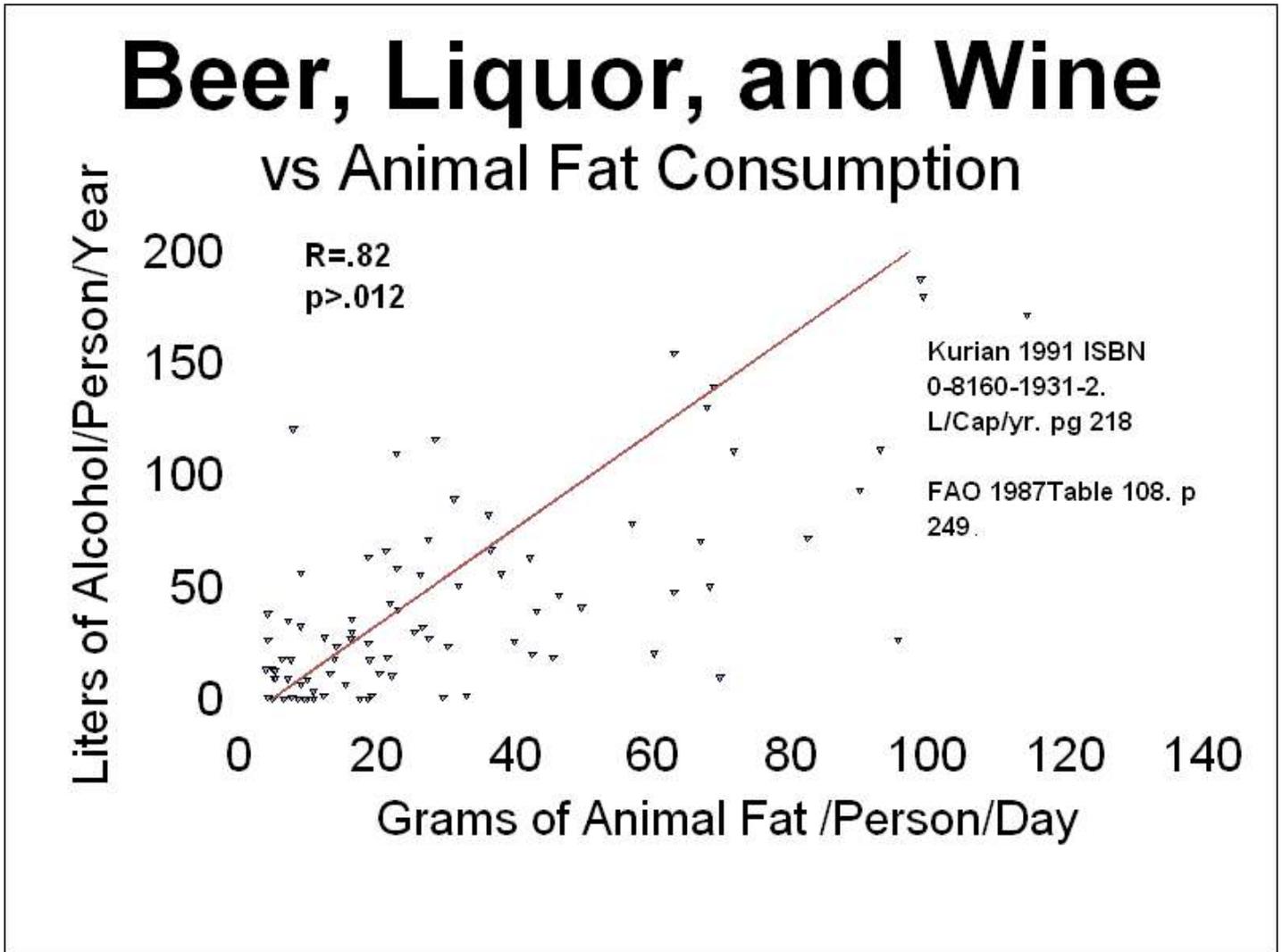


XIII. DOES DIET AFFECT BEHAVIOR?

Alcohol is involved in about 64% of all murders, 41% of assaults, 34% of rapes, and 29% of all other sex crimes.¹ Intake of alcoholic beverages^{2,3} parallels animal fat⁴ consumption, so the answer to the title question is: probably yes.



¹U.S. Dept. of Health, Education, and Welfare. *Alcohol and Health: from the Secretary of Health Education and Welfare*. June 1974. p 42.

²Kurian, George Thomas. *The New Book of World Rankings*. p 214. Facts on File Inc. New York, 1991. ISBN 0-8160-1931-2.

³*ibid.* pp 149, 180, and 181.

⁴See note 49. *FAO*.

