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Review - Basic and Applied Anatomy and Embryology

AIDS since 1984: No evidence for a new, viral epidemic – not even in Africa

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Summary

Since the discoveries of a putative AIDS virus in 1984 and of millions of asymptomatic carriers in subsequent years, no general AIDS epidemic has occurred by 2011. In 2008, however, it has been proposed that between 2000 and 2005 the new AIDS virus, now called HIV, had killed 1.8 million South Africans at a steady rate of 300,000 per year and that anti-HIV drugs could have saved 330,000 of those. Here we investigate these claims in view of the paradoxes that HIV would cause a general epidemic in Africa but not in other continents, and a steady rather than a classical bell-shaped epidemic like all other new pathogenic viruses. Surprisingly, we found that South Africa attributed only about 10,000 deaths per year to HIV between 2000 and 2005 and that the South African population had increased by 3 million between 2000 and 2005 at a steady rate of 500,000 per year. This gain was part of a monotonic growth trajectory spanning from 29 million in 1980 to 49 million in 2008. During the same time Uganda increased from 12 to 31 million, and Sub-Saharan Africa as a whole doubled from 400 to 800 million, despite high prevalence HIV. We deduce from this demographic evidence that HIV is not a new killer virus. Based on a review of the known toxicities of antiretroviral drugs we like to draw the attention of scientists, who work in basic and clinical medical fields, including embryologists, to the need of rethinking the risk-and-benefit balance of antiretroviral drugs for pregnant women, newborn babies and all others who carry antibodies against HIV.

Key words

HIV; population growth; anti-HIV agents; AIDS drugs; drug toxicity.

1. Introduction

In 1984 the hypothesis was advanced in the US that a new AIDS virus was at the threshold of causing an epidemic of immunodeficiency, alias AIDS, in line with the classic germ theory of disease (Gallo et al., 1984; Altman L.K., newspaper article in the New York Times, New York, pp. C1-C3, April 24, 1984). This virus-AIDS hypothesis has since monopolized AIDS research and the treatment and prevention

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of AIDS, although the predicted general epidemic never showed up. In view of this we have re-analyzed the epidemiology of AIDS and HIV, particularly of Africa, which is reportedly most affected. We have then compared our findings with the predictions made by the classic germ theory of disease.

The germ theory of disease predicts that a new (relative to a population) pathogenic virus or microbe causes an exponentially spreading epidemic of new microbe-specific illnesses and deaths within weeks to months after the arrival of the new pathogen (Encyclopædia Britannica, 2010). These fast kinetics are the results of the short generation times of microbes. Bacteria double in only 30 minutes; and human and animal viruses multiply 100- to 1000-fold within 8 to 24 hours (Fenner et al., 1974; Freeman, 1979; Mims and White, 1984). Since each carrier can infect numerous others, infections spread exponentially like biological chain reactions and run until all susceptible subjects are either killed or have acquired immunity, which limits such epidemics typically to a few months (Fenner et al., 1974; Freeman, 1979; Mims and White, 1984; Duesberg, 1991, 1994, 1996). The resulting bell-shaped epidemiological curves of illnesses and deaths were first described for a plague in London in 1665 that lasted several months (Institute of Historical Research, 1990). Many other bell-shaped epidemics have since then been described, as for example the global flu of 1918, shown in Fig. 1, and the polio epidemics of the 1950s, which all lasted 2-3 months.

In view of the widespread fear of a general AIDS epidemic following the announcement of an AIDS virus in 1984, the National Academy of Sciences and the Institute of Medicine appointed a blue ribbon committee of experts to confront the

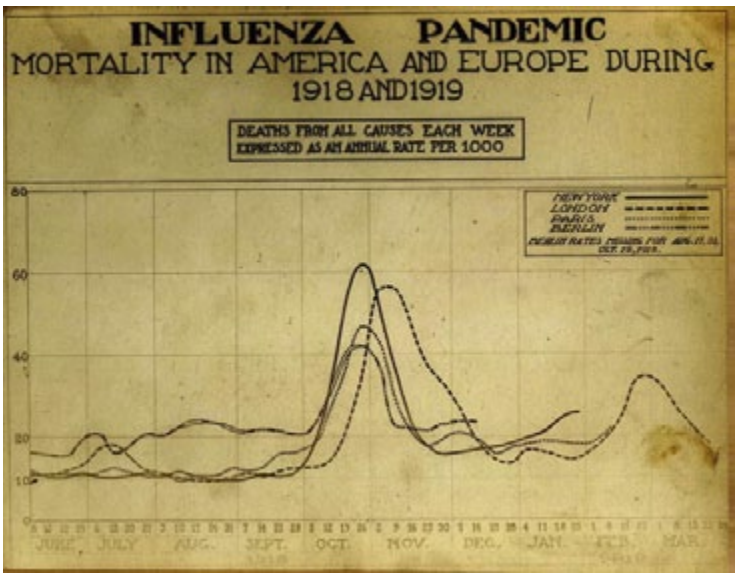

Figure 1 – Bell-shaped curves of the mortality of Americans and Europeans during the global Flu epidemic of 1918. As predicted by the germ theory of disease, the Flu-epidemic increased mortality exponentially over 4 weeks about 6-fold. It then declined exponentially to normal mortality over 4-6 weeks. The picture is from http://health.mo.gov/training/epi/Pandemic.html. Accessed February 4th, 2011.

expected AIDS epidemic (Institute of Medicine, National Academy of Sciences, 1986). In the light of the classic germ theory of disease this committee predicted in 1986, in a volume termed Confronting AIDS, a fast spreading AIDS epidemic that would decimate the general American population based on sexual and perinatal transmission of HIV: "There are 1 to 1.5 million Americans currently infected with HIV. Of these, 20 to 30 percent are expected to develop AIDS by 1991. AIDS cases … acquired through heterosexual contact will increase from 1100 in 1986 to almost 7000 in 1991… Pediatric AIDS cases will increase almost 10-fold during the next 5 years to more than 3000 cumulative cases …" (Institute of Medicine, National Academy of Sciences, 1986).

But despite these predictions, the American AIDS epidemic has remained restricted to non-general risk groups from its beginnings in the early 1980s (Duesberg, 1989) until now. By 2008 the cumulative total were 513,138 male homosexuals, who had used multiple recreational drugs, 341,546 intravenous drug users, 188,585 "heterosexuals … at high risk for HIV infection" (typically drug addicted), 20,509 hemophiliacs, other transfusion recipients and babies born to mothers from HIV risk groups (Duesberg et al., 2003; Centers for Disease Control, 2008). According to the AIDS statistics from the Centers for Disease Control (CDC) the American epidemic has increased in these risk groups slowly but not exponentially from 1984 until 1993, and then decreased slowly until 1997. Once the various AIDS definitions and testing methods

