

Primate polythelia puzzle

The term 'polythelia' comes from Greek and means 'many nipples'. In 1150 BC, King Chow Man in China was reported to have two supernumerary nipples, a condition then considered as a gift of divine power¹. In the West, polythelia could be traced back to the Romans; Lynceus described a woman with four breasts. Also, Julia, the mother of Alexander Severus and Anne Boleyn, the wife of Henry VIII of England had supernumerary nipples¹.

Geoffroy-Saint-Hilaire and Darwin suggested that humans descended from animals with multiple breasts and polythelia could be regarded as atavistic or reversionary manifestations, in which remote ancestral characteristics unexpectedly appear^{2,3}. Polythelia is medically described as a minor congenital malformation that consists of nipples and/or related tissue in addition to the two nipples normally appearing on the chest⁴. They are located along the embryonic milk line. In humans, the embryonic milk line extends bilaterally from a point slightly beyond the axillae on the arms, down the chest and the abdomen toward the groin, and ends at the proximal inner sides of the thighs. When



Figure 1. An adult female Formosan macaque with four supernumerary nipples located anterior and posterior to the normal nipples. (Photo: G. Agoramoorthy).

they are complete with breast tissue and ducts, they are called 'polymastia'⁴.

Polythelia occur in 1–5% of humans; range varies in countries from 0.22% in Hungary to 1.63% in USA, and from 2.5% in Israel to 5.6% in Germany⁵. In India, polythelia has been reported as a cutaneous marker of mitral valve prolapse, a common heart disorder⁶. They are usually expressed asymmetrically, and are associated with increased risk for urogenital malignancies – the nature of possible causal relationships between gene defects, polythelia and urogenital disease is not clearly known^{7,8}. Interestingly, polythelia has been anecdotally linked to multiple births in human but confirmatory data are lacking⁹.

Polythelia in non-human primates has been occasionally reported in species such as chimpanzee, orangutan, chacma baboon, rhesus macaque, Japanese macaque and Formosan macaque¹⁰. Nonetheless, the incidence of polythelia among the Formosan macaque, which is endemic to the island of Taiwan, was reported to be 33%, and the twinning rate was 1% – both are much greater than those reported for any other Cercopithecids and apes¹⁰.

Between January 2001 and October 2005, we examined a total of 244 adult female Formosan macaques in 18 social groups that inhabit Mt. Longevity, Taiwan to document infant twin birth and polythelia. We recorded 125 adult females (51.2%) with polythelia and the number of supernumerary nipples was two (23.8%) followed

by one (17.2%) and three (8.6%) respectively, with a maximum of four (1.6%, Figure 1). We observed four cases of twin births, of which three multiparous mothers had polythelia (Table 1). Only one infant survived till weaning out of every twin birth. In one out of four cases (Troop B 12, Table 1), two offspring had polythelia (2, 3) like their mother, while the rest did not follow this trend. However, in one case (Troop Kc 5, Table 1), the mother had none but her daughter had two supernumerary nipples. The percentage of adult females with polythelia among the 18 social groups was not evenly distributed and ranged from 10 to 81.8% (Figure 2). So far we have recorded ten cases of twinning in Formosan macaques at Mt. Longevity (including six cases from an earlier study¹⁰) and 90% of females had polythelia. Besides, twinning rate was significantly higher in females with polythelia than those without polythelia (χ^2 test, $P < 0.01$).

The ultimate cause for the high occurrence of polythelia in Formosan macaques is unknown. However, isolation and inbreeding, including developmental by-products reinforcing selection simultaneously may have caused this genetic trait to spread in the population of monkeys. The twinning rate correlated with the occurrence of polythelia in Cercopithecids and apes should be further investigated to understand the genetic and developmental bases of polythelia and its relationship with twinning. This may shed light on questions of

