

disintegrations per minute with a filling of 3 atmospheres of ethane, and with a sample containing 10 tritium units in our counter, which has a sensitive volume of 0.8 liter. A larger counter (2-liter) is at present being constructed. No effects from isotope separation were observed by using hydrogen of known tritium content. This is in agreement with the fact that the chemical yield of the ethane synthesis is close to 100 percent. Results of tritium measurements currently being carried out at this laboratory will be published elsewhere.

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References and Notes

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"Hypersexuality" in Male Cats without Brain Damage

Abstract. During 5 years of observation in a cat colony where mating tests are routinely conducted, the spontaneous occurrence of distortions of sexual activity in male cats has been recorded. Many of the behavioral patterns encountered have previously been described only in brain-damaged animals when they have been used as an index of "hypersexuality." Identical behavior occurs in normal males as a simple training effect.

The possible role of the temporal lobe in the normal regulation of sexual activity has remained a question of considerable interest since Kluver and Bucy described striking alterations in the sexual behavior of mature rhesus monkeys in the weeks after bilateral temporal lobectomy.

There is no doubt whatever that sexual manifestations in primates of both sexes increase, both in range and frequency, after such surgical interven-

tions (1, 2). Observations of a similar type have been extended, on rather less secure grounds, to several infraprimate species, and attention has been given in particular to the sexual activity shown by male cats toward (i) anoestrous, non-receptive female cats, (ii) other male cats, (iii) kittens, (iv) inanimate objects such as a child's woolly toy, and (v) alien species such as dogs, chickens, and rabbits (2, 3). Aberrant behavior of this kind has been widely used as a criterion of abnormal hypersexuality. The observation of the occurrence of such patterns of behavior after destruction of, or lesions in, the amygdala and pyriform cortex has implicated these structures, and the temporal lobe generally, in the regulation of the sexual behavior of the male cat (4).

Some of the reports describing the distortions of sexual activity, which result either from altering the hormone balance or from physical interference with the brain, indicate a lack of familiarity with the range of behavior normally shown by the cat and with the shifts from the normal which can be produced by simple manipulation of the environmental situation. I have conducted several thousand mating tests with the cat during the past 5 years and, therefore, my experience may be of interest to others in this field (5).

If a mature male cat is trained to carry out mating tests with receptive females and is "in territory" within its home cage or test pen and is then presented with another mature male, the latter will invariably be mounted. The mounted male in most instances passively tolerates the neck grip and copulatory thrusts of the mounting male. The sequence of mounting does not depend upon the relative sizes of the animals, but upon the influence of territory; the animal in familiar surroundings in its home cage is dominant. If on a subsequent occasion, the mounted male is established in its own territory (where it has previously mated with receptive females), it will then mount the male by which it had previously been mounted. "Tandem" and multiple mounting occur readily in the laboratory when trained animals are used, and the sequence can be changed indiscriminately by changing the order in which animals are presented. Homosexual behavior in the test situation (in the sense that the sexual object is another male), as well as mounting activity between males housed in pairs, is thus a common observation (6). In contrast

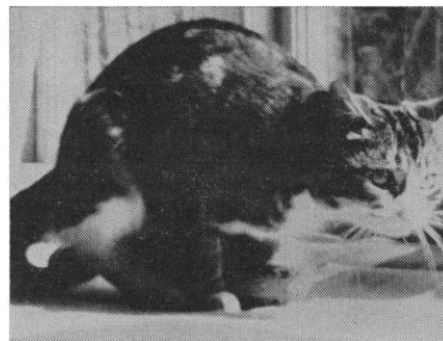


Fig. 1. Mounting activity and ejaculation shown by a normal male cat with a child's toy rabbit (frame from a motion-picture film taken in a private home).

to the foregoing, if two stud males, both of which have frequently mated in a test room and established territory rights there, are liberated in it simultaneously, serious fighting may ensue. It can be seen, then, that totally different behavioral patterns (passive acceptance of mounting or active fighting) can be evoked merely by a rearrangement of the test situation. Inexperienced males can be trained to show intense sexual interest in inanimate objects by alternately presenting a receptive female and some object such as a toy teddy-bear. A male so trained will then mount, secure a neck bite, and attempt copulation with any suitable soft object, including the sleeve and arm of the attendant's coat. Masturbatory activity of various kinds is readily observed in young, isolated males as well as in males housed in pairs, but only when the animals are well adapted to, and familiar with, the environment and not when newly arrived from a dealer.

Of even more interest than the sexual deviations which result from training and conditioning procedures within the laboratory is the occurrence of such phenomena spontaneously in domestic animals. Several reports of sexual activity with inanimate objects have reached me from owners of pet cats. One report, supported by a motion-picture film taken in a private home, describes a mature, intact male (Fig. 1). Although allowed complete freedom and the sire of many litters in the neighborhood, this cat, if left undisturbed, regularly mounted, and attempted copulation with, a child's toy rabbit from which sperm could be recovered. This type of masturbatory activity with an object which appears to stand for the true sexual object may be analogous to fetishism in the human. Careful histological examination of the temporal

lobes of three such animals has failed to reveal the slightest evidence of either Ammon's horn sclerosis or any more obvious pathology. Although aberrant behavior is infrequently reported because of the distaste it arouses in animal owners who, as a consequence, have their pets castrated, it is probably more common than we are accustomed to believe (1). In all this the male cat does not appear to differ from other species of domesticated animals which can be trained to mate with artificial vaginae for sperm collection.

