





THE TRUTH ABOUT circumcision and **HIV**

Some argue that recent studies support universal circumcision. The evidence disagrees.

BY GUSSIE FAUNTLEROY

MEDICAL JOURNALS and mainstream publications caught the world's attention in recent years with headlines such as this one, from the December 24, 2007 issue of *Time*: "Circumcision Can Prevent HIV." The magazine honored this dramatic claim with the top spot on its annual list of "medical breakthroughs." The *New York Times*, the *Manchester Guardian*, *Medical News Today*, and scores of other newspapers, magazines, and online news and medical information sources echoed the news. The World Health Organization (WHO) used the phrase "compelling evidence" to describe the development.

The source of all the excitement was a pair of research studies from Africa whose results were reported

in the British medical journal *The Lancet* in February 2007.^{1,2} According to the researchers, randomized trials conducted in Kenya and Uganda, and a similar, earlier one from South Africa, indicated that circumcision of heterosexual men could reduce the risk of HIV infection by 53 to 60 percent.

This attention-getting assertion quickly resulted in action by WHO and the United Nations' AIDS advocacy organization, UNAIDS, both of which recommended expanding programs of male circumcision in sub-Saharan Africa, where HIV rates are highest. These recommendations represent a "significant step forward in HIV prevention," according to Dr. Kevin De Cock, director of WHO's HIV/AIDS Department.³



ANNE HAYUNGA

How does the claim of HIV protection relate to neonatal circumcision in the US and the developed world? The short answer: It doesn't.

In the US, the national Centers for Disease Control and Prevention (CDC) concurred, stating that "several types of research have documented that male circumcision significantly reduces the risk of HIV acquisition by men during penile-vaginal sex."⁴ (At the same time, however, the CDC's own research has yielded contradictory results among American black and Latino homosexual men.⁵) In addition, the President's Emergency Plan for AIDS Relief (PEPFAR), established by Congress in 2003 to fund health initiatives in developing countries, last year asked beneficiary governments to draft policies encouraging male circumcision as part of their HIV prevention plans.⁶

WHAT ABOUT AMERICAN BABIES?

What does all this mean for American parents who may wonder whether to have their infant sons circumcised? How does the claim of HIV protection relate to neonatal circumcision in the US and the developed world?

The short answer: It doesn't. Short-term trials involving heterosexual adult males in Africa cannot be applied to babies in the US because the two populations have too little in common,

experts say. In addition, a number of scientists and scholars are raising serious questions about the African studies themselves, in terms of methodology, statistical results, confounding factors, ethics, and other issues.

Marilyn Milos, founder of the National Organization of Circumcision Information Resource Centers (NOCIRC), addresses the question of HIV risk protection succinctly in a pamphlet designed to clear up confusion on the issue: "Circumcision cannot prevent the spread of HIV; circumcised men contract HIV, transmit HIV, and die from AIDS. Transmission of HIV infection is caused by risky behaviors, such as multiple sex partners, failure to use condoms, and contaminated instruments or needles. Anyone who engages in high-risk behavior, whether circumcised or intact, is in danger of contracting HIV and other sexually transmitted diseases."⁷

Milos goes on to point out that the US has the highest rate of medically unnecessary, non-therapeutic infant circumcision in the world—about 56 percent of male babies today undergo the procedure,⁸ down from almost 85 percent in the 1960s⁹—and yet the HIV infection rate

in North America is twice the rate in Europe,¹⁰ where circumcision rates are low. Even in Africa, the correlation between circumcision and HIV in various countries and regions does not support the premise that intact men are more at risk for the infection. Some geographic areas where the practice is part of the culture have higher HIV rates than areas where circumcision is rare; in other places, the situation is reversed.^{11,12}

Weighing in on circumcision in general for American babies, the American Academy of Pediatrics statement, reaffirmed in 2005, asserts that the data on the potential medical benefits of circumcision are “not sufficient to recommend routine neonatal circumcision.”¹³⁻¹⁴ Physicians’ organizations and AIDS advocates in other countries, including Australia, have made similar statements.^{15,16}

WHAT’S BEHIND ALL THE FUSS?

