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CONTENTS

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EDITORIAL

The October - December issue of HTB South starts with HIV-related studies that stood out from the programme of the 52rd ICAAC, including interesting new HIV and TB compounds.

We also continue our coverage from the IAS World AIDS Conference, with reports that include the HPTN-52 study, an analysis of hormonal contraception and risk of HIV transmission, and the second part of a cure-based review.

Among other news, we report an increased incidence of ischemic stroke in an HIV positive cohort in the United States (US), news about Stribild (Quad) now approved in the US, and the welcome reduction in the cost of Xpert MTB/RIF cartridges.

This is the last issue of HTB South for 2012 and will be distributed at the first Southern African HIV Clinician's Society Conference in Cape Town. The next issue will include reports from that meeting.

Happy reading and enjoy the conference if you are attending.

Southern African HIV Clinicians Society

Since its inception in 1997, with a membership of approximately 250 members, the Southern African HIV Clinician's Society has grown to a membership of over 15,000 in the Sub Saharan region and internationally - a clear recognition of the services and support provided.

The Southern African HIV Clinician's Society is the largest special interest group within the South African Medical Association (SAMA). It is also the largest HIV interest group in the world.

The Society is thrilled to be part of the HIV Treatment Bulletin South initiative. This is a valuable publication for all Health Care Practitioners. This publication has essential, current and scientific information about research and HIV treatment updates with particular implications for clinical practice.

For more information about the Society or on how to become a member please visit:

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CONFERENCE REPORTS

52nd International Conference on Antimicrobial Agents and Chemotherapy (ICAAC)

9-12 September 2012, San Francisco

Introduction

The annual ICAAC conferences tend to have such a reduced focus on HIV in recent years that i-Base rarely prioritises attending this meeting.

Also, unlike most HIV meetings, only limited access is provided to abstracts and presentations. This is not a good model for health news. Some reports are restricted to data that was included in the abstract which have very limited peer review.

So the few articles included in this issue are to highlight potentially interesting studies that will hopefully be presented with greater detail and better access at either the HIV Congress in Glasgow in November, or at CROI in Atlanta in March next year.

For a limited period, abstracts and sessions can be searched and browsed online:

http://www.abstractsonline.com/Plan/browse.aspx

Despite their short access period and tediously long URLs, links to abstracts are included in each report.

PowerPoint slides from selected studies are also posted to the free-access NATAP.org which includes approximately 50 reports from ICAAC.

http://www.natap.org/2012/ICAAC/ICAAC.htm

Reports in this issue of HTB are:

- Study summaries from ICAAC 2012
  - Dolutegravir superior to efavirenz at week 48 in treatment-naive patients
  - Elvitegravir/cobicistat has no clinically significant interactions with methadone or buprenorphine
  - Albuvirtide: long-acting formulation T-20
  - High rates of adherence and virological suppression with once-daily raltegravir and directly observed therapy (DOT) in IDU patients
  - Role of HIV DNA, recent cellular infection and poor immunological responses despite viral suppression
- Antiviral activity in vitro with S/GSK1265744
- Efavirenz interaction studies with TB compounds bedaquiline and delaminid

Study summaries from ICAAC 2012

Simon Collins, HIV i-Base

The following brief summaries on new drugs and treatment strategies include links to the ICAAC online abstracts and/or links to slidesets or articles posted at natap.org.

Dolutegravir results superior to efavirenz at week 48 in treatment-naive patients

The top-line results from the randomised, double-blinded, placebo-controlled, non-inferiority, Phase 3 SPRING study were released in July just prior to the IAS conference.

Dolutegravir (50 mg once-daily) was paired with abacavir/3TC and compared to efavirenz/tenofovir/FTC (Atripla) in 674 treatment-naive patients, generally in early stage infection.

At week 48, the dolutegravir arm showed superiority with 88% vs 81% of patients suppresed to <50 copies/mL (difference +7.4%; 95%CI: +2.5, +12.3; p=0.003).

This result was driven by fewer discontinuations due to toxicity in the dolutegravir arm (2% vs 10%). Virological failure occured in 4% of patients in each group.

Ref: Walmsley S et al. Dolutegravir (DTG; S/GSK1349572) + abacavir/lamivudine once daily statistically superior to tenofovir/emtricitabine/efavirenz: 48-week results - SINGLE (ING114467). 52nd ICAAC, 9-12 September 2012, San Francisco. Abstract H-556b.

http://www.abstractsonline.com/Plan/ViewAbstract.aspx?sKey=e1c18d5b-830f-4b4e-8671-35bcfb20eed5&cKey=af219b7d-2171-46b2-91ef-b8049552c9e5&mKey=%7b6B114A1D-85A4-4054-A83B-04D8B9B8749F%7d

http://www.natap.org/2012/ICAAC/ICAAC_06.htm

Elvitegravir/cobicistat has no clinically significant interactions with methadone or buprenorphine

Results from two small PK studies in patients on stable opiate substitution therapy (n=12 methadone; n=18 buprenorphine) reported no indications of an interaction between elvitegravir/cobicistat and methadone and only modestly increased buprenorphine levels that did not require dose modification.

Ref: Bruce RD et al. Pharmacokinetics of cobicistat-boosted elvitegravir administered in combination with methadone or buprenorphine/naloxone. 52nd ICAAC, 9-12 September 2012, San Francisco. Abstract A-1250.

http://www.abstractsonline.com/Plan/ViewAbstract.aspx?sKey=a96a704b-ee24-44df-8955-f1688acf7663&cKey=7c849c73-6efd-4fce-9e2c-218df03ff40c&mKey=%7b6B114A1D-85A4-4054-A83B-04D8B9B8749F%7d

http://www.natap.org/2012/ICAAC/ICAAC_40.htm

Albuvirtide: long-acting formulation T-20

The first in vivo virological data were presented for a new long-acting formulation of the fusion inhibitor T-20. This compound is in development with the Chinese company Chongquing

Biotechnologies.

The limited information from the abstract reported results from a dose-finding study in Chinese HIV positive patients who received single IV injections daily for three days, followed by once-weekly injections for a further two weeks.

Mean maximum declines of 0.68 and 1.05 log copies/mL were reported with 160 mg and 320 mg doses respectively. In a single-dose study, viral reduction was maintained for 6-10 days, with albuvirtide showing a plasma half-life of 10-13 days.

Ref: Wu H et al. Albuvirtide, the first long-acting HIV fusion inhibitor, suppressed viral replication in HIV-infected adults. 52nd ICAAC, 9-12 September 2012, San Francisco. Abstract H554.

http://www.abstractsonline.com/Plan/ViewAbstract.aspx?sKey=e1c18d5b-830f-4b4e-8671-35bcfb20eed5&cKey=70d14bcc-bad6-4754-b4b1-66b7d2559a23&mKey=%7b6B114A1D-85A4-4054-A83B-04D8B9B8749F%7d

http://www.natap.org/2012/ICAAC/ICAAC_27.htm

High rates of adherence and virological suppression with once-daily raltegravir and directly observed therapy (DOT) in IDU patients

Although results of once-daily raltegravir studies did not support a label change or further research into this dosing option, a Canadian study reported very high rates of success in a cohort of 121 HIV positive treatment experienced injecting drug users (n=103 male) that also included comprehensive adherence support. DOT ws used by 81% of patients.

Over a median follow-up of 12 (6-18) months, 80% of the cohort achieved or maintained virologic suppression to <50 copies/mL (appromiately half the group switched with undetectable viral load at baseline.

Importantly, CD4 counts increased by a median 80 cells/mm3 from a median of 425 cells/mm3 (range 20-1600) at baseline. Adherence exceeded 90%. Virologic rebound to >400 copies/mL occurred in 10% of patients but resuppression was achieved in all cases over the subsequent three months. There were no cases of emergent raltegravir resistance.

Ref: Stewart K et al. Safety and efficacy of once daily raltegravir to enhance adherence and efficacy of HAART in vulnerable HIV-infected patients. 52nd ICAAC, 9-12 September 2012, San Francisco. Abstract H-884.

http://www.abstractsonline.com/Plan/ViewAbstract.aspx?sKey=e47a6478-452a-4c7c-9ebc-86a50a648cc7&cKey=8eb48052-2257-4337-8e1d-51658c50fefe&mKey=%7b6B114A1D-85A4-4054-A83B-04D8B9B8749F%7d

http://www.natap.org/2012/ICAAC/ICAAC_21.htm

Role of HIV DNA, recent cellular infection and poor immunological responses despite viral suppression

A group of French researchers looking at immunological non-responders despite viral suppression <50 copies/mL reported an association with HIV DNA as a marker of recent cellular infection and ongoing replication and overexpression of the activation marker CD38+, that was higher in patients with reduced CD4 responses on treatment. The natap report linked below report this study in detail.

Ref: Psomas KC et al. Poor CD4+ T-cell restoration linked to residual HIV-1 reverse transcription under antiretroviral therapy. 52nd ICAAC, 9-12 September 2012, San Francisco. Abstract H-1570a.

http://www.abstractsonline.com/Plan/ViewAbstract.aspx?sKey=0bc31dda-3bfe-443f-8051-1788529cb053&cKey=e7b3f725-db08-4db9-953e-126811e32026&mKey=%7b6B114A1D-85A4-4054-A83B-04D8B9B8749F%7d

http://www.natap.org/2012/ICAAC/ICAAC_35.htm

Antiviral activity in vitro with S/GSK1265744

Polly Clayden, HIV i-Base

The development of long acting formulations of antiretrovirals arouses great interest – and frequently tops the wish lists of treaters of adolescents.