Every variety of abnormal behavior which has been used as a criterion of hypersexuality in male cats has been encountered, with one exception, during the past 5 years of observation of animals without brain damage. The exception is mounting activity toward alien species which I have not observed. Upon this I cannot comment except to observe that such activity may be less specifically related to the sex drive than the visual agnosia which forms part of the temporal lobe syndrome. The patterns of spontaneously occurring abnormal behavior include (i) the tenacious clinging to female partners by males during copulation when attempts at separation are made—so that both animals can be suspended in mid-air, (ii) indiscriminate mounting by males of other males, (iii) tandem and multiple mounting behavior, (iv) neck grips, mounting, and attempts at copulation with kittens of under 900 grams, and (v) masturbatory activity, mounting, and ejaculation upon inanimate objects. This latter phenomenon occurs spontaneously in freely running animals as well as in those subjected to training procedures within the laboratory. Although such phenomena as multiple mounting behavior seem at first to be very bizarre, the expression of identical patterns of behavior in animals which have not been subjected to operative interference suggests the need for caution in the interpretation of results. The observations that are presented here show clearly that many of the manifestations of so-called "hypersexuality" can either occur spontaneously or be produced as a conditioning effect by simple manipulation of the environmental situation.

It would be wrong to infer from the foregoing that the rhinencephalon is not of great importance in the regulation of sexual behavior in the cat and other species; the evidence in the rhesus monkey is overwhelmingly against this. But the spontaneous occurrence of such

behavior in male cats without brain damage implies a need for quantitative studies combined with control procedures aimed at excluding the possible effects of training. Only such measurements will enable the precise role of the temporal lobe in the sexual activity of this species to be evaluated (8).

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Spontaneous Occurrence of Chromosome Abnormality in Cats

Abstract. A syndrome in male cats analogous to chromatin-positive Klinefelter's syndrome in human males has been demonstrated. The physical characteristics which suggested an abnormality of chromosome number in cats were "calico" or "tortoise-shell" coat colors in a male. Buccal mucosal smears were found to have "female-type" patterns in two out of 12 such male cats screened, and these two were found to have a diploid chromosome number of 39 rather than the normal 38. Testicular biopsy performed on one revealed an abnormal pattern; no gonadal tissue was found in the other cat with an abnormal chromosome number. These findings indicate that the cat, in addition to the mouse, is available for experimental study of chromosome number abnormalities.

Geneticists have been puzzled by the mechanisms involved in the rare male cat with both black and orange colored patches in its coat (1). Under the hypothesis that control of these two coat colors is related to allelic genes on the X sex chromosome (2), both should occur simultaneously only in individuals with two X chromosomes, such as normal females. The reports of males with both black and orange colors have cast doubt upon the hypothesis. However, the observation that a majority of reported "tortoise-shell" or "calico" males are sterile (3) suggests that some unusual mechanism is operating.

The possibility that the male calico

cat might represent a chromosome abnormality comparable to chromatin-positive Klinefelter's syndrome in human males was suggested. Chromatin-positive Klinefelter's syndrome includes a sex-chromatin pattern of "female" rather than "male" type, at least one additional chromosome determined by tissue culture techniques (this is considered to be an X chromosome to give a sex-chromosome complement of XXY), and abnormality of the testicular tubules with failure of spermatogenesis and clinical sterility. If male tortoise-shell and calico cats are feline analogs of human "Klinefelter's" and thereby have two X and one Y chromosomes, the explanation of the presence of both colors in their coats would be simple. The spontaneous presence of such an abnormality has additional interest in that it would permit laboratory study of basic mechanisms involved in an order other than the Rodentia and encourage search for similar anomalies in other species.

Male cats with combinations of three coat colors were examined for the criteria used in the diagnosis of human chromatin-positive Klinefelter's syndrome. Of 12 animals located, only one had typical black and orange patches. The 12 were screened by examining the nuclear chromatin patterns in buccal mucosal cells stained with aceto-orcin. Ten showed the normal male pattern consistent with control male cats tested, but two had the female type, chromatin-positive smears. These two, one being the typically marked calico cat, were examined further.

The one of the two cats with chromatin-positive cells but without the true orange and black spotting had a normal male phallus and a normal scrotum containing descended testes, one of which was removed by excision biopsy. The exposed testis was smaller than normal, measuring 10 by 15 mm, and was firmer than usual. Aceto-orcin squash preparation of fresh biopsy material previously treated with 0.17-percent NaCl solution for 10 min revealed cells in meiotic division, but no spermatids or spermatozoa were seen. This lack of normal spermatogenesis was confirmed by observation of tissue sections stained with hematoxylin and eosin.

The second cat, typically marked, also had a normal male phallus but the scrotum was undeveloped and no testes could be palpated in it or in the inguinal canals. Exploratory laparotomy was done, and no gonadal tissue or internal reproductive system structure could be