FTA-Abs) test for syphilis. *JAMA* 1966; **198**: 624–28.
8. Price JNO. The gonococcal complement fixation test. *J Pathol Bacteriol* 1930; **23**: 493–99.
9. Hekker AC, Brand-Saathof B, Vis J, Meijers RC. Indirect immunofluorescence test for detection of IgM antibodies to cytomegalovirus. *J Infect Dis* 1979; **140**: 596–600.
10. Oettlle AG. Geographical and racial differences in the frequency of Kaposi's sarcoma as evidence of environmental or genetic causes. *Acta Un Int Cancer* 1962; **18**: 330–63.
11. Mathur-Wagh U, Enlow RW, Spigland I, et al. Longitudinal study of persistent generalised lymphadenopathy in homosexual men: Relation to acquired immunodeficiency syndrome. *Lancet* 1984; i: 1033–38.
12. Hood AF, Farmer ER, Weiss RA. Kaposi's sarcoma. *Johns Hopkins Med J* 1982; **151**: 222–30.
13. De Jarlais DC, Marmor M, Thomas P, Chamberland M, Zolla-Pazner S, Sencer DJ. Kaposi's sarcoma among four different AIDS risk groups. *N Engl J Med* 1984; **310**: 1119.
14. Ravenholt RT. Role of hepatitis B virus in acquired immunodeficiency syndrome. *Lancet* 1983, ii: 885–86.
15. Barin F, Perrin J, Chotard J. Cross-sectional and longitudinal epidemiology of hepatitis B in Senegal. *Progr Med Virol* 1981; **27**: 148–62.
16. Rogers MF, Morens DM, Stewart JA et al. National case-control study of Kaposi's sarcoma and *Pneumocystis carinii* pneumonia in homosexual men II: Laboratory results. *Ann Intern Med* 1983; **99**: 151–58.

large heterosexual population. Two instances of clusters of AIDS (not included in the above series) involving males and females with frequent heterosexual contact further implicate heterosexual transmission.

Introduction

22% of patients with the acquired immunodeficiency syndrome (AIDS) reported in Europe were from sub-Saharan Africa[1] and 37 of 40 patients reported from Belgium were from central Africa, mostly Zaire.[2] 6 African patients with AIDS were identified in Belgium by the end of 1981, 7 cases in 1982, and 27 in 1983.[2] Reports of African cases have not identified the risk factors of homosexuality, drug abuse, haemophilia, or a history of transfusion.[1-3] Clinical features were similar to those reported for AIDS in Europe and North America except that diarrhoea, cryptococcosis, and tuberculosis have been more common. As in cases reported from Haiti,[4,5] 40% of the 59 African cases diagnosed in Europe were women and 17% had Kaposi's sarcoma (KS). We report here the clinical, immunological and epidemiological features of 38 AIDS patients observed in Kinshasa during a 3 week period in October, 1983.

Patients and Methods

Patients and Controls

33 cases were identified at the Mama Yemo or University Hospitals, Kinshasa, and the other 5 were identified in two smaller hospitals (Clinique Ngaliema and Clinique Kinoise). All 38 patients had recently been admitted to medical or dermatological departments. A case of AIDS was defined as an adult under 60 years of age who had evidence of an opportunistic infection or disseminated KS by histopathology, no underlying history of immunosuppressive disease or immunosuppressive drug use, and who fulfilled two of the three immunological criteria of skin test anergy to multiple antigens, an absolute number of helper T-lymphocytes (OKT 4) less than 400/μl, or a ratio of helper to suppressor T cells (OKT 4:OKT 8) less than 0·7. Opportunistic infections were defined as cryptococcal meningitis, cryptosporidiosis, extensive mucocutaneous herpes simplex virus (HSV) infection, bilateral pneumonia (by radiography) that was unresponsive to antibiotics and anti-tuberculosis drugs, extensive oral/oesophageal candidiasis, and chorioretinitis. Diagnostic laboratory facilities are limited in Zaire, and necropsies were not done; underlying malignant disease could be excluded on clinical grounds only.