The two randomized trials that have aroused so much discussion were initiated in Uganda and Kenya in early 2006, and were funded by the National Institute of Allergy and Infectious Diseases, which is part of the National Institutes of Health. Additional support for the Kenyan trial came from the Canadian Institutes of Health Research. Leading the Kenyan trial were Robert Bailey, PhD, of the University of Illinois, and Stephen Moses, MD, of the University of Manitoba, in Canada. The Ugandan study was headed by Ronald Gray, MD, of Johns Hopkins University. Both trials were similar in structure and outcome to one conducted the previous year in South Africa—which researchers brought to an early conclusion.^{17,18}

In Uganda, researchers began with a total of 4,996 men and randomly divided them into two groups, medically circumcising one group (2,474 men) and leaving the other group (2,522 men) intact. After 24 months, both groups were tested for HIV infection. Of the circumcised men, 22 tested positive, while 45 in the uncircumcised group tested positive. Researchers derived a 55 percent risk-prevention figure from the difference in results between the two groups. Similarly, the Kenyan trials began with 2,784 men and randomly divided them, with 1,391 undergoing circumcision and 1,391 left intact. Two years later, testing showed 22 new infections among the

circumcised men and 47 among those left intact. In both studies, the men were given extensive counseling on the use of condoms. Significantly, researchers made no attempt to determine the HIV status of any of the men’s female partners, a startling omission that effectively negates the findings, critics say.

Equally important were the findings of a major 2007 research investigation that sought to determine whether male circumcision had any effect on the risk to heterosexual African women of acquiring HIV from their male partners. Analyzing data from 4,417 Ugandan and Zimbabwean women enrolled in their study, the researchers concluded that “male circumcision status was not significantly associated with women’s risk of HIV acquisition in any group . . . [and we] did not observe a significant protective effect of male circumcision overall or for any subgroup in [their] cohort.”¹⁹

The results of the Ugandan and Kenyan trials were released to the media in early December 2006 in conjunction with UN World AIDS Day, two months *before* the studies were published in *The Lancet*. This unusual move produced worldwide publicity that was heavy on eye-catching headlines and light on details because—in the absence of the published studies themselves—few journalists took the time to dig beyond the press releases made available to them.

“MUTANT STATISTICS”

After the articles appeared in *The Lancet*, a number of scholars and scientists began questioning the studies’ methodology and statistical relevance. Charles Gesheker, an African studies specialist and Emeritus Professor of History at the California State University at Chico, has served on the executive council of the American Association for the Advancement of Science/Pacific Division. Gesheker cautions that the statistically small number of new infections in each group raises major questions about extrapolating such results to larger populations. In the Ugandan trial, 0.8 percent of the circumcised men tested positive after two years, while 1.7 percent of the non-circumcised men tested positive.^{20,21}

“Keep in mind that of all the participants, a total of 1.3 percent tested HIV positive; the other 98.7 percent remained HIV-negative,” Gesheker

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points out. Likewise, in Kenya, the claim of a 53 to 60 percent rate of risk reduction is based on 1.5 percent of circumcised men becoming infected, compared with 3.3 percent of those left intact. "These are microscopically small studies," Gesheker contends. An economic historian, he describes the use of such numbers as "mutant statistics" that "take on a life of their own and can have a remarkably long shelf life. The more they get repeated, the longer their shelf life." This is extremely important, critics observe, because policy decisions affecting millions of lives are based on headline-grabbing figures that may not reflect the reality on the ground.

A related issue that has raised scientific eyebrows is the African trials' short duration, with initial results presented as definitive less than two years into the studies. "Any time you have a short time span and then extrapolate,

