

Fig. 2. Diffusion chamber with homografted transitional epithelium 35 days; alcohol. Gomori reaction ($\times c. 10$). *a*, Bone tissue outside the chamber

In some cases inside the chamber not only epithelium layers but also connective tissue were growing without the two mixing. Osteogenesis inside the chamber was not observed. On the 30th day after implantation proliferation of host connective tissue around the chamber was obscure and the Gomori reaction was negative (Fig. 1 *A*). In this tissue distinct phosphatase-positive areas of typical osteogenesis could be recognized (Fig. 2). They were composed of osteoblasts and periodic acid-Schiff-positive bone trabeculae (Fig. 3). Some of them were lying in close contact with the host surface of the filter (Fig. 2); the others were some distance from it (about 80μ) (Fig. 3). Osteogenesis was evoked on the host side of the 'Millipore' filter opposite the transitional epithelium occupying the inner surface of the filter. This transitional epithelium had a high content of glycogen.

The details of histogenesis of bone induction with the characteristics of connective tissue outside and



Fig. 3. Bone tissue induced in the host connective tissue outside the chamber 30 days; alcohol. Periodic acid-Schiff hematoxylin. ($\times c. 20$)

inside the chambers as well as alkaline phosphatase and polysaccharide distribution in the filter itself will be described elsewhere. The results of other investigators and our own results show that the implantation of the diffusion chamber itself does not induce osteogenesis in the surrounding tissue. On the other hand, even the single epithelial cells can be easily recognized in the connective tissue, especially by using periodic acid-Schiff and Gomori reactions. This is why the absence of the epithelium outside the chamber and the intact character of the filters prove that the inductive influence originates only in the epithelium, lying inside the chamber.

Thus, the transitional epithelium induces osteogenesis by means of a cell-free substance which can diffuse through the filters in the same way as substances from the spinal cord⁶ and osteogenic tissue⁷ do.

It can be assumed that the transitional epithelium of normal urinary bladder produces and secretes the inducing substance in the same way as it did in the diffusion chamber. My results show that when epithelium is separated from vessels, it produces in the underlying connective tissue a concentration of inducing substance which is sufficient for osteogenesis at a distance of at least 150μ from the epithelium. Questions arise not only concerning the chemical nature of the inductor, but also its physiological significance (in particular, whether it is hormonal in nature⁸). The reasons why connective tissue growing inside the chamber as well as the urinary tract mucosa do not ossify are also of interest. It may depend on the tolerance to inducing influences of the connective tissue of the urinary tract. It may be, however, that in normal conditions the inductor is liberated predominantly in the vessels, or, on the contrary, excessive concentration of the inductor may not be effective. The investigation of these possibilities is now in progress.

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Uptake of Water by the Lizard, *Moloch horridus*

Moloch horridus is an agamid lizard living in the desert regions of Western and South Australia. It weighs as much as 50 gm. and has been described by Buxton¹ as "a repulsive animal with tubercles and spines, it has the power of absorbing water through the skin after showers of rain". This ability of absorbing water through the skin is characteristic of many Amphibia and is correlated with a ready loss of water by the same route². Reptiles living in arid conditions would find a water-permeable skin uneconomical for water conservation so that this mode of taking up water may be questioned for *Moloch*.

The following experiments were therefore made to investigate the uptake of water. This was estimated by changes in weight after the animal had been lying with its belly in water, the results being expressed as

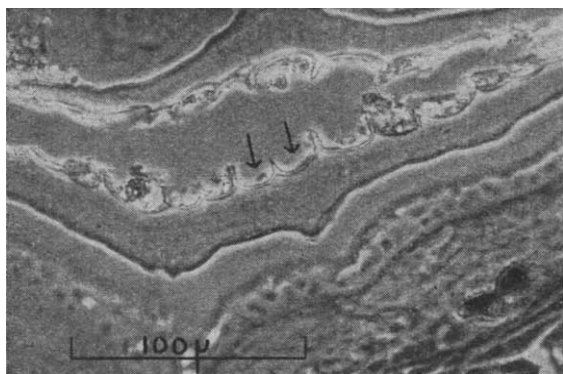


Fig. 1. Section through a skin fold showing the keratin ridges. Phase contrast photograph of a stained preparation. The arrows point to the channels in the keratin layer

