1968 #2

# THE ABDOMINAL PORES OF DOGFISH

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Abdominal pores are found in several types of primitive fish including cyclostomes and elasmobranchii. In the cyclostome fishes they function as apertures through which ova and sperm leave the body. Their structure and function in elasmobranchii have received only minimal attention (e.g. see Year Book of the American Philosophical Society, 1959, p. 238) since the earlier investigations of Bles and Weber (J. Anat. Physiol. 32:484, 1898; Morphologische Jahrbuch 12:366, 1886). The pores of elasmobranchii are not, however, concerned with the passage of sex cells.

This report is a preliminary account of some of our studies of the abdominal pore in the dogfish, Squalus acanthias.

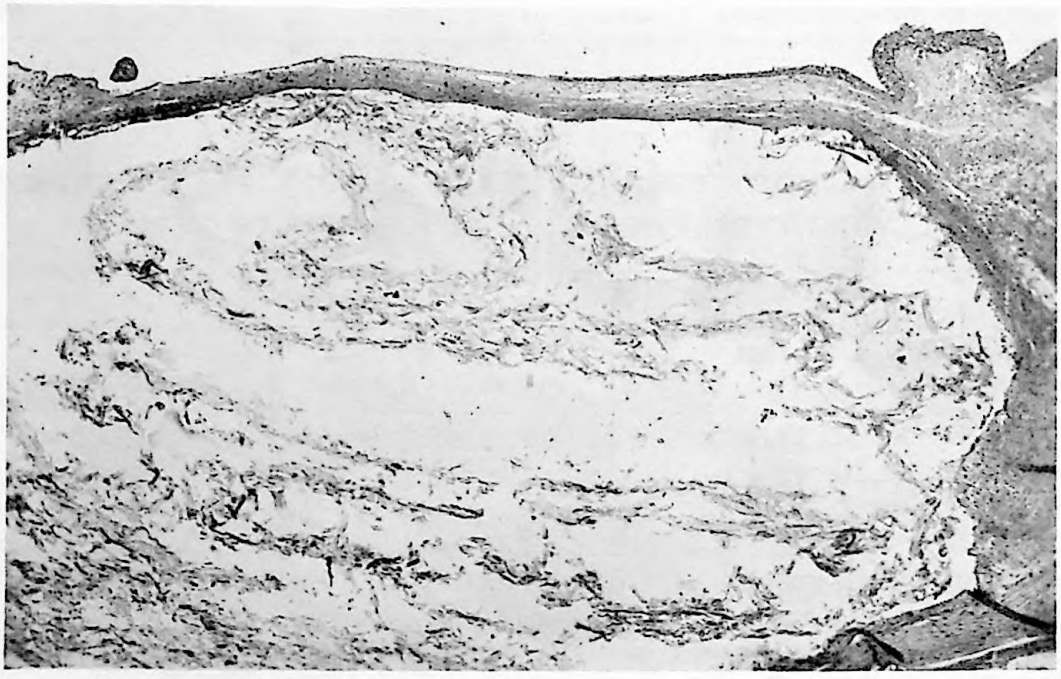

Figure 1. Low power photomicrograph of abdominal pore membrane. Abdominal cavity below and external surface above. Debris in abdominal cavity includes sloughed mesothelial cells and precipitated proteinaceous material. Hematoxylin and eosin. X35.

The abdominal pores in the dogfish are paired and located in the cloacal region. The pores form a channel of communication from the abdominal cavity to the exterior and are occluded by a thin membrane. Upon intraperitoneal (i.p.) injection of 10 ml of trypan blue (in dogfish Ringers) the pores are readily visualized. The pores were never open initially when examined in 29 fish of both sexes as evidenced by failure of dye to leak or stream out. However, dye would generally jet or leak out the pores after a period of 19-24 hours, although in some fish the pores did not ever open, and in a few fish the pore membrane became permeable within six hours after instillation.

After injection of 10 ml bromphenol blue i.p. (dissolved in dogfish Ringers) this dye was also excreted. However, after i.p. injection of 10 ml of dogfish blood to 2 male fish, the pores were not open when examined for periods up to 24 hours.

After i.p. injection of 10 ml trypan blue, different drugs were injected i.v. to different dogfish (at least 2 fish for each drug) to see if the pore would respond to a pharmacologic stimulus. Neither pilocarpine (0.2 mg/kg), epinephrine (5-10 $\mu$g/kg), neostigmine (0.1 mg/kg), d-tubocurare (1 mg/kg), acetylocholine (0.3 mg/kg), histamine (0.02 mg/kg), nor pitressin (1 unit/kg i.m.) opened the pore when examined for periods up to 3 hours. Injections of 50-100 ml of dogfish Ringers i.p. or 50 ml of air i.p. also did not open the abdominal pores.

The membrane of the abdominal pore is easily penetrated by polyethylene tubing permitting sampling of coelomic fluid. Dogfish whose pores had thus been opened were able to survive for at least a period of 7-10 days in a large circular pool.

