New Developments in HIV Prevention

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Overview

• New advances in HIV prevention

• Challenges to an AIDS-free generation

• Key steps to an AIDS-free generation

• Conclusion
Sexual transmission prevention - 2013

Source: Abdool Karim SS, Lancet 2013
Preventing vertical transmission -2013

**Study**

PACTG076 – zidovudine to mother during pregnancy and labour and infant (HIV positive pregnant women – United States, France)

Thai AZT trial – zidovudine to mother during pregnancy and labour (HIV positive pregnant women – Thailand)

HIVNET012* – single dose nevirapine to mothers and infants (HIV positive pregnant women – Uganda)

DITRAME – zidovudine to mother during pregnancy, labour and post partum (HIV positive pregnant women – Côte d’Ivoire, Burkina Faso)

Africa AZT – zidovudine to mother during pregnancy and labour (HIV positive pregnant women – Côte d’Ivoire)

* Adapted from : Abdool Karim SS, Lancet 2013

**Effect size (CI)**

- **PACTG076**
  - Effectiveness: 68% (40; 82)

- **Thai AZT trial**
  - Effectiveness: 50% (15; 71)

- **HIVNET012**
  - Effectiveness: 41% (16; 59)

- **DITRAME**
  - Effectiveness: 38% (5; 60)

- **Africa AZT**
  - Effectiveness: 37% (-5; 63)

* HIVNET was placebo-controlled for part of the time
Prevention in IDUs - 2013

Study

Bangkok Tenofovir Study—daily oral Tenofovir (IDUs—Thailand)

Effect size (CI)

49% (10; 72)

Source: Abdool Karim SS, Lancet 2013
Note: PMTCT, Screening transfusions, Harm reduction, Universal precautions, etc. have not been included – this is focused on reducing sexual transmission.

**HIV PREVENTION**

- **ARV prophylaxis**
  - Abdool Karim Q, Science 2010
  - Grant R, NEJM 2010 (MSM)
  - Baeten J, 2011 (Couples)
  - Paxton L, 2011 (Heterosexuals)

- **Microbicides for women**
  - Abdool Karim Q, Science 2010

- **Oral pre-exposure prophylaxis**
  - Grant R, NEJM 2010 (MSM)
  - Baeten J, 2011 (Couples)
  - Paxton L, 2011 (Heterosexuals)
  - Scheckter M, 2002

- **Post Exposure prophylaxis (PEP)**
  - Scheckter M, 2002

- **Male circumcision**
  - Gray R, Lancet 2007

- **Treatment of STIs**
  - Grosskurth H, Lancet 2000

- **Female Condoms**

- **Male Condoms**

- **HIV Counselling and Testing**
  - Coates T, Lancet 2000

- **Behavioural Intervention**
  - Abstinence
  - Be Faithful

**Notes:**

- **Oral pre-exposure prophylaxis**
  - Donnell D, Lancet 2010
  - Cohen M, NEJM 2011

CAPRISA (Centre for the AIDS Programme of Research in South Africa)
5 key challenges in PrEP & TasP:

1. **Adherence**: Will healthy people be willing to take medication everyday for decades?

2. **Safety**: Are ARVs safe in long-term?

3. **Resistance**: Will HIV infection on PrEP cause ARV resistance & will TasP lead to widespread resistance with poor adherence in well people?

4. **Displacing condoms**: Will there be behavioural disinhibition / risk compensation?

5. **Cost and Health service burden**: Can we afford large populations on ARVs as PrEP or TasP?
Broadly neutralizing antibodies Advancing the search for a vaccine

Evolution of an HIV glycan-dependent broadly neutralizing antibody epitope through immune escape


Co-evolution of a broadly neutralizing HIV-1 antibody and founder virus


Delineating Antibody Recognition in Polyclonal Sera from Patterns of HIV-1 Isolate Neutralization

Hope for a Cure

Timothy Ray Brown aka “The Berlin patient”: Effectively cured of AIDS in 2006 following two bone marrow transplants to treat leukaemia

The Mississippi Baby

Post-Treatment HIV-1 Controllers with a Long-Term Virological Remission after the Interruption of Early Initiated Antiretroviral Therapy ANRS VISCONTI Study

The search for an HIV cure: tackling latent infection

Stephen J Kent, Jeanette C Reece, Janka Petravic, Alexey Martyushev, Marit Kramski, Robert De Rose, David A Cooper, Anthony D Kelleher, Sean Emery, Paul U Cameron, Sharon R Lewin, Miles P Davenport
HIV has yet to be controlled!