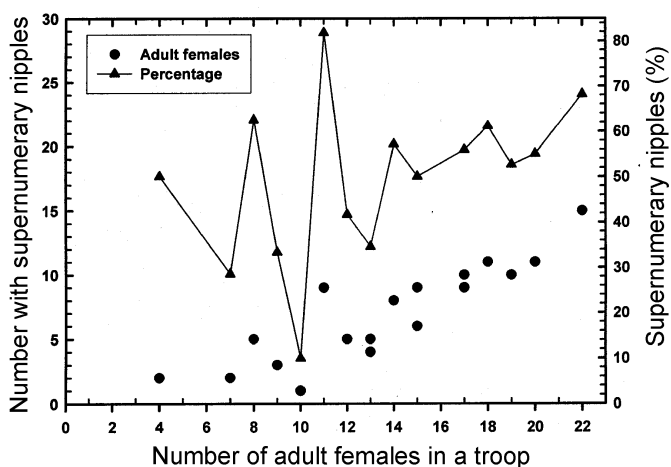


Figure 2. Number and proportion of adult females with supernumerary nipples in 18 social groups of Formosan macaques at Mt. Longevity, Taiwan.

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Table 1. Twin births and adult females/their offspring with polythelia among wild Formosan macaques at Mt. Longevity, Taiwan between 2001 and 2005

Troop name	ID no.	N	Date of birth	Sex	Outcome	Other births (year/sex)*	Offspring with supernumerary nipples
B	12	3	16 April 2003	M, F	M died < 3 days	2000 F, 2002 M, 2004 F	Yes (2, 3)
F	10	2	1 August 2005	F, F	1 died < 4 days	2000 F, 2002 M died < 6 months, 2003 F, 2004 M	No
I	12	2	13 April 2002	M, M	1 died < 2 week	2000 F, 2001 F, 2003 M, 2004 M	No
Kc	5	0	12 June and 26 June 2001	M, M	1 died < 6 weeks	2000 M, 2002 F, 2003 M, 2004 F	Yes (2)

N, Number of supernumerary nipples.

*Birth records of 2000 were pooled from unpublished data.

fundamental interest, such as fluctuating asymmetry and primate trend to single births.

It is not easy though to observe polythelia in the often arboreal and furry, non-human primates under field conditions due to visibility problems. Field biologists have to approach their subjects in close quarters to carefully observe the presence of polythelia. Countries like India where monkeys such as the bonnet macaque, rhesus macaque and Hanuman langur co-exist with people in rural and urban areas, may provide better opportunity for such closer scrutiny. This ultimately may result in understanding the population genetics and fitness consequences of both phenomena, as well as the intriguing relationship amongst multiple births, polythelia and the potential correlation of urogenital anomaly.

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Plight of higher education and our helplessness to act

One would like to agree and appreciate the commentary by Lakhota¹ about the plight of universities in our country in highlighting the prevailing conditions in teaching and research, faculty, facilities, funds, admissions, appointments, administration and also suggestions for possible improvements. A lot has been said in the past about publications and journals too. All this is too well known, particularly to those scientists who matter for shaping the policy of higher education and research. Sometime back, one of the top scientists of the country publicly expressed his anguish over the prevailing poor scientific status of universities in the country, and implying thereby his helplessness to do anything about it.

The basic question is: if the physician has diagnosed the illness rightly, why does he not administer the medicine? Unless such things are highlighted, how are they going to be improved?

Lakhota¹ has rightly suggested restrictions for Master's and Ph D degrees. If one wants to improve the situation, this is perhaps the first thing to be done. The big question is: Can we close down so many PG colleges which have sprung up in remote corners of the country? Will our political system permit this? Another far-reaching suggestion is contractual appointments of teachers. Would we permit an altogether different service condition in isolation from elite services? UGC

made this recommendation about three years ago, but so far no university has adopted the scheme.

Lakhota has not dealt with the factors affecting the standard of education in the universities. It is the government policy of liberalization of education which has literally reduced education to a commodity so that thousands of private professional and basic sciences colleges have been started throughout the country. How can one expect any standard and excellence from such institutions?

Given the existing circumstances, what little can a common scientist do? Thirty years ago when I was appointed as head of the Department of Chemistry of the