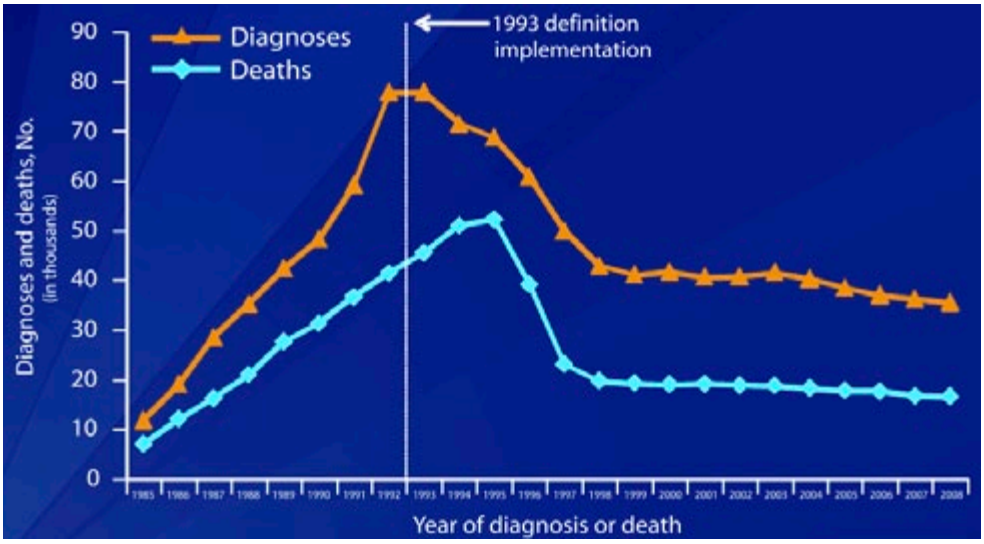

Figure 2 – Statistics of the American AIDS epidemic from the U.S. Centers of Disease Control. "This slide presents trends from 1985 through 2008 in the estimated numbers of AIDS diagnoses and deaths of adults and adolescents (aged 13 years and older) with AIDS, in the 50 states, the District of Columbia, and the U.S. dependent areas. The peak in AIDS diagnoses during 1993 can be associated with the expansion of the AIDS surveillance case definition implemented in January 1993." (Centers for Disease Control, 2011). Note: A new viral epidemic would have risen and declined exponentially within weeks or months after its discovery in 1984, as shown above for the 1918 Flu epidemic in Fig. 1. Instead the American AIDS epidemic increased slowly, not exponentially over 7 years, then declined slowly over 4 years and since then has remained steady for over 12 years now – much like a chemical lifestyle epidemic (Duesberg et al., 2003).

had become steady in 1997, the AIDS epidemic had also become steady until now, 13 years later (Fig. 2), (Centers for Disease Control, 2011). Slowly rising, declining or steady epidemics are, however, the characteristic patterns of chemical lifestyle diseases, not that of a new viral epidemic (Duesberg et al., 2003). Almost identical figures have been reported recently for Italy, where AIDS is also still restricted to the original risk groups and paediatric AIDS is virtually non-existent (Ruggiero et al., 2009).

Soon after the appearance of Confronting AIDS, Anderson et al. (1988) predicted in Nature, based on "mathematical models of the transmission dynamics of HIV", that in "developing countries" "AIDS is capable of changing population growth rates from positive to negative values over time scales of a few decades". And in 2000 "over 5000 scientists" signed the Durban Declaration, which projected that 24 million HIV-positive Africans are "likely to die within 5 years" (The Durban Declaration, 2000). But despite over 30 million of HIV antibody-positive people worldwide (The Durban Declaration, 2000), no general epidemic of immunodeficiency was recorded (Baumann et al., 1995; Stewart et al., 2000; Duesberg et al., 2003; Bauer, 2007).

Recently, however, a new study by Chigwedere et al. from Harvard University "estimated" that from 2000 to 2005 1.8 million South Africans were killed by HIV at a steady rate of 300,000 per year (Chigwedere et al., 2008). These estimates were based on information from the World Health Organization (WHO) (World Health Organization, UNAIDS, UNICEF, 2008a). Chigwedere et al. (2008) further claimed, based on "modeling" the South African epidemic, that anti-HIV drugs could have prevented at least 330,000 of those 1.8 million estimated deaths.

Since no general HIV-AIDS-epidemics had been observed in any other continent, despite millions of HIV antibody-positives, and since steady losses of lives per year for 6 years are inconsistent with the exponential increases and declines of new germ epidemics, we have investigated here the evidence for the claim that HIV killed 1.8 million South Africans at 300,000 per year from 2000 to 2005. In view of the inherent toxicities of anti-HIV drugs (see Section 6 below) we further asked, whether the potential benefits of these drugs, claimed by the Harvard study, do indeed outweigh their inherent toxicities.

This issue is of interest also for embryologists, who are called to evaluate the potential and actual effects of antiretroviral drugs on developing humans during prenatal life and in babyhood.

2. Population of South Africa grows steadily, despite claims of huge losses from a new epidemic of HIV

To answer our question about the reportedly huge losses of South African lives from HIV, we checked three sources:

1) The WHO;
2) The AIDS-mortality statistics of South Africa;
3) The population statistics of South Africa for new, abnormal losses between 2000 and 2005.

1) WHO statistics. Surprisingly, the WHO/UNAIDS does not list any numbers on "Reported HIV cases" and "Reported AIDS cases" in their epidemiological "Fact Sheet" for South Africa for the period of 2000 to 2005 (World Health Organization,

Reported AIDS cases

	<1996	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Total
Male														
Female														
Both sexes														

Source:

Reported HIV cases

A case of HIV infection is defined as an individual with HIV infection irrespective of clinical stage confirmed by laboratory criteria according to country definitions and requirements.

	<1996	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Total
Male														
Female														
Both sexes														

Source:

Note: In some instances, the number in the total column is not the sum of the individual years due to differing reporting, estimation processes or available data.

Figure 3 – Absence of numbers from "Reported HIV cases" and "Reported AIDS cases" in the WHO statistics of South Africa (World Health Organization, UNAIDS, UNICEF, 2008b).

UNAIDS, UNICEF, 2008b). As shown in Fig. 3, the respective statistics from 1996 until 2007 are two empty boxes (World Health Organization, UNAIDS, UNICEF, 2008b). Thus we could not confirm the HIV-AIDS epidemic described by Chigwedere et al. (2008) based on the sources they cited.

2) AIDS mortality of South Africa from 2000 to 2005. In an effort to find independent evidence on this issue, we investigated the AIDS mortality statistics of South Africa. Unexpectedly, we found that Statistics South Africa attributed an average of only 10,000 deaths to HIV per year between 2000 and 2005 (Tab. 1) (Statistics South Africa, 2007; Statistics South Africa, 2008). This is 30-times less than Chigwedere et al. (2008) claimed. And even this relatively low number may be an over-estimate, because the 27 "HIV-diseases" that are part of the AIDSyndrome (Centers for Disease Control, 1992) include the most common South African diseases and causes of death, namely "tuberculosis, pneumonias and intestinal infections" listed as "HIV-diseases" by Statistics South Africa (Statistics South Africa, 2007). Thus common African diseases may have been erroneously attributed to HIV, because they coincided with a positive test for antibodies against HIV. We conclude that there is no verifiable evidence that a putative HIV-epidemic killed 300,000 South Africans per year between 2000 and 2005, as claimed by Chigwedere et al. (2008).

3) Population statistics of South Africa. In an effort to obtain further independent evidence for HIV-dependent life losses, we looked for a corresponding decline in the population growth trajectory of South Africa. Unexpectedly we found that the population of South Africa had increased by 3 million from 2000 to 2005, based on concordant statistics from South Africa and the US Census Bureau (Statistics South Africa, 2007; US Census Bureau, International Data Base, 2008). As shown in Tab. 1 and Fig. 4A, this gain extended a steady growth trajectory of South Africa from 29 million in 1980 to 47.5 million in 2005, which then continued at the same steady rate (Statistics

Table 1 – Population statistics of South Africa from 1980 until 2008.

Year	Population $x10^{-3}$ (a)	HIV+ % (b)	HIV-Death $x10^{-3}$ (c)
1980	29,300		
1981	30,200		
1982	31,100		
1983	32,100		
1984	33,200		
1985	34,300		
1986	35,100		
1987	35,900		
1988	36,800		
1989	37,600		
1990	38,500	0.7	
1991	39,300	1.7	
1992	40,100	2.2	
1993	40,900	4.0	
1994	41,600	7.6	
1995	42,200	10.4	
1996	42,800	14.4	
1997	43,300	17.0	*
1998	43,900	22.8	*
1999	44,500	22.4	10.0
2000	45,100	24.5	10.5
2001	45,600	24.8	*
2002	46,100	26.5	*
2003	46,600	27.9	*
2004	47,000	29.5	13.0
2005	47,500	30.2	14.5
2006	47,900	29.1	
2007	48,400	28.0	
2008	48,800		

(a) Statistics South Africa and US Census Bureau (Statistics South Africa, 2007; Statistics South Africa, 2000; US Census Bureau, International Data Base, 2008).
(b) National Department of Health South Africa (National Department of Health South Africa, 2007).
(c) Statistics South Africa (Statistics South Africa, 2007; Statistics South Africa, 2008) Statistics South Africa. Mortality and causes of death in South Africa, 2006: Findings from death notification. Statistics South Africa, 2008.
*Not reported because HIV-deaths were below 10th rank.