The correlation coefficient (R) is .82 and the p value is much less than .01, indicating that the correlation of alcohol and fat intake is not a mathematical accident. There are 106 data points, each represented by a +, but not all the country names can be shown without overlap. The rich nations do the drinking. Is it because only they have the extra cash to buy alcohol, or does the insoluble fat in their diets cry out for a solvent: alcohol?

Diet may also affect sexual behavior.

Most of the higher plants and animals on Earth reproduce sexually, all arose within the last half billion years. By mixing their genes, two individuals can increase the gene variance in their offspring.

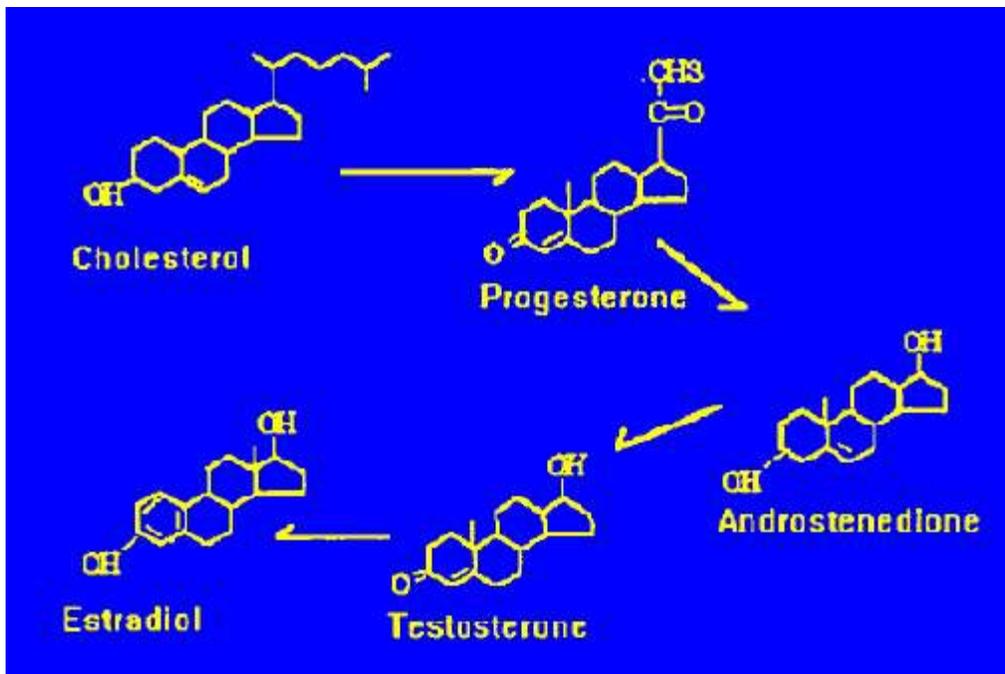
Death, the giant of evolution, then wields a merciless scythe that cuts down the poorly adapted variants, leaving rapid opportunities for the fit variants to expand and evolve even more.

The advantages of sexual reproduction extend into several additional areas. In vertebrates, a protective environment for the offspring is provided by the sexual bonding of the parents. Many bird species are monogamous. Mammals carry the process a step further: the female carries the fetus in her body until it's ready for the world and then feeds it with the milk from her modified sweat glands.

By exploiting their sexuality, human females not only improve their own reproductive chances but their children's survival chances as well. The evidence suggests that a positive feedback loop is in effect. Women trade off sex for male assistance, which is given by those males most driven by sex, who endow the offspring with similar features. The offspring reinforce the loop by their own mating selections.

Sexual pair bonding also endows individuals with personal survival advantages; marriage and parenthood are associated with greater longevity and good health.⁵ The bonding is catalyzed by the sex hormones, which are all derived from cholesterol.⁶

DERIVATION OF A FEW SEX HORMONES



⁵Macintyre S. *The effects of family position and status on health*. Soc Sci Med. 1992;35(4):453-64. ISSN 0277-9536.

⁶See note 2. *Harper's 1990*. p 467.

Most vertebrates mate once a year,⁷ the event being timed to give the new offspring an optimal seasonal environment. But many of the primates have no particular breeding season,⁸ and in humans the female can be receptive 365 days out of the year. We might as well stop disparaging sex on the grounds that "it's animalistic"; compared to us, the other animals have taken vows of chastity.

Sterol hormones are insoluble in blood, so they are carried through the circulation bound to transport proteins. Once unbound they freely cross the plasma membranes of all cells but only encounter receptors in their target cells. The hormone-receptor complex then binds to DNA in the cell nucleus, changing its genetic structure and influencing prenatal brain and genital development as well as postnatal behavior.⁹ The hormones progesterone and estradiol¹⁰ have higher values and ranges that vary with the menstrual cycle and pregnancy.