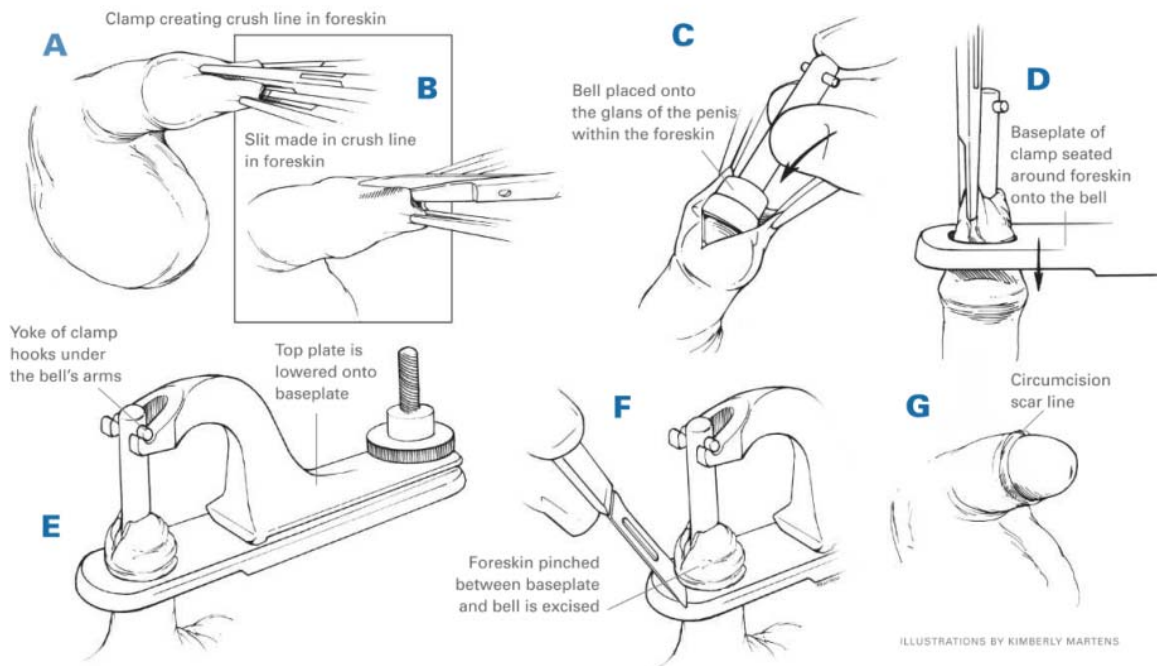
small differences become amplified," observes pediatric specialist Dr. Robert S. Van Howe, of Marquette General Hospital, Marquette, Michigan, who for many years has studied the issue of infant circumcision.²²

CONFOUNDING FACTORS

Emphasizing that HIV infection is "driven by behavior, not by biology," Van Howe suggests that behavioral factors could have influenced participants in the African studies, producing results that may not be replicated in a widespread circumcision of men, even within the same African countries. The Kenyan and Ugandan men—more than half of whom were unemployed when they signed up—were eager to join the studies, for which they were paid to take part in. The men received two years of free health care, as well as thorough and continual

WHAT HAPPENS DURING A CIRCUMCISION?

The diagram below is a step-by-step illustration of circumcision using a Gomco clamp, the most commonly performed method.





instruction in the importance of condom use. For these reasons, their experience was not reflective of the broader population in many parts of Africa, where a powerful stigma continues to be attached to HIV/AIDS and many are reluctant to undergo even routine testing, Van Howe and others note.

While the African studies' claim of 53 to 60 percent risk reduction is based on the assumption of infection transmission through heterosexual activity—a broadly accepted assumption among most of the AIDS community—some researchers point to other highly probable but little-acknowledged sources of infection. In an article in the October 2007 issue of the *International Journal of STD and AIDS*, the authors state that an exhaustive review of studies linking HIV to sexual behavior among African adults accounts for only about a third of HIV infections. The rest, they argue, is likely transmitted through unsafe medical procedures, including injections, transfusions, and other contact with infected blood.²³ In fact, a March 2007 article in *Annals of Epidemiology*, the official journal of the American College of Epidemiology, suggests that some HIV infections may result specifically from circumcision procedures.²⁴

Other scholars go further, positing a possible overreliance on the HIV and AIDS labels themselves. These critics, including some African leaders, question the accuracy of using HIV/AIDS terminology to define medical condi-

tions among millions of people—especially in rural, impoverished parts of Africa considered at “high risk” for HIV infection—whose disease symptoms potentially have nothing to do with the virus. “The available medical literature cites over 60 pre-existing medical conditions, including pregnancy, influenza, tuberculosis, hepatitis, and malaria, that can trigger a false positive test result,” Charles Gesheker warns.

WHERE SHOULD FUNDING BE GOING?

