

- CLONTZ, G. W.. Personal correspondence. University of Idaho. Moscow, Idaho.
- ECONOMIC DEVELOPMENT ADMINISTRATION, 1972. A statistical reporting system for the catfish farming industry, methodology and 1970 results. U.S. Department of Commerce. Washington, D.C. p. 4.
- FAO, 1965. Agricultural projections for 1975 and 1985 (data compiled in 1960-62). United Nations, New York.
- FAO, 1966. Fisheries statistics yearbook, 1955. United Nations, New York.
- GAUCHER, T. A., 1968. Thermal enrichment and marine aquaculture. In ed. McNEAL, W. J., Oregon State University of Marine Science Center. Corvallis, Oregon. p. 145.
- HATANAKA, M., 1958. *Tohuku Journal of Agricultural Research*. 9 : 69.
- MINISTRY of Agriculture and Forestry, Japan, 1967. Yearbook of fishery statistics, 1950-1966. Department of Statistics, Fisheries Statistics Section. Tokyo, and personal correspondence.
- ORAVETZ, Charles. National Marine Fisheries Service, St. Petersburg, Florida, personal correspondence.

— — —

ESTROGEN, CORTICOSTEROID AND PROGESTAGEN PATTERNS IN THE
PREGNANT AND NONPREGNANT BOTTLE-NOSED DOLPHIN
Tursiops truncatus, FOLLOWING THE INTRAMUSCULAR AND
INTRAVASCULAR ADMINISTRATION OF NIH-FSH-OVINE-S9

by M. Richkind, MSc, DVM, FRVCE* and S. H. Ridgway, DVM, PhD**.

Summary

The increasing popularity of the bottle-nosed dolphin (*Tursiops truncatus*) in marinelands, coupled with restrictions upon their capture as set forth in the

* Division of Nuclear Medicine, Department of Radiological Sciences, Center for the Health Sciences, University of California, Los Angeles, California, U.S.A.

** Naval Undersea Research and Development Center, San Diego, California, U.S.A.

Marine Mammal Protection Act (P.h. 92-522, 210, October 1972) passed by the Congress of the United States of America has directed interest towards the problem of the propagation of the species in captivity. However, propagation of the bottle-nosed dolphin in captivity is not founded on sound reproductive husbandry practices due to a virtual lack of information about their reproductive cycles.

Behavior patterns in the bottle-nosed dolphin do not seem to correlate well with reproductive events in either sex. Further complications arise over the lack of any external morphological signs which correlate with active reproductive events. High plasma testosterone levels in the male have been observed during the seasons when births occur most frequently (HARRISON and RIDGWAY, 1971). Other than this observation, there are no data available about the reproductive hormones in the bottle-nosed dolphin. Consequently, it has become of interest to examine these parameters.

Methods

Blood samples from captive adult female bottle-nosed dolphins, *Tursiops truncatus* were collected as described by RIDGWAY (1965). Water was drained from the dolphin tanks, and the animals were guided onto stretchers. The stretchers were then lifted out of the water and secured. Blood was withdrawn from the central vessels on the ventral aspect of the fluke. All blood samples were collected in heparinized syringes and centrifuged. The plasma was removed and frozen at -20°C.

