are fastened to the frame with coiled spring wire. This permits the animal to be held firmly but is still elastic. Under such conditions the animals are restrained but not immobilized. They do not feel frightened and remain quiet and docile upon the board.

Mr. B. Dan, Supervisor of Equipment of the Institute of Pathology, Western Reserve University, has given suggestions for some mechanical features and his help is gratefully acknowledged.

5526

Pharmacology of Ruvettus Pretiosus, or "Castor-Oil Fish."

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Ruvettus pretiosus is a deep-sea fish inhabiting the Southern Pacific, the flesh and bones of which contain a fat or oil known to South Sea Islanders as a purgative agent.[1] At the suggestion of Dr. E. W. Gudger, of the American Museum of Natural History, who described the biology of the fish,[2, 3] a pharmacological study was undertaken of the oil obtained through Mr. Donald G. Kennedy, of Vaitupu, Ellice Islands, South Seas. The physical and chemical constants of the specimen studied, as determined by Dr. Warren M. Cox, were as follows:

Density $\frac{25}{25}$	0.8725
Density $\frac{25}{4}$	0.8700
Iodine No.	74.42
Saponification No.	124.0
Refractive Index $\frac{25}{D}$	1.4628

Preliminary experiments revealed that 10 to 15 cc. of *Ruvettus* oil administered to a cat by stomach tube was followed by an abundant soft stool after 2 hours. In dogs, 25 to 30 cc. of the oil have the same effect. The oil being limited, a special method of pharmacological experimentation was devised for quantitative and comparative studies. This consisted in preparing a thick suspension of finely divided animal charcoal and introducing from 0.5 to 1 cc. by

[1] Lowe, *Trans. Zool. Soc., London*, 1841, **2**, 180.

[2] Gudger, *Boston Med. and Surg. J.*, 1925, **192**, 107.

[3] Gudger, *Am. Naturalist*, 1928, **62**, 467.

means of a "stomach tube" into rats previously fed on a standard dry diet and allowed to fast a day before the experiment. The rats are killed at the end of a suitable period of time, usually 50 minutes; and the entire gastrointestinal tract is excised and spread out on the table. The distance traversed by the carbon suspension, seen through wall, is carefully measured and expressed as a percentage of the total length of the intestine. 0.1 to 0.2 cc. of an oil or other substance to be examined is given in the same way together with the black emulsion; comparative figures are thus obtained as to the laxative effect of a substance and normal controls. *Ruvettus* oil is as laxative as castor oil but the pharmacodynamic mechanism is different. Castor oil produces purgation by virtue of its *saponifiable* fraction, namely, ricinoleic acid. When *Ruvettus* oil is separated into the saponifiable and unsaponifiable fractions, it is the *latter* which is purgative. Studies on isolated intestinal loops by Moreau's method show that the *Ruvettus* oil is not irritating and causes only slight increase of intestinal secretion and mucus and less congestion than is produced by castor oil. *Ruvettus* oil does not act as a purgative when injected subcutaneously or intramuscularly. Emulsions injected intravenously are not toxic, producing only transient fall in blood pressure in cats and dogs and not affecting the respiration at all. Further pharmacological study made a thorough chemical analysis of the oil imperative.

Warren M. Cox, Jr., made an exhaustive chemical study, while the pharmacological examination of numerous fractions and other compounds he prepared was carried out by the present authors. This work is still in progress but the findings so far obtained are here described.

The principal constituent of the saponifiable portion of *Ruvettus* oil was found to be oleic acid and the comparatively low iodine numbers obtained from various fractions studied indicated that there was very little unsaturation of a higher order than the mono-ethylenic. The more important *unsaponifiable* portion of *Ruvettus* oil was also fractionated by Dr. Cox; and its principal constituent is the *saturated* compound cetyl alcohol, $C_{16}H_{33}OH$. The most important *unsaturated* compound in the unsaponifiable portion of the oil is oleyl alcohol. Comparative pharmacological tests were made with ethyl esters of *oleic* and *hydroxy-oleic* acids, on the one hand, and with *cetyl acetate* and *oleyl acetate,* on the other. The following table shows the relative laxative effects for rats, by the above method, of olive oil, castor oil, *Ruvettus* oil and the principal fractions mentioned. In each case, 0.1 cc. of the compound was administered with a carbon suspension.

TABLE I.

		Average Distance Traversed (% of total length)
I	Controls	45
II	Olive oil	55
III	Castor oil	70
IV	*Ruvettus* oil	68
V	Saponifiable fraction	
	a. Saturated compound—ethyl oleate	63
	b. Unsaturated compound—ethyl hydroxy oleate	59
VI	Unsaponifiable fraction	
	a. Saturated compound—cetyl acetate	77
	b. Unsaturated compound—oleyl acetate	74

The most active compound from the purgative standpoint was *cetyl acetate*. The action of cetyl alcohols and their esters were studied. Eight hexadecanols were prepared by Dr. Cox and Professor Reid, and the 8 alcohols with their 8 acetates were obtained in small quantities but in pure form. Various hexadecanols and their acetates were examined by the rat method and also on isolated segments of cat's intestine by a method devised by the authors, to be described elsewhere. The various hexadecanols and their esters differ from each other pharmacodynamically both *quantitatively* and *qualitatively*. The 2 compounds which were strikingly stimulating to the intestinal movements are 2 ethyl-2 dodecyl-ethanol 1; 2 hexyl-2 octyl-ethanol 1.

A roentgenological investigation of all the compounds studied is in progress and results obtained so far completely agree with the findings described above.

5527

A Method for Interval Determinations of Liver Glycogen in the Same Dog.

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(Introduced by E. A. Graham.)

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In most experiments heretofore described for the study of changes in liver glycogen, a series of animals are used, one of which is sacrificed at the end of a given period. Cori[1] has described a method of obtaining several samples of liver from the same animal for the determination of liver glycogen. The advantage of repeated obser-

[1] Cori, C. F., Cori, G. T., and Pucher, G. W., *J. Pharm. and Exp. Therap.*, 1923, **21**, 377.