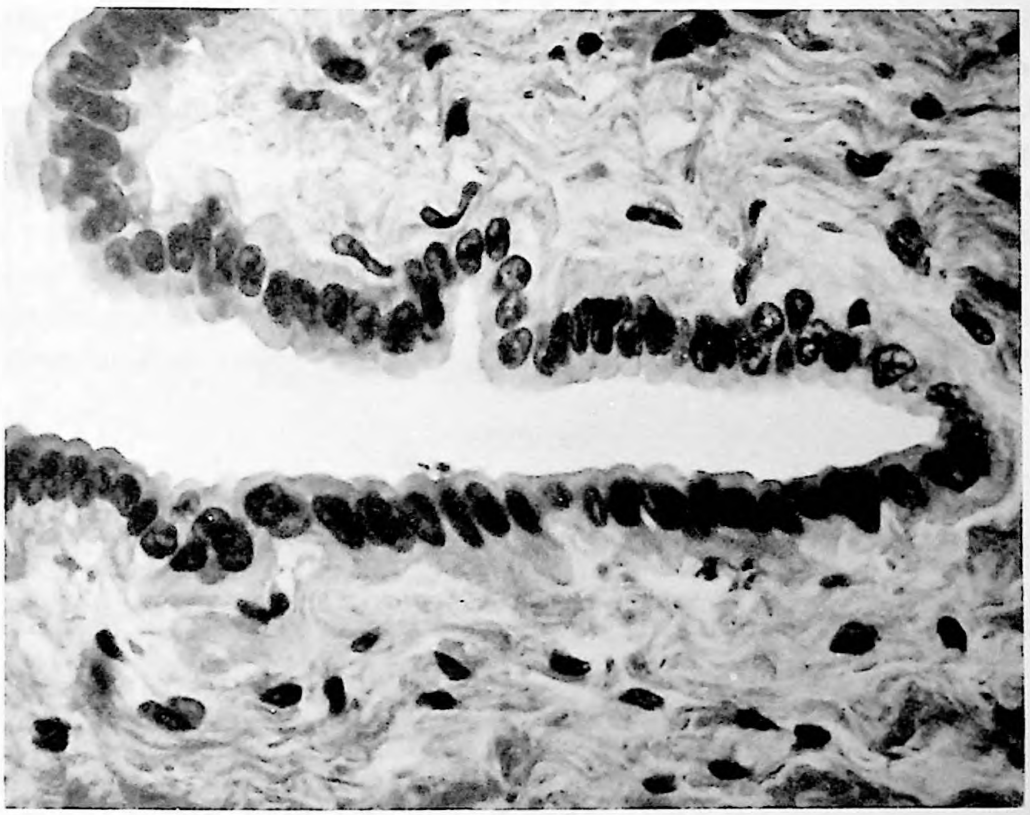

Figure 2. Mesothelial lining of pore membrane taken from a dissected membrane. Prompt fixation gave better preservation of histologic detail than was possible in block fixed specimens. Hematoxylin and eosin. X520.

Histological studies of the abdominal pore were also performed. The lower abdominal regions of 3 adult dogfish, with both abdominal pores intact, were fixed in formalin and embedded in paraffin. Semi-serial sections were made through the abdominal pores at intervals of 60 microns. About 80 to 100 sections were examined on each pore membrane. The membranes appeared to form a continuous covering and no apertures or fenestrations were seen. The membrane had a thickness of about 0.08 mm at its thinnest point (Fig. 1). The outer surface of the

membrane was covered by a thin layer of stratified epithelium continuous with that covering the rest of the body, but much thinner. The inner surface of the membrane was covered by a single layer of cuboidal mesothelial cells (Fig. 2), continuous with the lining of the peritoneal cavity. The space between the two layers of surface cells was occupied by collagenous tissue, containing lymphatic and small blood vessels.

1968 #3

## LACK OF EFFECT OF M-99 IN THE DOGFISH AND LOBSTER

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M-99 (Etorphine or 19-Propylorvinol) is one of a series of potent analgesics derived from thebaine. This compound has been especially useful for the capture of large wild ungulates. For example, the dose used for the capture of white rhinoceros ranged from 0.13 to 11.8 $\mu$g/kg body weight (Fed. Proc. 26:1251, 1968). We have studied the effects of M-99 in the dogfish (Squalus acanthias) after i.v. or intra-arterial administration and in the lobster (Homerus americanus).

M-99 was injected into six male dogfish at three different dose levels—0.1 mg/kg, 1 mg/kg, and 3 mg/kg and the overt behavior of the fish was observed intensely for 3 hours and less frequently for 4-8 days. The dogfish appeared normal at all times, and were never tranquilized, sedated or excited during this observation period. M-99 also had no effects in lobsters in doses up to 1 mg/kg. A phylogenetic study of the site of action of M-99 would be of interest.

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## ANATOMICAL OBSERVATIONS IN THE HARBOR SEAL, Phoca vitulina

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During the course of the summer opportunity was provided to obtain plastic casts of various portions of the circulatory system in four seals. We injected Batson's corrosion compound and macerated the tissues by immersion in 20N KOH, for 48 to 72 hours. Casts were obtained of the cerebral arterial tree, the coronary circulation and the systemic venous bed. The cerebral arterial and coronary circulations had no unusual distinctive features as compared to other mammals. Figure 1 illustrates a cast of the systemic venous bed obtained by injection into the superior vena cava. The casting medium filled retrogradely two conspicuous subdural veins, the stellate plexuses of both kidneys, the double inferior vena cava and the enormous hepatic sinus (HS). These findings confirmed previous descriptions of the venous system in seals by Harrison et al. (Proc. Zool. Soc. London 126:205-33, 1956).