FIGURE 1

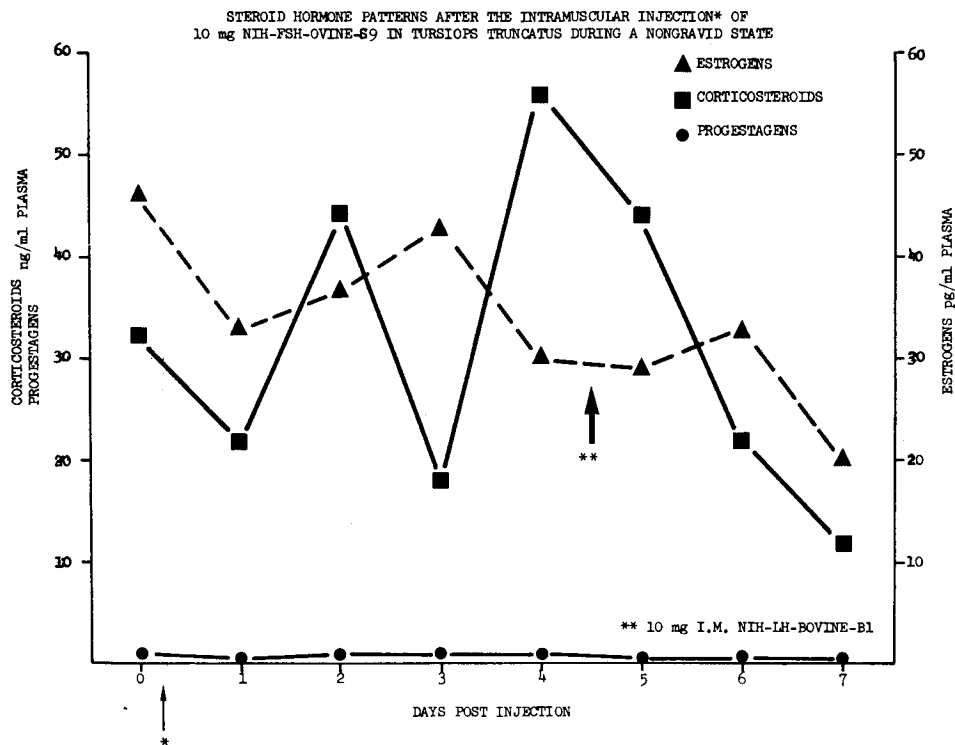
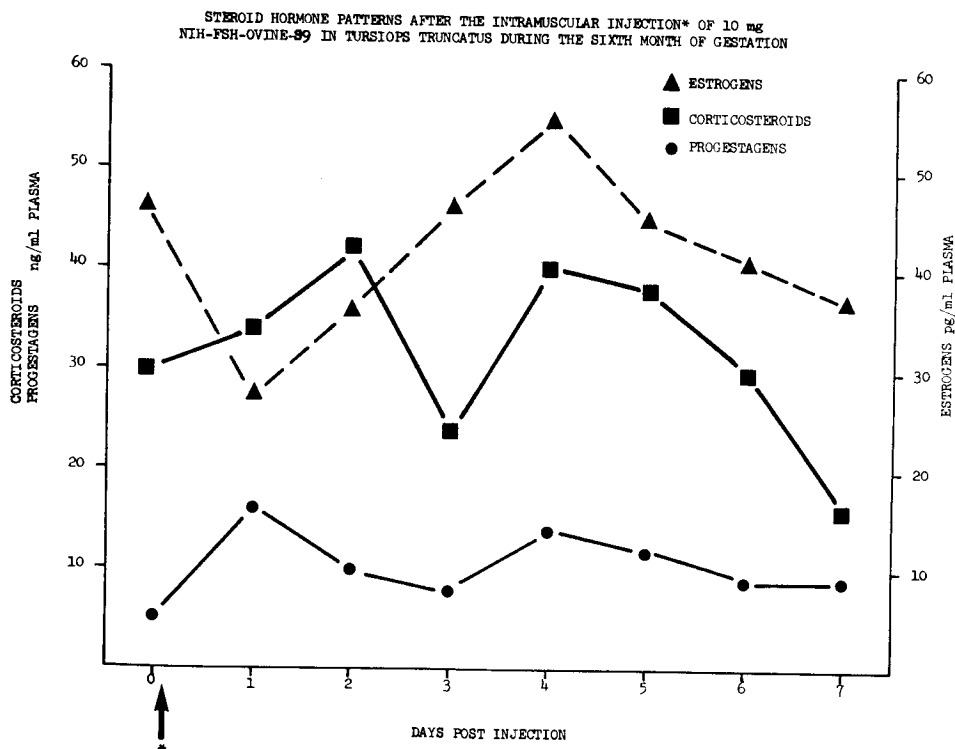


FIGURE 2



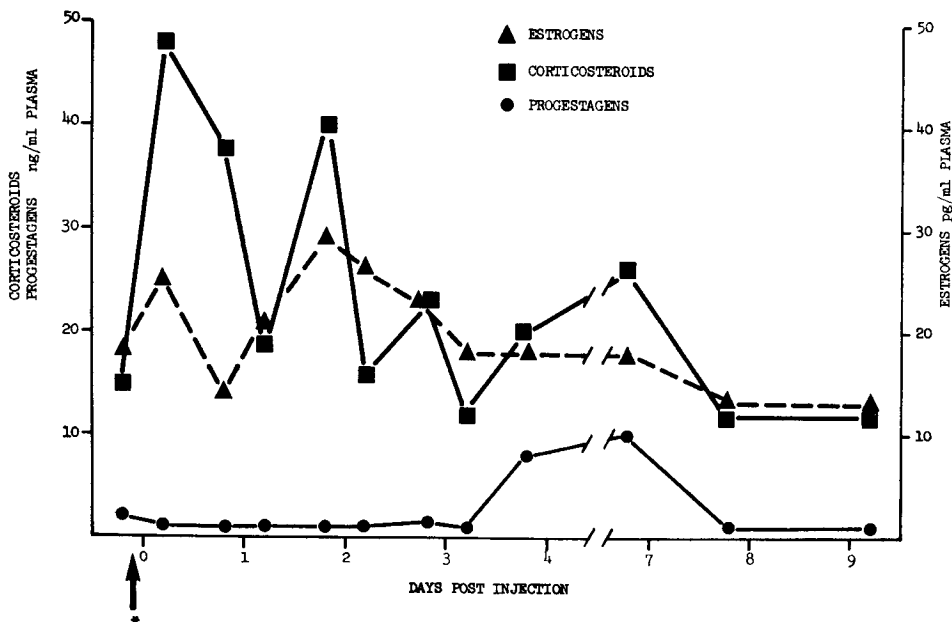
Plasma levels of estrogens, corticosteroids and progestagens were measured at different times of the year in ovariectomized and nongravid females and in gravid females in various stages of gestation. Ten milligrams of NIH-FSH-OVINE-S9 was administered intramuscularly to gravid females in midgestation (Fig. 2) and to nongravid females in December (Fig. 1). Ten milligrams of NIH-FSH-OVINE-S9 was administered intravascularly to gravid females in late gestation (Fig. 4) and to nongravid females in February (Fig. 3). Nongravid females and females in early gestation did not receive FSH (Table 1).

