

For
debate

Immunological functions of the human prepuce

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The demonisation of the human male prepuce has been an unscientific process, even though some research, on the surface, might seem to support it. In the late 19th century, when male circumcision came into vogue in medicine in the United States, there was near universal acceptance among American medical professionals that circumcision was an effective treatment for such "diseases" as masturbation, headache, insanity, epilepsy, paralysis, strabismus, rectal prolapse, hydrocephalus, and clubfoot.¹ Leading medical journals published thousands of case reports demonstrating these and other miraculous therapeutic benefits from preputial amputation. The notion that circumcision improves hygiene and prevents sexually transmitted diseases (STDs) originated at the same time in the context of the discourse over racial and moral hygiene. The peculiar American phenomenon of mass newborn (that is, involuntary) circumcision is a product of the cold war era. United States doctors readily embraced the concept of mass, involuntary circumcision just as they had embraced involuntary sterilisation and other eugenic measures—practices rejected by almost all other Western nations. Mass circumcision peaked in the 1970s, when almost 90% of male neonates in the United States were circumcised. Since then, the rate has declined, but circumcision industry spokesmen have added to the list of diseases that circumcision allegedly prevents and cures.

Historically, the most common reason given for circumcision has been that it prevents masturbation. Today, the most common reason given is that it inhibits the transmission of STDs, even though rigorously controlled studies have consistently shown that circumcised males are at greater risk for all major STDs than males whose penises are intact.²⁻⁶ Circumcision advocates are now claiming that circumcision prevents AIDS.

A review of the scientific literature, however, reveals that the actual effect of circumcision is the destruction of the clinically demonstrated hygienic and immunological properties of the prepuce and intact penis.

The sphincter action of the preputial orifice functions like a one way valve, blocking the entry of contaminants while allowing the passage of urine.⁷⁻⁸ Ectopic sebaceous glands concentrated near the frenulum produce smegma.⁹⁻¹² This natural emollient contains prostatic and seminal secretions, desquamated epithelial cells, and the mucin content of the urethral glands of Littre.¹³⁻¹⁴ It protects and lubricates the glans and inner lamella of the

prepuce, facilitating erection, preputial eversion, and penetration during sexual intercourse.

The inner prepuce contains apocrine glands,¹⁵ which secrete cathepsin B, lysozyme, chymotrypsin, neutrophil elastase,¹⁶ cytokine (a non-antibody protein that generates an immune response on contact with specific antigens),¹⁷ and pheromones such as androsterone.¹⁸ Lysozyme, which is also found in tears, human milk, and other body fluids, destroys bacterial cell walls.

The natural composition of preputial bacterial flora is age dependent and similar to that of the eyes, mouth, skin, and female genitals.¹⁹ Washing the preputial sac was once thought to aid hygiene. Washing a stallion's preputial sack with soap, however, encourages the growth of pathogenic organisms.²⁰ Washing the human prepuce with soap is a common cause of balanoposthitis.²¹

Fussell *et al* have claimed that the prepuce is predisposed to colonisation by pathogenic bacteria, but they did not measure naturally occurring bacterial flora in living cohorts with undisturbed preputial microenvironments.²² They measured bacterial rates in dead, amputated, chemically treated prepuces inoculated with virulent strains of pathogenic bacteria—conditions that represent no known biological or behavioural reality.

Animal experiments reveal that in the presence of hydrogen peroxide and halide or pseudohalides, soluble peroxidase in the prepuce has an antimicrobial activity.²³ Plasma cells in the mucosal lining of the bovine prepuce secrete immunoglobulin under the epidermis that diffuses across the epidermis into the preputial cavity. In response to pathogenic bacterial infection, preputial plasma cells increase.²⁴ Antibodies in breast milk supplement genital mucosal immunity in infants. Oligosaccharides in breast milk are ingested, then excreted in the urine, where they prevent *Escherichia coli* from adhering to the urinary tract and inner lining of the prepuce.²⁵ An 8 year prospective study that controlled for genitourinary abnormalities found no difference in the rate of upper urinary tract infections between circumcised and intact boys.²⁶

There are no histological studies that validate the claim that the sclerotic keratinisation of the epithelium of the surgically externalised, desiccated glans penis, meatus, or scar of the circumcised penis creates a barrier against infection. The higher rate of STDs in circumcised males might well be the result of

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the loss of preputial immunoprotective structures. The loss of the protective, self lubricating, mobile, double layered prepuce exposes the glans and meatus to direct friction, abrasion, and trauma. Eyes without eyelids would not be cleaner. Neither is a glans without its prepuce. The surgically externalised and unprotected glans and meatus of the circumcised penis are constantly exposed to abrasion and dirt, making the circumcised penis less hygienic.²⁷ The circumcised penis is more prone to infection in the first years of life than the intact penis.²⁸⁻³⁰

The prepuce is a specific erogenous zone.³¹ It contains a rich, complex network of nerves and an abundance of mucocutaneous end organs sensitive to motion, touch, temperature, and erogenous stimulation.³²⁻³⁷ Both the inner and outer folds of the prepuce have a denser distribution of nerve networks than the rest of penile skin.³⁸ The rich innervation of the inner prepuce contrasts sharply with the limited sensory investment of the glans penis, which is characterised primarily by free nerve endings, which feel only deep pressure and pain.³⁹ The double layered prepuce provides the skin necessary to accommodate the expanded erect organ and to allow the penile skin to slide freely, smoothly, and pleurably over the shaft and glans. One function of the prepuce is to facilitate smooth, gentle movement between the mucosal surfaces of the two partners during intercourse. The prepuce enables the penis to slip in and out of the vagina non-abrasively inside its own sheath of self lubricating, movable skin. The female is thus stimulated by moving pressure rather than by friction only, as when the male's prepuce is missing.