Cell culture data from S/GSK 1265744, the investigational integrase inhibitor, shown at ICAAC 2012, suggests it has a favourable resistance profile. [1]

S/GSK1265744 is in development both as a long acting parental formulation and the back up oral formulation to dolutegravir. Phase 1 data shown at IAS 2012 using 200 mg/mL nanosuspension administered by intramuscular - dosed at 100 to 800 mg - or subcutaneous abdominal injection – at 100 mg to 400 mg – in HIV negative people produced an apparent plasma half-life of 25-50 days and supports parenteral once monthly dosing. [2]

Results presented at ICAAC were from a study accessing resistance in cell culture, in which HIV-1 IIIB was passaged in MT-2 cells with increasing concentrations of S/GSK1265744 and the integrase gene was sequenced. Fold changes were calculated as a ratio of IC50 against wild type virus.

The investigators reported S/GSK1265744 IC50 of 0.22 nM in human peripheral blood mononuclear cells (PBMC). IC50s for dolutegravir, raltegravir and elvitegravir were respectively 0.51, 2.0 and 2.0 nM. The fold potency shift for 100% human serum was 408 for S/GSK1265744, and 75, 4.7 and 22 for dolutegravir, raltegravir and elvitegravir. The protein adjusted IC50 estimate for S/GSK1265744 was 102 nM compared to 38, 5.6 and 20 nM for dolutegravir, raltegravir and elvitegravir respectively.

Exposure of MT-2 cells infected with HIV-1 IIIB to S/GSK1265744 for up to 112 days did not produce highly resistant mutants. The maximum resistance was 8.4 fold. Raltegravir/elvitegravir resistant signature mutation site-directed molecular clones had less than 2-fold change in susceptibility to S/GSK1265744, except for Q148K/R, which had 5.6/5.1 fold change, respectively. Fold changes of 14 double mutants among 15 site directed molecular clones were less than 12.

C O M M E N T

A poster at ICAAC showed results from a phase 1, open-label, two-cohort, single sequence crossover study, looking at the effects of oral co-administration of rilpivirine with S/GSK1265744 (also dolutegravir). [3]

HIV negative subjects received S/GSK1265744 30 mg once daily for 12 days followed by a washout, rilpivirine 25 mg once daily

for 12 days, and rilpivirine 25 mg plus S/GSK1265744 30 mg for 12 days, taken following a moderate fat meal. Serial PK sampling was performed on the last day of each dosing period.

This evaluation found similar S/GSK1265744 and rilpivirine PK parameters when administered separately or together. Bioequivalence criteria were met for all parameters except S/GSK1265744 decreased rilpivirine Cmin by 8%, which is not considered clinically relevant. This lack of interaction is promising for co-administration in long-acting depot injection regimens.

References

1. Yoshinaga T et al. Antiviral characteristics of S/GSK1265744, an HIV integrase inhibitor (INI) dosed by oral or long-acting parenteral Injection. 52nd ICAAC, San Francisco, 9-12 September 2012. Oral abstract H-550.
2. Spreen W et al. Pharmacokinetics, safety and tolerability of the HIV integrase inhibitor S/GSK1265744 long acting parenteral nanosuspension following single dose administration to healthy adults. 19th International AIDS Conference 22-27 July 2012. Washington, DC. Poster abstract TUPE040.
3. Ford SL et al. Lack of pharmacokinetic (PK) interaction between rilpivirine and the integrase inhibitors dolutegravir and S/GSK1265744. 52nd ICAAC, San Francisco, 9-12 September 2012. Poster abstract A-1249.

Efavirenz interaction studies with TB compounds bedaquiline and delamanid

Polly Clayden, HIV i-Base

HIV and TB co-infection is common and treatment is complicated by drug-drug interactions.

Two poster presentations at ICAAC described potential reduced exposure of bedaquiline and a lack of interaction with delamanid when co-administered with efavirenz (EFV).

Bedaquiline, is metabolised to an N-monodesmethyl metabolite (M2) by CYP3A4. For the population pharmacokinetic (PK) study presented, data were obtained from a previously reported drug-drug interaction trial (ACTG A5267) conducted in 33 HIV negative volunteers, who received two doses of 400 mg bedaquiline, the second co-administered with EFV after two weeks of receiving this at 600 mg once daily. Samples were obtained over 14 days after each bedaquiline dose. The investigators used non-linear mixed effects modeling for this analysis.

They reported oral clearance of bedaquiline (CL/F) and M2 (CL/F/fm) of 3.1 L/h (relative standard error, RSE, 6.9%) and 13.2 L/h (RSE 7.1%) respectively. The impact of induction was described as an immediate change in CL/F one week after starting EFV. The estimated change in CL/F was the same for bedaquiline and M2, an increase of 104% (RSE 4.3%).

Both bedaquiline and M2 exposure was decreased by 40-50% under a range of plausible assumptions used in this model-based analysis. This is more than previously concluded from the single-dose data.

Delamanid does not inhibit or induce CYP enzymes. EFV is metabolised by CYP2B6.

Data were presented from a phase 1, open-label, randomised, multiple dose trial in 30 (15 per group) healthy volunteers, conducted to investigate the effect on drug exposure and safety of co-administered delaminid 100 mg twice daily and EFV 600 mg once daily.

In this study, EFV was given alone for 10 days (Group 1); delamanid was given alone for seven days and with EFV for a further 10 days (Group 2). Pre-dose and at trough samples were obtained before full PK sampling. For EFV PK, samples were taken on day 10/11 (Group 1) and day 17/18 (Group 2); for delamanid PK on day 7/8 (Group 1) and day 17/18 (Group 2).

The investigators calculated plasma PK parameters including geometric mean ratios for Cmax and AUCt with 90% CI. This revealed that exposure to both drugs does not appear to be affected by co-administration. One participant in each group had elevated EFV exposure associated with CYP2B6 polymorphisms.

Adverse events were reported in 93% of participants who received both drugs, 73% EFV alone and 60% delamanid alone. All were mild to moderate. One participant discontinued while on two drugs due to abnormal liver function tests.

The phase 3 trial of delaminid is now enrolling a subgroup of HIV positive people receiving ART.

References

1. Svensson E et al. Population pharmacokinetics (PK) of TMC207 and its M2 metabolite with efavirenz (EFV) demonstrate reduced Exposure. 52nd ICAAC, San Francisco, 9-12 September 2012. Poster abstract A-1256.
2. Petersen C et al. Delamanid, a new drug for multi-drug resistant tuberculosis (MDR-TB), and efavirenz do not show clinically relevant drug interactions in healthy subjects. 52nd ICAAC, San Francisco, 9-12 September 2012. Poster abstract A-1255.

CONFERENCE REPORTS

19th IAS World AIDS Conference

22–25 July 2012, Washington

Simon Collins, HIV i-Base

Introduction

In this issue, includes further coverage from this important meeting.

Abstracts are easily accessed on-line through a searchable 'Programme at a glance' database on the conference website.

Although many presentations are web cast (and pod cast) this does not comprehencively cover all the clinical treatment sessions.

Some PowerPoint slides are also online.

http://www.aids2012.org

Reports in this issue include:

- HPTN-052: clinical advantages from earlier treatment
- Hormonal contraception and the risk of HIV acquisition
- Towards an HIV cure: Early developments reported at IAS: pt 2
- Online video interviews between researchers and activists

HPTN-052: clinical advantages from earlier treatment

Simon Collins, HIV i-Base

A late breaker oral presentation from the HPTN-052 study was widely reported from IAS this year, with the simple conclusion that it added to the evidence supporting clinical benefits of earlier treatment. [1]

These findings are reassuring, and certainly take away nothing away from the more important primary prevention endpoint results that treatment dramatically reduces the risk of sexual transmission. [2] However, the primary clinical endpoint of benefits to the HIV positive partners, were driven by a few very specific events.

The study randomised over 1700 HIV positive people with CD4 counts350-550, who were in serodifferent heterosexual relationships, to either start treatment immediately or wait until their CD4 count dropped to 250 cells/mm3. Patients were recruited at sites in Africa (54%), Asia (34%) and South America (16%).

HPTN-052 presented first results following a DSMB recommendation to discontinue the study four years earlier than expected. This year, data from a final 855 patient years of follow up (total 4038 years) and a broader range of clinical events was presented by Beatriz Grinsztejn for the study team.

Median (IQR) CD4 and viral load at baseline was approximately 430 cells/mm3 (360-520) and 4.4 log copies/mL (3.8-4.9). Median follow-up was 2.1 years (1.6-2.9) across both arms. A total of 213 patients (24%) in the deferred arm started treatment at a median CD4 count and viral load of 230 cells/mm3 (197-249) and 4.4 log copies/mL (3.9 - 4.9). Time to ART was a median 3.8 years (IQR 3.5-4.4) with approximately 1 year on ART compared to 2 years in the immediate treatment group.

134 people experienced at least one primary clinical event (77 vs 57; 9% vs 6%) including 26 deaths (15 vs 11) and 21 non-AIDS events (9 vs 12), all in the delayed versus immediate arms respectively.

Compared to immediate ART, delayed ART was associated with higher rates of AIDS-defining events (p=0.03) and tuberculosis (p=0.02); and higher incidence (per/100 years) of tuberculosis (1.8, 95% CI=[1.3, 2.6] vs 0.8, [0.5, 1.3], p=0.009) and all targeted clinical events (29.0, [26.3, 31.9] vs 24.7, [22.3, 27.3]; p=0.02).

