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Spermatogenesis or sperm retention? The problem of the undescended testis. Comment on a new theory by Michael Chance

by John Price

I had always thought that the testes were externalised in order to lower the temperature, and that this in some way facilitated spermatogenesis. One hoped that this was really necessary, to make up for the inconvenience and occasional excruciating pain to which the external testis is subject. But this is not the accepted answer. In the most recent review of the field, Bedford (1) says, "Descent of the testis to an accommodating scrotal sac is one of the more puzzling features of the reproductive tract of mammals.....the present conceptual framework in male reproductive physiology may yet be inadequate to resolve these questions."

Now Michael Chance has come up with an entirely new and amazingly bright idea. In a paper (2) in a recent issue of the Journal of Zoology he proposes that the testes are externalised in order to avoid sudden rises in intraperitoneal pressure. He points out that the mammalian male reproductive tract is not guarded by a sphincter, and so, if the peritoneal pressure rises, the seminal fluid would be expelled from an internalised testis, epididymis and seminiferous tubules. This idea came to him when he read in a newspaper that the urine of Oxford and Cambridge boatmen contained prostatic fluid after the boat race. If prostatic fluid is expelled after exertion, why not also spermatic fluid? The answer: the organs containing stored semen are not subject to rises in intra-abdominal pressure because they are not in the abdomen!

Now, it is known that many mammals do not have externalised testes. It is this fact which casts doubt on the temperature theory of externalisation. What is it which distinguishes those mammals who do from those who don't have externalised testes? Here Michael Chance is able to marshall evidence in favour of his "concussive peritoneal pressure theory (CPPT)". Those mammals with internalised testes are burrowers and scuttlers, whereas the externalised mammals are leapers, bounders and gallopers, with the body raised off the ground. In other words, it is only those species of mammals which are subject to CPP which have externalised testes. This strongly supports the CPPT.

Unfortunately the Journal of Zoology does not have a correspondence column, otherwise one would wait with rising excitement the response of Michael's zoological colleagues. Already there has been some comment in New Scientist (August 21) and on the BBC's World Service (August 23). It is certainly a cause for excitement in ASCAP members that our first President and long-time guru should set the zoological world aflame at the venerable age of 81. There is no doubt that his "systems forming faculty" is still fully operative.

An additional reaction of my own is to be profoundly disappointed in evolution. Mammals are very good at providing sphincters where necessary. The Oxford crew do not regurgitate their stomach contents, their faeces or their urine during their exertions, so why should they lose prostatic fluid? And why on earth can the testis and its appendages not stay comfortably in the abdomen and be protected by a sphincter from what might be called exertional ejaculation?

How easy to provide a sphincter! How hard to send these little organs on a long journey through the abdominal cavity, out through the abdominal wall, leaving it weak and subject to hernia, and in doing so to expose them to all sorts of risks and injuries, even to the extent of being bitten off by one's fellow chimpanzees. There must, surely, be some reason why a seminiferous sphincter was not a viable option during the evolutionary solution of this CPP problem.

A similar argument applies to the Surbey explanation of anorexia nervosa (3). If adolescent girls want to delay reproduction for a few years until circumstances are more propitious for childbirth, why can't they inhibit the release of gonadotropic hormone releasing hormone from the hypothalamus, in the way that the humble marmoset does, rather than evolve the convoluted, crude and clumsy pathway of getting the girl to believe she is too fat when she weighs five stone just to keep her weight below some threshold at which ovulation is inhibited? This is not the sort of behaviour we have come to expect from evolution. We can forgive the odd lapse, like having some of the photosensitive pigments on the wrong side of the neuronal network of the retina, but this is clearly one of those minor peaks on the epigenetic landscape, and to scale the highest peak one would have had to go through the valley of altering the whole evolution of the eye. But when a simple alternative is available, like a seminiferous sphincter? When and if we finally get to call our Maker to account, we should put it to him that we are not at all happy that the race of men should have been handicapped with external testes, just so that the Oxford and Cambridge crews can cling on to that precious fluid they have been accumulating through the long weeks of intensive training and self-denial.

But seriously, Michael's theory will give rise to a lot of thinking about the evolution of sphincters, and also to a reappraisal of the whole subject of intra-abdominal hydrodynamics in relation to exercise.

References

1. Bedford, J.M. (1977) Evolution of the scrotum: the epididymis as prime mover? In: Reproduction and Evolution (ed J.H.Callaby & C.H.Tyndale-Biscoe) Pp. 171-182. Canberra: Australian Academy of Science.

2. Chance, M.R.A. (1996) Reason for the externalisation of the testis of mammals. Journal of Zoology, London, 239, 691-695).

3. Surbey, M.K.. (1987) Anorexia nervosa, amenorrhea and adaptation. Ethology and Sociobiology, 8, 47-62.