TABLE 1. Duplicate determinations of plasma levels of steroid hormones in single individuals measured by radioimmunoassay* and competitive protein binding**.

Adult female <i>Tursiops truncatus</i>	Estrogens* pg/ml	Corticosteroids** ng/ml	Progestagens** ng/ml
Ovariectomized	42.10	44.00	0.20
Intact (Dec.)	41.00	19.00	0.72
Intact (Feb.)	18.41	26.00	10.40
Intact (Feb.)	32.00	30.00	8.00
3 Months gestation	51.08	24.00	10.40
6 Months gestation	54.52	34.00	15.60
9 Months gestation	85.06	24.00	41.60

FIGURE 3

STEROID HORMONE PATTERNS AFTER THE INTRAVASCULAR INJECTION* OF 10 mg NIH-FSH-OVINE-S9 IN *TURSIOPS TRUNCATUS* DURING A NONGRAVID STATE



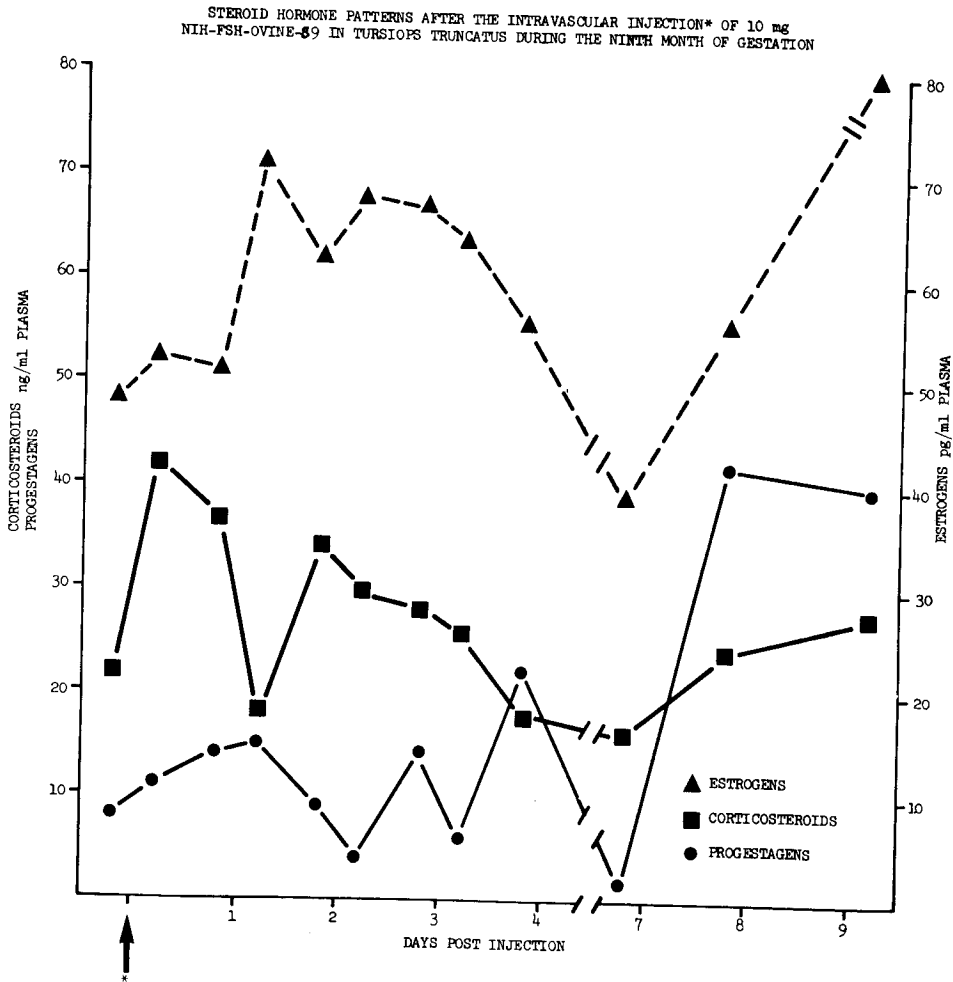
Estrogen levels in the plasma were measured by radioimmunoassay (HOTCHKISS, 1971). Corticosteroid levels were measured by competitive protein binding (RICHKIND, 1973) as were progesterone levels (NEILL, 1967).