However there was only a trend to shorter time to first primary clinical event [HR 1.37 (0.97 - 1.93), p=0.07] with no differences seen in the Kaplan-Meier plots over the first year.

The number of secondary endpoints was numerically similar between both groups (n=317 vs 298; 36% vs 34%), although incidence rates became significant (incidence 494 vs 427/100 PY; p=0.05). Herpes and candida were more likely with delayed ART and dyslipidaemia was more likely with early ART.

COMMENT

Although the study reported clinical benefits from earlier treatment this was not consistent across all events and all analyses. While earlier treatment may have advantages, this study should not clearly translate to a conclsion for treatment at higher CD4 counts.

Firstly, the significantly higher rate of extrapulmonary tuberculosis in the delayed arm (17 vs 3 cases; p< 0.002) was driven by higher reports in two sites in India, rather than reflecting a trend from the study as a a whole. [3] Secondly, serious non-AIDS events, rather than being reduced by earlier treatment, occured more frequently with immediate treatment.

Another detail, from the supplementary information made available with publication in the New England Journal of Medicine last year, is that the three suicides in HPTN-052 were all in the immediate arm in patients taking efavirienz: a caution that should temper any recommendation to widely prescribe treatment at higher CD4 counts. These indivudals may have died many years before they were likely to have a demonstrable clinical benefit from treatment.

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Hormonal contraception and the risk of HIV acquisition

Polly Clayden, HIV i-Base

Hormonal contraception is widely used and plays a critical role in women's health, education, employment, economic development and autonomy.

But there is considerable controversy about the role of hormonal contraception in HIV acquisition. There have also been concerns over its potential role in disease progression. A session at IAS 2012 explored the evidence to date. [1]

A prospective cohort study of 3790 couples from East and southern Africa, the Partners in Prevention HSV/HIV Transmission Study recently found that HIV negative women in partnerships with HIV positive men and using injectable contraceptives had a 2-fold increase in HIV acquisition risk (aHR 2.05, 95% CI 1.04 – 4.04, p=0.04). [2] These results gained a great deal of international attention. Following an expert consultation and a systematic review of the existing data, WHO issued a statement upholding its previous guidance on hormonal contraceptive use and re-emphasised the importance of condom use for dual protection. [3]

Renee Heffron presented the results from multiple additional sensitivity analyses examining the robustness of the Partners in Prevention findings. [4] She noted that the findings from this and other observational studies have been inconsistent, are hard to interpret and might have behavioural and/or biological explanations.

In the primary analysis previously reported the investigators used Cox proportional hazards regression, adjusting for age, male partner's viral load, and time-dependent unprotected sex and pregnancy, to compare HIV incidence in women using injectable hormonal contraceptives to women reporting no hormonal method.

The more recent sensitivity analyses examined the possible effects of behaviour, miss-classification of women who switched hormonal contraception during follow-up and the effect of depot medroxyprogesterone acetate (DMPA) compared to other hormonal contraception methods. As information about the brand of hormonal contraception was not collected in the study, in order to isolate the effect of DMPA, data from South African women were censored, as this is the only country with study sites where other methods of hormonal contraception are used.

Dr Heffron reported a persistent increase in HIV acquisition risk of approximately 2-fold across the analyses. When limited to only DMPA users, injectable hormonal contraception was associated with an almost 4-fold increase in risk of HIV acquisition (see Table 1).

Table 1. Results from sensitivity analyses of HIV incidence in women using injectable contraception versus no hormonal contraception

Analysis	aHR	95% CI	p-value
Number of sex acts	2.06	1.04 – 4.07	0.04
Male report of unprotected sex*	2.03	0.95 – 4.35	0.07
Women who reported unprotected sex*	2.29	0.70 - 7.53	0.17
Restricting to periods prior to HC method switch	2.62	0.93 – 7.33	0.07
DMPA users	3.39	1.38 – 11.22	0.01

Adjusted for age, baseline viral load of HIV-positive partner and time dependent report of pregnancy
* Adjusted for the above covariates and the other partner's report of unprotected sex

Dr Heffron noted that some analyses had diminished power for precision due to decreased sample size of the sub groups but the adjusted hazard ratios always suggested a trend towards increased risk. She concluded that these results must be balanced with the unequivocal benefits of injectable contraception. She added that more high quality studies of hormonal contraception and HIV risk are needed and stressed the importance of integrating reproductive health and HIV prevention programmes.

Following this presentation Chelsea Polis from USAID, Office of Population and Reproductive Health, Washington showed results from a systematic review of the epidemiological literature on the association between hormonal contraception and HIV acquisition, including articles published or in press by December 15, 2011. [5]

The investigators identified twenty relevant studies, eight of which met minimum quality criteria. Only one study found a statistically significant association between use of oral contraceptive pills and HIV acquisition.

None of the studies reported statistically significant associations between use of norethisterone enantate (Net-En) and HIV acquisition, but the investigators noted that these data were limited. For DMPA, the data available at the time of review neither established a clear association nor definitely ruled out the possibility of an effect on HIV acquisition.

In order to look at disease progression in HIV positive women, Sharon Phillips from the WHO showed findings from a similarly conducted systematic review. [6]

This review revealed twelve reports of eleven studies meeting the inclusion criteria. One randomised controlled trial found increased risk of a composite endpoint of CD4 decline or death in hormonal contraceptive users versus copper IUD users. Ten observational studies reported no increased risk of HIV disease progression, as determined by death, time to CD4 below 200, time to initiation of antiretroviral therapy, increased viral load, or decline in CD4 with use of hormonal contraception versus non-use.

The investigators noted that although one randomised controlled trial found that hormonal contraceptive use was associated with increased risk of HIV disease progression it had important methodological shortcomings. None of the cohort studies found an association

between hormonal contraceptive use and HIV disease progression compared with non-use of hormonal contraceptives.

They concluded that, "the preponderance of evidence indicates that HIV positive women can use hormonal contraceptive methods without concerns related to HIV disease progression".

C O M M E N T

In the first systematic review conducted for the WHO consultation and presented here, findings are mixed and conflicting. None of the studies reviewed were designed to assess HIV transmission risk and, like all observational findings have many potential confounders.

Eight of 20 relevant studies reviewed met minimum quality criteria - related to use of multivariate analysis, low loss to follow up and clear definition of hormonal contraceptive use. Only one study of sex workers in Kenya showed an association between oral contraception and 46% elevated HIV transmission risk. [7] The Heffron et al study described above showed elevated point estimates but this was not significant.

No studies reported statistically significant associations between use of norethisterone enatate (Net En) and elevated transmission risk, but only three gave estimates specific to this method.

Three of eight studies had statistically significantly increased relative risks with DMPA or unspecified injectable methods, including double the risk in Heffron 2012, 73% increase (and narrower confidence intervals) in Baeton 2007 and 48% increase in risk with marginal structural modelling in Morrison 2010 (but not with Cox proportional model in a previous analysis). [8,9] Other studies had non-significant increased and decreased relative risks. This heterogeneity did not appear to be explained by differences in HIV incidence, purpose of data collection, size of study population, approach to pregnancy, number of seroconverters or overall statistical approach. Differences in manner of handling condom use, length of inter-survey interval and analysis of serodiscordant couples need further consideration and concerns about the potential for residual confounding remain.

The systematic review and the WHO expert consultation concluded that the body of evidence on injectable contraceptives does not establish a clear casual association with HIV acquisition nor does it rule out the possibility of an effect.

The medical eligibility criteria (MEC) for use of contraception offers guidance on the safety of use of different methods for women and men with specific characteristics or known medical conditions and is used by policy-makers, programme managers, and the scientific community, to support national programmes in preparing service delivery guidelines. The MEC did not change following the WHO consultation and there are no restrictions on the use of any hormonal contraceptive method for women living with HIV or at high risk of HIV, although the following clarification was added: "Some studies suggest that women using progestogen-only injectable contraception may be at increased risk of HIV acquisition, other studies do not show this association. A WHO expert group reviewed all the available evidence and agreed that the data were not sufficiently conclusive to change current guidance. However, because of the inconclusive nature of the body of evidence on possible increased risk of HIV acquisition, women using progestogen-only injectable contraception should be strongly advised to also always use condoms, male or female, and other HIV preventive measures. Expansion of contraceptive method mix and further research on the relationship between hormonal contraception and HIV infection is essential. These recommendations will be continually reviewed in light of new evidence".

It is important to note however that a numbering system such as this one cannot reflect nuance, uncertainty (and the complexity of discussion) involved.

Women living with HIV and activists involved in the expert consultation and a subsequent one to discuss the associated operational considerations have stressed the critical importance of clear information for women using hormonal contraceptives and health workers.

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Towards an HIV cure: Early developments reported at IAS, part 2

Muirgen Stack, HIV i-Base

The announcement of the IAS Towards an HIV Cure scientific strategy at the 3rd IAS pre-conference symposium, held this year from 20-21 July, gave a new emphasis to advances in the field of cure research. [1]

The strategy outlines seven important areas of research where advances needed to be made if a cure (functional or sterilising) is to be realised:

- Why does HIV persist: immune and viral factors
- Where does HIV persist: tissue and cell reservoirs
- Immune activation and dysfunction on ART
- Natural models of HIV/SIV control
- How to measure persistent infection
- How to reverse latency: treatments
- Immune approaches, gene therapy, vaccine

Fortunately, some promising cure-related research was presented at AIDS 2012 – something that is hopefully sustained and expanded upon at further meetings.