South Africa, 2000; Statistics South Africa 2007; US Census Bureau, International Data Base, 2008). The change of the growth trajectory predicted by the losses of 300,000 per year for 6 years is shown as a hypothetical branch of the observed monotonic growth curve in Fig. 3A. But the actual growth curve did not show any evidence for such losses. In sum, the South African population grew steadily during the period from 2000-2005, extending a long-established growth trajectory. Indeed, this growth curve has

been so consistently monotonic that it predicted exactly the increase of the South African population by 3 million between 2000 and 2005 (see Tab. 1, Fig. 4A).

Moreover, a new viral epidemic causing steady losses of 300,000 per year for 6 years is not compatible with the classic germ theory of disease. Instead, the germ theory predicts that new viruses and microbes cause epidemics that rise exponentially, because of exponential growth and spread of microbes, and then fall exponentially, because of the resulting immunity and deaths within several months, rather than go steady over 6 years (see Fig. 1 and Introduction). HIV has been demonstrated 20 years ago to induce anti-viral immunity - but not AIDS - within several weeks after infection (Clark et al, 1991; Daar et al, 1991), just like any other virus (Duesberg, 1989). Thus a new virus could have been a plausible explanation for a seasonal epidemic of several months within a given year, but not for a steady loss of lives for 6 years in a row.

In sum, neither the WHO, nor the mortality statistics of South Africa, nor the population statistics of South Africa provide verifiable evidence for the predicted epidemiological pattern associated with a new killing virus in South Africa between 2000 and 2005.

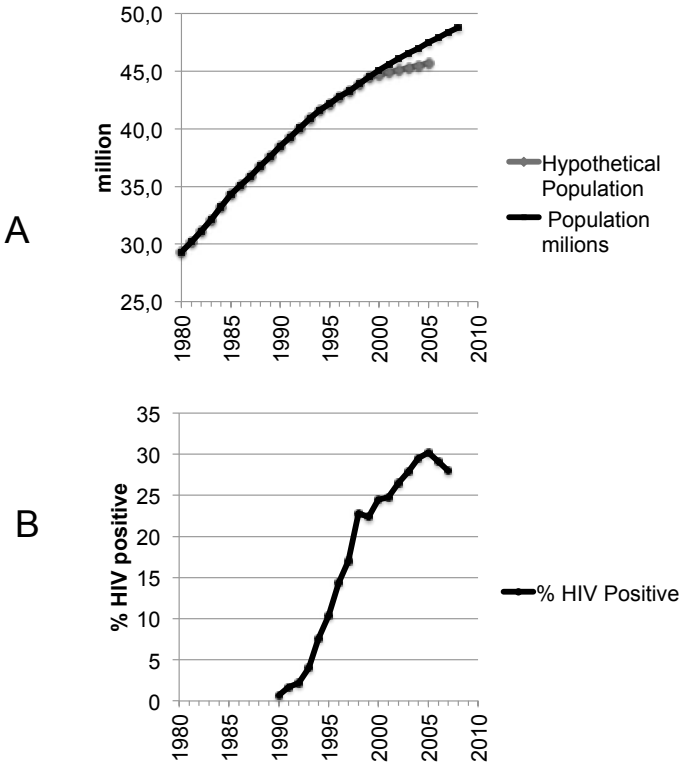

Figure 4 – (A) The population growth curve of South Africa from 1980 until 2007 based on *Statistics South Africa* and the US Census Bureau (Statistics South Africa, 2000, 2007; US Census Bureau, International Data Base, 2008). A hypothetical branch of the growth curve shows the expected population growth curve if a new AIDS epidemic had claimed 300,000 lives per year from 2000 to 2005. (B) The percentage of HIV-antibody-positive South Africans is based on data from antenatal clinics of the South African Department of Health (Department of Health South Africa, 2007).

Similar non-correlations between mortality and prevalence of HIV were found in Italy. The Italian case is, however, based on actual data rather than on estimates (Ruggiero et al., 2009).

The discrepancies between our findings and the claims by Chigwedere et al. (2008) might be due to un-verifiable information from the WHO, on which those authors relied. Skepticism about AIDS statistics from the WHO has been voiced by the recent Chief of the Global Programme on AIDS of the WHO, Public Health professor James Chin from the University of California at Berkeley, who wrote that "AIDS programs developed by international agencies and faith based on organizations have been and continue to be more socially, politically, and moralistically correct than epidemiologically accurate." (Chin, 2007). Since Chin also was a member of the 'Confronting AIDS' committee of the National Academy and the Institute of Medicine in 1986 (Institute of Medicine, National Academy of Sciences, 1986), his remarks cannot be dismissed lightly. More recently the WHO has also been accused of manipulating epidemiological numbers of a new flu epidemic (Cohen and Carter, 2010).

To test our hypothesis that HIV may not be pathogenic, we asked next, whether the population growths of other HIV antibody-positive African countries were also independent of HIV, as for example Uganda.

3. Population of Uganda doubles despite HIV epidemic

Based on the AIDS literature, Uganda is the epicenter of the African AIDS epidemic and thus a primary challenge of hypotheses on the pathogenicity of HIV. In 1989 the Minister of Health has already announced that 5.8% of the population was HIV antibody-positive (Goodgame, 1990). It is for this reason that the New England Journal of Medicine described Uganda as a model for emerging AIDS epidemics in Africa: "AIDS is already the most common cause of admission and death among hospitalized adults" (Goodgame, 1990). Concordantly Mulder et al. claimed in 1994 in The Lancet and in Aids that, "Among adults, half of all deaths and among those aged 13-44 over 80% of deaths were attributable to HIV-1 infection" (Mulder et al., 1994a,b).

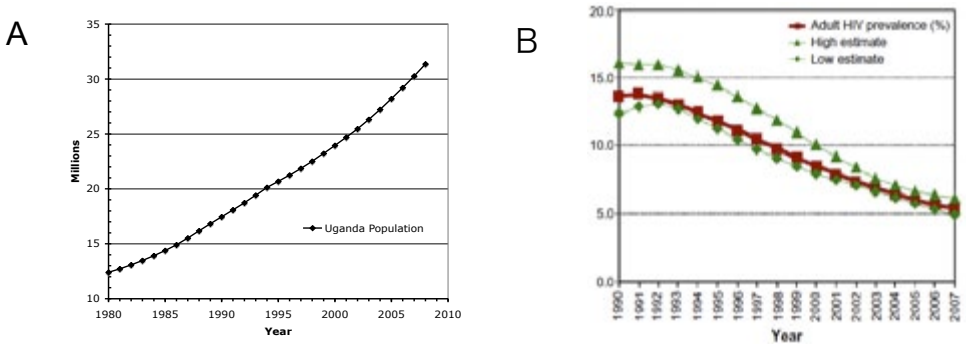

Figure 5 – (A) The population growth curve of Uganda from 1980 until 2008 based on statistics from the US Census Bureau (US Census Bureau, International Data Base, 2008). (B) The percentage of HIV-antibody-positive Ugandans is based on data from the Ugandan Minister of Health (Goodgame, 1990) and the World Health Organization (World Health Organization, UNAIDS, UNICEF, 2008a).

In contrast to these daunting prognoses the Ugandan population was growing rapidly, much as that of South Africa (Fiala, 2009). Vital statistics from the US Census Bureau, International Data Base (2008) show that the Ugandan population has increased 2.5-fold - from 12 to 31 million since the early 1980s, when HIV presumably first appeared in Africa (Goodgame, 1990; Mulder et al., 1994b); see Fig. 5A and Tab. 2.