Results and discussion

Plasma levels of estrogens, corticosteroids and progesterone were compared after the intramuscular administration of 10 mg NIH-FSH-OVINE-S9 during midgestation and the intravascular administration of 10 mg NIH-FSH-OVINE-S9 during late gestation in the bottle-nosed dolphin, *Tursiops truncatus*. Plasma levels of estrogens, corticosteroids, and progesterone were also measured in ovariectomized and intact individuals in the months of December and February and in individuals in the third, sixth, and ninth month of gestation.

Plasma levels of estrogens and progesterone were higher during the gravid state when compared to the nongravid state. These elevated plasma levels of estrogens and progesterone were best demonstrated during late gestation. However, plasma levels of estrogens and progesterone in individuals in early gestation were not strikingly different from plasma levels in intact, nongravid mature females. They were moderately different during midgestation and very different during late

FIGURE 4



gestation. Plasma levels of estrogens varied from 18.41 pg/ml to 42.10 pg/ml in ovariectomized and intact, nongravid, mature female individuals, while early, mid-, and late gestation individuals had plasma levels of 51.08 pg/ml, 54.42 pg/ml and 85.06 pg/ml, respectively. Plasma levels of progesteragens varied from 0.20 ng/ml to 10.40 ng/ml in ovariectomized and intact nongravid, mature female individuals, while early, mid-, and late gestation individuals had plasma levels of 10.40 ng/ml, 15.60 ng/ml, and 41.60 ng/ml, respectively. There was no difference observed between plasma levels of corticosteroids during the gravid and nongravid state. The plasma levels of corticosteroids varied from 12.0 ng/ml to 56.0 ng/ml.

Conclusions

Plasma levels of estrogens, corticosteroids and progesteragens in the bottle-nosed

dolphin are influenced more strongly by pregnancy than by administration of FSH. Females in late gestation showed striking differences in the plasma levels of these hormones when compared to nongravid females; differences between non-gravid females and females in early and midgestation were less apparent. The sudden increase in plasma levels of these hormones during late gestation may indicate an extramaternal source of steroid hormones.

Acknowledgements

The NIH-FSH-OVINE-S9 was a gift from the National Institutes of Health, Bethesda, Maryland.

References

- HARRISON, R. J. and S. H. RIDGWAY, 1971. Gonadal Activity in some bottle-nosed dolphins (*Tursiops truncatus*). *J. Zool. Lond.* 165: p. 355.
- HOTCHKISS, J., L. E. ATKINSON and E. KNOBIL, 1971. Time course of serum estrogen and L. H. concentrations during the menstrual cycle of the Rhesus monkey. *Endocr.* 89: p. 177.
- NEILL, J. D., E. D. B. JOHANSSON, J. K. DALLA and E. KNOBIL, 1967. Relationships between the plasma levels of L. H. and progesterone during the normal menstrual cycle. *J. Clin. Endocr.* 27: p. 1167.
- RICHKIND, M. and L. E. EDQUIST, 1973. Peripheral plasma levels of corticosteroids in normal beagles and greyhounds measured by a rapid competitive protein binding technique. *ACTA Vet. Scand.* 14: p. 745.
- RIDGWAY, S. H. 1965. Medical care of marine mammals. *J. Am. Vet. Med. Assoc.* 147: p. 1077.

FIBREOPTIC GASTROSCOPY IN AN ANAESTHEZISED WALRUS (*Odobenus rosmarus*)

by Hagenbeck *, Dr. Med. vet. C.C., Priv. Doz. Dr. med. H. Lindner **
and Dr. med. D. Weber ***

Introduction

Keeping walruses in Carl Hagenbecks Tierpark is a tradition since its founding. Eight young walruses could be seen in 1908 in the recently completed polar-

* Hagenbecks Tierpark, Hamburg, Germany.

** DRK Krankenhaus, Hamburg, Germany.

*** DRK Krankenhaus, Hamburg, Germany.