Novel therapeutic approaches

A greater understanding of viral latency and persistence alongside an expansion of existing therapies is only likely to be one part of any future HIV cure (see Part 1 of this report published in the previous issue of HTB). The creation of novel treatments may be just as essential if targeting viral production and/or replication in sanctuary and/or reservoir sites.

Carolina Garrido and colleagues from UNC Chapel Hill, North Carolina presented a poster on using gold nanoparticles to target viral reservoirs in the brain. [2]

Early research from this group showed that fluorescently labelled (TAMRA) gold nanoparticles successfully enter lymphocytes, macrophages, astrocytes and human brain microvascular endothelial cells (HBMECs) after 24-hours incubation. FACS analysis showed up to 15% of CD4+ T-cells contained TAMRA. Moreover, the ability of the nanoparticles to cross the blood-brain-barrier was confirmed in vivo by intravenous tail injection in mice. Mouse brain gold content reached up to 869 ppb/gram of tissue, and was also observed by microscopy. The nanoparticles were then conjugated to a raltegravir derivative to assess antiviral activity. This reduced viral replication to 25–38% by day 5 compared to 100% HIV replication in media alone. Unfortunately, this was not compared to an unconjugated raltegravir derivative or other ARVs. Nevertheless, these preliminary findings showed initial efficacy and targeting specificity for nanomedicine-based approaches to HIV treatment – although any implications for accumulating gold nanoparticles in brain tissue with chronic treatment were not addressed. [3]

Frauke Christ from the University of Leuven, Belgium, presented pre-clinical data on a new class of integration inhibitors, known as LEDGINs. [4] LEDGINs bind allosterically to a site on integrase where the cellular co-factor LEDGF/p75 attaches. LEDGF/p75 acts to anchor the viral DNA to the host chromatin, before integration. LEDGINs have previously been shown to inhibit HIV replication in vitro via this mechanism. [5]

In the current study, the researchers evaluated the ability of LEDGINs to block the catalytic activity of integrase directly, reporting further inhibition of HIV replication in MT2 and PBMC cells, as well as activity over a broad range of viral clades, and even with viruses containing mutations conferring resistance towards other integrase inhibitors.

Although still in their developmental infancy, there at least appears possible future use for LEDGINs – either on their own or concomitantly with other integrase inhibitors. However, whether they will retain their pre-clinical efficacy in animal and human clinical trials remains to be seen.

Targeting the integrated virus and immunotherapies

Helga Hofmann-Sieber from the Heinrich Pette Institute, Hamburg, presented research, which directly addressed an HIV cure (functional or sterilising) by creating a system that can remove integrated HIV proviral DNA from infected human cell cultures. [6] This approach uses a viral LTR-specific recombinase (Tre-recombinase) that the researchers have previously shown to excise HIV-1 proviral DNA from infected human cell cultures. Tre-recombinase is an enzyme based on the bacterial cre-recombinase, which removes sections of DNA that are flanked by a specific series of nucleotides called loxP. Unfortunately HIV proviral DNA does not contain any loxP sequences. So, the researchers chose a mutant cre-recombinase that could recognise a sequence of nucleotides in the LTRs of integrated HIV.

Applying the technique to HIV positive humanised mice meant creating an advanced lentiviral self-inactivating (SIN) vector that expressed Tre-recombinase conditionally in HIV-infected cells. Both human CD4+ T-cells and CD34+ haematopoietic stem cells (HSC) were successfully transduced prior to engraftment in HIV-1 positive Rag2-/-gammac-/- mice. The pronounced antiviral activity via the Tre-recombinase system was not associated with undesired cytopathic effects in the transduced cells from Tre-recombinase over expression.

Excising integrated HIV-1 DNA would theoretically allow for the eradication of HIV-1 from the body. However, transducing all latently infected cells with Tre recombinase in the many viral reservoirs found in the body remains infeasible. Therefore, the Tre system needs to be modified to allow easier administration before it can be considered for clinical trials like other "anti-latency" drugs such as the histone deacetylase (HDAC) inhibitor vorinostat. [7] First however, the researchers must address a question raised at the end of the presentation which highlighted the Tre-recomninase system to be dependent on the transcription of the viral protein TAT. Unfortunately, disruption of the expression of TAT is a marker of latency, meaning that the Tre-recombinase system would have minimal efficacy on excising proviral DNA from latently infected cells. [8] However, this does make the Tre-recombinase system redundant and perhaps by pairing with other equally novel lentiviral vectors that deliberately over stimulate TAT, the system could continue to be advanced. [9]

Shifting away from novel molecular therapeutics, Lydia Trautmann from VGTI, Florida gave an interesting presentation on possible advances in immunotherapies. [10] She focused on better characterising the differences between HIV-specific CD8+ T cells before and during ART. Her findings included that under low HIV antigen loads (caused by viral suppression from ART), the dominant HIV-specific CD8+ T cell clonotype gained poly-functionality - recognising more epitopes of HIV antigens. This led to a small but efficient clonotype developing under ART. Dr Trautmann concluded that if ways were found to expand these high-affinity HIV-specific CD8+ T cells in vivo, they might be able to control the virus without ART.

Fortunately, an oral abstract by Scott Kitchen from the UCLA AIDS Institute, Los Angeles covered this topic. [11] After recognising the cytotoxic CD8+ T lymphocyte (CTL) response as a critical component in controlling HIV infection, the researchers set out to enhance and expand CTLs' effects in vivo. They utilised molecularly cloned HIV-specific T-cell receptors (TCRs) derived from CD8+ T-cells, which were then used to genetically transduce human haematopoietic stem cells (HSCs). The transduced cells were then introduced into a humanised mouse and were allowed to differentiate into mature

human CD8+ CTLs. Mice expressing the transgenic HIV-specific TCRs were compared to control mice after both were infected with HIV-1.

They observed successful differentiation into mature CTLs and migration into multiple anatomic sites. They also crucially saw significant reduction in plasma HIV RNA levels, which correlated with both levels of reconstitution with cells bearing the HIV-specific TCR and antigen-driven T cell expansion.

These early findings from a humanised mouse model demonstrated the importance of the CTL response and how it can be expanded and improved. By relying on the CTLs own ability to transverse to multiple compartments in the body, it could also potentially override some of the difficulty ARVs may have in reaching sanctuary sites.

Stem cell transplantation

Taking host immune system modification even further, Timothy Henrich from Brigham and Women's Hospital, Boston presented two case reports of allogeneic stem cell transplantation in two HIV positive individuals. [12] Both had haematological malignancies and had previously undergone autologous stem cell transplant. The patients remained on ART and were given a reduced-intensity conditioning (RIC) form of allogeneic stem cell transplant. Immunosuppressive therapy was eventually given in the form of prednisone or tacrolimus/sirolimus to treat chronic graft-versus-host disease (GVHD) after the transplant.

Total HIV-1 DNA was still seen up to 2 months after transplant in patient A (87 copies/million PBMCs) and up to 3 months after transplant in patient B (281 copies/million PBMCs). However after 8 and 9 months respectively, total HIV-1 DNA and 2-LTR HIV-1 DNA (copies/million PBMCs) became undetectable. This was also true for plasma HIV-1 RNA, which due to the sensitivity of the assay can only be shown to be <3 copies/ml.

Parallels will naturally be drawn to the "Berlin patient" (Timothy Brown) who received a stem cell transplant from a donor homozygous for the CCR5 delta-32 mutation. [13] However, the stem cells received by both patients A and B were from donors with normal CCR5 expression. Whether, this undermines the CCR5 delta-32 mutation being necessary as a mechanism to explain Timothy Brown being labelled as "cured" is unclear.

The authors proposed multiple possibilities to explain why HIV could not be detected; namely, GVHD and/or the effect of cytotoxic therapies given to treat it. However, a fuller understanding will have to wait until further samples are analysed to see if any HIV can be detected. More information can be found in a recent interview with the co-researcher Dan Kuritzkes from Harvard Medical School, Boston where he hints at the protective role of ART - acting as "PrEP on a cellular level". [14]

It is clear that cure research covers many different areas and that any likely successes may involve a combination therapy approach. These are tentative stages of cure science, but there are still reasons for optimism. The most obvious being the open nature of cure research, which stresses the importance of collaboration between scientists in the field and is endorsed by the "Towards an HIV cure" working group. This leaves an update of cure-related advances at the 20th international AIDS conference (AIDS 2014) in Melbourne, Australia as an appealing prospect. [15]

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Online video interviews between researchers and activists

Simon Collins, HIV i-Base

The US activist Fred Schaich has for many years persuaded leading researchers and other activists attending key medical meetings to step away from the main meeting and spend 10-20 minutes being interviewed for short web cast videos.