Based on statistics from the World Health Organization, UNAIDS, UNICEF (2008a) the 5.8% HIV-prevalence of Ugandans in 1989 shot up to about 13% in 1990 and then slowly declined spontaneously back to about 5% again by 2006 and 2007 (Fig. 5B). Since the WHO "fact sheets" again lacked any numbers of "Reported HIV cases" from Uganda (World Health Organization, UNAIDS, UNICEF, 2008a), it is unclear whether, and if so, why HIV would have decreased in Uganda during the same time, in which it increased in South Africa (see Section 5).

The fact that the population of Uganda increased 2.5-fold during the HIV-AIDS era, although it was described in the professional literature as model for the dire consequences of a fatal HIV epidemic, lends support to our conclusion that South African population growth is also independent of HIV.

4. Population of total Sub-Saharan Africa doubles from 400 to 800 million between 1980 and 2007

In an effort to raise our investigation above variations among population statistics and AIDS epidemics of different African countries, we asked next whether the population of Sub-Saharan Africa as a whole was increasing or decreasing – in the face of the widespread prevalence of antibodies against HIV (Quinn et al., 1986; Goodgame, 1990; Merson, 1993; Mulder et al., 1994b; The Durban Declaration, 2000; Gisselquist et al., 2002).

Again we found in the statistics of the World Bank that the population of Sub-Saharan Africa as a whole had doubled during the HIV-AIDS era, from almost 400 million in 1980 to about 800 million in 2007 (World Bank, 2008). On May 4, 2011, the New York Times reported that Africa had just reached 1 billion and is projected to be the fastest growing continent for the coming century. The article remarked "that the AIDS epidemic, devastating as it has been, has not been the demographic disaster that was once predicted." (Gillis J, Dugger C., newspaper article in the New York Times, New York, p. A1, A3, May 4, 2011).

We conclude that the predicted epidemiological patterns associated with a widespread new killing virus never showed up in Africa. In the following we briefly investigate the theory that HIV is a passenger virus.

5. Could HIV be a passenger virus?

By definition a passenger virus is not sufficient and not necessary to cause a disease (Duesberg, 1994). A passenger virus can thus be associated with healthy people and also with people suffering from virus-independent diseases. Human examples are cytomegalovirus, adenovirus or reovirus (Fenner et al., 1974; Fields, 2001).

The hypothesis that HIV is a passenger predicts that its spread and prevalence do not coincide with mortality. To test this prediction we investigated the effect of the spread and prevalence of HIV on the population growth curve of South Africa.

Table 2 – Population statistics of Uganda from 1980 to 2008.

Year	Population x 10^{-3} (a)
1980	12,400
1981	12,700
1982	13,100
1983	13,500
1984	13,900
1985	14,400
1986	14,900
1987	15,600
1988	16,200
1989	16,800
1990	17,500
1991	18,100
1992	18,700
1993	19,400
1994	20,100
1995	20,700
1996	21,200
1997	21,900
1998	22,500
1999	23,200
2000	24,000
2001	24,700
2002	25,500
2003	26,300
2004	27,200
2005	28,200
2006	29,200
2007	30,300
2008	31,400

(a) US Census Bureau (US Census Bureau, International Data Base, 2008).

For this purpose we plotted the HIV-antibody prevalence of the South African population reported by the National Department of Health South Africa since 1990 (Department of Health South Africa, 2007) on a separate panel of Fig. 4, which shows the population growth curve of South Africa. Fig. 4B shows that anti-HIV antibodies were first detected in 1990 in 0.7% of the population. This percentage then increased gradually (not exponentially!) over about 10 years until 2000, when it leveled off between 25 and 30%.

By comparing Fig. 4A and B it can be seen that the steady growth trajectory of the African population since 1980 is unaffected by the rise of the HIV-prevalence from 0.7 to 30% between 1990 and 2000 and the steady prevalence of HIV since then. Inde-

pendence of the growth trajectory of the South African population of HIV prevalence is in agreement with the hypothesis that HIV is a passenger virus. Moreover, the rise of the HIV-antibody prevalence from 0.7% in 1990 to about 30% in 2000 is much too slow for the natural, exponential spread of a new virus (see Fig. 1). It may be proposed, therefore, that the apparent rise of HIV prevalence between 1990 and 2000 reflects the rise of a new epidemic of HIV-antibody testing. HIV-testing epidemics first started in the US after the acceptance of the new HIV-AIDS hypothesis in 1984 and then in many other countries of the world (See Introduction).

In all countries where testing was introduced the prevalence of HIV-antibodies was soon found to be steady as it would be expected if HIV were a long-established endemic retrovirus (Duesberg, 1996; Duesberg, 1992; Duesberg et al., 2003). In the US, for example, 1 million have been HIV-antibody-positive since 1985 (Curran et al., 1985; Institute of Medicine, National Academy of Sciences, 1986; Duesberg et al., 2003; Centers for Disease Control and Prevention, 2007, 2008). In Italy, about 140,000 – 180,000 have been HIV-antibody-positive since the beginning of testing in the 1980s (Ministero della Salute, Italy, 2011; Istituto Superiore di Sanità, Italy, 2007).

Recent evidence estimating that HIV has been in humans since at least the early 1900s corroborates the hypothesis that HIV is a long-established endemic retrovirus (Woodman and Williamson, 2009).

Unexpectedly indirect support to the view that HIV is a passenger appears to come from the CDC and WHO, which postulate that HIV causes 27 previously known diseases, if antibody against HIV is also present (Centers for Disease Control and Prevention, 1992; The Durban Declaration, 2000). Since all of these diseases were known prior to the presumed recent origin of HIV (Duesberg, 1988) and continue to occur in the absence of HIV (Blattner et al., 1988; Duesberg, 1993, 1996), a logical conclusion may be that HIV is not necessary for any one of these diseases.

The CDC and WHO also report over 30 million of HIV antibody-positive people in the US, Europe, Asia, and particularly in Africa, who are AIDS-free (The Durban Declaration, 2000; Centers for Disease Control and Prevention, 2007, 2008). Thus HIV cannot be sufficient to cause AIDS. Since HIV replicates and induces virus-neutralizing antibodies within weeks after infection (Clark et al., 1991; Daar et al., 1991), it should cause AIDS prior to immunity, when it is biochemically active, just like conventional pathogenic viruses (Fenner 1974: Mims & White 1984). Since that is never observed, HIV is postulated to depend on exceedingly long latencies of 5-10 years after the induction of immunity to cause AIDS (Weiss and Jaffe, 1990; The Durban Declaration, 2000; Henry et al., 2006). According to this view HIV depends on still unknown, time-dependent events to cause AIDS (Duesberg et al., 2003; Henry et al., 2006) and thus appears to be insufficient to cause AIDS by itself.

Likewise the CDC reports a steady 1 to 1.5 million of HIV-positive Americans since 1985 (see pages 186 and 191 above, and Duesberg et al. 2003). Since immigration of HIV-positives is banned, this indicates that the mortality of average American HIV-positives is close to normal. Furthermore, a study of the US Army reported recently that about 5% HIV-positive soldiers (Renzullo et al., 2001) "through an experiment of nature" developed no AIDS for up to 20 HIV-antibody-positive years without anti-HIV treatments (Okulicz et al. 2009), confirming the view that HIV is not sufficient for AIDS. The reason for AIDS-free HIV infection was not solved by the Army's study. But since the Army's study did not investigate the use of recre-

ational drugs, although the majority of American AIDS patients have used recreational and anti-viral drugs (Duesberg et al., 2003, see also Introduction), it is possible that the AIDS-free HIV-positives were those who had used neither recreational nor anti-viral drugs. The toxic effects of antiviral drugs are described in the next section. Thus the CDC, the WHO and the US Army provide evidence that supports our demographic evidence that HIV is a passenger virus.

