25 Years of AIDS – Reflecting Back and Looking Forward

The Scientific Response

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Adults and Children Estimated to be Living with HIV, 2005

Global Total: ~38.6 million

Source: UNAIDS, 2005

Advances in AIDS Research, 1981-2006

- Etiology
- Diagnosis
- Molecular Virology and Epidemiology
- Pathogenesis
- Natural History
- Treatment
- Prevention
- Vaccine Development

Discovery of HIV as the Cause of AIDS, 1983-84

201,110 HIV-Related Papers in PubMed Database as of August 14, 2006
Immediate Importance of Blood Test for HIV
- Protect blood supply
- Diagnosis, especially early in disease
- Demonstration of extent of asymptomatic disease
- Epidemiological and natural history studies

The Human Immunodeficiency Virus (HIV)

The Replication Cycle of HIV

Dynamics of HIV Infection In Vivo

Treatment of the HIV-Infected Individual

_targets for antiretroviral drugs_
FDA-Approved Antiretroviral Drugs

NRTI
- Abacavir
- Didanosine
- Emtricitabine
- Lamivudine
- Stavudine
- Zidovudine
- Zalcitabine
- Tenofovir

NNRTI
- Delavirdine
- Efavirenz
- Nevirapine

Fusion Inhibitor
- Enfuvirtide (T-20)

PI
- Amprenavir
- Atazanavir
- fosamprenavir
- Indinavir
- Lopinavir
- Nelfinavir
- Ritonavir
- Saquinavir
- Tipranavir

DARUNAVIR (TMC114)

Combinations
- 5 available, combining 2 or 3 drugs
  - e.g. Atipam + efavirenz + emtricitabine + tenofovir

AIDS Drugs Have Saved 3 Million Years of Life in the United States

The Survival Benefits of AIDS Treatment in the United States

RP Walensky et al.

Global Access to Antiretroviral Drugs in Low and Middle Income Countries is Improving

12/2002: 300,000 people on ARVs
12/2005: ~1.3 million people on ARVs

- In 2005, 250,000-350,000 deaths were averted because of recent treatment scale up.
- However, only 1 in 5 people in need of ARVs in low- and middle-income countries are receiving them.

Source: WHO, 2006

HIV Prevention Research

- Education and behavior modification
- Interruption of transmission from mother to child
- Treatment/prevention of drug/alcohol abuse
- Clean syringes (i.e. “needle exchange” programs)
- Circumcision
- Condoms, other barrier methods
- Topical microbicides
- Treatment of other sexually transmitted diseases
- Prophylactic antiretroviral therapy
- Vaccination

Looking Forward: Key Scientific Challenges

- Persistence of viral reservoir
- Early events in HIV infection
- New targets for drugs
- Topical microbicides
- Vaccines

Topical Microbicides

- Most HIV infections are spread by unprotected sex
- Current methods are male controlled and contraceptive
- Women have no means to protect themselves if their partners do not use male condoms or allow female condoms to be used
- Abstinence and being faithful are not likely to protect married women or those who are sexually abused
A Safe and Effective HIV Vaccine

- Critical to the effective control of HIV globally.
- The most important and difficult scientific challenge in AIDS research.

Confronting AIDS in the 21st Century

Prevention
Treatment
Care

Basic and Clinical Research

History will judge us as a global community by what we will do in the next 25 years as much as by what we have accomplished in the first 25 years.