The informal discussions complement the main programme and more than 15 interviews have been posted online.

http://www.ifarablog.org/

Selected highlights include:

- Daniel Douek, Senior Investigator at the US NIH discusses cure research and the development of therapeutic and prophylactic vaccines for HIV with activist Jeff Taylor.

  http://www.ifarablog.org/2012/07/ias-2012-daniel-douek.html

- Jens Lundgren, from the University of Copenhagen talks about the early associations between elevated biomarkers such as IL-6, D-dimer and increased risk of serious complications in the SMART and ESPRIT studies, and why these results while exciting are not yet ready for clinical use. Also, earlier testing and the currently ongoing START study, which will produce randomised data to inform the decision on when to start ART.

  http://www.ifarablog.org/2012/07/ias-2012-jens-lundgren.html

- Judith Aberg, Chair of the HIV Medicine Association (HIVMA) discusses the ways in which the organisation educates the US Congress about science that drives the benefits of ART and the differences between increased health complications associated with HIV and ageing and the differences between this and the common sound-bite of "premature ageing".

  http://www.ifarablog.org/2012/07/ias-2012-judith-aberg.html

- Myron Cohen discusses treatment as prevention, a future with new and easy-to-take drugs, the potential for a "virtual cure", and patient treatment, and reflects on how clinical practice is never fixed - developing over decades of research.

  http://www.ifarablog.org/2012/07/ias-2012-myron-cohen.html

- Antu Dey from Novartis vaccine devleopment programme in Massachusetts, discusses HIV vaccine development, human vs. animal trials, monoclonal antibodies, and prevention.

  http://www.ifarablog.org/2012/07/ias-2012-antu-dey.html

- Sheila Tlou, Director, Regional Support Team for Eastern and Southern Africa, UNAIDS, discusses her long and distinguished history in HIV in Eastern and Southern Africa and expectations for expanding treatment access by 2015.

  http://www.ifarablog.org/2012/07/ias-2012-sheila-tlou.html

- Enid Vasquez on Treatment as Prevention, difficulties for sex workers to attend the IAS meeting, new drugs and PrEP.

  http://www.ifarablog.org/2012/08/ias-2012-enid-vasquez.html

ANTIRETROVIRALS

FDA approves Quad in US: price may prohibit access

Simon Collins, HIV i-Base

On 27 August 2012, both the US Food and Drug Administration (FDA) and Gilead Sciences issued news releases confirming the approval for a single pill boosted integrase inhibitor fixed dose combination for adult HIV treatment.

Developed under the name Quad and with a new tradename Stribild, the combination contains elvitegravir, a new pharmacokinetic booster called cobicistat, FTC and tenofovir. The indication is for treatment-naive patients with estimated creatinine clearance (CrCl) of >70 mL/min. [1, 2]

The two large phase 3 studies on which approval was based compared Quad to Atripla (efavirenz/FTC/tenofovir) and to atazanavir/ritonavir plus separate FTC/tenofovir. Both studies concluded that Stribild was non-inferior to the comparitor arms with 88-90% rates of undetectable viral load at week 48 compared to 84% with Atripla and 87% with boosted atazanavir.

The press release summarised nausea and diarrhoea as common side effects and new or worsening kidney problems, decreased bone mineral density, fat redistribution and changes in the immune system (immune reconstitution syndrome) as serious side effects. Stribild's label gives advice to health care providers on how to monitor patients for kidney or bone side effects.

Stribild needs to be taken with food. This is based on increased mean exposure of elvitegravir and tenofovir by 34% and 24% respectively with a light meal (373 kcal, 20% fat) and by 83% and 23% respectively with a higher fat meal (~800 kcal, 50% fat). [3]

Of note, the US DHHS guidelines have already issued an update that recommends Stribild as an alternative rather than preferred option for first-line therapy. This decision was based on "a significant potential for drug-drug interactions, the availability of only 48 weeks of safety data, usage limited to individuals with pre-treatment CrCl >70 mL/min, a possible increased risk of proximal renal tubulopathy, limited data in patients with advanced HIV disease and in women, and the need for the drug to be taken with food". [4]

COMMENT

This decision was expected after the FDA advisory panel voted 13:1 in May 2012 [5] based on the 200-page briefing document summary of preclinical and clinical studies. [6]

But the expected welcome for an important new option for treatment is tempered by a US price more than a third higher than Atripla (approximately $28,500 vs $21,000 for the US annual wholesale list price). Although the European decision on approval is not expected until later this year, and drug pricing is complex, a similar differential in the UK would severely restrict prescribing . [7]

While Quad offers potential advantages to some current options, these were not demonstrated in the clinical trials that led to approval based on finding it is "not likely to be worse" than current treatment, based on a non significant 4% difference in the percentage of patients with undetectable viral load after 48 weeks of treatment.

Unless Stribild is a cost neutral option compared to Atripla, this potentially important new drug is likely to be rarely used in the UK. Without a cost-neutral price compared to boosted atazanavir or boosted darunavir, it is likely to be rarely used in second-line therapy, or as a switch option based on a better side effect profile compared to efavirenz. If the price is not cost-neutral compared to raltegravir, it is unlikely to be widely used in patients with multidrug resistance.

The cost differences are likely to widen further when efavirenz comes off patent in 2013, with costs savings from generic formulations expected to be sufficient to routinely switch patients from Atripla to efavirenz and separate tenofovir/FTC.

While switching between brand and generic formulations is a basic tenet of NHS healthcare, switching between classes is not.

Gilead have stated that this is a competitive price for the US market and that they have set up patient access programme. Gilead in the UK do not want to comment on European pricing prior to EU licensing.

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Merck acquires CMX157 and EFdA and starts phase 2 study for new NNRTI

Simon Collins, HIV i-Base

On 24 July 2012, a press release from Merck announced that the company had signed licensing agreement for the development of two new nucleoside analogues and is about to launch a phase 2 study for its in house NNRTI. [1]

CMX157 is a nuceloside analogue in development at Chimerix that reported promising phase 1 results over four years ago and has been waiting for a financial backer since. [2] The compound is a prodrug of tenofovir (tenofovir diphosphate as the active moiety), with an improved pharmacokinetic profile to tenofovir and initial results suggesting a potential for once-weekly dosing. The in vitro resistance profile includes sensitivity to K65R with some but not all thymidine analogue mutations. This was a compound that was expected to be picked up several years ago.

EFdA (4'-ethynyl-2-fluoro-2'-deoxyadenosine) is a compound in development with the Japanese biotech division of the Yasama Corporation (who have a history that includes brewing soy sauce since the time of the English civil war) and which has been studied with amFAR and US NIH support. A poster presented at the 19th IAS conference in Washington this summer reported a significantly stronger in vitro resistance profile compared to tenofovir following multiple passaging with a mixture of 11 multinucleoside resistant viral mutations.

Merck also used the opportunity to announce its in-house NNRTI compound MK1439 is about to enroll treatment naive patients into a phase 2 dose-finding study (from 25 mg to 200 mg) using efavirenz as a comparitor and tenofovir/FTC as background nukes.

COMMENT

It is promising news that Merck is developing an active programme of research for new HIV drugs to in parallel to development of integrase inhibitors.

Although less well publicised, Merck is also one of the companies investing in cure research.

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TREATMENT ACCESS

FDA approval of generic ARVs

Since the last issue of HTB, the US Food and Drug Administration (FDA) has granted full and tentative approval for the following new generic ARV products.

Drug and formulation	Manufacturer, Country	Approval date
AZT/3TC/nevirapine FDC scored tablets (60 mg/30 mg/50 mg) for oral suspension, for children weighing 5 to 25 kg.	Strides Arcolab, India	21 Sep 2012

* full approval; FDC: Fixed Dose Combination

"Tentative Approval" means that FDA has concluded that a drug product has met all required quality, safety and efficacy standards, but because of existing patents and/or exclusivity rights, it cannot yet be marketed in the United States. Tentative approval does, however make the product eligible for consideration for purchase under the PEPFAR program for use outside the United States.

Fixed Dose Combinations are reviewed for PEPFAR under the FDA guidance titled "Fixed Dose Combinations, Co-Packaged Drug Products, and Single-Entity Versions of Previously approved Antiretrovirals for the Treatment of HIV". This document was developed to clarify what regulatory requirements apply to such applications, what issues might be of concern, and how these issues should be addressed. The guidance is intended to encourage sponsors to submit applications for combination and co-packaged products, and to facilitate submission of such applications to FDA.

http://www.fda.gov/downloads/Drugs/GuidanceComplianceRegulatoryInformation/Guidances/UCM079742.pdf

Effective patent dates are listed in the agency's publication titled Approved Drug Products with Therapeutic Equivalence Evaluations, also known as the Orange Book:

http://www.accessdata.fda.gov/scripts/cder/ob/default.cfm

An updated list of generic tentative approvals (now at 140) is available on the FDA website:

http://www.fda.gov/oia/pepfar.htm

Source: FDA list serve:

http://www.fda.gov/InternationalPrograms/FDABeyondOurBordersForeignOffices/AsiaandAfrica/ucm119231.htm

Free HIV treatment in the UK for all, irrespective of resisdency status

UK Department of Health

From 1 October 2012, an amendment to the NHS (Charges to Overseas Visitors) Regulations means that HIV treatment will no longer chargeable to any overseas visitor.

This guidance sets out:

- The background to the policy change.
- Definitions of HIV treatment and care.
- Prescribing of antiretroviral therapies.
- The role of the Overseas Visitor Manager.
- How the Department of Health will monitor the change.

HIV often presents with other healthcare needs that may be chargeable unless they too are exempt from NHS charge. This guidance supports implementation of the change in England.

C O M M E N T

These changes take immediate effect and should be widely publicised. They will hopefully contribute to earlier diagnosis and access to care and remove the previous fear associated with seeking treatment.

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Robin Hood Tax begins in France

Rebecca McDowall, HIV i-Base

The Robin Hood Tax campaign are celebrating victory after a 0.2% financial transaction tax (FTT) came in to effect in France on 2 August 2012.

This was just days after the campaign featured strongly in the March to end AIDS in Washington France became the first country to implement this new type of taxation.