Human Serum Sex Hormone Ranges (In nanograms per 100 milliliters)

	Male		Female	
	Low	High	Low	High
Androstenedione	75	205	85	275
Estradiol	100	600	300	350000
Progesterone	5	50	150	20000
Testosterone, free	9	30	0.3	1.9
Testosterone, total	350	800	10	60

Units:
 Milligram (mg)=10⁻³ gm Nanogram (ng)=10⁻⁹ gm
 Microgram(ug)=10⁻⁶ gm Picogram (pg)=10⁻¹² gm

A basket load of animal studies and a few human studies¹¹ indicate that testosterone and similar androgenic hormones are responsible for the sex drive and the aggressive behaviors of both males and females.¹²

In the U.S. in 1991, 78% of persons arrested for murder, robbery, and other serious crimes were male. Eighty-two percent of all other arrestees were also male,¹³ 98.7% of the rapes were by males, and it's anybody's guess how the implied 1.3% of rapes by women were accomplished. The only areas in which the ladies excelled were prostitution (65.9%) and juvenile runaways (56.7%).

⁷Spector W. *Handbook of Biological Data: Values in Mammalian Reproduction*. W.B. Saunders Co. London 1961.p 128. LOCCC 56-13410.

⁸Altman P, Dittmer D. *Biology Data Book. Second Edition Vol. I*. p 137 Federation of American Societies for Experimental Biology. Bethesda 1972. LOCCC 72-87738.

⁹LeVay S. *The Sexual Brain*. MIT Press. Cambridge 1993. ISBN 0-262-12178-6.

¹⁰Bakerman S. *ABC's of Interpretive Laboratory Data*. Interpretive Laboratory Data, Inc. Greenville, NC 1984. ISBN 0-945577-00-1.

¹¹Schiavi R, Owen D, Theilgaard A, White D. *Sex chromosome anomalies, hormones, and aggressivity*. Archives of general psychiatry.1994;41(1):93-99. ISSN: 0003-990X.

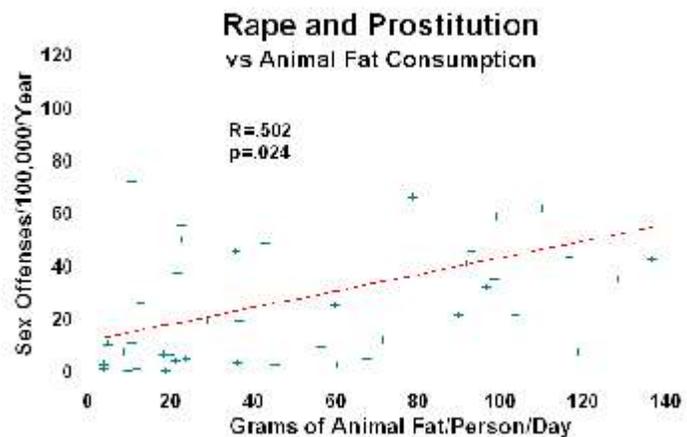
¹²Christiansen K, Knussmann R. *Androgen levels and components of aggressive behavior in men*. Horm Behav. 1987;21(2):170-80. ISSN 0018-506X.

¹³U.S. Dept of Commerce. *Statistical Abstract of the United States*. p 199. Bureau of the Census. U.S. Government Printing Office, 1993. Washington, DC 20402. LOCC No. 4-18089.

Several studies suggest that vegetarians and vegans run lower total and bound estrogen and progesterone¹⁴ (female) and testosterone¹⁵ (male) levels than do omnivores¹⁶ although the unbound (active) hormone levels are about the same. This is part of the reason why they also have lower rates of hormone-dependent breast^{17,18} and prostate cancers.¹⁹ Most research indicates that the higher hormone levels in omnivores are due to increased reabsorption of endogenous hormones secreted into the gut, a phenomenon brought about by low dietary fiber. However, there is nothing in the literature to rule out the possibility that some of the effect is due to increased synthesis of hormones resulting directly from dietary cholesterol.

Since females have a fraction of the testosterone level of males, and since female hormones such as estradiol and progesterone lead more to nurturing behavior than sexual arousal in women, there's a mismatch in sex drives. Prostitution, the oldest profession, and rape, a form of violent theft, probably reflect this. Monetary transactions in which the bartered item is valued equally by both parties seldom occur, and one seldom steals what is freely given. Feminists often claim that rape is entirely a matter of male aggression and dominance, but what would happen to the incidence of prostitution and rape if male and female sex drives were equal?

The following graph²⁰ is compatible with the notion that since animal fat consumption increases sex hormone levels, it also aggravates the sex drive mismatch (right):



¹⁴See note 162. Adlercreutz.