3 Key obstacles to an AIDS-free generation

1. Dysfunctional health systems
   - Failing to convert efficacious treatment and prevention interventions into effectiveness

2. HIV continues to grow in Key Populations
   - Young women in Africa
   - MSM
   - IDU

3. Stigma & discrimination
   - Major obstacle to prevention & care
Status of the global HIV epidemic - 2011

34.2 million living with HIV, 2.5 million new infections, 1.7 million deaths

North America
1.4 million
[1.1 million – 2.0 million]

Caribbean
230 000
[200 000 – 250 000]

Latin America
1.4 million
[1.1 million – 1.7 million]

Middle East & North Africa
330 000
[250 000 – 450 000]

Eastern Europe & Central Asia
1.5 million
[1.3 million – 1.8 million]

East Asia
830 000
[590 000 – 1.2 million]

South & South-East Asia
4.2 million
[3.1 million – 4.7 million]

Sub-Saharan Africa
23.5 million
[22.2 million – 24.7 million]

Middle East
330 000
[250 000 – 450 000]

Oceania
530 000
[47 000 – 60 000]

South Africa:
• 0.7% of world’s population
• 16% of global HIV burden (5.4m)
• Country with the most AIDS cases

Source: UNAIDS 2012
SA: Implementation success at country level

- **HIV testing campaign:** 13 million HIV tests in 2010/11
- **Medical Male circumcision:** 250,000 in 2011
  - 50-fold from 5190 circumcisions in 2008
- **Preventing mother-to-child transmission:**
  - Vertical transmission rate 2008 vs 2011: 9.6% vs 2.7%
- **Scale up of ART provision**
  - South Africa has the largest ART programme in the world with 52% of those in need of ART receiving treatment in South Africa in 2011
- **Tuberculosis detection**
  - Between March 2011 and July 2012, 472,734 specimens were tested using GeneXpert
- **6 year increase in Life Expectancy**
High coverage of antiretroviral therapy reduces HIV risk & increases life expectancy

Adult life expectancy has increased from 49.2 years in 2003 to 60.5 years in 2011.
Worsening of the HIV epidemic in young women in South Africa from 1990 to 2005

1990

HSRC Mandela survey (Shisana et al)

MRC HIV survey (Abdool Karim et al)

2005

HSRC Mandela survey (Shisana et al)
High rates of HIV among key populations: young women in Africa


Young women have up to 8 times more HIV than men

Source: Adapted from UNAIDS 2012
Young women: a key population for HIV prevention in South Africa (CAPRISA 055)

<table>
<thead>
<tr>
<th>Age Group (years)</th>
<th>HIV Prevalence 2004-2008 (N=1237)</th>
<th>HIV Prevalence 2009-2011 (N=728)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12-16</td>
<td>10.6%</td>
<td>6.7%</td>
</tr>
<tr>
<td>17-18</td>
<td>21.3%</td>
<td>18.5%</td>
</tr>
<tr>
<td>19-20</td>
<td>33.0%</td>
<td>27.9%</td>
</tr>
<tr>
<td>21-22</td>
<td>44.3%</td>
<td>33.6%</td>
</tr>
<tr>
<td>23-24</td>
<td>51.0%</td>
<td>43.8%</td>
</tr>
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</table>
## Baseline Characteristics: CAPRISA 007

<table>
<thead>
<tr>
<th></th>
<th>Cash incentivised HIV intervention (N=7)</th>
<th>Standard HIV education (N=7)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean cluster size</strong></td>
<td>227.4 (120 – 313)</td>
<td>232.1 (140 – 336)</td>
<td>0.764</td>
</tr>
<tr>
<td><strong>Proportion male</strong></td>
<td>47.9%</td>
<td>46.5%</td>
<td>0.482</td>
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<td><strong>Proportion &lt;18 years</strong></td>
<td>72.9%</td>
<td>68.2%</td>
<td>0.343</td>
</tr>
<tr>
<td><strong>HIV Prevalence</strong></td>
<td>4.6% (3.2 – 5.9)</td>
<td>3.6% (1.9 – 5.2)</td>
<td>0.330</td>
</tr>
<tr>
<td><strong>Pregnancy Prevalence</strong></td>
<td>3.3% (1.6-4.9)</td>
<td>4.0% (2.4-5.6)</td>
<td>0.445</td>
</tr>
<tr>
<td><strong>HSV-2 Prevalence</strong></td>
<td>8.9% (7.9-9.9)</td>
<td>7.1% (5.4-8.9)</td>
<td>0.084</td>
</tr>
</tbody>
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Stigma: Major impediment to HIV prevention and treatment

Stigma impedes AIDS prevention

Medical advances cannot help those who deny they are at risk of HIV and avoid HIV tests. Salim S. Abdool Karim describes how such attitudes may be overcome.
Key Lessons

• Complex challenge - No quick fix, no magic bullets, no one size fits all
• Plan interventions considering diversity of epidemics, populations & transmission modes
• Partnerships are critical – scientists, activists, community, donors and industry
• Hope lies in the power of research & innovation to develop new technologies
  - Need to meets the needs of the infected (treatment & cure) and the uninfected (vaccines, microbicides, PrEP)
Conclusion

• Now is NOT the time to slow down our HIV/AIDS efforts

• First, do what we know works:
  – Health systems strengthening
  – Efficacious prevention in key populations
  – Provide ART to those who qualify
  – Maintain high ARV adherence (Avoid the path of TB which led to the emergence of XDR-TB)

• Continue research and development of:
  – New diagnostics, including for early post-exposure
  – Safe and effective vaccines
  – Prevention approaches for young women
  – Long-acting / slow release antiretroviral drugs
  – A cure