Former French President Sarkozy first announced plans to introduce a 0.1% financial transaction tax in January. This was later doubled by his successor President Hollande. The tax is expected to raise half a billion euros in the first year, with a pledge from President Hollande that a part of the revenue will go towards combating AIDS.

The Robin Hood Tax campaign hopes that this step by the French President will act as a signal to other countries, including the UK, to rethink their position on the FTT.

For further information, and to support the campaign, visit the Robin Hood Tax website:

http://robinhoodtax.org.uk/

Novartis case enters Indian Supreme court

Rebecca McDowall, HIV i-Base

The long running Novartis legal challenge to India's patent law entered the Supreme Court in New Delhi, on September 11.

This is a final bid by the company in a six-year attempt to undermine India's pro public health patent laws, and has been met by protests across the world.

The Swiss pharmaceutical company Novartis has been engaged in a legal battle over a part of India's patent law (known as Section 3d) which says that a new form of a known medicine can only be patented if it shows significantly improved therapeutic efficacy over existing compounds; this is a provision to stop the common industry practice of extending, or 'evergreening,' their patent monopolies for routine modifications of known compounds.

Section 3d, which is in line with international trade rules, formed the basis for Novartis not being granted a patent for its cancer drug imatinib mesylate (marketed as Gleevec) in 2006. Novartis' patent application was on a new form of the imatinib molecule already described several years previously in patents in the US and other developed countries.

MSF flashmob brings Novartis protest to Geneva

On Wednesday 19 September, at noon, 200 people froze in the streets of Geneva to protest against Novartis. The group included an ambulance, removing a patient on a stretcher, emphasising the potential impact for access to healthcare from the case. "If Novartis wins, everything stops. Millions of people around the world will no longer have access to affordable medicine. We therefore urge Novartis to drop the case in India". (MSF protestor) [2]

Act-Up Paris protesters arrested outside of Novartis

In order to coincide with the start of the trial, Act-Up Paris activists gathered at Novartis HQ in order to deliver a petition of 18,000 signatories condemning the case, which led to the entire group being arrested. The activists were detained separately for 48 hours whilst being prevented from accessing medical care, basic hygiene facilities, lawyers or phone calls. One HIV positive activist was denied access to HIV treatment for the duration of his detention. [3]

Stop AIDS Campaign demands Novartis drops the case

The UK based Stop AIDS Campaign held protests outside the Swiss Embassy and Novartis' UK offices. Lotti Rutter, from the Stop AIDS Campaign said: "This case is about a cancer drug, but the result will have a much wider impact on the health of poor people all around the world. If they win, the change will make it easier for drug companies to get unjustifiable extensions to their monopolies, and make it more difficult for generic companies to produce and sell the affordable generic medicines health care providers across the developing world rely on." [4]

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India: Bayer stay order against compulsory licence denied

MSF Press Release

On 17 September 2012, India's Intellectual Property Appellate Board (IPAB) dismissed pharmaceutical company Bayer's request for a stay order against the compulsory licence granted by the Patent Controller to a generic manufacturer earlier this year.

In its appeal before the IPAB, Bayer alleged that the CL decision of the Indian Patent Controller is illegal and unsustainable, and had filed for an immediate stay until the appeal could be heard. This has now been rejected by IPAB.

Interest of public health

"This decision once again affirms that courts can and should act in the interest of public health in the case of pharmaceutical products," said Leena Menghaney, of Médecins Sans Frontières/ Doctors Without Borders (MSF)'s Access Campaign.

"The high prices caused by patents in India are a growing problem that needs to be grappled with: one year's treatment costs over US$1,700 for one of the newer HIV medicines we use in our project in Mumbai, and will be needed across the developing world. This price needs to come down, and we hope that the routine use of compulsory licensing may be one way of making this happen."

Affordable access to patented medicines

India's first compulsory licence is seen as a prospective watershed for affordable access to patented medicines, by potentially opening the way for other life-saving drugs - such as the newest drugs used to treat HIV – now patented in India and priced out of reach to be produced by generic companies for use across the developing world at a fraction of the price.

The CL brought the price of the patented anti cancer drug, sorafenib tosylate, down from over US $5,500 per month to $175 per month; a price reduction of 97 percent.

MSF had welcomed the grant of a compulsory licence issued in March this year to allow a more affordable version of liver and kidney cancer drug, sorafenib tosylate, to be produced. Bayer is being paid a six per cent royalty on sales by Natco, the generic manufacturer who received the licence.

Reference

MSF Press Release. India: Bayer stay order against compulsory licence denied (17 September 2012). **http://www.msf.org.uk/Bayer_patent_case_India_20120903.news**

SIDE EFFECTS & COMPLICATIONS

Increased incidence of ischemic stroke amongst HIV positive cohort

Muirgen Stack, HIV i-Base

A retrospective analysis performed by Felicia Chow and colleagues published in the 1st August issue of the Journal of AIDS showed a significant increase in the incidence of ischemic strokes within an HIV positive cohort compared to HIV negative controls matched for age, gender and race. The relative increase in stroke rates was highest amongst women and younger patients. [1]

Whilst HIV infection has become established as a risk factor for developing such non-AIDS defining illnesses as cardiovascular disease (CVD) and osteoporosis (and increased fragility-fracture risk), analysis of stroke in this context has so far languished. [2,3] However, although a recent study has shown a higher ratio of strokes being attributed to HIV-infected persons, this was not a direct comparison of stroke incidence between persons with and without HIV. [4]

A total of 4308 HIV positive patients were analysed from the Research Patient Data Registry (RPDR) clinical care database from Massachusetts General Hospital and Brigham and Women's Hospital (US) between 1996 and 2007. International Classification of Diseases, 9th revision, Clinical Modification (ICD-9-CM) codes were used to ascertain HIV status and ischemic stroke (from the category of ischemic cerebrovascular disease). If multiple strokes were reported as per ICD-9-CM codes, only the first was included. A control group of 32,423 was generated by matching HIV negative patients from the RPDR to patients in HIV cohort in a 10:1 ratio on the basis of age, gender and race.

Primary demographics between the two study groups were well matched: mean age of 41.6 vs 40.8, percentage of women 31% vs 35%, race; white 53% vs 52%, black 21% vs 22% and hispanic 17% vs 17% for HIV positive and HIV negative respectively.

Within the HIV positive cohort: mean (SD) CD4 count and CD4 nadir were 473 (+/-317) cells/mm3 and 271 (+/-252) cells/mm3, respectively. The percentage of patients with a viral load below 400 HIV RNA copies/mL was 73% and percentage of patients with CNS infection/malignancy was 4%. Previous ARV use included 95% NRTI, 56% NNRTI and 67% PI use (from the N= 2105 patients with antiretroviral therapy (ART) data).

The proportion of HIV-infected patients with traditional stroke risk factors including hypertension, diabetes mellitus, dyslipidemia, smoking, cardiomyopathy, left sided valvular heart disease, coronary heart disease (CHD) and heart failure was significantly higher than in the HIV negative cohort ($P < 0.001$ for all comparisons).

The incidence rate (IR/1000 patient years) of ischemic stroke was 5.27 vs 3.75 in the positive vs negative groups respectively, resulting in an unadjusted hazard ratio (HR) of 1.40 (95% CI: 1.17 to 1.69, $P < 0.001$). In these unadjusted incidence rates, HIV infection was associated with higher rates of stroke amongst those younger than 50. Between 18-29 years the IR was 3.87 vs 0.88 giving an incidence rate ratio (IRR) of 4.42 (95% CI: 1.56 to 11.09, p=0.004), between 30-39 years the IR was 3 vs 1.02 giving an IRR of 2.96 (95% CI: 1.69 to 4.96, $p < 0.001$) and between 40-49 years the IR was 4.02 vs 2.62 giving an IRR of (95% CI: 1.06 to 2.17, p=0.02) in the positive vs negative groups respectively. For men specifically however, only HIV positive patients between 30-39 years had elevated stroke rates that remained significant: IR of 2.84 vs 1.28 giving an IRR of 2.23 (95% CI: 1.07 to 4.26, p=0.022) in the positive vs negative groups respectively. Once age, gender, race and the traditional stroke risk factors were accounted for, HIV infection remained an independent predictor of stroke with a hazard ratio (HR) of 1.21 95% CI: 1.01 to 1.46, P = 0.043.

Within the HIV cohort, age (HR: 1.06 per year, 95% CI: 1.03 to 1.09, $p < 0.001$), female gender (HR: 1.76; 95%CI 1.24 to 2.52, p=0.002), a higher log-transformed viral load (HR: 1.10, 95%CI: 1.04 to 1.17, P = 0.001), and a history of CNS infections or malignancy (HR: 2.75, 95% CI: 1.26 to 6.03, p=0.011) were associated with an increased risk of stoke. Conversely, longer duration of any ART use was associated with a significantly decreased risk of stroke (HR: 0.79, 95% CI: 0.71 to 0.88, $p < 0.001$). Most recent CD4 cell count and nadir value were not associated with stroke risk.

COMMENT

Careful interpretation is needed to distinguish the causality from traditional risk factors (which were more common in the HIV-infected cohort) and what may be an indication of HIV specific aetiology i.e. high viral load increasing stroke risk.

The increased stroke risk in HIV-infected women is also notable, and may in part be attributable to "lower baseline risk for stroke in women, amplifying the relative impact of an HIV-specific effect" as speculated by the authors.