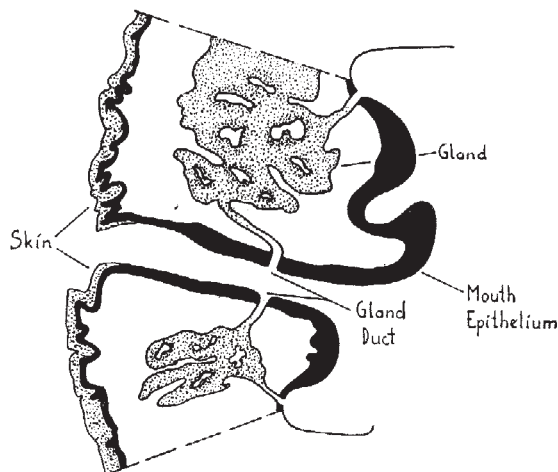


Fig. 2. Diagrammatic vertical section of the upper and lower lips reconstructed from stained serial sections

mean percentage gain in weight \pm the standard error for six animals. Adequately hydrated animals, that is animals that had been allowed free access to water, when placed in water gained $2.68 (\pm 0.1)$ per cent in weight in the first 5 min. and did not gain thereafter. If, however, the animals had been made deficient in water by the intraperitoneal injection of 2 ml./100 gm. body-weight of 3 per cent sodium chloride 24 hr. before the experiment, then the gain in weight continued after the first 5 min. even though the animal did not drink in the usual manner. Thus after 95 min. the gain in body-weight was 5.6 ± 0.4 per cent and after 155 min. 6.5 ± 0.7 per cent. While the weight was increasing the jaws were noticed to be opening and closing and the significance of this was investigated by holding the jaws closed with adhesive tape. Then water-deficient animals, when lying in water, gained in weight an amount similar to the adequately hydrated animals (2.67 ± 0.1 per cent) in 5 min. and did not gain weight thereafter. If, however, the tape was removed, then the jaws started to move and a further gain in weight ensued.

During the first 5 min. the skin, like blotting paper, appears to absorb water and indeed an advancing water front can be seen moving over the skin. When the water reaches the mouth the water-deficient animals move their jaws and take in water. As confirmation, an animal deficient in water was allowed to lie in water containing a colloidal dye (Evans blue).

Later the dye was found in the stomach despite the fact that drinking in the ordinary way was never seen.

The movement of water over the skin seems to be by capillarity along fine open channels in the outer keratinized layer of the skin. These channels are about 20μ across and are separated from one another by sharp keratin ridges (Fig. 1). The lips are well supplied with mucous glands some of the ducts of which open on to the opposable surfaces of the lips (Fig. 2). Possibly water from the skin on reaching the lip edges mixes with the hygroscopic mucus, is passed into the mouth and swallowed.

Ditmars³ described what appeared to be absorption through the skin in another genus of agamid lizards, the *Uromastix*. These lizards live in the desert regions of North Africa and South-West Asia and it seems likely that a mechanism may operate in these animals which is similar to that in *Moloch*.

The ecological significance of this mechanism may be that animals with an impervious skin suitable to the desert can still use it to collect water, from dew or sporadic showers, which is then swallowed.

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Function of the Inferior Vena Cava Valve of the Harbour Seal

THE anatomical descriptions of the venous system of the seal have impressively described the large hepatic venous sinuses and the existence of a sleeve-like valve surrounding the inferior vena cava¹. These hepatic venous sinuses are capable of holding a large volume of blood¹. It has been tempting in the past to assume that the purpose of this anatomical system was to store a large volume of blood in the hepatic venous sinuses for use during periods of diving. This would require that the inferior vena cava valve impede flow of blood from the abdominal cavity during diving.

Five young female harbour seals (*Phoca vitulina*) were studied to ascertain the time of constriction of the inferior vena cava valve. They were maintained in live cars floated in the bay, fed fresh herring, and remained healthy throughout the period of investigation. The seals were trained to dive using a teeter-board tilted into an aquarium as previously described².

Advantage was taken of two anatomical features of the seal. Its jugular vein is rudimentary in nature and returns little blood from the cranial vault¹. The major portion of the venous blood from the cranial cavity returns via the extradural vein (Fig. 1) and enters into the veins in the abdominal cavity by way of the renal venous plexus. A plastic cannula was threaded into the extradural vein through a thin-walled needle inserted through an area anaesthetized with 'Meticaïne'. The cannula was then advanced to the level of the neck of the seal. Albumin labelled with iodine-131 and Evans blue were used as indicators and were either administered superior to the inferior vena cava valve by way of the fore flipper vein, or administered caudally to the vena cava valve by way of the renal venous plexus or the hind flipper veins.