26 controls were selected from patients on the same wards as the cases (9), from patients undergoing elective surgery (11), or from patients at a public tuberculosis clinic (6). For the analysis of immunological data the controls were subdivided into the 14 with non-infectious diseases and the 12 with infectious diseases (tuberculosis 8, malaria 3, non-bacterial meningoencephalitis 1).

A standard questionnaire was used to collect demographic, epidemiological and clinical information from cases and controls.

Laboratory Methods

T-lymphocyte subpopulations were determined by fluorescent microscopy. Lymphocytes were separated from heparinised whole blood by 'Ficoll-Hypaque' density centrifugation. The lymphocytes were washed and reacted with monoclonal antibodies OKT3 (anti-human T-cell), OKT4 (anti-human inducer/helper T-cell), and OKT 8 (anti-human suppressor/cytotoxic T-cell) (Ortho Diagnostic Systems, Raritan, New Jersey). After 30 min reaction, the cell suspension was washed, reacted with fluorescein conjugated $F(ab)_2$-goat anti-mouse IgG (Kallestadt, Oiaskau, Minnesota) for 30 min, all at room temperature. The cells were then washed and counted microscopically.

Delayed hypersensitivity was assessed by a skin test panel of: tuberculin, tetanus and diphtheria toxin, candidin, trichophytin, proteus, and streptokinase and a control ('Multitest CMI'; Merieux Institute, Miami, Florida).

Statistical Analysis

The Wilcoxon rank-sum test was used for comparison of two groups and the non-parametric test of Kruskal and Wallis for comparison of more than two groups. Student's *t* test, chi square test, and Fisher's exact test were also used.

Results

Clinical Features

During a 3 week period we identified 38 newly admitted patients who fulfilled the criteria for AIDS. There were 20 males (53%) and 18 females (47%). 10 (26%) patients died during the 3 week study period, and at least 6 more patients had died by the end of 1983—a case fatality rate of at least 42% within 3 months of diagnosis. The average duration of illness was 10 months (range 1–30 months) in the 34 patients for whom the onset date was available.

The most striking clinical features (table I) were profound weight loss and severe chronic diarrhoea, which was often the initial manifestation of the disease and was refractory to therapy. A distinct pruritic maculopapular or pustular rash was often observed on the extremities. Amenorrhoea, commonly reported as a marker of the onset of AIDS in these patients, has not been previously noted.

32 patients had clinical and/or laboratory evidence of one or more opportunistic infections. Cryptococcal meningitis occurred in 5 patients. Chronic mucocutaneous HSV infection was seen in 10 (26%) patients and affected the anogenital area in 9. 14 patients had a bilateral interstitial pneumonia with severe dyspnoea, unresponsive to antibiotics or tuberculostatics. Oral and/or oesophageal candidiasis were found in 31 (82%) cases. In 8 of the 14 patients examined, there was evidence of cottonwool exudates and/or inflammation consistent with cytomegalovirus chorioretinitis.[6] *Salmonella* group B bacteraemia and disseminated strongyloidiasis occurred in 1 patient each, in addition to other more common opportunistic infections. Pulmonary tuberculosis was suspected in 4 patients who also had other opportunistic infections.

Disseminated KS was diagnosed by histopathology in 6 (16%) patients. All had profound weight loss and 5 had chronic diarrhoea; 2 had interstitial pneumonia accompanied by oral thrush and severe anogenital mucocutaneous herpes. 1 patient died of cryptococcal meningitis; 1 case was associated with extensive genital mucocutaneous herpes; 1 had extensive and deep genital ulcerations; and 1 died on the day after admission, before further testing.

TABLE I—CLINICAL MANIFESTATIONS IN 38 PATIENTS WITH AIDS IN KINSHASA, ZAIRE

Sign or symptom	No (%)	Mean duration (range) (mo)
Weight loss (>10% of body weight)	38 (100)	7·2 (1–30)
Diarrhoea	34 (89)	9·9 (1–36)
Fever	32 (84)	7·4 (1–24)
Fatigue	24 (63)	6·0 (0·25–15)
Headache	18 (47)	8·0 (2–24)
Cough	18 (47)	4·7 (0·25–18)
Dysphagia	12 (31)	5·8 (0·12–11)
Oral thrush	31 (82)	NA*
Generalised lymphadenopathy	21 (55)	NA
Pruritic papular skin lesions	8 (21)	6·0 (2–9)
Amenorrhoea (n = 18)	4 (22)	7·0 (3–11)

*NA = information not available.