Adding to these concerns are questions about the testing methods themselves. Gesheker explains, for example, that there are ten proteins said to be characteristic of HIV-infected blood. Yet depending on the country of origin, the medical authority in charge, and the location of the laboratory analyzing the test results, detection of as few as two of these proteins may be considered sufficient to earn the HIV label. He adds that HIV testing kits themselves, from all manufacturers, include a packet insert with a disclaimer stating that such kits cannot be used to conclusively detect HIV infection in human blood.²⁵ Mathematician and former HIV researcher Rebecca Culshaw calls the HIV-antibody tests “some of the worst tests ever manufactured in terms of standardization, specificity, and reproducibility.”²⁶

As a result, critics say, large numbers of Africans suffering from diseases common among impoverished populations may be

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CIRCUMCISION **WORLDWIDE**

The US is the only country in the world where non-religious, medically unnecessary neonatal circumcision continues to be performed on more than half of all newborn males. In non-English-speaking countries, the rate for this type of circumcision is close to zero, while in English-speaking countries it ranges from a high of about 56 percent in the US¹ to less than 1 percent in New Zealand,² and 2.1 percent in England.³ The rate in Australia is about 13 percent,⁴ while about 9 percent of Canadian baby boys are circumcised.⁵ Worldwide, about 30 percent of males are circumcised, an estimated two-thirds of whom are Muslim.⁶

NOTES

1. C. T. Merrill et al., "Circumcisions Performed in U.S. Community Hospitals 2005," Statistical Brief 45, Health Care Utilization Project, Agency for Health Care Research and Quality (Rockville, MD: January 2008): [http://hcup-us.ahrq.gov/reports/](http://hcup-us.ahrq.gov/reports/statbriefs/sb45.jsp)

[statbriefs/sb45.jsp](http://hcup-us.ahrq.gov/reports/statbriefs/sb45.jsp).

2. Ken McGrath and Hugh Young, "A Review of Circumcision in New Zealand," in George C. Denniston et al., eds., *Understanding Circumcision* (New York: Kluwer Academic/Plenum Publishers, 2001): 129–146.

3. P. Cathcart et al., "Trends in Paediatric Circumcision and Its Complications in England Between 1997 and 2003," *British Journal of Surgery* 93, no. 7 (July 2006): 885–890.

4. Hugh O'Donnell, "Circumcision Incidence in Australia" (February 2004): www.cirp.org/library/statistics/Australia/.

5. Canada Circumcision Statistics: www.cirp.org/library/statistics/Canada/.

6. Helen Weiss and Jonny Polonsky, *Male Circumcision: Global Trends and Determinants of Prevalence, Safety and Acceptability*, UNAIDS (February 2007): 6.



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—GUSSIE FAUNTLEROY

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tossed into the "AIDS epidemic" pot, producing overly high figures. Although many in the AIDS advocacy field are motivated by a genuine desire to relieve suffering, some critics point out that most well-established AIDS-related research careers and professional reputations—and associated funding—remain inherently dependent on claims of an ever-increasing number of AIDS cases.

Many AIDS advocates contend that, rather than encouraging widespread circumcision, international funding would be much more effectively spent on an intensive, ongoing, continent-wide, and culturally sensitive educational push involving proven methods of risk reduction, especially condoms. The cost of one circumcision in Africa (\$70) is enough to buy 3,500 condoms—enough condoms for one man for every day for ten years, notes Dr. Robert S. Van Howe. Concern about widespread circumcision is particularly strong when it is described as a "virtual vaccine," as it has been in some publications. The fear is that, among newly circumcised African men, an unfounded belief in lifelong protection from infection could cause some to abandon any commitment to measures known to

provide substantial protection, such as condoms, limiting sexual partners, and abstinence. Under-scoring this point, Thailand and Uganda have seen significantly reduced HIV/AIDS rates in recent years as a result of intensive educational programs, reduced visits to sex workers, and strong encouragement for 100 percent condom use among sex workers.²⁷ A 2000 US Census Bureau paper also counts Senegal as a "success story," noting that "programs put into place early in the epidemic have kept HIV prevalence rates low."²⁸

BACK IN THE USA

Whatever the case in Africa, public health professionals emphasize that studies on African men cannot be applied to American infants. The two populations share little more than the male biology, differing substantially in areas such as culture, conditioning and behavioral patterns, health risks, and access to medical care. Another key difference is that, in the US, there is no evidence of an AIDS epidemic through heterosexual transmission. The CDC, estimating 40,000 new cases of HIV infection each year in the US, puts the rate of new AIDS cases among males in 2004 at 25.6 per 100,000, and among females at 9.0 per 100,000.