¹⁵Howie B, Shultz T. *Dietary and hormonal interrelationships among vegetarian Seventh-Day Adventists and nonvegetarian men.* Am J Clin Nutr. 1985;42(1):127-34. ISSN 0002-9165.

¹⁶Bennett F, and Ingram D. *Diet and female sex hormone concentrations: an intervention study for the type of fat consumed.* Am J Clin Nutr. 1990;52:808-12.

¹⁷Rose D, Goldman G, et al. *High-fiber diet Reduces serum estrogen concentrations in premenopausal women.* Am J Clin Nutr. 1991;54:520-5. ISSN 0002-9165.

¹⁸Bennett F, and Ingram D. *Diet and female sex hormone concentrations: and intervention study for the type of fat consumed.* Am J Clin Nutr. 1990;52:808-12. ISSN 0002 9165.

¹⁹Mousavi Y, Adlercreutz H. *Genistein is an effective stimulator of sex hormone-binding globulin production in hepatocarcinoma human liver cancer cells and suppresses proliferation of these cells in culture.* Steroids. 1993;58(7):301-4. ISSN 0039-128X.

²⁰See note 2. Harper's 1990. p 256.

Sociobiology is a recent branch of scientific theory that more or less postulates that humans are simply life support systems used by their genes to get themselves into the next generation. It's not a comforting idea, but the theory has developed elegant mathematical formulations that predict animal behavior on the basis of genes. Humans have 46 genetic chromosomes in 23 matched pairs. Females have two X chromosomes; males have an X and a Y. Fetuses default to female unless they have the testis differentiation factor (TDF) encoded by a gene on the short arm of the Y chromosome²¹; in this case the fetus becomes a male.²²

This genetic difference leads to different reproductive strategies as well. Here is a nearly perfect sociobiological expression of raw male reproductive strategy:

"They fought against Midian, as the Lord commanded Moses, and killed every man...Now kill all the boys and kill every woman who has slept with a man, but save for yourselves every girl who has never slept with a man."

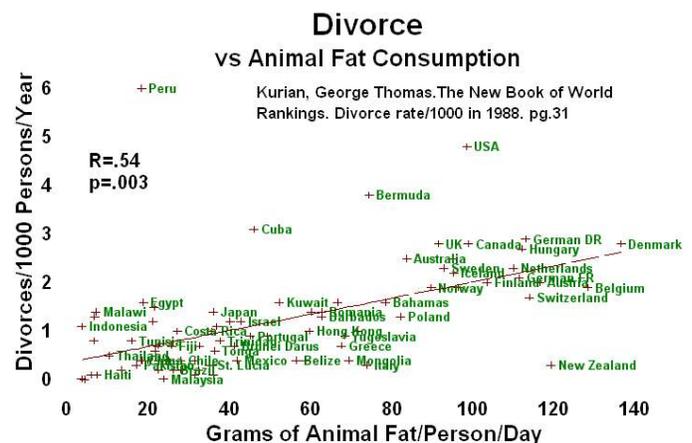
-Deuteronomy²³ 31:7 and 31:17.

As that great Bible fan, Mark Twain, once said, "Man is the only animal that blushes—or needs to." The reproductive objective here is obvious; however, one cannot imagine a female Moses telling her Amazon warriors to "Kill all the women, all the men who may have slept with a woman, and all the little girls, but keep the little boys for yourself." Since women can rarely manage more than one baby a year, there is little advantage to multiple matings and only marginal advantage to destroying other females and their offspring. Female strategy depends on cooperation and on attracting a dependable male who will stay around to help with the chores, which may include fending off large, muscular, predacious males. Those up to the task often turn out to be large, muscular, and predacious themselves. Feminists who despair of macho male behavior should blame it on the reproductive choices of their female ancestors.

"Men are the result of a vast breeding experiment run by women."

-Anon

While there are many confounding social factors, here's another correlation between diet²⁴ and sexual conflict:²⁵



²¹See note 98. Ganong. p 387.