TABLE II—IMMUNOLOGICAL FINDINGS AMONG PATIENTS WITH AIDS AND AMONG CONTROLS IN KINSHASA, ZAIRE

Feature	Cases (n=38)	Controls	
		Infectious diseases (n=14)	Non-infectious diseases (n=12)
Skin anergy to all antigens tested	36	0	0
White blood cell count (/μl)	4281±1893*	9537±5389	5807±1525
Total lymphocytes (/μl)	1241± 803†	3291±2788	2326± 934
Total OKT3+ (T) cells (/μl)	727± 497†	1657±1455	1418± 688
Total OKT4+ (T-helper) cells (/μl)	97± 150*	463± 597	937± 621
Total OKT8+ (T-suppressor) cells (/μl)	633± 449	1047± 664	564± 280
OKT4+:OKT8+ ratio*	0·17±0·14*	1·23±1·74	1·90±1·21

Results as mean±SD.
*$p<0·001$; †$0·001<p<0·01$ (Kruskal and Wallis, non-parametric test).

Delayed hypersensitivity (including to tuberculin) was intact in all controls but in only 2 of the 38 AIDS patients, who both reacted weakly to candida (table II).

AIDS patients had a lower mean white blood cell count than controls. The total number of both lymphocytes and T-helper lymphocytes (OKT4) were significantly reduced. Lymphopenia of less than 1400 lymphocytes/μl was found in 62% of the patients compared with 18% of the controls ($\chi^2=8·56$; $p<0·01$), with a range of 100–3520/μl for the cases. A mean of 97 OKT4+ cells/μl was observed in AIDS patients, with an average ratio of OKT4+/OKT8+ of 0·17. A ratio of <0·7 was observed in 7 of 12 controls with different infectious diseases, including malaria (2 patients) and tuberculosis (5 patients). This low OKT4+/OKT8+ ratio was due to a decrease of OKT4+ in 5 patients and to an increase of OKT8+ in 2 patients. However, none of these patients had any clinical manifestations of AIDS.

Epidemiological Data

The mean age of the female AIDS cases was 28·4 (range 13–45 years), compared with 41·1 years in male cases (range 27–56 years) ($p<0·001$, Student *t*-test) (table III). 29 patients had lived in Kinshasa for more than 2 years. 7 patients came from different regions of Zaire outside Kinshasa, including the provinces of Equateur, Bas Zaire, Haut Zaire, Kivu, and East Kasai. 22 of the 38 cases were seen in hospitals which serve primarily private patients, a distinctly small proportion of the total population of Kinshasa. While rates of disease by socioeconomic status cannot yet be calculated these figures do suggest that a disproportionate number of cases may be occurring in the higher income population.

TABLE III—CHARACTERISTICS OF PATIENTS WITH AIDS AND CONTROLS IN KINSHASA, ZAIRE

Feature	Cases	Controls
Sex ratio (M/F)	20/18	12/14
Mean age (and range)		
Men	41·1 (27–56)*	30·7 (20–40)
Women	28·4 (13–45)	27·1 (18–45)
Single: Men	2/20 *(10%)*†	5/12 *(42%)*
Women	14/18 *(78%)*	6/14 *(43%)*
Mean size of household (range)	7·6 (2–11)	7·9 (2–17)
Living in Kinshasa	29/37 *(81%)*	23/25 *(92%)*
Education >12 yr	9/27 *(33%)*	4/11 *(36%)*
Aware of a friend or family member with AIDS	5/35 *(11%)*	0/16
Prior to onset of disease:		
Injection	26/32 *(81%)*	11/14 *(79%)*
Transfusion	4/31 *(13%)*	1/14 *(7%)*
Traditional enema	8/29 *(28%)*	3/14 *(21%)*
History of sexually transmitted disease given by patient (men only)	8/16 *(50%)*	1/7 *(14%)*

Data show number of individuals with feature/number of individuals on whom information was available (and % of positives).
*$p<0·001$, Student *t*-test, for male *vs* female patients with AIDS.
†$\chi^2=15·18$ ($p<0·001$) for male *vs* female patients with AIDS.