Circumcision radically desensitises the penis and immobilises whatever shaft skin remains.⁴⁰ The loss of preputial mobility, primary sensory structures, orgasm triggering nerve endings, and the inevitable desensitisation of the glans may necessitate more vigorous and prolonged thrusting to trigger orgasm. For this reason, a circumcised penis may be more likely than an intact penis to cause the breaks, tears, microfissures, abrasions, and lacerations in a vagina (or rectum) through which HIV in the thrusting partner's semen could enter the receiving partner's bloodstream.

The prepuce is also richly vascular.^{37 41 42} The most vascular parts of the body are those least vulnerable to infection.

These factors may explain why circumcised American males are more likely than their genitally intact peers to engage in high risk sexual behaviours (such as anal intercourse and active and passive homosexual oral sex) that lead to HIV and other STD infections.⁴³

Epithelial Langerhans cells (ELCs), a component of the immune system, help the body recognise and process antigens, directing them to lymphocytes or macrophages. Weiss *et al* noted an abundance of ELCs in the outer surface of the neonatal prepuce comparable with the general density of ELCs found in adult skin.⁴⁴ They suggest that the relative paucity of ELCs in the inner mucosal surface of the neonatal prepuce results in a reduced immune

response to cutaneous antigens and recommend universal neonatal circumcision to prevent HIV infection. This recommendation is untenable because the prepuce of virtually all neonates is fused to the glans, sealing the undeveloped preputial pouch from external contact.^{45 46} Furthermore, the newborn has just emerged from a sterile environment, where no ELCs are needed. There is no documentation of the comparable density of ELC in the mucous membranes of the surgically externalised glans penis, meatus, or the circumcision scar of the sexually active adult.⁴⁷

Although a study of primates found that Langerhans-like cells in the lamina propria, not the epithelium, appeared to be infected with simian immunodeficiency virus,⁴⁸ it is unclear whether this observation can be extrapolated to the Langerhans cells in the epithelium of the human prepuce. If Langerhans cells are a factor, the ethical response would be to promote the use of condoms, not excise normal tissue laden with immunoprotective cells.

It was an American circumciser in 1986 who first hypothesised that circumcision prevents HIV infection.⁴⁹ In an attempt to verify this theory, others have published numerous epidemiological surveys, conducted primarily in Africa. A review of these surveys, however, does not support their assertion. Of the 36 published studies examining the relation between the circumcised penis and HIV infection, 15 found a negative correlation,⁵⁰⁻⁶⁴ four found a positive correlation,⁶⁵⁻⁶⁸ and 16 found no statistically significant difference.^{2 69-83}

The studies that find a positive correlation are all population based. Most of the negative association studies are based on STD clinic data, have serious population bias, and must therefore be viewed with caution. For example, according to undisclosed criteria, Pépin *et al* counted 11% of their self reported circumcised cohort as intact.⁷⁰ Konde-Lule *et al* assumed all Muslims were circumcised,⁷⁷ an assumption that Urassa *et al* found to be true in only 68% to 92% of cases.⁶⁴

Although circumcision proponents in the United States cite these studies when debating routine circumcision,^{84 85} African data are not applicable to developed nations.⁸⁶ Circumcision status in Africa has an important but poorly understood cultural significance that proponents of circumcision have ignored. Circumcised and intact males lead very different lives in the African regions investigated. Marck has shown that intact males in circumcising areas face severe discrimination in work, housing, marriage, and sexual relations. A significant percentage resort to prostitutes, increasing their risk of exposure to STDs.⁸⁷ Ignoring these facts, some AIDS researchers have recommended intervening into African cultures and promoting circumcision in circumcision-free regions.⁸⁸ Implementing this recommendation would invite disaster. In many parts of Africa, circumcision causes most tetanus infections.⁸⁹ The spread of tuberculosis through circumcision in developing countries is well documented.⁹⁰ The risk of severe complications and death following circumcision rituals in Africa is high.^{91 92} The

common use of dirty instruments in group circumcisions only increases the risk of HIV transmission.⁹³ Although the risk of circumcision related complications is higher in Africa than in the United States, no level of risk is acceptable when a healthy, and often protesting, "patient" has not consented.

In addition to its long term immunological handicap, neonatal circumcision immediately compromises the immune system, making the circumcised male neonate vulnerable to infection, often with tragic consequences.⁹⁴⁻⁹⁵ Even if the circumcisionists' studies were valid, the real and unavoidable risks of circumcision outweigh, both quantitatively and ethically, the alleged risks of intact genitalia. Amputation of the prepuce neither inhibits risky sexual behaviour nor confers immunity after exposure to pathogens. This is demonstrated by the fact that the United States has both the highest number of sexually active circumcised males and the highest rates of genital cancers, STDs, and AIDS of any first world nation.⁹⁶⁻⁹⁷

Mass involuntary circumcision has failed to achieve any of the public health benefits its advocates have claimed for it; but even if it had achieved them all, there can be no scientific or ethical justification for depriving anyone of sovereignty over his own sex organs. Neonatal circumcision violates bodily integrity and imposes on an unconsenting individual a diminished penis for life. In the wake of the Nuremberg trials, it is inappropriate and unethical for doctors to persist in performing or advocating involuntary penile reduction surgery on healthy, normal individuals. The totalitarian concept of involuntary prophylactic surgery espoused by circumcision advocates has no place in modern medicine or the civilised world. The key to decreasing the transmission of STDs is education, not amputation.

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