# Meetings

## Animal Reproduction and Artificial Insemination

The Sixth International Congress of Animal Reproduction and Artificial Insemination took place 21–26 July, in Paris, France. Some 900 animal scientists from 58 countries attended. The more than 350 research and invited papers that were presented in various sessions discussed gametogenesis and the ultrastructure of germ cells in vertebrates, biochemical aspects of capacitation and gamete survival in the genital tract, temperature and fertility in mammals, embryonic mortality and diagnosis, chromosomal abnormalities and sexual disorders, the immunobiology of sterility, synchronization of the estrous cycle and fertility, and the fertilizing ability and biology of sperm stored in vitro, artificial insemination, and inbreeding. Six round-table discussions were conducted on the reproductive behavior of domestic animals, the glycogen content of the female reproductive organs, collection and transfer of mammalian eggs, artificial insemination in horses, dilution and deepfreeze storage of ram and goat semen, and the reproductive physiology of the fowl.

Contractile proteins, similar in molecular structure and analogous in behavior to those of vertebrate skeletal muscle, may be obtained from spermatozoan flagella. "Spermosin," characterized as myosin-like, has adenosine triphosphatase activity, but its viscosity does not change on addition of ATP. Sperm flagellar movement depends on the orderly interaction of two species of protein, mediated by ATP and divalent cations, in the reversible production of a deformable protein complex.

The final maturation of spermatozoa, which occurs within 5 to 6 hours in the female tract, may be achieved partially elsewhere in the body. This phenomenon, *capacitation*, is an integrated process that involves the uterus and the oviduct. Estrogens and progestogens affect the properties of endometrial secretion, and hence sperm physiology, in the female tract. The need for capacitation of primate sperm was suggested by indirect evidence.

Several sperm enzymes, including those involved in penetration of the zona pellucida, have been isolated and identified. The degradative enzymes of the acrosome are hyaluronidase and trypsin, which are extracted as a single molecule with a molecular weight of 59,000. Their combined action produces a rapid and complete dissolution of the zona pellucida, although the vitellus and its membrane are unaffected by prolonged exposure to this enzyme complex. An inhibitor of acrosomal trypsin was also identified in rabbit seminal plasma; this may be the decapacitation factor of rabbit semen.

Several techniques have been developed to study sperm capacitation and related phenomena. Respiration rates of sperm are measured after in utero incubations in similar or alien species. Sperm motility is studied in uterine secretions from castrated and hormone-treated females. Differences in the nature of epididymal, vas deferens, ejaculated, or uterine-incubated spermatozoa are assessed on the basis of the meiotic stages of eggs recovered at specific intervals after insemination.

Immune bodies may be classified according to: (i) antigenic origin (auto-, iso-, or hetero-antibodies); (ii) existence (lifelong or temporary); or (iii) type (agglutinins, precipitins, lysins, complement fixation antibodies, or allergins). Immune bodies are responsible for different types of infertility, such as immotility of spermatozoa, lack of implantation, early embryonic mortality, and abortion. Specific antibodies may be formed at different stages of the reproductive process, such as spermatogenesis, ejaculation of semen, fertilization, implantation, embryogenesis, and fetogenesis.

Spermatozoa, seminal plasma, protein components of semen dilutents, zygote, embryo, and fetus may act as antigens for the formation of immune bodies. Cytotoxic antibodies to spermatozoa can occur independent of sperm agglutinins. Although sperm agglutinins may interfere with fertility in man, they do not cause testicular damage. The immunofluorescent properties of accessory sex glands have been determined with fluorescein-labeled antivesiculoprostate serum and glandular tissues from normal, castrated, and hormone-treated castrated animals. Normal and androgen-deficient accessory glands can be identified and differentiated by immunohistochemical procedures.

There are striking species differences in the pattern of oviductal innervation and the functional role of the oviduct. The isthmus of the oviduct in cattle and rats receives extensive adrenergic innervation. The bovine oviduct and the cervix uteri of the rat contain large amounts of dopamine. Radioactive substrates have been used to determine the ability of the pre-implantation rabbit embryo to oxidize glucose and pyruvate to carbon dioxide. Much less carbon dioxide is produced from glucose than from pyruvate when these compounds are employed as energy sources in the medium.

Bull co-twins to freemartins are often inferior in their fertility level to non-chimeric bulls born as singles. The presence of tetraploid cells in the blastocysts suggests that chromosome abnormalities contribute to early embryonic mortality in cattle.

The reproductive performance of sheep in the tropics possibly may be improved by selection against high body temperature. Spermatozoa obtained from rabbit epididymides retained *in situ* remain viable for a longer period of time than epididymal sperm transferred to the abdomen. Sperm retained in the epididymis do not lose their fertilizability, but they cause increased pre- and post-implantation mortality. Cryptorchidism, however, causes loss of fertilizability of sperm.

