SCIENTIFIC SECTION

QUANTITATIVE APPLICATIONS OF THE MODIFIED TÜRK TEST.*[1]

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A number of local anesthetics, analgesics, hypnotics and sedatives have been tested for their relative potencies on intact frogs or on isolated tissues (1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13). Qualitative tests have been made by painting the skin, by direct immersion of the entire frog, or of one or both feet. Tests upon the sensitivity of the frog's foot have been conducted under a procedure to which the name "Türk" Test is applied. *Rana pipiens* (frogs) weighing between 15 and 40 Gm. were stored in running water at temperature of 15° C. for several days before use. Each frog was then removed from the storage bath and the brain destroyed by pithing. In a few instances Van Leeuwen's suggestion to decerebrate or decapitate was followed, but without improving the delicacy or accuracy of the method (6). After an interval of from five to ten minutes, to allow shock to pass off, the sensitivity of each frog was determined by immersing both feet in an $N/10$ solution of hydrochloric acid. Suitable frogs jerked out both feet from the acid within five seconds or less; frogs not showing this degree of sensitivity were discarded. The feet were then washed free from acid with water. One foot was immersed in the test solution, the other being used as a control. At the expiration of the desired time interval, measured by watch or interval timer, any adhering solution was wiped from both feet with a towel and both feet at once placed in $N/10$ hydrochloric solution. Special pains were taken to avoid injuring the skin during the wiping process. A positive result was recorded when the frog jerked out the untreated foot within five seconds or less, while the treated foot remained in the acid solution for five to thirty seconds, or even longer. In a number of experiments we found that soaking the treated foot in water for several minutes failed to cause a return of the original susceptibility and therefore no attempts were made to conduct more than one test on each foot. The first result obtained on a frog was felt to be more nearly quantitative; after a rest period, a qualitative test was conducted, immersing the foot which originally had served as a control and using the foot originally treated as the control for the second test.

For periods of immersion of 120 seconds or less, tests were made on different frogs at five-second intervals; for periods between two minutes and five minutes, at ten-second intervals; for periods longer than five minutes, thirty-second intervals. Results obtained upon five to ten frogs at each concentration are averaged. Plotting the concentrations against the average time in seconds the observation values suggest a curve with a trend toward an exponential, logarithmic or hyperbolic curve. When the logarithms of concentrations are plotted against the average time in seconds, results approach a straight line for periods up to 120 seconds. A different type of curve appears to develop at about two minutes' immersion.

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Statistical studies of the curves obtained in less than 120 seconds suggest that an interval of immersion of 60 seconds is the proper time for induction of analgesia (at least on a comparative basis).

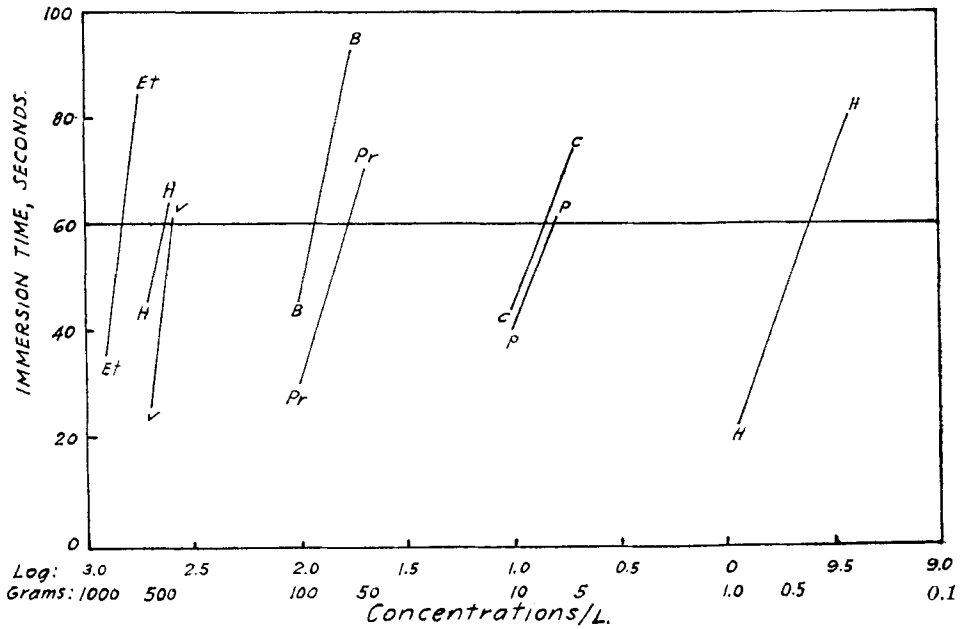

Fig. 1.—Induction of anesthesia—Türk test.

The detailed results obtained in testing a number of products are given in Fig. 1 and Table I. The estimated isoanalgesic concentrations for 60-second immersion periods have been interpolated from the curves when feasible.

TABLE I.—ISOANALGESIC CONCENTRATIONS BY TÜRK TEST.

(60-Second Immersion.)

Product.	Concentration (Gm. per Liter).	Product.	Concentration (Gm. per Liter).
Hexylresorcinol	0.45	Urethane	25.0
Morphine Sulphate	5.0	Procaine	62.0
Phenol	7.2	Borocaine	85.0
Cocaine	7.5	Chloral Hydrate	330.0
Beta Eucaine	10.0	Valerian	400.0
Chloretone	25.0	Hops	450.0
Nembutal	25.0	Ethyl Alcohol	680.0

The early attempts to use this method are not capable of giving quantitative results, because of the effects of a large number of variables which appear to influence the end result. However, as one becomes accustomed to this type of testing, it is possible to obtain better agreement. In some animals it is almost impossible to get quantitative results, although the qualitative findings are in harmony with previous tests upon other frogs. Using a sufficient number of frogs, it is believed that differences of plus or minus ten per cent may be detected by this method.

CONCLUSION.

Using a period of 60 seconds immersion, and using a sufficient number of frogs, it is possible to detect variations of plus or minus ten per cent in the concentration of local anesthetics, analgesics, hypnotics and sedatives.

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MEDICINAL COD LIVER OIL—OBSERVATIONS ON COLOR AND VISCOSITY.*

BY GEORGE E. ÉWE.

COLOR.

Medicinal cod liver oil appears in the market showing various shades of yellowish or brownish yellow color. This color is to a large extent due to its content of biliary constituents of the liver from which the oil is obtained, although, as will be shown further on the source of the oil, the iron content, extent of oxidation, manufacturing manipulations, degree of exposure to sunlight, age, etc., materially affect the color of the oil. The presence of biliary matters can be demonstrated by applying Pettenkofer's test to a water-extract of cod liver oil and also by applying Gmelin's test to the residue obtained by evaporating a fresh alcohol-extract of the oil.

When the oil is obtained by the "steaming" process a pale colored oil is procurable whereas when the "rotting" process is employed a much darker product results. While there is no data available on the relative content of biliary con-

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