Pole 2

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Estimation of HIV-1 prevalence in the population of Abidjan by adjustment of the prevalence observed in antenatal centres

In many settings, and particularly in developing countries, HIV prevalence estimates in the general population are based on the prevalence observed through sentinel surveillance in antenatal centres. Pregnant women are thus considered to be representative of all women of childbearing age. This estimation relies on the hypothesis that HIV-infected women have an equal probability of being pregnant and to visit antenatal centres than uninfected women. However, several studies have shown that HIV-1 infection could impair female fertility [1–3]. This means that HIV-1-infected women are expected to visit antenatal centres less often than other women, and thus that HIV-1 prevalence amongst the general population may be underestimated when based upon sentinel surveillance in antenatal centres. The prevalence assessed at the antenatal care centres should therefore be adjusted, taking into account the fertility differences between HIV-1 positive and HIV-negative groups.

Nicoll *et al.* [4] have presented a method of adjustment by estimating a summary relative inclusion ratio (RIR), based on the relative probability of including HIV-infected and uninfected women in a seroprevalence survey in prenatal centres. The authors estimated that this ratio was equivalent to the ratio of live birth rates in HIV-infected women to live birth rates in uninfected women. Once this ratio is obtained, the prevalence in the general population can be estimated as the prevalence observed among pregnant women divided by the RIR.

We applied this method of adjustment to the city of Abidjan, Côte d'Ivoire, since we had data on female fertility by HIV status for 5483 pregnant women who agreed to be tested for HIV between 1995 and 1997 in three antenatal care centres of the district of Yopougon, Abidjan, in the context of a clinical trial to reduce mother-to-child transmission of HIV [5]. This method was applied for HIV-1 infection only, since HIV-2 is not suspected to impair female fertility. For each group, an RIR was calculated from the live birth rates (Table 1), following the method of Nicoll *et al.* [4]. However, the method was simplified, because in a first approach, women consulting in antenatal centres are a homogeneous group in terms of reproductive behaviour. However, we stratified the analysis by age, since fertility in African countries is strongly age-dependent. Since we only had retrospective cumulated data on live births for women, we calculated cumulated birth rates for each age-group.

The overall RIR was significantly smaller than unity (Table 1), which confirms the trend of lower fertility in the HIV-1-infected group. However, when stratifying

Table 1. Live birth rates observed by HIV status and relative inclusion ratios (RIR) by age (calculated using the method of Nicoll *et al.* [4]) in antenatal centres, Abidjan, Côte d'Ivoire, 1995–1997.

	HIV-negative			HIV-1-positive			
Age-group (years)	No. live births	Women-years at risk	Live birth rate* (95% CI)	No. live births	Women-years at risk	Live birth rate* (95% CI)	RIR (95% CI)
15–19	267	2514	10.62 (9.39–11.85)	52	374	13.90 (10.33–17.48)	1.31 (0.87–1.86)
20–24	1540	10436	14.76 (14.06–15.45)	270	2005	13.47 (11.94–14.99)	0.91 (0.77–1.07)
25–29	2482	13699	18.12 (17.46–18.78)	269	1846	14.57 (12.93–16.21)	0.80 (0.69–0.93)
30–34	3057	13462	22.71 (21.99–23.43)	291	1572	18.51 (16.55–20.47)	0.82 (0.71–0.93)
≥ 35	2068	8639	23.94 (23.02–24.86)	184	781	23.56 (20.52–26.60)	0.98 (0.83–1.16)
Total	9414	48750	19.31 (18.95–19.67)	1066	6578	16.21 (15.30–17.11)	0.84 (0.78–0.90)

*Cumulated rates. CI, Confidence interval.

Table 2. Estimated HIV-1 prevalence by age in the general female population based on the prevalence values observed in an antenatal centre using the method of adjustment of Nicoll *et al.* [4].