"Almost all 'heterosexual female AIDS cases' in the US are actually intravenous drug users," Charles Gesheker maintains. "Heterosexual non-IV-drug users in the US almost never contract AIDS. This was pointed out by a definitive survey published in 1994.²⁹ But the mainstream AIDS establishment ignores all of that."

For parents considering whether to have a son circumcised for purported health benefits of any kind, physicians and public health officials stress that, even under ideal medical safety conditions, the surgery comes with inherent health risks, some quite serious. Among them are pain, hemorrhage, infection, complications of anesthesia or analgesia, damage to the penile shaft or the urethra, surgical mishap, and possible death, as well as postsurgery interference with breastfeeding and normal sleep patterns. There also may be physical complications such as skin tags, skin bridges, or extensive scarring of the penis, as well as loss of penile sexual sensitivity.

Increasingly, another risk has begun looming large on the public-health radar screen: infection by Methicillin-resistant *Staphylococcus aureus* (MRSA), commonly known as a superbug. This staph infection frequently is spread in hospital newborn nurseries by parents and caregivers whose skin or nasal mucosa may carry the bacteria.^{30, 31} The risk is compounded by circumcision, which produces on an infant's penis an open wound through which the life-threatening infection may enter.³² Moreover, newborns' immune systems are immature and thus less resistant to infection.

FORESKIN: A BARRIER TO HIV?

On the other side of the health and circumcision equation, recent studies suggest that the presence of a certain type of cell in the foreskin of intact males may actually serve as a protective agent against HIV and other pathogens.³³ Langerhans cells are known to exist in mucosa and on the skin's surface, and are especially concentrated on the inner lining of the foreskin. In laboratory studies using an amputated foreskin, the HIV virus appears to attach itself to Langerhans cells, leading researchers to believe that they serve as "target cells," providing the

infection with a gateway for absorption into the body.³⁴ Based on this research, the CDC has postulated that the "inner mucosa of the foreskin . . . is more susceptible to HIV infection."³⁵

However, more recent studies offer another view of the role of Langerhans cells. According to a roundup of the relevant research published in March 2007 in the *Journal of Cell Biology*, it appears that, "rather than transmitting the virus . . . [Langerhans cells] trap HIV-1 and thus act as a barrier to infection."³⁶ That is why intact men also have a lower incidence of some types of sexually transmitted diseases (STDs). However, experts suggest that when the cells are overwhelmed by a heavy viral load, their ability to protect against HIV decreases. As Dr. Robert S. Van Howe puts it, Langerhans cells are "the bouncer at the door. If the crowd is too big, sometimes infection slips in."

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THE BOTTOM LINE

As parents struggle to sift through the conflicting "facts" of circumcision and HIV, it is instructive to know that many research studies and published papers claiming circumcision's medical benefits have been written by physicians and others, primarily North American, known to be advocates of circumcision.³⁷ Likewise, whole-baby advocates point out that many of the recent news releases on the issue have been actively channeled to media outlets by some of the same circumcision supporters.

One thing is clear: Existing evidence worldwide does not support non-therapeutic infant circumcision. And despite the media frenzy around this issue, the African studies do not provide scientific data convincing enough to undermine or contradict this conclusion. As for protection against HIV, we know that neither circumcised nor intact men, or their partners, are free of this risk. Well beyond babyhood, responsibility rests with parents and society to instill a solid, commonsense approach in children, adolescents, and adults, and to create an environment of open discussion and reliable education about high-risk behavior.

NOTES

1. R. H. Gray et al., "Male Circumcision for HIV Prevention in Men in Rakai, Uganda: A Randomised Trial," *The Lancet* 369, no. 9562 (24 February 2007): 657-666.
2. R. C. Bailey et al., "Male Circumcision for HIV Prevention in Young Men in Kisumu, Kenya: A Randomised Controlled Trial," *The Lancet* 369, no. 9562 (24 February 2007): 643-656.
3. WHO press release, "WHO and UNAIDS Announce Recommendations from Expert Consultation on Male Circumcision for HIV Prevention" (28 March 2007): www.who.int/mediacentre/news/releases/2007/pr10/en/index.html.
4. CDC Fact sheet, "Male Circumcision and Risk for HIV Transmission and Other Health Conditions: Implications for the United States" (updated February 2008): www.cdc.gov/hiv/resources/factsheets/circumcision.htm.
5. Gregorio A. Millett et al., "Circumcision Status and HIV Infection Among Black and Latino Men Who Have Sex with Men in 3 US Cities," *Journal of Acquired Immune Deficiency Syndromes* 46, no. 5 (15 December 2007): 643-649. The discussion in this study states: "We found no statistically significant evidence of a protective effect from prevalent HIV infection among circumcised black or Latino MSM (men who have sex with men)."
6. Edwin Musoni and Florence Mutesi Kigali, "Rwanda: Draw Circumcision Plans, U.S. Tells Govts," *The New Times* (29 November 2007): <http://allafrica.com/stories/200711290124.html>.

