towards the adult condition in color, *i. e.*, green dorsally and yellow ventrally, the keeling of the tail and general reactions among all the efts given prolactin was so profound that within 3 to 4 weeks they could be distinguished from adult water-stage controls only by their smaller size.

The effect of prolactin on the land phase of *Triturus viridescens* has thus been shown to be identical in every way with that of implants of anterior lobes from adult water stages. So far as is known, the return of Triturus to water is essential for reproduction. If prolactin is a normal product of the Triturus pituitary and really is the water drive factor then the process of migrating to water for the purpose of reproduction may be considered a total reaction of the organism similar to—or analogous with—the maternal behavior and broodiness which prolactin induces in organisms much higher in the phylogenetic scale. This possibility is quite in line with the statement of Riddle and Bates[4] that "lactogenesis is a response to prolactin which excites also—in both sexes—additional responses more ancient phylogenetically and more significant generally".

Summary. Prolactin induces the water drive in normal, thyroidectomized or gonadectomized land phases of *Triturus viridescens* within 10 days, irrespective of their size or sex. It induces repeated molting in efts with normal thyroids but not in efts deprived of their thyroids. It causes also the rapid assumption of the adult coloration and finally the appearance of adult structural characteristics.

11674 P

Emulsions of Ethylaminobenzoate as Topical Anesthetics.

R. BEUTNER AND K. R. BEUTNER.

From the Department of Pharmacology, Hahnemann Medical College, Philadelphia.

Ethylamino benzoate, the mother substance of procaine, butyn, and many other local anesthetics, is in itself a valuable surface anesthetic, but is difficult to use on account of its insolubility in water and its inability to form water soluble salts. The solutions in alcohol are too irritant, the solutions in fats too inactive. Attempts were therefore undertaken to use ethyl amino benzoate (also known as benzocaine) in the form of a finely divided suspension in watery colloid solution. However, the use of various hydrophilic colloids

[4] Riddle, O., and Bates, R. W., *Sex and Internal Secretions*, 1939, 1089.

per se proved *inadequate* to keep this drug in finely divided suspension and in a pharmacologically active state. Such a suspension even when containing 5% of benzocaine failed to produce any anesthesia when applied to a rabbit's cornea. A solution of this problem was found by first suspending a resin, preferably a phenol resin or mastix in a watery solution of acacia and subsequently adding "benzocaine" to it. In this manner a stable suspension was formed in which the benzocaine functioned as a potent local anesthetic.

While in the absence of the resin "benzocaine" settles completely in about a day, the resin containing suspension settles only to a slight extent. More important is the lasting local anesthetic effect which it produces particularly if phenol resins are used. Upon instilling a 1% benzocaine suspension containing about 4% resin on a rabbit's cornea a superficial local anesthesia lasting from 1 to 5 hours was obtained.

However, some of these resins had in themselves a feeble effect upon the cornea, either slightly irritant or anesthetic. In order to eliminate this effect, one eye of a rabbit was instilled with a 4% resin solution without benzocaine while the other eye was treated with the same emulsion plus 1% benzocaine, and the time of extension of the local anesthesia was noted. This addition of benzocaine extended the time of superficial local anesthesia of the rabbit's eye at least one hour in one case, but over 2 and up to 5 hours in 4 other cases. In these experiments the dispersing agent used was a phenolic resin which has a slightly anesthetic action *per se*.

In another set of experiments the anesthetic effect of finely powdered benzocaine dusted upon a rabbit's cornea was compared with the local anesthetic effect of benzocaine *1%* suspended by means of resin as described. The massive dusting of the eye with the pure local anesthetic proved to be far less efficient than the application of the dilute emulsion; to quote just 2 of several experiments: the emulsion instilled on the left eyes of 2 rabbits gave an anesthesia lasting 3 hours and 50 (or 53) minutes; the right eyes of the same animals were dusted as described but were anesthetized for only 1 hour and 26 to 27 minutes

Even less active than the dust was a 1% benzocaine solution in corn oil (which is an almost saturated solution). This gave only 46 to 47 minutes of anesthesia in the left eyes of 2 rabbits while the right eyes of the same animals, treated with the 1% benzocaine emulsion, remained anesthetized for over 4 hours. Alcohol solutions of benzocaine were not tried on account of the overwhelming irritation they cause to the eye.

It is important that a 1 or 2% procaine hydrochloride solution

was found to be even much less active than the oil solution just described, under the same conditions, giving an anesthesia of less than 10 minutes or none at all in some cases. This means that "benzocaine", when rendered soluble by the attachment of a diethyl amino group plus HCl (which is procaine HCl) is a less active surface anesthetic than unmodified benzocaine if it is only finely divided, suspended in water.

Conclusions. By a suitably fine dispersion in water benzocaine can be rendered efficacious as a topical anesthetic, to a higher degree than when powdered on the mucous membrane in pure form, or when dissolved in oil, or when rendered water soluble as a diethyl amino compound (=procaine).

11675

Immunological Studies on Intestinal Theiler's Virus, and Its Relation to Poliomyelitic Virus.*

PETER K. OLITSKY.

From the Laboratories of the Rockefeller Institute for Medical Research, New York City.

The properties of Theiler's virus (mouse encephalomyelitis, or so-called "mouse poliomyelitis") as it is found in the intestines of practically all normal albino mice of young adult and mature age, or as it occurs in mice having the spontaneous or experimental disease, have recently been described.[1, 2] The similarity of Theiler's virus to that of human poliomyelitis in many characteristics has been pointed out[1, 2] although Theiler[3] has shown that there is no relationship between them in immunological reactions or in host-susceptibilities. Now that there is at hand the intestinal form of the mouse virus, it was thought desirable to make further attempts to determine the relation of this agent to the virus of poliomyelitis. To this end, studies on the possible existence of active and passive cross immunity were

* The writer thanks Dr. M. Theiler for his cooperation, Dr. E. H. Lennette for a sample of pooled, monkey poliomyelitic antiserum, and Mr. P. Haselbauer for technical assistance.

1 Olitsky, P. K., PROC. SOC. EXP. BIOL. AND MED., 1939, **41**, 434; 1940, **43**, 296; *J. Exp. Med.*, 1940, **72**, 113.

2 Theiler, M., and Gard, S., *J. Exp. Med.*, 1940, **72**, 49, 79.

3 Theiler, M., *J. Exp. Med.*, 1937, **65**, 705.