Thermoreceptors occur in the hypothalamus, as well as the skin. Prolonged heat or cold stress (with long-term involvement of the hypothalamus) may thus interfere with crucial stages of reproduction. Heat poses a more direct threat to the testis than does cold, although the scrotum possesses numerous "warm" and "cold" receptors, which can initiate local and general thermoregulatory reflexes. Oxygen deficiency, elevated metabolism, and the inability of testicular blood vessels to dilate, together with depletion of pituitary gonadotropins, may be involved in the lower reproductive performance of heat- or cold-stressed animals.

Exogenous and endogenous progesterone stimulates embryo growth up to a certain point, but is deleterious to embryonic survival thereafter. For example, embryonic mortality in sheep increases as the total quantity of progesterone per embryo increases. In rats, steroid administration corrects the effects of reduced caloric intake on pregnancy and enhances placental growth, but does not improve nitrogen balance or liver protein levels.

The time when estrus and ovulation occur may be controlled readily with progestins given orally, intravaginally, by subcutaneous implant, or by injection. The manner of administration, and the type and dose of steroid used, affect the precision of the response, the frequency of ovulation without estrus, and subsequent fertility. All treatments cause some subfertility at the first estrus after treatment due to faulty sperm transport and survival in the female reproductive tract, and to endocrine imbalance. The stimulatory effect of chorionic gonadotropin on urinary steroid output during periods of inhibition of estrus suggests that progestins act at the hypothalamic-pituitary level, suppressing gonadotropin secretion. Pregnant mare's serum gonadotropin can be used to advance the breeding season of sheep. However, the problem of breeding sheep during anestrus or lactation remains unsolved.

The fertility of bull semen improves for a time after collection, reaches an optimum, and then declines as the spermatozoa age. Embryo mortality is inversely related to semen fertility. The optimum fertility, and thus minimum embryonic mortality, for sperm stored at 4°C is on the day after collection. The early improvement in fertility may be due to selective death of spermatozoa containing aberrant chromatin. The decrease in fertility and the increase in early embryonic death found after long storage periods may be due to disturbances of the genetic information system.

Several techniques have been developed for freezing ram semen in colored plastic straws, and bull and stallion semen in pelleted form. Ram semen may also be frozen by the pelleting method if freezing is rapid, if a low concentration of glycerol in a simple medium is used, and the equilibration period is short. There are striking seasonal and individual variations in the freezability of stallion semen. Polyols like xylitol are used for the protection of bovine semen during freezing.

Bull and buffalo semen is preserved at room temperature in a coconut water diluent. The coconut water is collected in Kenya, lyophilized in ampoules, and sent to Germany, where it is stored up to 1 year before it is used. Such semen is reliable for at least 4 days if sufficient attention is paid to laboratory hygiene and the semen is not kept at temperatures below 12°C. This method is being used to increase animal protein supplies of developing countries by eliminating the need for refrigerated semen in artificial insemination programs.

The proceedings of the congress, edited by Professor Charles Thibault, will be published by Station Physiologie Animale, C.N.R.Z., 78 Jouy-en-Josas, France. The site of the seventh congress in 1972 will be West Germany.

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## Calendar of Events—Courses

**Mass Spectrometry—Principles and Applications**, Ledgewood, N.J., 2–6 December. Will provide a basic understanding of the theory of operation and function of mass spectrometers. Will include functions of major assemblies; mechanisms of ion formation; application in inorganic, forensic medical, and geological fields; principles of focusing; and interpretation of cracking patterns. *Fee*: $190. (Center for Professional Advancement, P.O. Box 66, Hopatcong, N.J. 07843)

**Oceanography—Tour to Coasts of the World: South Pacific**, 11 January–1 February. This is a noncredit course which will cover intertidal and nearshore environment, Great Barrier Reef, coral atolls, coastal engineering, tropical marine biology, seismic sea waves, volcanoes, fjords, and beaches. (University of Washington, Division of Evening and Extension Classes, Seattle 98105)

**Photochemistry**, Moffett Field, Calif., 11–13 December. Intended for scientists, enigneers, medical researchers, students, and teachers, the program will emphasize a basic understanding of chemical and physical processes affected by light, including the methods of kinetics and quantum mechanics. The latest techniques for generating, detecting or measuring visible, ultraviolet, and vacuum ultraviolet radiation will also be summarized, with descriptions drawn from research in polymers, medicine, space sciences, and atmospheric photochemistry. (Letters and Science Extension, University of California, Berkeley)

**Communication Systems**, Washington, D.C., 9–13 December. Modern communication theory and its applications to communication systems, such as radar, satellite communications, and point-to-point digital transmission. (J. E. Mansfield, School of Engineering and Applied Science, George Washington University, Washington, D.C. 20006)