Age-group (years)	Observed HIV-1 prevalence in antenatal centres [5] [% (n/total)]	RIR	Estimated HIV-1 prevalence (%) in general population*	% Weight of age-group in 15–45-year female urban population [6]
15–19	12.43 (106/853)	1.31	9.49	28
20–24	15.67 (300/1914)	0.91	17.22	22
25–29	11.85 (160/1350)	0.80	14.81	18
30–34	10.45 (97/928)	0.81	12.90	15
≥35	8.22 (36/438)	0.98	8.39	17
Total				
Without stratifying	12.75 (699/5483)	0.84	15.18	
Stratifying by age			12.47	

*Observed prevalence/relative inclusion ratio (RIR).

by age-group, it appeared that this RIR was age-related (Table 1), with divergent trends below and above age 20 years. Amongst the youngest women (aged < 20 years), the RIR was 1.31 (95% confidence interval, 0.87–1.86), whereas it was lower than unity amongst the older women. This indicated that HIV-1 prevalence values collected in antenatal centres would overestimate the community prevalence for women aged under 20 years and would underestimate prevalence for women aged older than 20 years (Table 2). This is consistent with other African data [2] and implies that an estimation of the HIV prevalence in a community based on antenatal centre prevalence must be age-stratified, since this estimation will strongly depend on the age structure of the consulting population.

Hence, in our setting, the estimated overall prevalence calculated for the 15–45-year-old female population by the method of adjustment of Nicoll *et al.* [4], with and without stratifying by age, gives quite different results: 15.2% without stratifying by age versus 12.5% when stratifying by age ($P < 0.01$; Table 2). We note that in this example, given the age structure of the antenatal centres, the observed prevalence among pregnant women was not different from the general population estimate (12.7% versus 12.5%; $P = 0.69$). Therefore, in this particular case, the antenatal centre prevalence can be considered to be a proxy of the prevalence in the general population of childbearing women.

In conclusion, the application of the method of adjustment presented by Nicoll *et al.* [4] to estimate community HIV prevalence from a sentinel survey in antenatal centres is easily applicable in African countries, although it is important to take into account the age structure of the population in antenatal centres and to stratify this adjustment by age. The only data needed for such an adjustment are age, number of live births, HIV serostatus for women entering the sentinel centre, and, if possible, age at first sexual intercourse (to calculate the period at risk for live birth rates), as well as the age structure of the community considered (available in all demographic surveys). It would then be interesting to routinely collect these data in all sentinel surveys in order to perform such an adjustment and to verify for each sentinel centre whether there is a significant difference between the observed and the adjusted prevalence. This will confirm whether the sentinel prevalence is a good estimate of the community prevalence, or whether it requires further adjustment.

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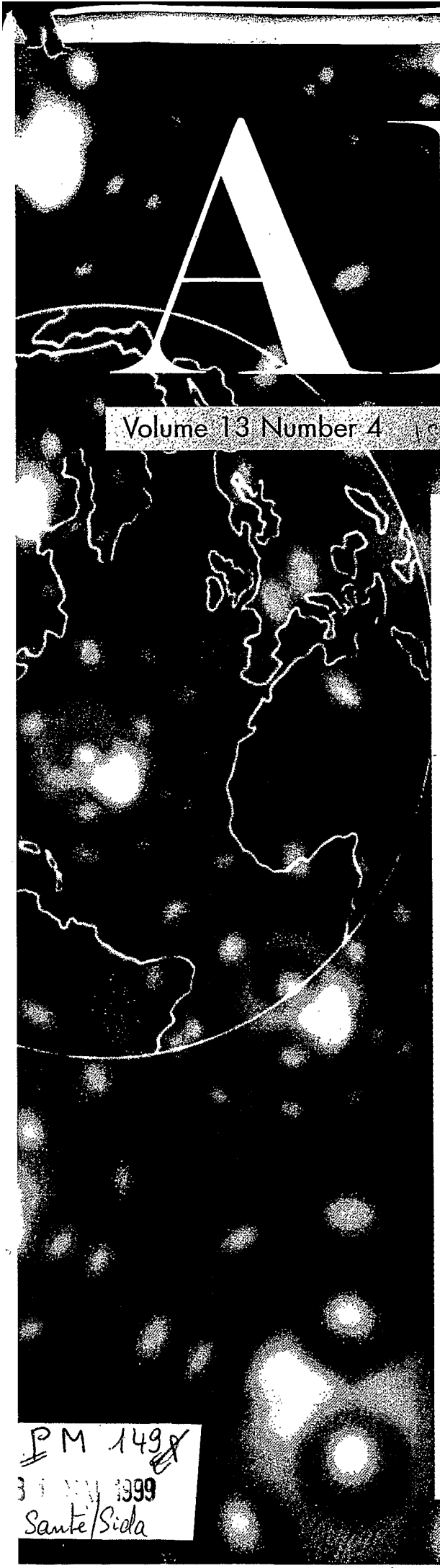
Interleukin-2 treatment of microglia has no effect on *in vitro* HIV infection