14 of the 18 female cases and 8 of the 14 female controls were single or divorced ($\chi^2=2·94$; $p>0·05$). 5 of the 12 male controls were single compared with 2 of 20 cases. The mean size of household of the patients was 7·6 compared with 7·9 for the controls. Patients belonged to all ethnic groups and social strata of Zairean society. There was no difference between cases and controls with regard to length of education, history of injection or blood transfusion within two years of onset of illness, or the practice of traditional enema or scarifications before onset of illness (table III).

13 of 15 male cases confirmed having had more than 1 female sex partner during the year before onset of their disease. Their median number of annual sex partners was 7 (range 1–100). 6 of 8 female cases also had more than 1 sex partner, with a median of 3 (range 0 to 5). Information on sexual activity of the controls was difficult to substantiate during this brief study and has not been included. None of the patients or controls admitted to homosexuality. 8 of 16 male cases gave a history of sexually transmitted diseases (urethritis or genital ulceration), compared with 1 of the 7 male controls on whom data were obtained ($p=0·12$; Fisher's exact test). There was no history of intravenous drug addiction in any patient. 5 of the AIDS patients were aware of a relative or friend who had a similar disease or who had died from AIDS, compared with none of the controls ($p=0·14$; Fisher's exact test). Husbands of 2 female cases had died with AIDS during the previous 6 months.

We identified retrospectively two clusters of AIDS in heterosexual partners in Kinshasa (none were among the 38 cases of this report). Many of the patients in these clusters had been diagnosed in Belgium. Information on sexual activity was obtained from physicians who had treated these patients, and from friends and relatives. In the first cluster case 1 was a woman who died from cryptococcal meningitis in Kinshasa in 1980. She had frequent sexual contact with case 2, a 46-year-old man with proven AIDS, who died in Belgium in early 1983. His wife (case 3) died of cryptococcal meningitis in Kinshasa in early 1983. Case 4 was a frequent sexual partner of case 2: she died with AIDS diagnosed in Belgium in February, 1983. Case 5 was a kitchen maid of case 2, and died in 1984 of AIDS diagnosed in Belgium.

The index case of the second cluster was a 30-year-old woman who died in 1981 in Kinshasa with chronic diarrhoea, weight loss, aggressive mucocutaneous herpes simplex infection, and pneumonia. Her husband died of apparent AIDS in Kinshasa in 1982, as did a frequent male sexual contact of the index case. AIDS was diagnosed in Belgium in 1983 in a second frequent male sexual partner of the index case (he died in Antwerp in November, 1983). The wife of the first male lover also died of AIDS-like disease, in March 1983. The chronology of events is compatible with both male-to-female and female-to-male heterosexual transmission.

Discussion

This report confirms that AIDS with clinical manifestations similar to the disease in Europe and the United States and Haiti is an important health problem in

Zaire, central Africa. Using as numerator the number of cases of AIDS seen during the three weeks of this investigation and which came from Kinshasa and as denominator the population of Kinshasa (about 3 million) we estimate the annual rate to be about 17 per 100 000. If children were excluded from the denominator the rate would be even higher. This is a minimal estimate, and it is comparable with or higher than the rate in San Francisco or New York.

Because of limited diagnostic facilities we used a case definition which included clinical features of AIDS and the immunological characteristics of low T helper cell counts and low helper to suppressor ratios which have been hallmarks of AIDS. We believe that this combination strengthens the case definition in an area where severe infectious diseases abound, often going undiagnosed.