Finally, the role of HIV increasing stroke risk in younger people (18-49 years) is intriguing, as the effect from traditional risk factors on stroke risk tends to increase with age. However, before inferring a more pronounced effect of HIV infection on stroke risk in younger persons, it is important not to make a more general underestimation of stroke incidence in persons below 45 years. [5]

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HIV PATHOGENESIS

Discord controllers: characterising a new viremic controller phenotype

Muirgen Stack, HIV i-Base

The results from this study suggest more evidence for the role of immune activation in disease progression, including in the subset of patients who experience decline of CD4+ T cells yet maintain low plasma RNA-loads.

Groves and colleagues from Queen Mary's School of Medicine and Dentistry and Barts and The London NHS Trust Department of Virology analysed a subgroup of HIV-1 viraemic controllers, which presented with both unusual immunology and clinical uncertainty (published on 16 August ahead of print in the Journal of AIDS). [1]

Viraemic controllers are defined as HIV positive individuals who maintain HIV suppression level without the use of ARVs. They are distinguished from normal progressors in having HIV RNA-loads below 2000 copies/ml and CD4+ T-cell counts of >450 cells/mm3 (as defined by the International HIV Controller Consortium). This review covers the complex mechanism that might explain these responses. [2] Therefore, the identification of a new subset of patients that seem to show a mixture of traits convergent to both viraemic controllers and progressors is extremely important in the broader context of elucidating how immunopathophysiology contributes to disease progression. [3]

Patients were recruited from outpatient clinics at Barts and The London and Homerton University Hospital Trusts. Of 3000 clinic attendees, 82 were identified as HIV-1 viraemic controllers, divided into 64 "typical" controllers (HIV RNA-loads below 2000 copies/ml and CD4+ T-cell counts of >450 cells/mm3) and 18 "discord" controllers (HIV RNA-loads below 2000 copies/ml and CD4+ T-cell counts of <450 cells/mm3) thus representing 2.7% and 0.6% of patients respectively. The two controller cohorts were compared against progressors (HIV RNA-loads above 10,000 copies/ml and CD4+ T-cell counts of <450 cells/mm3) and in some cases HIV negative patients.

The authors quantified CD4+/CD8+ T-cell subsets, HIV RNA-loads, HIV DNA-loads and analysed viral clade. Demographics identified in the controller cohort included age, gender and ethnicity. Of note, 13 patients (3 discord and 10 typical controllers) were treated with ART during pregnancy but controlled plasma RNA-load for at least 12 months before and after. Two other typical controllers with low RNA-loads for 3.7 and 3.5 years subsequently showed a significant rise in RNA-loads whilst maintaining good CD4+ T-cell counts (geometric means of 732 and 708 cells/mm3, respectively). All of the mentioned patients were included in the patient characteristics and clade analysis, but were not used for DNA-load and T-cell analysis.

In the controller cohort, average age was median 37.5 (IQR 32-43 years) vs 38.5 (32.5-49 years), percentage of cohort of female gender was 54.7% vs 61.1%, plasma RNA-load (log10 copies/mL) was median 408.5 (IQR 160.7-1000) vs median 428.6 (100.3-1043) and CD4+ T-cell count (cells/mm3) was median 699.3 (IQR 550.4-843.1) vs median 347.2 (298-406.6) for typical and discord controllers respectively. The only statistically significant difference between the groups was discord controllers having a lower %CD4 T-cells than typical controllers, median 22.3 (IQR 17.6-26) vs median 33.7 (IQR 23.8-40, p<0.0001).

Of the n=15 discord controllers where clade data was available, 40% were positive with subtype CRF02_AG compared to 19.5% of typical controllers. As the clade distribution of the study population was diverse (East London), any inference from this is currently unclear.

Despite an extensive T-cell subset analysis, statistical significance for comparisons between controllers, progressors and HIV negative patients is lacking. Unfortunately, this remained true for CD8+ T-cell subset populations and levels of CD4+/CD8+ T-cell activation. However, this should not wholly detract away from the researcher's findings, as discord controllers only seem to represent a very small proportion of patients in the wider population.

Discord controllers appear to share many characteristics with progressors namely, depleted naive CD4+ T cells and increased CD4+ T cell activation levels. However, discord controllers appear to have more similarities to typical controllers than progressors in both their CD8+ T-cell activation pattern and preservation of CD8+ naïve T-cell pool.

Both discord and typical controllers had much lower plasma HIV RNA-loads than viraemic noncontrollers (p<0.0001) yet, discord controllers are then distinguished from typical controllers by having higher HIV-1 DNA loads (p=0.002).

COMMENT

Although more clarification on the defining features of discord controllers is needed, the identification of this subset is important for two reasons. Firstly, it provides evidence of sub-clinical disease progression despite maintaining low plasma viral load. This may be an indicator for more regular analysis of HIV DNA-loads and/or CD4+ T-cell activation levels in patients who present with a seemingly anomalous decreasing CD4+ T-cell count.

Secondly, the authors offer multiple explanations for the disease progression seen in discord controllers, with most possibilities aligning alongside the effects of aberrant immune activation/dysregulation. [4] Whilst these may be valid, it still remains unclear why high cellular HIV DNA levels do not result in higher-level plasma RNA viral load in discord controllers - perhaps suggestive of increased levels of ongoing replication in vivo.

Finally, a concern when characterising new subsets of patients is that it may just be a failure to account for natural variation in the population, in this case lower "normal" CD4+ T-cells counts. However, during the study five patients in the discord controller group started ART and all saw modest gains in their CD4+ T-cell counts. This should hopefully help to define discord controllers as patients who can respond well to treatment even if they appear to be somewhat managing the virus without ARVs.

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DRUG INTERACTIONS

Ritonavir significantly increases exposure to colchicine (gout)

www.hiv-druginteractions.org

The pharmacokinetic interaction between ritonavir (100 mg twice daily) and colchicine (0.6 mg single dose) was investigated in 24 HIV negative subjects.

Ritonavir increased colchicine Cmax and AUC by 170% and 240% compared to colchicine alone. There was no apparent increase in the incidence of adverse events during coadministration.

Colchicine doses should be adjusted when administered with ritonavir to avoid the risk of colchicine–related toxicities.

C O M M E N T

Colchicine is a herbal medicine used to treat gout and has a wide range of potential interactions including with antibiotics, antifungals, statins and other HIV protease inhibitors. [2]

Source: hiv-druginteractions.org (31 July 2012).

http://www.hiv-druginteractions.org

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Ritonavir interaction with quinine is clinically insignificant but may warrant caution

www.hiv-druginteractions.org

Coadministration of ritonavir (100 mg twice daily) and quinine (105.3, 162, 210.6 or 648 mg single doses) was studied in 4 groups of HIV negative subjects (n=20 per group).

Quinine did not have a significant effect on ritonavir Tmax or Cmax, but increased AUC from 9.2 ± 2.21 ug.h/ml to 11.1 ± 3.96 ug.h/ml.

Similarly, ritonavir had no significant effect on quinine pharmacokinetics (Cmax 4.3 ± 1.07 vs 3.9 ± 0.88 ug/ml, AUC 78.9 ± 26.78 vs 68.4 ± 22.29 ug.h/ml, alone vs with ritonavir). Although the increased ritonavir exposure and decreased quinine exposure are unlikely to be of clinical significance, caution should be exercised if coadministered.

Source: hiv-druginteractions.org (31 July 2012).

http://www.hiv-druginteractions.org

Ref: Wason S et al. Lack of clinically significant pharmacokinetic interactions between quinine and ritonavir in healthy adult participants. International Workshop on Comorbidities and Adverse Drug Reactions in HIV, Washington, July 2012. Abstract P21.

Case report: fluticasone, fluconazole and ritonavir interactions

www.hiv-druginteractions.org

This case report further highlights the well documented interaction of a ritonavir-boosted PI and inhaled fluticasone but also describes an added interaction issue with the introduction of fluconazole for oral candidiasis.

Within days of discontinuing fluticasone and initiating fluconazole, the 52 year old man was confirmed with exogenous Cushing's syndrome and secondary adrenal insufficiency. The authors propose that fluconazole inhibits adrenal steroidogenesis and thereby has an adrenal inhibitory effect.

Source: hiv-druginteractions.org (27 July 2012).

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TREATMENT GUIDELINES

US guidelines include Stribild (Quad) as alternative rather than preferred option for treatment naive adults

Shortly after FDA approval of the new once-daily single-pill formulation of elvitegravir/cobicistat/tenofovir/emtricitabine (Stribild) the US HHS guideline panel issued a statement on how this combination has been assessed in its recommendations for treatment naive adult patients.

The included the recommendation for elvitegravir 150 mg / cobicistat 150 mg / tenofovir 300 mg / emtricitabine 200 mg once daily (with food) as an "alternative" regimen for ART-naive HIV-infected patients with CrCl >70 mL/min. The recommendation was rated BI (moderate strength recomendation, based on results from randomised clinical trials).

Factors behind the decision not to make this a "preferred" option included "a significant potential for drug-drug interactions, the availability of only 48 weeks of safety data, usage limited to individuals with pre-treatment CrCl >70 mL/min, a possible increased risk of proximal renal tubulopathy, limited data in patients with advanced HIV disease and in women, and the need for the drug to be taken with food".