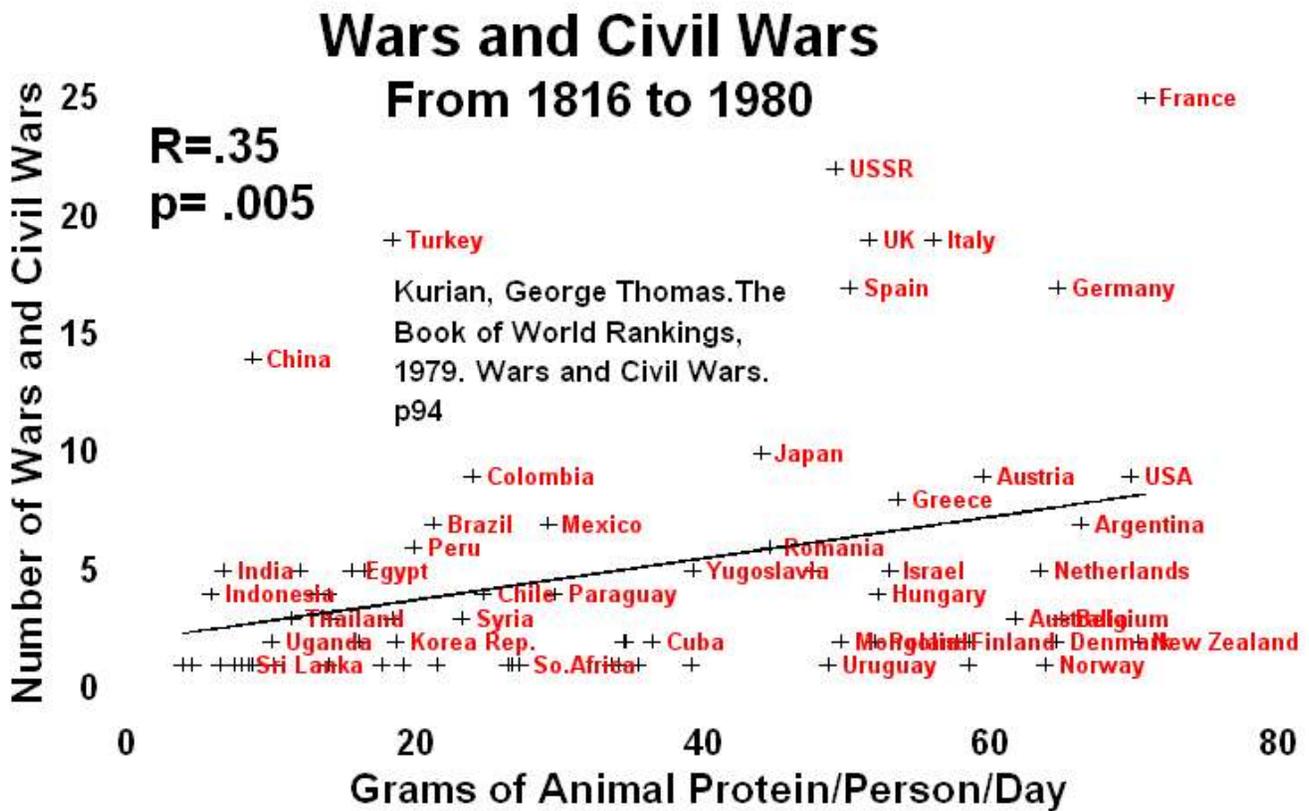
²²See note 372. LeVay. p 18.

²³See note 35. The Holy Bible.

²⁴See note 49. FAO.

²⁵See note 365. Kurian 1991. p 31.

Somewhat less robust but nevertheless suggestive, is this correlation of war²⁶ and animal protein consumption:



Population pressures and territorial ambitions drive most wars, but the "Moses effect" may also be operative. Many male animals fight each other at mating time but the losers generally trot off into the woods, largely intact. Human males regularly carry combat to its mortal end point, not infrequently taking many of the female war prizes with them. Twenty million humans died in WWI and about 36 million in WWII.²⁷ It's likely that 100 million people will have died in the wars²⁸ of the 20th century.