Interleukin (IL)-2 immunotherapy, in conjunction with highly active antiretroviral therapy (HAART), is viewed as a potential means of safely reconstituting the immune systems of AIDS patients [1,2]. Since stimulation of immune cells of HIV-infected individuals increases viral replication [1,3], IL-2 therapy must be



AIDS

Volume 13 Number 4 ISSN 0269-9370 http://www.AIDSonline.com

EDITORIAL REVIEW

435 The treatment of tuberculosis in HIV-infected persons
A.L. Pozniak, R. Miller and L.P. Ormerod

BASIC SCIENCE

447 Longitudinal analysis of serum chemokine levels in the course of HIV-1 infection
S. Polo, F. Veglia, M.S. Malnati, C. Gobbi, P. Farci, R. Raiteri, A. Sinicco and P. Lusso

455 Acute upregulation of *CCR-5* expression by CD4+ T lymphocytes in HIV-infected patients treated with interleukin-2
W. Zou, A. Foussat, S. Houhou, I. Durand-Gasselin, A. Duliousť, L. Bouchet, P. Galanaud, Y. Levy and D. Emilie for the ANRS 048 IL-2 Study Group

CLINICAL

465 Redistribution of body fat in HIV-infected women undergoing combined antiretroviral therapy
C. Gervasoni, A.L. Ridolfo, G. Trifirò, S. Santambrogio, G. Norbiato, M. Musicco, M. Clerici, M. Galli and M. Moroni

473 Urological complaints in relation to indinavir plasma concentrations in HIV-infected patients
J.P. Dieleman, I.C. Gyssens, M.E. van der Ende, S. de Marie and D.M. Burger

479 A phase I/II study of the safety and pharmacokinetics of nevirapine in HIV-1-infected pregnant Ugandan women and their neonates (HIVNET 006)
P. Musoke, L.A. Guay, D. Bagenda, M. Mirochnick, C. Nakabiito, T. Fleming, T. Elliott, S. Horton, K. Dransfield, J.W. Pav, A. Murarka, M. Allen, M.G. Fowler, L. Mofenson, D. Hom, F. Mmiro and J.B. Jackson

487 The effect of *Plasmodium falciparum* malaria on HIV-1 RNA blood plasma concentration
I.F. Hoffman, C.S. Jere, T.E. Taylor, P. Munthali, J.R. Dyer, J.J. Wirima, S.J. Rogerson, N. Kumwenda, J.J. Eron, S.A. Fiscus, H. Chakraborty, T.E. Taha, M.S. Cohen and M.E. Molyneux

495 Micronutrient supplementation in the AIDS diarrhoea-wasting syndrome in Zambia: A randomized controlled trial
P. Kelly, R. Musonda, E. Kafwembe, L. Kaetano, E. Keane and M. Farthing

501 Isoniazid prophylaxis for tuberculosis in HIV infection: a meta-analysis of randomized controlled trials
H.C. Bucher, L.E. Griffith, G.H. Guyatt, P. Sudre, M. Naef, P. Sendi and M. Battegay

EPIDEMIOLOGY & SOCIAL

509 HIV-1 seroprevalence among childbearing women in northern Thailand: monitoring a rapidly evolving epidemic
R.E. Bunnell, S. Yanpaisarn, P.H. Kilmarx, P.H. Rhodes, K. Limpakarnjanarat, R. Srismith, T.D. Mastro and M.E. St Louis

517 Impaired fertility in HIV-1-infected pregnant women: a clinic-based survey in Abidjan, Côte d'Ivoire, 1997
A. Desgrées du Loû, P. Msellati, A. Yao, V. Noba, I. Viho, R. Ramon, C. Welffens-Ekra and F. Dabis

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