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HHS Panel Statement. HHS panel on antiretroviral guidelines for adults and adolescents recommends a fixed-dose combination product of elvitegravir/cobicistat/tenofovir/emtricitabine as an alternative regimen in antiretroviral treatment-naive Individuals with HIV-1 infection. (18 September, 2012).

http://aidsinfo.nih.gov/contentfiles/AdultARVStatementOnEVG_COBI_TDF_FTC.pdf (PDF file)

IAS USA update adult ARV treatment guidelines

An update of the International Antiviral Society-USA (IAS-USA) recommendations for adult HIV treatment as an open access article in the Journal of the American Medical Association (JAMA).

The document is written by an international panel of doctors and the update is based on a systematic review of conference presentations and published research from the previous two years.

Changes since the previous edition include:

- Offering ART to all patients regardless of CD4 cell count.
- Changes in therapeutic options (including both tenofovir/FTC and abacavir/3TC as first-line background nucleoside analogues).
- Recognising the protective benefit of treatment in reducing the risk of transmission.

- Cited new evidence that untreated HIV can also lead to a range of other conditions, including cardiovascular disease and kidney disease, and some cancers.
- Modifications in the timing and choice of ART in the setting of opportunistic illnesses such as cryptococcal disease and tuberculosis.

C O M M E N T

These guidelines are a significantly briefer document that the US DHHS guidelines which has a far more significant reach and influence.

Although criteria for membership of the panel includes not participating in pharmaceutical industry sponsorship, this is only for the duration of the period on the panel. As with most treatment guidelines, extensive conflicts of interest are declared for most if not all panel members.

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TUBERCULOSIS COINFECTION

Costs for rapid TB test reduced by 40%

USAID press release

On 6 August 2012 a USAID press release announced that an agreement that reduces the cost of a rapid TB diagnostic test in 145 high-burden and developing countries. [1]

Under the arrangement, organised by PEPFAR, USAID, UNITAID, and the Bill & Melinda Gates Foundation, the price of Xpert MTB/RIF cartridges will be reduced from $16.86 to $9.98 and will not increase before 2022.

To date, the high unit cost of Xpert MTB/RIF cartridges produced by the medical device manufacturer Cepheid has proven a barrier to their introduction and widespread use in low- and middle-income countries. The new agreement will immediately reduce the cost of cartridges used to diagnose TB by more than 40%.

In December 2010, the World Health Organization (WHO) recommended the Cepheid product, known as Xpert MTB/RIF assay, which is run on Cepheid's GeneXpert platform. Until Cepheid developed the Xpert MTB/RIF assay, the only method used in most laboratories in developing countries was smear microscopy, a technique first developed in the 1880s by the German bacteriologist Robert Koch that requires visual detection of the TB bacterium under a microscope.

Smear microscopy is particularly insensitive for diagnosing TB in patients who are co-infected with HIV. It also does not help clinicians detect the presence of drug-resistant strains of TB. The limitations of traditional smear microscopy, along with the cost and long delays to receive culture results, have limited the ability to diagnose and treat TB and drug-resistant forms of the disease.

Xpert is a molecular diagnostic system that can detect TB disease in patients co-infected with HIV and resistance to the antibiotic rifampicin - a widely accepted indicator of the presence of multi-drug resistant TB - in less than two hours. The system also can be used outside of conventional laboratories because it is self-contained and does not require specialized training.

Because TB is the leading cause of death among people living with HIV in Africa, greater access to the Xpert test offers a significant advance in the capacity of health care workers to diagnose TB quickly and help reduce TB transmission, the development of TB disease, and premature TB deaths.

The capacity of the Xpert MTB/RIF assay to yield a rapid and accurate diagnosis has the potential to improve TB diagnosis and treatment in rural clinical settings. A large percentage of people with TB disease fail to start treatment promptly because of the long wait for results of older conventional tests and the need for them to return to the clinic, which may be far from where they live. Using the Xpert system, clinics in poor and rural settings can deliver rapid diagnosis and immediately start patients on appropriate treatment, including

second-line drugs in cases of drug-resistant.

Research suggests that the incremental scale up of Xpert in countries with high TB burdens could allow for the rapid diagnosis of 700,000 cases of TB disease and save health systems in low- and middle-income countries more than U.S. $18 million in direct health costs.

C O M M E N T

The demands for lower cost access to this test have been widespread since the technology was first developed.

Even though $10 remains a significant cost in many settings, this news was widely welcomed.

Dr Lucica Ditiu, Executive Secretary of the Stop TB Partnership said "This agreement will translate into life-saving TB care for people affected by TB" and Dr Mario Raviglione, Director of the WHO Stop TB Department said "We see innovation happening in real time - scientific evidence rapidly translated into policy, policy quickly adapted into practice, and scale-up significantly accelerated by innovative funding mechanisms effectively addressing cost and affordability." [2]

The capacity for machines range from 4 to 100 tests and the cost was reduced from $60,000 to $17,000 when in 2007 when the price of cartridges for low and middle-income countries was initially reduced to $17 per test. [3]

Source:

1. USAID press release. Public-private partnership announces immediate 40 percent cost reduction for rapid TB test. (6 August 2012). http://www.usaid.gov/news-information/press-releases/public-private-partnership-announces-immediate-40-percent-cost
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3. Non-technical review on Gene Xpert http://www.tbonline.info/posts/2011/10/3/gene-xpert/

OTHER NEWS

Jerome Horwitz dies at 93

Jerome Horwitz, the chemist who first synthesised AZT, d4T and ddC while a researcher at Wayne State University's cancer research center in Detroit in the early 1960's, died on 6th September, aged 93.

His obituary in the New York Times noted that when AZT failed as a potential treatment for cancer based on lack of biological activity in murine studies, it was shelved, and Horwitz told colleagues that he had developed "a very interesting set of compounds that were waiting for the right disease."

Dr Horwitz neither patented the drug nor earned income from developing these compounds, even though as the first approved successful treatment it went on to eventually generate billions of dollars for Boroughs Wellcome (later GlaxoSmithKline). The development and patents for ddC and d4T went to Roche and Bristol Myers-Squibb, respectively.

The development of dideoxythymidines later provided the basis for treating HIV, hepatitis and herpes.

Although Burroughs Wellcome donated $100,000 to the Karmanos Cancer Institute, the research center affiliated with Wayne State, to establish a chair in his name, this "gift" was not enough to cover the cost of an endowed professorship. He said the size of the gift, given the profits earned, made him angry for a while. But he got over it, saying in a 2005 interview "If I was ever bitter, it's long since passed".

Source: Vitello P. New York Times. Jerome Horwitz, AZT creator, dies at 93. (20 September 2012).

http://www.nytimes.com/2012/09/21/health/jerome-p-horwitz-creator-of-azt-dies-at-93.html

FUTURE MEETINGS

Conference listing 2012/13

The following listing covers some of the most important upcoming HIV-related meetings and workshops.

Registration details, including for community and community press are included on the relevant websites.

20th Conference on Retroviruses and OIs (CROI) 2013

3 – 7 March 2013, Atlanta, USA.

http://retroconference.org

19th Annual (BHIVA) 2013

16th – 19th April 2013, Manchester.

http://www.bhiva.org

14th International Workshop on Clinical Pharmacology of HIV Therapy

22 – 24 April 2013, Liverpool, UK.

http://www.virology-education.com

48th International Liver Congress (EASL 2013)

24 – 28 April 2013, Amsterdam.

http://www.easl.eu

7th IAS Conference on HIV Pathogenesis, Treatment and Prevention (IAS 2013)

30 June – 3 July 2013, Kuala Lumpur, Malaysia.

http://www.ias2013.org

53rd ICAAC

10 – 13 September 2013, Denver, USA.

http://www.icaac.org

14th European AIDS Conference (EACS)

16 – 19 October 2013, Brussels, Belgium.

http://www.europeanaidsclinicalsociety.org

HIV i-BASE

HIV i-Base is an HIV-positive led treatment information service. We produce information both for clinicians and other health workers and for people with HIV.

Our publications are used and have been adapted in many countries and settings.

Our fully searchable website is designed to be fast to access, easy to use, and simple to navigate.

All i-Base publications are available online.

http://www.i-base.info

i-Base produce five non-technical treatment guides, which are available online as web pages and PDF files.

http://www.i-base.info/guides

- Introduction to combination therapy
- A guide to changing treatment
- Avoiding & managing side effects
- HIV, pregnancy & women's health
- Hepatitis C for People living with HIV
- HIV testing and risks of sexual transmission

The site also includes a web-based Q&A section for people to ask questions about treatment.

http://www.i-base.info/questions

We have also posted online a set of generic clinic forms, developed with the Royal Free Centre for HIV Medicine, which may be a useful resource for other hospitals.

http://www.i-base.info/clinicforms

HIV i-Base

All publications are free, including bulk orders, because any charge would limit access to this information to some of the people who most need it.

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Since many employers match their employees donations a donation through Give-As-You-Earn could double your contribution. For more information on Give-As-You-Earn visit www.giveasyouearn.org

REFUNDS FROM THE TAX MAN

From April 2005 the Inland Revenue is operating a system whereby you can request that any refunds from them should be paid to a charity of your choice from the list on their website. If you feel like giving up that tax refund we are part of this scheme and you will find us on the Inland Revenue list with the code: **JAM40VG** (We rather like this code!) Any amount is extremely helpful.

However you chose to donate to i-Base,
we would like to thank you very much for your support.

REG IN ENGLAND WALES WITH LIMITED LIABILITY REG NO 3962064 CHARITY REG 1081905

HIV i-Base

www.i-Base.info

Southern African HIV Clinician's Society

www.sahivsoc.org

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