The 38 cases described are similar in their clinical features to those reported from the USA and Europe. The high mortality in newly diagnosed patients is probably due to delay in seeking medical care and to the limited facilities for diagnosis and treatment. Clinical manifestations were similar to those reported among AIDS patients in Haiti, where severe chronic diarrhoea, profound weight loss, and thrush were common.[4,5]

KS was diagnosed in 17% of patients, similar to the rate observed in Belgium,[2] among Haitian patients in the USA, and in the group without specific risk factors in the USA.[4] Since KS has long been endemic in Zaire,[7] only patients with fulminant KS were included as cases, all of whom had profound immunological abnormalities; 4 had opportunistic infections, and 2 died during the survey. While there are some clear differences between the epidemiology of endemic KS and that associated with AIDS (eg, 90% of endemic KS is in males), further studies on the epidemiology, clinical features and immunological status of patients with endemic KS in Zaire are urgently needed further to assess the relation between African KS and that associated with AIDS.

Patients with AIDS in Zaire demonstrated immunological abnormalities similar to patients in other parts of the world.[8] However, several control patients with malaria and tuberculosis exhibited abnormal immunological test results as well, although none had cutaneous anergy. Tuberculosis,[9] protein calorie malnutrition,[10] and various parasitic diseases[11–13] can all be associated with depression of cellular immunity. In a study of antibody to lymphadenopathy virus isolated from AIDS patients as well as those with lymphadenopathy syndrome,[14] 94% of the patients were found to have antibody. 6 controls were also found to have antibody, and 5 of those 6 were patients with profoundly diminished OKT4+ cell counts as well as very low OKT4+/OKT8+ ratios.[14]

Two important differences between AIDS in Zaire and the disease in patients of European or American origin merit discussion—namely, the sex distribution and apparent lack of risk factors among patients in Zaire. The 1·1:1 ratio of males to females is likely to be more representative of the endemic situation than the ratio in patients from Zaire seen in Europe which probably represents those able to afford treatment in Europe. A similar ratio (1·5:1) has also been reported for patients without attributable risk factors in the USA.[15]

The essentially equal proportion of males and females would require that transmission occurs both male to female and female to male, since one-direction transmission would soon result in an imbalance in the ratio. Heterosexual transmission of AIDS is also supported by finding AIDS in both spouses of two married couples, as well as in the two separate clusters of individuals linked by sexual contact. Most female AIDS patients were either never married or divorced. Heterosexual male-to-female transmission of AIDS has been suggested in the USA, although so far this has been infrequent.[16–18]

The mean age of the patients was similar to the American, Haitian, and European cases, but it is not clear what the significance is, if any, of the lower age of the female patients. Attempts at eliciting other risk factors were limited in this study; however, no patient had a recent history of blood transfusion (table III). Injections were common among patients and controls. The cost of disposable needles limits their availability in developing countries, where medication is often given with unsterilised needles or syringes. The use of contaminated needles and syringes has been implicated in Zaire in the transmission of Ebola virus haemorrhagic fever.[19] Further study is needed to determine their role, if any, in AIDS.

While numerical data are lacking, it is clear that several thousand professional people went from Haiti to Zaire between the early 1960s and the mid-1970s. Discussion with Haitians remaining in Zaire shows that most of these people have now left and live in Europe or North America. We were unable to identify any common factor accounting for the occurrence of AIDS in Haiti and in Zaire almost simultaneously. Indeed only 1 case of AIDS has been recorded in a Haitian in Zaire, and that was in 1983 in an unmarried woman. We are unaware, therefore, of any facts implicating either central Africa or Haitian immigrants from central Africa as the origin of the disease, and such speculation must be viewed with scepticism unless substantive data appear.

It was impossible to date the onset of AIDS in Kinshasa. A chart review revealed syndromes including weight loss, lymphadenopathy, and invasive KS in young adults as far back as 1975, but information was inadequate to diagnose AIDS definitively. AIDS cases originating in Zaire in 1976 and 1977 have been reported.[20–21] It seems unlikely, however, that large numbers of African patients with AIDS before 1981 were unrecognised in Europe, when the first African AIDS cases were diagnosed.[1] The reported rate of cryptococcal meningitis in Kinshasa was 1 case per year in each of the two hospitals surveyed between the mid-1950s and late 1979;[22] since 1981 more than 35 cases of cryptococcal meningitis have been diagnosed in these hospitals. Most of these recent cases are believed to be associated with AIDS (Lamey and Melameka[23] and unpublished data from hospital records). This is consistent with the emergence of the disease in large numbers simultaneously with the first cases in the USA and Haiti.

