species during restraint. The data presented here show that the animals used in these experiments have an extremely labile cardiac response to the asphyxia of diving and suggest that cardiovascular responses similar to those previously described in other aquatic animals are also present in this species. They suggest, furthermore, that the intensity of the circulatory response to diving is subject to control depending on the anticipated duration of the dive, a purposeful sounding apparently producing the most profound response.

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Diving Bradycardia in the Unrestrained Hippopotamus

THE slowing of heart rate in animals and birds responding to the asphyxia of diving has been noted many times since the early observations of Bert in 1870 (ref. 1). More recently, the diving bradycardia has been shown to be associated with major circulatory changes in which the blood flow in viscera and skeletal muscle is reduced without change in the arterial blood pressure. Additional evidence suggests that coronary and cerebral circulation is maintained[2–4].

Physiological studies on diving animals have not included the hippopotamus. Although clearly an aquatic animal, the diving times of the hippopotamus averages about 1 min or less[5]. An opportunity to measure heart rate during diving in a hippopotamus was made available at the San Diego Zoo. A 6 month old male hippopotamus weighing an estimated 200 lb. was fed daily by hand and sufficiently handled to become accustomed to the presence of the research workers. After 10 days it became tame enough to tolerate considerable handling.

Electrocardiograph electrodes (1 in. square) were embedded in 8 in. rubber disks and cemented to the dorsal surface of the animal. 100 ft. of shielded cable leading to a Sanborn 'Visette' electrocardiograph apparatus was attached to the electrodes. The gate to the hippopotamus pool was opened, and the animal walked slowly into the pool and dived and surfaced repeatedly in an undisturbed manner. The electrodes remained attached for 6 min, and during this period six dives occurred. The resulting electrocardiograms were suitable for determining the heart rate. Typical rates obtained during two short dives are shown in Fig. 1.

The profound bradycardia observed matches that seen in other aquatic animals such as harbour seals, and suggests that major circulatory adjustments to diving also take place in this species.

I thank Dr. Charles R. Schroeder, director of the San Diego Zoo, for making available the experimental animal and the facilities of the Zoo and for his enthusiastic support. Mr. Ephraim Galvez, hippopotamus keeper, gave competent assistance throughout the training period and during the experiment.

This investigation was supported in part by a U.S. Public Health Service research grant from the National Heart Institute.

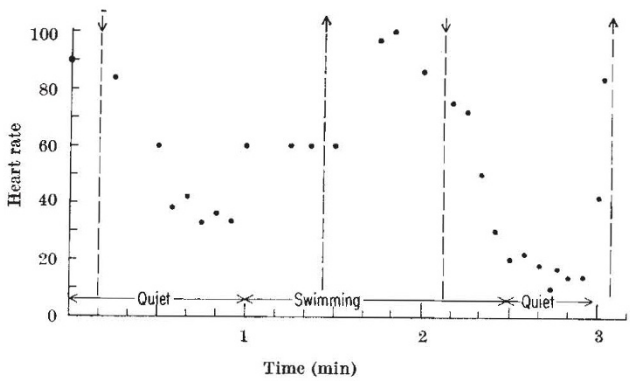

Fig. 1. Heart rate of the hippopotamus during two spontaneous dives (indicated by arrows).

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Effects of Human Chorionic Gonadotrophin on Capacitation of Rabbit Spermatozoa

SPERM capacitation is the acquisition in the female genital tract of the ability to penetrate the zona pellucida[1,2]. In the rabbit the process is said to require a minimum of 6 h in the uterus[2] and in the oviduct as well[3]. In experimental studies on capacitation, capacitated sperm can be obtained by two different methods: either spermatozoa from the ejaculate or from the epididymis are deposited surgically in the female tract (uterus or oviduct), or sperm are deposited in the vagina by normal mating or artificial insemination. Capacitated sperm can be recovered from the uterus 6 h or more later. When capacitation is evaluated in terms of yield of fertilized ova from suitable recipient does, it appears that surgical deposition results in lower efficiency of capacitation than does deposition by normal mating. Adams and Chang[4,5] compared the two methods of preparing capacitated sperm and found that the yield of fertilized ova was 16 per cent with surgical deposition but 60 per cent with normal mating. Similar results were found in our laboratory[9] and, although a different experimental procedure was used, average yields of 15·4 per cent and 69·3 per cent fertilized ova were observed, respectively, for the two types of capacitation methods[9]. The obvious difference between the two methods is the presence of coital stimulus in one and its absence in the other. Coital stimulus in the rabbit causes the release of pituitary LH (luteinizing hormone) which in turn induces ovulation. Experimentally, ovulation is induced by intravenous injection of LH[4] (30 I.U.) or of HCG (human chorionic gonadotrophin) (25 I.U.), but the amount of LH actually released following normal mating is not at present known. We therefore investigated the effectiveness of capacitation after surgical deposition of sperm in the uterus of oestrous does.

The does are divided into three sets and receive, before operation, doses of HCG in multiples of the minimum