6. Can anti-HIV drugs be beneficial, particularly if HIV is not pathogenic per se?

The evidence that HIV may be not pathogenic casts a new light on the question how AIDS should be treated. In view of this we review here briefly the theoretical limits of anti-retroviral (anti-HIV) treatments, and then the effects of currently used anti-HIV drugs, particularly those recommended for South Africa (Chigwedere et al., 2008).

1) Antiviral drugs are inevitably toxic. Owing to their low genetic complexity all viruses are obligatory parasites that depend on the host cell for the synthesis of viral DNA, RNA and proteins (Crick and Watson, 1956). Viral DNA, RNA and protein synthesis can thus only be inhibited via that of the cell. It is for this reason that all antiviral drugs are inevitably cytotoxic (see also Duesberg et al., 2003). It is presumably also for this reason that even nature has never evolved any antiviral drug – except antiviral immunity.

Moreover, there are no replicating HIV DNA-, RNA- and protein targets in people with antibodies against HIV, because antiviral antibodies inhibit virus replication (Clark et al, 1991; Daar et al, 1991; Duesberg, 1988, 1989, 1992, 1994; Duesberg et al., 2003). The chronic latency of the virus in all antibody-positive people is also the reason why virtually no virus is detectable in AIDS patients and why viral DNA and RNA are only detectable after billion-fold-amplifications with the polymerase chain reaction in vitro (Duesberg et al., 2003; Rodriguez et al., 2006). Nevertheless this procedure is called "viral load test", although it generates a "load" only artificially outside the body, in vitro. This is pointed out here, because the polymerase chain reaction is designed to detect just one or a few HIV DNA or RNA fragments of about 1 kilobase in HIV-positive people by generating billions of copies of these viral genomic fragments in vitro. Thus this test detects trace fragments of HIV DNA or RNA, far below the thresholds of direct pathogenicity, and cannot distinguish between intact and defective viruses. In the following we discuss the expected toxicities of anti-HIV drugs currently used or recommended for African AIDS.

2) Anti-HIV-AIDS drugs recommended for African AIDS. Based on "modeling" of the putative South African HIV-AIDS epidemic described above (Section 2) and on "consensus scientific opinion", the DNA chain terminator AZT and the DNA inhibitor Nevirapine have been recently recommended as anti-HIV-AIDS treatments and "prophylaxis" by Chigwedere et al. (2008).

AZT was developed in 1964 to terminate human DNA synthesis for cancer chemotherapy (Horwitz et al., 1964) and is used since 1987 to treat AIDS by inhibiting HIV DNA synthesis (Kolata, 1987). As DNA chain-terminator it is inevitably cyto-toxic and immuno-toxic, much like most other cancer chemotherapies (Horwitz et al., 1964).

Nevirapine was recently developed to inhibit HIV DNA synthesis, and is recommended as "prophylaxis" against "mother-to-child transmission" of HIV (Chigwedere et al., 2008). In the following we list known toxicities of these drugs.

3) Toxicities of AZT, Nevirapine and other anti-HIV-AIDS drugs. It is known since the beginnings of anti-HIV-AIDS therapy and "prophylaxis" in 1987 that, "more than half of all AIDS patients may not benefit from the drug because it is more toxic for them than their AIDS infection" (Kolata, 1987). "The most serious side effect of AZT is to suppress the bone marrow leaving patients highly vulnerable to bacterial infections" (Kolata, 1987). Since the same effect is also attributed to HIV, controlled tests are necessary to determine whether the drug is in fact beneficial.

The original, placebo-controlled study of AZT, undertaken to test AZT's ability to cure AIDS, showed life-threatening anemia in 24% and neutropenia in 16% within several weeks after treatment (Richman et al., 1987). In addition, "serious adverse reactions, particularly bone marrow suppression, were observed. Nausea, myalgia, insomnia, and severe headaches were reported more frequently by recipients of AZT; macrocytosis developed within weeks in most of the AZT group" (Richman et al., 1987). Thirty of 149 AZT recipients could only be kept alive by blood transfusions (Fischl et al., 1987). By 21 months 42% of the AZT group and 35% of the control group, who by then had also received AZT on a "compassionate basis", had died (Fischl et al., 1989).

In 1994 the ability of AZT to prevent AIDS was tested by the British-French Concorde study, the largest, placebo-controlled study of its kind (Aboulker and Swart, 1993; Seligmann et al., 1994). This study investigated the onset of AIDS and death of 1749 HIV-positive, mostly male homosexual subjects, which had been divided into an untreated and an AZT-treated subgroup. It was found that AZT is unable to prevent AIDS and increases the mortality by 25%. In view of this it was concluded, "The results of Concorde do not encourage the early use of zidovudine (AZT) in symptom-free HIV-infected adults." (Seligmann et al., 1994).

More recent studies also demonstrate that up to half of all HIV–positive American AIDS patients treated with anti-viral drug cocktails including AZT die from HIV-independent, non-AIDS-defining diseases. For example, Reisler et al. observed, "The most common grade 4 events ["serious or life-threatening events that are not AIDS defining"] were liver related (148 patients, 2.6 per 100 person-years). Cardiovascular events were associated with the greatest risk of death (hazard ratio = 8.64; 95% CI: 5.1 to 14.5). The first grade 4 event and the first AIDS event were associated with similar risks of death, 5.68 and 6.95, respectively." (Reisler et al., 2003). Likewise, a study of antiretroviral treatments found that "an important secondary end point was major cardiovascular, renal, or hepatic disease." (El-Sadr et al., 2006). A Danish group also concluded recently after studying the causes of death among AIDS patients treated with anti-viral drugs, "Almost half of deaths in persons diagnosed with HIV in a health care setting with free access to highly active antiretroviral therapy stemmed from factors unrelated to HIV disease." (Lohse et al. , 2011).

Other rare publications show AIDS-defining wasting disease even in HIV-negative adults treated erroneously with anti-HIV drugs (Guthrie J., newspaper article on "False diagnosis of HIV discovered after 8 years" in the San Francisco Chronicle, San Francisco pp. B1, B7, August 27, 2004). According to the responsible physician, "the patient exhibited symptoms that could be consistent with an HIV diagnosis".

Numerous clinical observers have corroborated these findings over the years. For example, AIDS researchers at the International AIDS conference in Vienna in 2010 "reassure[d] clinicians of not starting [anti-retroviral therapy] ART when patients

report a stable CD4" in agreement with the Concorde study. Likewise, the State of California has just warned about the inherent toxicity of AZT as carcinogen and particularly as toxin for embryonic development (California State, 2011), which should be of special concern to embryologists. And a recent Italian study reported that the high toxicity of early anti-HIV treatment was responsible for the death of 2000 AIDS patients in 1997 (Ruggiero et al., 2009).

Regarding Nevirapine, recommended as possible prophylaxis of mother-to-child transmission of HIV (Chigwedere et al., 2008), the National Institutes of Health (NIH) Treatment Guidelines advise that the drug may induce "liver failure and severe skin reactions" in addition to "rush, headaches, diarrhea, fever, abdominal pain and myalgia". Further, the guidelines point out that "the risk of several non-AIDS-defining conditions, including cardiovascular diseases, liver-related events, renal disease, and certain non-AIDS malignancies is greater than the risk for AIDS in persons with CD4 T-cell counts >200 cells/mm3".

A magazine article published in 2009 offered rare views of the various abnormal facial and bodily appearances of nine HIV-positive Americans treated with anti-HIV drug cocktails such as accelerated aging and disfigurations, which are termed "serious adverse effects" (France D., newspaper article on "Another Kind of AIDS Crisis, A striking number of HIV patients are living longer but getting older faster—showing early signs of dementia and bone weakness usually seen in the elderly" in New York Magazine, New York, November 1, 2009). By contrast, such appearances are not observed in the estimated 34 million mostly untreated, asymptomatic HIV antibody-positives (The Durban Declaration, 2000). A recent British-American collaborative study has since confirmed "that people with successfully treated HIV infection age prematurely, leading to progressive multi-organ disease," in part because "patients treated with commonly used nucleoside analog anti-retroviral drugs progressively accumulate somatic mitochondrial DNA mutations, mirroring those seen much later in life caused by normal aging." (Payne et al., 2011).