200711290124.html.

7. National Organization of Circumcision Information Resource Centers, *Answers to Your Questions about Circumcision and HIV/AIDS*, Pamphlet no. 11 (September 2007): www.nocirc.org/publish/11-HIV.pdf.
8. Chaya T. Merrill et al., "Statistical Brief #45: Circumcisions Performed in U.S. Community Hospitals, 2005," AHRQ, Nationwide Inpatient Sample (2005): <http://hcup-us.ahrq.gov/reports/statbriefs/sb45.jsp>.
9. E.O. Laumann et al., "Circumcision in the United States," *JAMA* 277, no. 13 (1997): 1052-1057.
10. Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization, *AIDS Epidemic Update* (2007): 7.
11. V. Mishra et al., "HIV Testing in National Population-based Surveys: Experience from the Demographic and Health Surveys," *Bull WHO* 84 (2006): 537-545.
12. Scholars note that attempting to correlate HIV infection rates with geographic regions is extremely problematic. In some cases, figures from populous cities are extrapolated to rural areas (see J. Chin, *The AIDS Pandemic: The Collision of Epidemiology with Political Correctness* [Oxford: Radcliffe Publishing, 2007]), while other studies are based on circumcision data collected decades ago (see J. Bongaarts et al., "The Relationship Between Male Circumcision and HIV Infection in African Populations," *AIDS* 3, no. 6 [June 1989]: 373-377).
13. American Academy of Pediatrics, "Circumcision Policy Statement," *Pediatrics* 103, no. 3 (March 1999): 686-693 (Reaffirmed in 2005): <http://aappolicy.aappublications.org/cgi/content/full/pediatrics;103/3/686>.
14. Also, the American Academy of Family Physicians notes, "Limitations to the studies from which these risk ratios are derived include poor sampling, a low rate of acquiring the disease, and not controlling for confounders such as the number of sexual partners or other sexual practices." American Academy of Family Physicians, "Circumcision: Position Paper on Neonatal Circumcision" (Board Approved: August 2007 Reaffirmed): www.aafp.org/online/en/home/clinical/clinicalrecs/circumcision.html.
15. Australian Federation of AIDS Organisations briefing paper, "Male Circumcision Has No Role in the Australian HIV Epidemic" (23 July 2007): www.afo.org.au/library_docs/policy/Circumcision07.pdf.
16. Canadian Paediatric Society, "Circumcision: Information for Parents" (November 2004): www.caringforkids.cps.ca/babies/Circumcision.htm.
17. In a letter published in *The Lancet* 368 (7 October 2006), Edward Mills of the Centre for International Health and Human Rights Studies in Toronto, and Nanci Siegfried of the Clinical Trial Service Unit at the University of Oxford's Department of Medicine, wrote, concerning the 2005 RCT in South Africa: "The inferences drawn from the only completed randomised controlled trial (RCT) of circumcision could be weak because the trial stopped early. In a systematic review of RCTs stopped early for benefit, such RCTs were found to overestimate treatment effects. . . . The circumcision trial . . . is therefore at risk of serious effect overestimation."
18. Victor M. Montori et al., "Randomized Trials Stopped Early for Benefit: A Systematic Review," *Journal of the American Medical Association* 294, no. 17 (12 November 2005): 2203-2209.



19. Abigail Norris Turner et al., "Men's Circumcision Status and Women's Risk of HIV Acquisition in Zimbabwe and Uganda," *AIDS* 21 (2007): 1779-1789.

20. This and subsequent references: personal communications (15 January-3 March 2008).

21. See Note 1.

22. This and subsequent references (except Note 25): personal communications (11-26 February 2008).

23. Ibrahim Alkatout et al., "Sexual Behaviour as the Limiting and Linking Factor in HIV-Infected People in Rural Zimbabwe," *International Journal of STD & AIDS* 18, no. 10 (October 2007): 688-691.