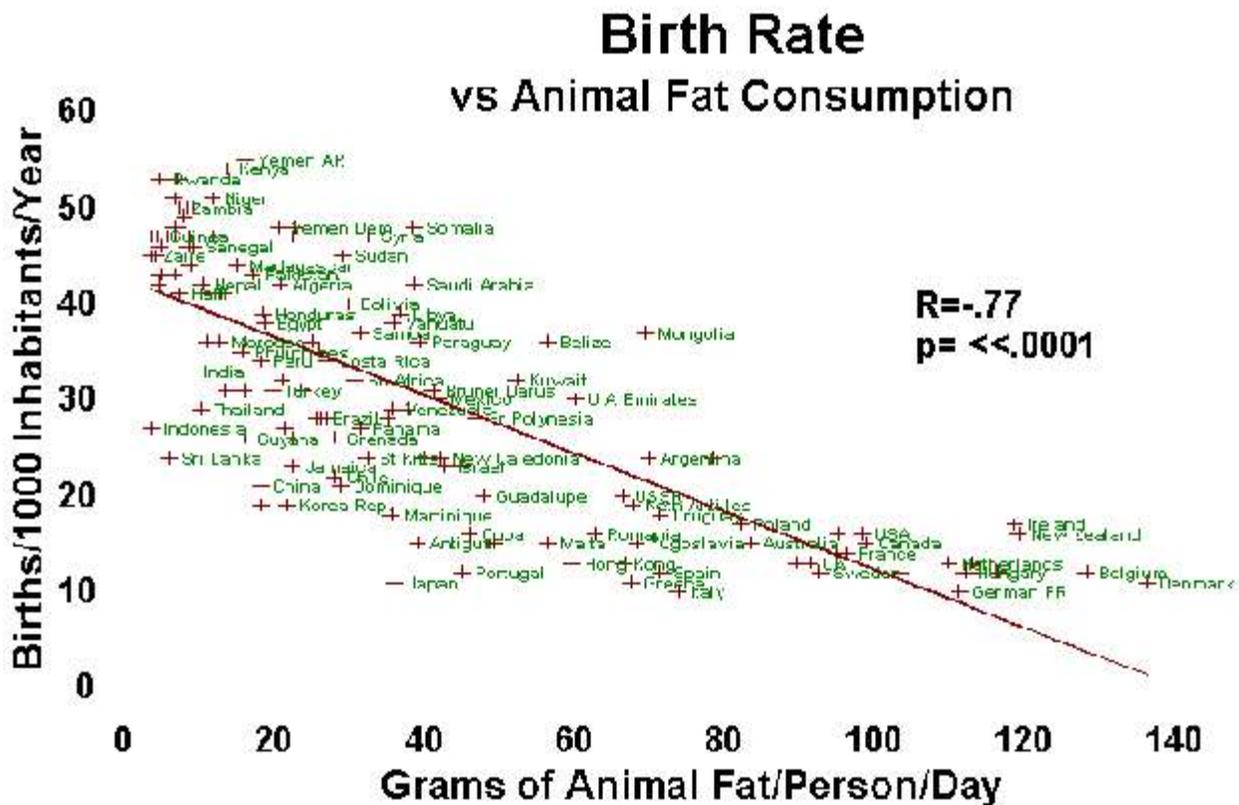
²⁶See note 156. Kurian 1979 pp 92-3.

²⁷See note 22. *Encyclopedia Britannica*. Vol.19, p 1023.

²⁸Rhodes R. *Man-made Death: A Neglected Mortality*. JAMA 1988;260(5):686-7.

If vegetarians do in fact have lower sex hormone levels, is reproduction impaired? FAO data plotted against birth rate data²⁹ suggests just the opposite. The higher the intake of animal source food, the lower the birth rate.

This graph is nothing to brag about. The countries having all the kids are hovering on the brink of economic disaster and can't afford meat. Unless they find a way to cut their birthrates, there will be more appeals to feed the starving faces on TV. Nevertheless, there's nothing here to suggest that low animal food intake leads to reproductive problems:



injections of 200 mg testosterone shut off sperm production in 70% of male members of a study population.³² High levels of testosterone slow the release of two pituitary hormones; follicle stimulating hormone (FSH) and luteinizing hormone (LH) that trigger the production of sperm in the testes. Perhaps high testosterone levels are helpful in the bedroom but not in the nursery.

Disturbances in fertility, fetal sex organ development, and adult gender identification in both animals and humans have recently been correlated with environmental contaminants such as DDT and PCB, that interact with hormone receptor sites.³³ The widespread medical use of diethylstilbestrol (DES) from the '40s to the '60s to prevent miscarriage caused an increase in vaginal and possibly testicular cancer in the children.³⁴

Male fetuses exposed to female hormones become feminized. Female fetuses exposed to male hormones become masculinized.³⁵ As a result, exposed fetuses of both genders demonstrate homosexual mating behavior in later life. Scientific writers³⁶ are beginning to link the unwise use of sterols and sterol mimics to escalating human sexual dysfunction and gender orientation problems.

Impotence is a problem in the U.S., affecting an estimated 10 million³⁷ males, many of whom take it with poor grace that their plumbing no longer stands up to expectations. Out of 440 men studied for impotence,³⁸ the frequency of organic impotence rose from 49% to 100% in those individuals who were smokers,³⁹ diabetic, hyperlipidemic, and hypertensive. Vegans have a low incidence of all these risk factors, and a Medline search for "impotence, vegetarian, vegan" turned up no references. If impotence is a problem for vegetarians and vegans, it has thus far escaped detection. Smoking and nonsmoking impotent patients do not differ in terms of their hormonal profile.⁴⁰ It's unlikely that low testosterone levels are by themselves a common cause of impotence⁴¹ unless

³²American Association for the Advancement of Science. *Contraceptive Methods Go Back to Basics*. Science. Dec 1994; 266:1480. ISSN 0036-8075.

³³Raloff J. *The Gender Benders*. Science News. 1994;145:24-27. ISSN 0036-8423.

³⁴See note 394. Rennie. p 38.

