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Breast Asymmetry, Sexual Selection, and Human Reproductive Success

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Breasts of human females are large compared to those of closely related primate species, and they can thus be hypothesized recently or currently to have been subject to directional sexual selection. Here we show that (1) large breasts have higher levels of fluctuating asymmetry than small breasts, (2) breast fluctuating asymmetry is higher in women without children than in women with at least one child, (3) breast fluctuating symmetry is a reliable predictor of age-independent fecundity, and (4) breast fluctuating symmetry appears to be associated with sexual selection. These conclusions were similar in studies from two cultures differing in fecundity and breastfeeding traditions (Spain; New Mexico, U.S.A.). Choosy males that prefer females with symmetrical breasts may experience a direct fitness benefit in terms of increased fecundity and an indirect benefit in terms of attractive or fecund daughters.

KEY WORDS: Breasts; Breast asymmetry; Developmental instability; Fecundity; Fluctuating asymmetry; Humans; Sexual selection.

Size dimorphism in breasts of humans is exaggerated compared to that of closely related primate species (Darwin 1871), suggesting that recent directional selection has played a role in the evolution of adult female breast size. There is little evidence that the size of breasts in human

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females is a reliable predictor of lactation ability or milk composition in current industrial societies (reviews in Anderson 1983; Cant 1981; Low et al. 1987), and the functional significance of breast size therefore remains obscure. The exaggerated size of female breasts, their rapid development prior to and during puberty, and their apparent role in male-female interactions suggest that breasts may be involved in sexual selection (Alexander 1971; Low 1979). A directional male preference for large breasts (or an associated feature) may account for the evolutionary increase in breast size in humans as compared to related primate taxa. Because of a recent evolutionary history of directional selection and a net evolutionary change, breasts are expected to demonstrate higher levels of developmental instability than other morphological characters (Møller and Pomiankowski 1993). Directional selection covaries with low levels of developmental stability because selection for increased size simultaneously results in (1) selection against genetic modifiers that control the stable development of the character in question and (2) selection of uncommon alleles that sometimes confer high phenotypic trait values disrupting a coadapted genome (Møller and Pomiankowski 1993).

Developmental stability reflects the ability of an individual to generate the same phenotype under different environmental conditions (Ludwig 1932; Palmer and Strobeck 1986; Parsons 1990). Measures of developmental instability include deviations from bilateral symmetry such as phenotypic deviants and fluctuating asymmetry. Morphological characters usually demonstrate small, random deviations from the optimal phenotype of perfect bilateral symmetry that are termed fluctuating asymmetry (reviews in Ludwig 1932; Palmer and Strobeck 1986; Parsons 1990). Individuals with high degrees of fluctuating asymmetry often show low levels of environmentally and genetically caused health (Møller 1993; Palmer and Strobeck 1986; Parsons 1990; Watson and Thornhill 1994). Therefore, conspecifics and heterospecifics potentially are able to use the level of fluctuating asymmetry as a reliable health certificate of an individual, because it is very difficult to produce a perfectly symmetrical phenotype, particularly if it is exaggerated in size and subject to intense directional selection.

Developmental stability may play an important role in sexual selection because deviations from bilateral symmetry provide individuals with important information reflecting direct and indirect fitness benefits of mate choice (Møller 1990, 1992a, 1993; Thornhill 1992a, 1992b; Watson and Thornhill 1994). As characters become exaggerated due to net directional sexual selection, the levels of fluctuating asymmetry increase and become a perceivable and reliable indicator of general health. The character per se and its fluctuating asymmetry thus become the targets of sexual selection. A number of studies have now shown that symmetrical individuals have higher-than-average mating success, apparently because symmetrical mates are preferred over asymmetrical ones (reviews in Møller 1993; Thornhill and Gangestad 1994; Watson and Thornhill 1994).

In this paper we hypothesize that breast symmetry in human females is a target of sexual selection, because breast symmetry reliably reflects environmentally and genetically caused health, and that males by choosing females with symmetrical breasts obtain a direct fitness benefit in terms of increased fecundity