Furthermore treatment of unborn or newborn babies, which the Harvard study recommends, shows that anti-HIV drugs cause various forms of genetic damage including also "long-term mitochondrial toxicity" (Poirier et al., 2003), "persistent mitochondrial dysfunction" (Barrett et al., 2003), in addition to "chromosome loss and duplication, somatic recombination and gene conversion", which "justify surveillance for long-term genotoxic (mutagenic) consequences" (Escobar et al., 2007). This should prompt further investigations to give a sound basis to the risk-and-benefit balance evaluation in prenatal and early postnatal life. These genetic defects are treatment-dependent and HIV-independent, because the same defects were found in HIV-negative children of HIV-positive mothers treated with anti-HIV drugs (Duesberg et al., 2003; Poirier et al., 2003; Brogly et al., 2007). Another rare study describes an HIV-free baby, who had developed Pneumocystis pneumonia after prophylactic treatments with antiviral drugs, because the mother was HIV-positive (Heresi et al., 1997).

Independent, rarely mentioned animal experiments with mice, rats, dogs and monkeys have also shown that anti-HIV drugs cause immunodeficiency, anemia, muscle atrophy, nephropathy, liver disease, cancer of lung, liver and vagina, and deaths, as well as retarded development and abortions; as far as developing organisms are concerned, it is relevant that these drugs may cause the same diseases and outcomes in humans (reviewed in Duesberg et al., 2003).

We deduce from these findings that anti-HIV drugs are inevitably toxic, can induce AIDS-defining and non-AIDS-defining diseases. We do not rule out, however, that anti-HIV drugs, owing to their inherent cytotoxic effects, can have beneficial effects against "opportunistic" microbial diseases and cancers, if prescribed for limited periods of time (Duesberg et al., 2003; Monini et al., 2004). In agreement with us a recent study in Nature Genetics warned about the "irreversible long-term effects of the drugs", which "raise the specter of progressive iatrogenic mitochondrial genetic disease emerging over the next decade" (Payne et al., 2011). Other voices have also called for caution on when and how to start treatments of asymptomatic HIV-positive subjects, which might enlarge the reader's perspective on this point (DART Trial Team 2010; Sturt et al., 2010; Nunes et al., 2011; Panel de expertos de Gesida y Plan Nacional sobre el Sida, 2011; Siegfried et al., 2011).

7. General Conclusions

In sum, our analyses of African HIV- and AIDS prevalence revealed unexpected discrepancies between the reported epidemics of AIDS and of HIV. The predicted epidemiological pattern of mortality associated with the putative new AIDS virus never showed up in South Africa or anywhere else in Africa between 2000 and 2005. On the contrary, the African population doubled during the HIV-AIDS era, despite high prevalence of HIV. Our findings that there is no evidence for a new fatal HIV-AIDS epidemic in Africa have thus resolved the paradox that HIV would cause a general AIDS epidemic in Africa, but not in the rest of the world – namely by the absence of said epidemic.

In view of this and the inherent toxicities of anti-HIV drugs reviewed by us here, we propose a reevaluation of the HIV-AIDS hypothesis and of the prescription of anti-viral drugs to HIV antibody-positive subjects. Until there is verifiable evidence that HIV is fatally pathogenic, we deduce that South Africa's ''failure to accept the use of available ARVs [anti-HIV drugs]" (Chigwedere et al., 2008) has probably saved rather than cost South African lives.

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References

Aboulker J.P., Swart A.M. (1993) Preliminary analysis of the Concord trial. Lancet 341: 889-890.

Anderson R.M., May R.M., McLean A.R. (1988) Possible demographic consequences of AIDS in developing countries. Nature 332: 228-234.

Barrett B., Tardieu M., Rustin P., Lacroix C., Chabrol B., Desguerre I., Dollfus C., Mayaux M.J., Blanche S. (2003) Persistent mitochondrial dysfunction in HIV-1-exposed but uninfected infants: clinical screening in a large prospective cohort. Aids 17: 1769-1785.

Bauer H.H. (2007) The origin, persistence and failings of the HIV/AIDS theory. McFarland & Company, Inc., Publishers. Jefferson, North Carolina, and London.

Baumann E., Bethell T., Bialy H., Duesberg P., Faber C., Geshekter C., Johnson P., Maver R., Schoch R., Stewart G., Strohman R., Thomas Jr. C. (1995) for the Group for the Scientific Reappraisal of the HIV/AIDS Hypothesis. AIDS Proposal. Science 267: 945-946.

Blattner W., Gallo R.C., Temin H.M. (1988) HIV causes AIDS. Science 241: 515-516.

Brogly S.B., Ylitalo N., Mofenson L.M., Oleske J., Van Dyke R., Crain M.J., Abzug M.J., Brady M., Jean-Philippe P., Hughes M.D., Seage G.R. 3rd. (2007) In utero nucleoside reverse transcriptase inhibitor exposure and signs of possible mitochondrial dysfunction in HIV-uninfected children. Aids 21: 929-938.

California State. (2011) Chemicals known to the State to cause cancer or reproductive toxicity. Online at: http://www.oehha.ca.gov/prop65/prop65_list/Newlist.html. Accessed February 4th, 2011.

Centers for Disease Control and Prevention (1992) 1993 revised classification system for HIV infection and expanded surveillance case definition for AIDS among adolescents and adults. Morb. Mort. Wkly Rep. 41 (RR17): 1-19.

Centers for Disease Control and Prevention (2009) HIV/AIDS Surveillance Report, 2007. 19. Online at: http://www.cdc.gov/hiv/surveillance/resources/reports/2007report/pdf/2007SurveillanceReport.pdf. Accessed March 29th, 2011.

Centers for Disease Control and Prevention (2010) HIV Surveillance Report, 2008. 20. Online at: http://www.cdc.gov/hiv/surveillance/resources/reports/2008report/pdf/2008SurveillanceReport.pdf. Accessed March 29th, 2011.

Centers for Disease Control and Prevention (2011) HIV/AIDS Statistics and Surveillance, 1985-2008.

Chigwedere P., Seage G.R. 3rd, Gruskin S., Lee T.H.E, Essex M. (2008) Estimating the Lost Benefits of Antiretroviral Drug Use in South Africa. J. Acquir. Immune Defic. Syndr. 49: 410-415.

Chin J. (2007) The AIDS pandemic: The collision of epidemiology with political correctness: Radcliffe Publishing.

Clark S.J., Saag M.S., Decker W.D., Campbell-Hill S., Robertson J.L., Veldkamp P.J., Kappes J.C., Hahn B.H., Shaw G.M. (1991) High titers of cytopathic virus in plasma of patients with symptomatic primary HIV-1 infection. N. Engl. J. Med. 324: 954-960.

Cohen D., Carter P. (2010) WHO and the pandemic flu "conspiracies". BMJ 340: c2912.

Crick F.H., Watson J.D. (1956) Structure of small viruses. Nature 177: 473-475.

Curran J.W., Morgan M.W., Hardy S.A.M., Jaffe H.W., Darrow W.W., Dowdle W.R. (1985) The epidemiology of AIDS: current status and future prospects. Science 229: 1352-1357.

Daar E.S., Moudgil T., Meyer R.D., Ho D.D. (1991) Transient high levels of viremia in patients with primary human immunodeficiency virus type 1 infection. N. Engl. J. Med. 324: 961-964.

DART Trial Team (2010) Routine versus clinically driven laboratory monitoring of HIV antiretroviral therapy in Africa (DART): a randomised non-inferiority trial. Lancet 375: 123-131.

Department of Health South Africa (2007) Report National HIV and Syphilis Prevalence Survey South Africa 2006. Online at: http://www.doh.gov.za/docs/reports/2007/hiv/index.html. Accessed May 18th, 2011.