24. Devon D. Brewer et al., "Male and Female Circumcision Associated with Prevalent HIV Infection in Virgins and Adolescents in Kenya, Lesotho, and Tanzania," *Annals of Epidemiology* 17, no. 3 (March 2007): 217-226.

25. An insert in the HIV/ELISA test from Abbott Laboratories states: "At present there is no recognized standard for establishing the presence or absence of antibodies to HIV-1 in human blood."

26. Rebecca Culshaw, *Science Sold Out* (Berkeley, CA: North Atlantic Books, 2007): 36.

27. D. Low-Beer, R. L. Stoneburner, "Behaviour and Communication Change in Reducing HIV: Is Uganda Unique?" *African Journal of AIDS Research* 2, no. 1 (May 2003): 9-21.

28. Karen A. Stanecki, Chief, Health Studies Branch, International Programs Center, Population Division US Census Bureau, "The AIDS Pandemic in the 21st Century: The

Demographic Impact in Developing Countries," prepared for presentation at the XIIIth International AIDS Conference, Durban, South Africa, 9-14 July 2000: www.usaid.gov/press/releases/2000/censusfinal.doc.

29. Robert T. Michael et al., *Sex in America: A Definitive Survey* (New York: Warner Books, 1994): 216-218. The authors state that after more than 12 years of being warned that everyone was at risk, few Americans changed their sexual behavior, yet AIDS cases did not spread. They conclude that "there is not and very unlikely ever will be a heterosexual AIDS epidemic in this country." They also acknowledged that it could be "more difficult to raise research funds for a disease that is not a threat to most Americans."

30. V. Hurst, "Transmission of Hospital *Staphylococci* Among Newborn Infants: Colonization of the Skin and Mucous Membranes of the Infants," *Pediatrics* 25 (1960): 204-214.

31. J. L. Zeller et al., "MRSA Infections," *Journal of the American Medical Association* 298, no. 15 (October 2007): 1826.

32. R. S. Van Howe, W. L. M. Robson, "The Possible Role of Circumcision in Newborn Outbreaks of Community-associated Methicillin-resistant *Staphylococcus aureus*," *Clinical Pediatrics* 46, no. 4 (May 2007): 356-358.

33. L. de Witte et al., "Langerhans Cells Limit HIV Invasion," *Journal of Cell Biology* 177, no. 1 (March 2007): 5.

34. B. K. Patterson et al., "Susceptibility to Human Immunodeficiency Virus-1 Infection of Human Foreskin and Cervical Tissue Grown in

Explant Culture," *American Journal of Pathology* 161, no. 3 (September 2002): 867-873.

35. Centers for Disease Control, "Male Circumcision and Risk for HIV Transmission and Other Health Conditions: Implications for the United States," CDC Fact Sheet (February 2008): www.cdc.gov/hiv/resources/factsheets/circumcision.htm.

36. See Note 33.

37. "The principal authors of the three randomized controlled trials (RCTs) all were on record as being in favor of circumcision to prevent HIV infection prior to the commencement of the trials. None had a neutral viewpoint," notes George Hill, vice president of bioethics and medical science for the Seattle-based organization Doctors Opposing Circumcision. Hill adds, "A review of the cited references of the three RCTs shows an overwhelming bias in favor of male circumcision." In making this point, he cites the following papers previously published by the principal authors of the three African studies:

a) R. C. Rain-Taljaard et al., "Potential for an Intervention Based on Male Circumcision in a South African Town with High Levels of HIV Infection," *AIDS Care* 15, no. 3 (June 2003): 315-327.

b) S. Moses et al., "The Association Between Lack of Male Circumcision and Risk for HIV Infection: A Review of the Epidemiological Data," *Sexually Transmitted Diseases* 21, no. 4 (July-August 1994): 201-210.

c) R. H. Gray et al., "Might Male Circumcision Be More Protective Against HIV in the Highly Exposed? An Immunological Hypothesis," *AIDS* 19, no. 18 (2 December 2005): 2181-2182.

d) D. T. Halperin, R. C. Bailey, "Male Circumcision and HIV Infection: 10 Years and Counting," *The Lancet* 354, no. 9192 (20 November 1999): 1813-1815.

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