³⁵Crews D. *Animal Sexuality*. Scientific American 1994; January:108-114. ISSN 0036-8733.

³⁶Raloff J. *That Feminine Touch: Are men suffering from prenatal exposures to "hormonal" toxicants?* Science News. 1994;145:56-58. ISSN 0036-8423.

³⁷*ibid*. Science News. 1992;142:10. ISSN 0036-8423.

³⁸Virag R, Bouilly P, Frydman D. *Is impotence an arterial disorder? A study of arterial risk factors in 440 impotent men*. Lancet 1985;1(8422):181-4. ISSN 0023-7507.

³⁹Rosen M, Greenfield A, et al. *Cigarette smoking: an independent risk factor for atherosclerosis in the hypogastric-cavernous arterial bed of men with arteriogenic impotence*. J Urol Apr 1991;145(4):759-63. ISSN 0022-5347.

⁴⁰Condra M, Morales A, Owen J, et al. *Prevalence and significance of tobacco smoking in impotence*. Urology. Jun 1986;27(6):495-8. ISSN 0090-4295.

⁴¹Monastersky R. *Impotence: More than a middle-age metaphor*. Science News. 1994;145:21. ISSN 0036-8423.

combined with obesity,⁴² in which case there may be an association. However, obese vegans are rare.

The age of puberty has been falling steadily in developed countries at the rate of 1-3 months per decade for the past 175 years.⁴³ It appears to have dropped at the same time that fat consumption was going up. One author⁴⁴ suggests that in prehistoric times when the food supply was scarce, stored fat was essential for reproduction. Further analysis indicated that girls do not reach menarche until their percent of body fat is high enough to support a successful pregnancy. Since vegan fat intake is low, it's possible that vegan girls will tend to mature later than omnivores, but is this a disadvantage? Are there any advantages to early puberty and late menopause, both characteristics of omnivores? One might argue the advantage of a longer reproductive life, but is there any advantage to children having babies they can't take care of? Is the number of babies born as important as the quality of life provided by their parents? Do we need a larger population than we have?

Female fertility seems a bit more hormonally fragile⁴⁵ than male fertility. A Medline search for "infertility, vegetarian, vegan," turned up some references pertaining to women. Both underweight and obese women are at risk for infertility.⁴⁶ Vegans and vegetarians are at some risk for underweight,⁴⁷ but not as much as omnivores are for obesity. Obese women are at greater risk for reproductive problems⁴⁸ and infertility,⁴⁹ with or without polycystic ovarian disease.⁵⁰ Normal weight and vigorous exercise for less than an hour a day correlates with good female

⁴²Jarow J, Kirkland J, Koritnik D, Cefalu W. *Effect of obesity and fertility status on sex steroid levels in men.* Urology. 1993;42(2):171-4. ISSN 0090-4295.

⁴³See note 98. Ganong. p 395.

⁴⁴Frisch R. *Fatness, menarche, and female fertility.* Perspect Biol Med. 1985;28(4):611-33. ISSN 0031-5982.

⁴⁵Kiddy D, Hamilton-Fairley D, et al. *Improvement in endocrine and ovarian function during dietary treatment of obese women with polycystic ovary syndrome.* Clin Endocrinol (Oxf). 1992;36(1):105-11. ISSN 0300-0664.

⁴⁶Koloszar S, Godo G, Sas M. *A koros testsuly szerepe a functionalis noi infertilitas kialakulasaban. [Role of pathological body weight in the development of functional female infertility]* Orv Hetil. 1985;126(17):1017-9. ISSN 0030-6002. (Hungarian) English Abstract.

⁴⁷Dwyer JT. *Health aspects of vegetarian diets.* Am J Clin Nutr. 1988;48(3 Suppl):712-38. ISSN 0002-9165.

⁴⁸Kumar A, Mittal S, Buckshee K, Farooq A. *Reproductive functions in obese women.* Prog Food Nutr Sci (ENGLAND). 1993;17(2):89-98. ISSN 0306-0632.

⁴⁹Kusakari M, Takahashi K, Yoshino K, Kitao M. *Relationship between the delayed-reaction type of LH-RH test and obesity in sterile women with ovulatory disturbances: a preliminary report.* Int J Fertil. 1990;35(1):14-6, 21-2. ISSN 0020-725X.