The strong indication of heterosexual transmission in Zaire implies a different and important epidemiological pattern compared with that of AIDS in other areas. The recent isolation of a retrovirus strongly associated with AIDS should allow important epidemiological studies to be carried out, further clarifying this new epidemiological pattern in central Africa. Such studies are under way.

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REFERENCES

1. Anon. AIDS in Europe: Status quo 1983. *Eur J Cancer Clin Oncol* (in press).
2. Clumeck N, Sonnet J, Taelman H, Cran S, Henrivaux P. Acquired immune deficiency syndrome in Belgium and its relation to central Africa. *Ann NY Acad Sci* (in press).
3. Clumeck N, Sonnet J, Taelman H, et al. Acquired immune deficiency syndrome in African patients. *N Engl J Med* 1984; **310**: 492–97.
4. Malebranche R, Arnoux E, Guerin JM, et al. Acquired immunodeficiency syndrome with severe gasrrointestinal manifestations in Haiti. *Lancet* 1983; ii: 873–78.
5. Pape JW, Liautaud B, Thomas F, et al. Characteristics of the acquired immune deficiency syndrome in Haiti. *N Engl J Med* 1983; **309**: 945–50.
6. Bachman D, Rodrigues M, Chu F, Straus SE, Cogan DG, Macher AM. Culture-proven cytomegalovirus retinitis with the acquired immunodeficiency syndrome. *Ophthalmology* 1982; **98**: 797–804.
7. Gigase P. Quelques aspects du sarcome de Kaposi en Afrique. *Ann Soc Belge Med Trop* 1965; **45**: 195–210.
8. Fahey JL, Prince H, Weaver M, et al. Quantitative changes in T-helper or T-suppressor/cytotoxic lymphocyte subsets that distinguish acquired immune deficiency syndrome from other immune disorders. *Am J Med* 1984; **76**: 95–100.
9. Chaparas SD. The immunology of mycobacterial infections. *CRC Crit Rev Microbiol* 1982; **9**: 139–97.
10. Smythe PM, Breton-Stiles GG, Grace HJ, et al. Thymolymphatic deficiency and depression of cell-mediated immunity in protein-calorie malnutrition. *Lancet* 1971; ii: 939–43.
11. Brasseur PH, Agrapart M, Ballet JJ, Briulhe P, Warrel MJ, Savanat Tharavany. Impaired cell-mediated immunity in *Plasmodium falciparum* infected patients with high parasitemia and cerebral malaria. *Clin Immunol Immunopathol* 1983; **27**: 38–50.
12. Ganguly NK, Mahajan RC, Gill J, Koshy A. Kinetics of lymphocyte subpopulations and their functions in cases of amoebic liver abscess. *Trans Roy Soc Trop Med Hyg* 1981; **75**: 807–09.
13. Greenwood BM, Whittle HC, Molyneux DH. Immunosuppression in Gambian trypanosomiasis. *Trans Roy Soc Trop Med Hyg* 1973; **67**: 846–50.
14. Montagnier L, McCormick JB, Quinn T, Piot P. Antibody to lymphadenopathy associated viruses in AIDS patients in Zaire. *Science* (in press).
15. Jaffe HW, Bregman DJ, Selik RM. Acquired immune deficiency syndrome in the United States: The first 1000 cases. *J Infect Dis* 1983; **148**: 339–45.
16. Centers for Disease Control. Immunodeficiency among female sexual partners of males with acquired immune deficiency syndrome (AIDS)—New York. *MMWR* 1983; **31**: 697–98.
17. Harris C, Small CB, Klein RS et al. Immunodeficiency in female sexual partners of men with acquired immune deficiency syndrome. *N Engl J Med* 1983; **308**: 1181–84.
18. Pitchenik AE, Fischl MA, Spira TJ. Acquired immune deficiency syndrome in low risk patients. *JAMA* 1983; **250**: 1310–12.
19. Breman JG, Piot P, Johnson KM, et al. The epidemiology of Ebola haemorrhagic fever in Zaire, 1976. In: Pattyn SR, ed. Ebola virus haemorrhagic fever. Amsterdam: Elsevier, 1978: 103–23.
20. Bygbjerg IC. AIDS in a Danish surgeon (Zaire, 1976). *Lancet* 1983; i: 925.
21. Vandepitte J, Verwilghen R, Zachee P. AIDS and cryptococcosis (Zaire, 1977). *Lancet* 1983; i: 925–26.
22. Renoirte R, Michaux JL, Gatti D, et al. Nouveaux cas d'histoplasmose africaine et de cruptococcose observés en Republique Democratique du Congo. *Bull Acad Roy Méd Belg* 1967; **7**: 465–527.
23. Lamey B, Melameka N. Aspects cliniques et epidemiologiques de la cryptococcose à Kinshasa: à propos de 15 cas personnels. *Méd Trop* 1982; **42**: 507–11.