Duesberg P.H. (1988) HIV is not the cause of AIDS. Science 241: 514-516.

Duesberg P.H. (1989) Human immunodeficiency virus and acquired immunodeficiency syndrome: Correlation but not causation. Proc. Natl. Acad. Sci. USA 86: 755-764.

Duesberg P.H. (1991) AIDS epidemiology: inconsistencies with human immunodeficiency virus and with infectious disease. Proc. Natl. Acad. Sci. USA 88: 1575-1579.

Duesberg P.H. (1992) AIDS acquired by drug consumption and other noncontagious risk factors. Pharmacol. Ther. 55: 201-277.

Duesberg P.H. (1993) The HIV gap in national AIDS statistics. Biotechnology 11: 955-956.

Duesberg P. (1994) Infectious AIDS--stretching the germ theory beyond its limits. Int. Arch. Allergy Immunol. 103: 118-127.

Duesberg P.H. (1996) Inventing the AIDS Virus. Washington DC: Regnery Publishing Inc.

Duesberg P., Koehnlein C., Rasnick D. (2003) The chemical bases of the various AIDS epidemics: recreational drugs, anti-viral chemotherapy and malnutrition. J. Biosci. 28: 383-412.

El-Sadr W.M., Lundgren J.D., Neaton J.D., Gordin F., Abrams D., Arduino R.C., Babiker A., Burman W., Clumeck N., Cohen C.J., Cohn D., Cooper D., Darbyshire J., Emery S., Fatkenheuer G., Gazzard B., Grund B., Hoy J., Klingman K., Losso M., Markowitz N., Neuhaus J., Phillips A., Rappoport C. (2006) CD4+ count-guided interruption of antiretroviral treatment. N. Engl. J. Med. 355: 2283-2296.

Encyclopædia Britannica. (2010) "germ theory". Encyclopædia Britannica Online, http://www.britannica.com/EBchecked/topic/230610/germ-theory. Accessed February 4th, 2011.

Escobar P.A., Olivero O.A., Wade N.A., Abrams E.J., Nesel C.J., Ness R.B., Day R.D., Day B.W., Meng Q., O'Neill J.P., Walker D.M., Poirier M.C., Walker V.E., Bigbee W.L. (2007) Genotoxicity assessed by the comet and GPA assays following in vitro exposure of human lymphoblastoid cells (H9) or perinatal exposure of mother-child pairs to AZT or AZT-3TC. Environ. Mol. Mutagen. 48: 330-343.

Fenner F., McAuslan B.R., Mims C.A., Sambrook J., White D.O. (1974) The Biology of Animal Viruses. Academic Press Inc., New York.

Fiala C. (2003) AIDS in Africa: a call for sense, not hysteria [Rapid Response to Sidley P. (2003) Free retroviral drugs could save up to 1.7 million South Africans. BMJ, 327: 184]. BMJ, Published August 19. Online at: http://www.bmj.com/letters, to be reached from the "search" field by article title. Accessed June 9, 2011.

Fields B. (2001) Field's Virology. Lippincott Williams & Wilkins, Philadelphia.

Fischl M.A., Richman D.D., Grieco M.H., Gottlieb M.S., Volberding P.A., Laskin O.L., Leedom J.M., Groopman J.E., Mildvan D., Schooley R.T., Jackson G.G., Durack D.T., Phil D., King D., the AZT Collaborative Working Group. (1987) The efficacy

of azidothymidine (AZT) in the treatment of patients with AIDS and AIDS-related complex. A double-blind, placebo-controlled trial. N. Engl. J. Med. 317: 185-191.

Fischl M.A., Richman D.D., Causey D.M., Grieco M.H., Bryson Y., Mildvan D., Laskin O.L., Groopman J.E., Volberding P.A., Schooley R.T., Jackson G.G., Durack D.T., Andrews J.C., Nusinoff-Lehrman S., Barry D.W., the AZT Collaborative Working Group. (1989) Prolonged zidovudine therapy in patients with AIDS and advanced AIDS-related complex. JAMA 262: 2405-2410.

Freeman B.A. (1979) Burrows Textbook of Microbiology. W. B. Saunders Co., Philadelphia.

Gallo R.C., Salahuddin S.Z., Popovic M., Shearer G.M., Kaplan M., Haynes B.F., Palker T.J., Redfield R., Oleske J., Safai B., White G., Foster P., Markham P.D. (1984) Frequent detection and isolation of cytopathic retroviruses (HTLV-III) from patients with AIDS and at risk for AIDS. Science 224: 500-503.

Gisselquist D., Rothenberg R., Potterat J., Drucker E. (2002) HIV infections in sub-Saharan Africa not explained by sexual or vertical transmission. Int. J. STD AIDS 13: 657-666.

Goodgame R.W. (1990) AIDS in Uganda--clinical and social features. N. Engl. J. Med. 323: 383-389.

Henry W.K., Tebas P., Lane H.C. (2006) Explaining, predicting, and treating HIV-associated CD4 cell loss: after 25 years still a puzzle. JAMA 296: 1523-1525.

Heresi G.P., Caceres E., Atkins J.T., Rueben J., Doyle M. (1997) Pneumocystis carinii pneumonia in infants who were exposed to human immunodeficiency virus but were not infected: an exception to the AIDS Surveillance case definition. Clin. Infect. Dis. 25: 739-740.

Horwitz J.P., Chua J., Noel M. Nucleosides. V. (1964) The monomesylates of 1-(2'-deoxy-beta-D-lyxofuranosyl)thymidine. J. Org. Chem. 29: 2076.

Institute of Historical Research (1990) ii Epidemics and mortality in the pre-industrial city:Florence and London compared. In: Centre for Metropolitan History, Annual Report 1989-1990. University of London, School of Advanced Study. London. Pp. 11-17.

Institute of Medicine, National Academy of Sciences (1986) Confronting AIDS. Washington, DC: National Academy Press.

Istituto Superiore di Sanità (2007) AIDS in Italy. Online at http://www.salute.gov.it/resources/static/primopiano/503/DATI_AIDS_ISS.pdf. Accessed February 4th, 2011.

Kolata G. (1987) Imminent marketing of AZT raises problems;Marrow suppression hampers AZT use in AIDS victims. Science 235: 1462-1463.

Lohse N, Gerstoft J, Kronborg G, Larsen CS, Pedersen C, Pedersen G, Nielsen L, Sorensen HT, Obel N. (2011) Comorbidity acquired before HIV diagnosis and mortality in persons Infected and uninfected with HIV: A Danish population-based ochort study. J Acquir Immune Defic Syndr; 57:334-339.

Merson M.H. (1993) Slowing the spread of HIV:Agenda for the 1990s. Science 260: 1266-1268.

Mims C., White D.O. (1984) Viral Pathogenesis and Immunology. Blackwell Scientific Publications, Oxford.

Ministero della Salute (2011) HIV e AIDS. Dati Epidemiologici. Online at: http://www.salute.gov.it/hiv/paginaInternaHiv.jsp?id=198&menu=strumentieservizi. Accessed February 4th, 2011.

Monini P., Sgadari C., Toschi E., Barillari G., Ensoli B. (2004) Antitumour effects of antiretroviral therapy. Nat. Rev. Cancer 4: 861-875.

Mulder D.W., Nunn A.J., Wagner H.U., Kamali A., Kengeya-Kayondo J.F. (1994a) HIV-1 incidence and HIV-1-associated mortality in a rural Ugandan population cohort. AIDS 8: 87-92.

Mulder D.W., Nunn A.J., Kamali A., Nakiyingi J., Wagner H.U., Kengeya-Kayondo J.F. (1994b) Two-year HIV-1-associated mortality in a Ugandan rural population. Lancet 343: 1021-1023.

Nunes E.P., Grinsztejn B., Schechter M. (2011) The DART Trial: 'The Doctor's Dilemma' revisited. J. Antimicrob. Chemother. 66:964-967.