⁵⁰Jaffe R, Abramowicz J, et al. *Sonographic monitoring of ovarian volume during LHRH analogue therapy in women with polycystic ovarian syndrome.* J Ultrasound Med. 1988;7(4):203-6. ISSN 0278-4297.

reproductive health,⁵¹ but vegetarians are at some risk for menstrual irregularities^{52,53} and women who are also heavily involved in long distance running sometimes become amenorrheic,⁵⁴ anovulatory, hypoestrogenic, and osteoporotic.⁵⁵ After cutting back on the miles and regaining normal periods, they recover lost bone mass.⁵⁶ Of ancillary interest, it has shown that even post-menopausal women can recover up to 3.8% of forearm bone mass density by weight lifting.⁵⁷ Another author suggests that a natural progesterone skin cream derived from yams can also recover bone mineral density.⁵⁸ The alleged adverse effect of prolonged exercise on women has been challenged,⁵⁹ but to put this complex issue in perspective, perhaps it should be recalled that the first Marathon runner immortalized himself by dropping dead at the finish line.

In short, slender vegetarian women who also engage in competitive athletics should probably regard loss of ovulatory and menstrual function as a warning that they're overdoing it; otherwise, there is little evidence that vegan and vegetarian men and women are at risk for infertility or sexual dysfunction, and considerable evidence that omnivorous men and women *are*, in spite of higher total sex hormone levels.

CULTURAL CONSIDERATIONS:

In the age of theatrical overkill, macho violence sells at the box office. The old Batman defeated his opponents with gymnastic feats and a reasonable physique. Stallone approaches his foes not only with muscles that would make a gorilla feel inadequate, but half an ammo dump on his shoulders.

Sexual content is dominant in the U.S. media, with particular emphasis on the female form. The only detectable difference between the covers of women's magazines and men's magazines is that in the former, the models keep their clothes on. TV soap operas feature fictitious sexual exploits in the lives of imaginary people, and newspaper columns report their antics in idolatrous detail. Apparently someone watches the soaps and reads the synopses; one suspects that many devotees are chubby omnivores thinking more about sex and enjoying it less.

⁵¹Green B, Daling J, Weiss N, Liff J, Koepsell T. *Exercise as a risk factor for infertility with ovulatory dysfunction*. Am J Public Health. 1986;76(12):1432-6. ISSN 0090-0036.

⁵²Pirke K, Schweiger U, et al. *Dieting influences the menstrual cycle: vegetarian versus nonvegetarian diet*. Fertil Steril. 1986;46(6):1083-8. ISSN 0015-0282.

⁵³Pedersen A, Bartholomew M, et al. *Menstrual differences due to vegetarian and nonvegetarian diets*. Am J Clin Nutr. 1991;53(4):879-85. ISSN 0002-9165.

⁵⁴Dugowson C, Drinkwater B, Clark J. *Nontraumatic femur fracture in an oligomenorrheic athlete*. Med Sci Sports Exerc. 1991;23(12):1323-5. ISSN 0195-9131.

⁵⁵Hight R. *Athletic amenorrhoea. An update on aetiology, complications and management*. Sports Med. 1989;7(2):82-108. ISSN 0112-1642.

⁵⁶Drinkwater B, Nilson K, Ott S, Chesnut C. *Bone mineral density after resumption of menses in amenorrheic athletes*. JAMA. 1986;256(3):380-2. ISSN 0098-7484.

⁵⁷Simkin A, Ayalon J, and Leichter I. *Increased trabecular bone density due to bone loading exercises on post-menopausal osteoporotic women*. Calcif Tissue Int. 1987;40:59-63.

⁵⁸See note 86. Lee. *Natural progesterone*.

⁵⁹Loucks A. *Does exercise training affect reproductive hormones in women?* Clin Sports Med. 1986;5(3):535-57. ISSN 0278-5919.

Perhaps someone will eventually summarize the tragic marital effects of women scarfing down meat like football players, while desperately hoping to retain the slimness desired by their spouses. If they switched to whole vegan food, most of these ladies could drop their weight without ever reading another diet book, improve their chances in the mating market, turn off the TV, and get on with their own love lives.

But humans are probably the most sexually active species on the planet with or without the lamb chops. Hypersexuality has paid off handsomely in terms of family bonding and social organization, but with increasing animal food consumption, the already hypertrophied human hormone system is thrown into overdrive. The result is a morbid preoccupation with sex and violence, impairment of reproductive function, amplification of the unavoidable gap between male and female reproductive strategies, and a resultant increase in conflict between the sexes and within and between nations.

While these considerations may make life less tranquil for individuals, the overall effect is quite different; societies seem to thrive on conflict. If the level of murder and mayhem can be held below the threshold of mass extinction, warfare promotes science, technology, and even the arts. Aggression advances national interest as long as it doesn't destroy the nation first. Without the "raging male hormones" underlying the World Wars (with the support of admiring female hormones, it should be noted), we'd be flying about in Curtiss Jennies, not 747s. With less machismo on the part of Tybalt, Romeo would have finally assisted Juliet with the diapers, and we would have been deprived of at least a dozen masterpieces (Shakespeare, Tschaikowsky, Prokofieff, Berlioz, etc.)