RUPTURE OF FETAL MEMBRANES AND PREMATURE DELIVERY ASSOCIATED WITH GROUP B STREPTOCOCCI IN URINE OF PREGNANT WOMEN

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Summary 68 of a group of 2745 consecutive pregnant women had group B streptococci in their urine. In this group primary rupture of the membranes and premature delivery occurred in 35% and 20% respectively. In women without group B streptococci 15% had primary rupture of the membranes and premature delivery occurred in 8·5%. Group B streptococcal sepsis occurred in five infants, all had mothers with positive urine culture. Women with group B streptococci in their urine seem to have a significantly increased risk of primary rupture of the fetal membranes and premature delivery.

Introduction

APPROXIMATELY 25% of pregnant women have group B streptococci in the vagina.[1] Their infants may become infected at delivery, and 1% of these children become seriously ill with group B streptococcal sepsis or meningitis.[2] Although colonisation of the vagina by group B streptococci was not significantly associated with abortion, prematurity, primary rupture of the membranes, or stillbirths,[3] a positive correlation was demonstrated between urinary tract infection caused by gram-negative rods and premature delivery.[4]

We have determined the occurrence of primary rupture of the membranes and premature delivery in pregnant women with group B streptococci in the urine.

Methods

We studied 2745 consecutive pregnant women who spontaneously went into labour in the department from Jan 1, 1982, to April 1, 1983. Mid-stream urine samples had been obtained from all women on at least one occasion between week 12 and week 38 of pregnancy. Urine was examined for aerobic and anaerobic bacteria at Statens Seruminstitut, Denmark.

Group B streptococci were identified on the basis of colony morphology, haemolysis, and a positive CAMP reaction.[5] The number of bacteria per ml of urine was determined as colony-forming units after serial dilutions and plating with calibrated loops.

Results

Urine from 2677 pregnant women was negative for group B streptococci by culture (table 1). Primary rupture of the fetal membranes—ie, rupture more than 1 h before onset of labour—occurred in 402 cases (15%). Premature labour (delivery before the end of week 37 of gestation) occurred in 233 (8·5%) women. Sepsis caused by group B streptococci was not observed in any infant. 68 pregnant women (2%) had group B streptococci in their urine. Primary rupture of the fetal membranes was significantly more common in this group than in women without group B streptococci (table 1). Primary rupture did not correlate with the number of bacteria in the urine (fig 1), but the rate of primary rupture was increased when group B streptococci were demonstrated late in pregnancy (fig 2). 14 (20%) women with group B streptococci in their urine had premature labour (table 1). In 12 of these cases, premature labour occurred after primary rupture of the membranes.

TABLE 1—GROUP B STREPTOCOCCI IN URINE OF PREGNANT WOMEN AND PRIMARY MEMBRANE RUPTURE, PREMATURE LABOUR, AND SEPSIS IN INFANTS

	Group B streptococci in urine	
	Positive (n=68)	Negative (n=2677)
Primary rupture of the membranes	35%*	15%*
Premature onset of labour	20%†	8·5%†
Group B streptococcal sepsis in infant	7·4%	0·0%

*$p<0·001$; χ^2. †$p<0·001$; χ^2.