Okulicz J.F., Marconi V.C., Landrum M.L., Wegner S., Weintrob A., Ganesan A., Hale B., Crum-Cianflone N., Delmar J., Barthel V., Quinnan G., Agan B.K., Dolan M.J.; and the Infectious Disease Clinical Research Program (IDCRP) HIV Working Group. (2009) Clinical outcomes of elite controllers, viremic controllers, and long-term nonprogressors in the US Department of Defense HIV natural history study. J. Infect. Dis. 200: 1714-1723.

Panel de expertos de Gesida y Plan Nacional sobre el Sida (2011) Documento de consenso de GESIDA/ Plan Nacional sobre el Sida respecto al tratamiento antirretroviral en adultos infectados por el virus de la inmunodeficiencia humana (actualizaci√≥n enero 2011) Enferm. Infecc. Microbiol. Clin. 29: 209.e1-209.e103.

Payne BA, Wilson IJ, Hateley CA, Horvath R, Santibanez-Koref M, Samuels DC, Price DA, Chinnery PF. (2011) Mitochondrial aging is accelerated by anti-retroviral therapy through the clonal expansion of mtDNA mutations. Nat. Genet. 43: 806-810.

Poirier M.C., Divi R.L., Al-Harthi L., Olivero O.A., Nguyen V., Walker B., Landay A.L., Walker V.E., Charurat M., Blattner W.A. (2003) Long-term mitochondrial toxicity in HIV-uninfected infants born to HIV-infected mothers. J. Acquir. Immune Defic. Syndr. 33: 175-183.

Quinn T.C., Mann J.M., Curran J.W., Piot P. (1986) AIDS in Africa: an epidemiologic paradigm. Science 234: 955-963.

Reisler R.B., Han C., Burman W.J., Tedaldi E.M., Neaton J.D. (2003) Grade 4 events are as important as AIDS events in the era of HAART. J. Acquir. Immune Defic. Syndr. 34: 379-386.

Renzullo P.O., Sateren W.B., Garner R.P., Milazzo M.J., Birx D.L., McNeil J.G. (2001) HIV-1 seroconversion in United States Army active duty personnel, 1985-1999. AIDS 15: 1569-1574.

Richman D.D., Fischl M.A., Grieco M.H., Gottlieb M.S., Volberding P.A., Laskin O.L., Leedom J.M., Groopman J.E., Mildvan D., Hirsch M.S., Jackson G.G., Durack D.T., Nusinoff-Lehrman S., the AZT Collaborative Working Group. (1987) The toxicity of azidothymidine (AZT) in the treatment of patients with AIDS and AIDS-related complex. N. Engl. J. Med. 317: 192-197.

Rodriguez B., Sethi A.K., Cheruvu V.K., Mackay W., Bosch R.J., Kitahata M., Boswell S.L., Mathews W.C., Bangsberg D.R., Martin J., Whalen C.C., Sieg S., Yadavalli S., Deeks S.G., Lederman M.M. (2006) Predictive value of plasma HIV RNA level on rate of CD4 T-cell decline in untreated HIV infection. JAMA 296: 1498-1506.

Ruggiero M., Galletti Prayer M., Pacini S., Punzi T., Morucci G., Gulisano M. (2009) On the risk of contracting AIDS at the dissection table. Ital. J. Anat. Embryol. 114: 97-108.

Seligmann M., Warrell D.A., Aboulker J-P., Carbon C., Darbyshire J.H., Dormont J., Eschwege E., Girling D.J., James D.R., Levy J-P., Peto P.T.A., Schwarz D., Stone A.B., Weller I.V.D., Withnall R., Gelmon K., Lafon E., Swart A.M., Aber V.R.,

Babiker A.G., Lhoro S., Nunn A.J., Vray M. (1994) Concorde: MRC/ANRS randomised double-blind controlled trial of immediate and deferred zidovudine in symptom-free HIV infection. Lancet 343: 871-881.

Siegfried N., Uthman O.A., Rutherford G.W. (2011) Optimal time for initiation of antiretroviral therapy in asymptomatic, HIV-infected, treatment-naive adults. Cochrane Database Syst. Rev.: CD008272.

Statistics South Africa (2000) Statistics in brief, 2000. Statistics South Africa. Online at: http://www.statssa.gov.za/publications/statsdownload.asp?PPN=StatsInBrief&SCH=2359. Accessed May 18th, 2011.

Statistics South Africa (2007) Mid-year population estimates, 2007. Statistics South Africa. Online at: www.statssa.gov.za/publications/statsdownload.asp?PPN=P0302&SCH=3952. Accessed May 18th, 2011.

Statistics South Africa (2008) Mortality and causes of death in South Africa: Findings from death notification, 2006. Statistics South Africa. Online at:

Stewart G.T., Mhlongo S., de Harven E., Fiala C., Koehnlein C., Herxheimer A., Duesberg P.H., Rasnick D., Giraldo R., Kothari M., Bialy H., Geshekter C. (2000) The Durban Declaration is not accepted by all. Nature 407: 286.

Sturt A.S., Dokubo E.K., Sint T.T. (2010) Antiretroviral therapy (ART) for treating HIV infection in ART-eligible pregnant women. Cochrane Database Syst. Rev.: CD008440

The Durban Declaration (2000) The Durban declaration. Nature 406: 15-16.

US Census Bureau, International Data Base (2008) Population South Africa. U.S. Department of Commerce.

US Department of Health and Human Services (2009) AIDSinfo. Online at http://www.aidsinfo.nih.gov/DrugsNew/DrugDetailNT.aspx?int_id=4 and http://www.aidsinfo.nih.gov/DrugsNew/DrugDetailNT.aspx?int_id=116. Accessed February 4th, 2011.

Weiss R., Jaffe H. (1990) Duesberg, HIV and AIDS. Nature 345: 659-660.

Woodman Z., Williamson C. (2009) HIV molecular epidemiology: transmission and adaptation to human populations. Curr. Opin. HIV AIDS 4: 247-252.

World Bank (2008) Population of Sub-Saharan Africa (developing only). Online at: http://databank.worldbank.org/ddp/editReport?REQUEST_SOURCE=search&CNO=2&country=SSA&series=&period=. Accessed May 18th, 2011.

World Health Organization, UNAIDS, UNICEF (2008a) Epidemiological fact sheet on HIV and AIDS; Core data on epidemiology and response Uganda. Geneva. Pp. 1-18.

World Health Organization, UNAIDS, UNICEF (2008b) Epidemiological fact sheet on HIV and AIDS; Core data on epidemiology and response, South Africa. Geneva. Pp. 1-19.

A brief *Note added in proof* is attached to the electronic version.

Note added in proof

After this manuscript went to press, Apostolova, Blas-Garcia and Esplugues have reviewed "the long-term adverse effects" of anti-HIV drugs including those of the non-nucleoside reverse transcriptase inhibitors such as Nevirapine. They found that these drugs cause "rash and hypersensibility reactions, hepatotoxicity, metabolic disturbances including lipodystrophy, pancreatitis, gastrointestinal toxicity, hyperlactatemia, hyperlipedimia, insulin resistance, and neuropsychiatric symptoms" (Blas-Garcia et al., 2011; Apostolova et al., 2011). These new findings confirm and extend reservations we have made here on similar grounds. Further we draw the attention of the reader to "The Myth of Heterosexual AIDS" by Fumento as independent evidence for the absence of a general AIDS epidemic in the US (Fumento, M, 1990).

Apostolova N, Blas-Garcia A, Esplugues JV. (2011) Mitochondrial toxicity in HAART: an overview of in vitro evidence. Curr Pharm Des; 17: 2130-2144.

Blas-Garcia A, Esplugues JV, Apostolova N. (2011) Twenty years of HIV-1 non-nucleoside reverse transcriptase inhibitors: time to reevaluate their toxicity. Curr Med Chem, 18: 2186-95.

Fumento M (1990) The Myth of Heterosexual AIDS. New York, NY: Basic Books, Inc.