

The RES-O-MAT Effective Thyroxine Ratio Test for the Determination of Neonatal Thyroid Activity*

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Today's nuclear medicine departments are experiencing an ever-increasing demand for diagnostic procedures on pediatric patients. The need for early diagnosis of thyroid dysfunction is universally understood. The RES-O-MAT Effective Thyroxine Ratio (ETR) test has been successfully used on a series of normal newborns in an effort to establish a range of normal values for this *in vitro* examination.

It is a well-established medical fact that premature and full-term newborns experience a physiologically thyrotoxic period that lasts for a few days. This increase in thyroid activity is due to large amounts of stored fetal thyroid-stimulating hormone (TSH) being released to aid the neonate in fulfilling its increased metabolic demands (1). This flush of TSH results in increased amounts of circulating thyroid hormone. The measurement of the serum concentration of the circulating thyroxine at this early stage of life will facilitate the diagnosis and subsequent treatment of dysfunctional thyroid glands.

Material and Methods

The effective thyroxine ratio (ETR) was developed as a single *in vitro* examination to simultaneously integrate competitive protein binding analysis for the determination of serum T_4 and the serum uptake of radiolabeled hormone for the determination of the binding capacity of thyro-binding globulin (2).

The RES-O-MAT ETR test kits were obtained from Mallinckrodt/Nuclear, and the examinations were performed in strict accordance with their directions.

Discussion

Sixty-one serum samples were submitted that met the following criteria set forth for this study:

1. The neonate serum sample should not be obtained from cord whole blood.
2. The neonate should be between the age of 1 and 7 days and full term.
3. The neonate should be clinically thyroasymptomatic.
4. At least 1.1 ml of serum should be submitted.
5. There should be no maternal or paternal history of thyroid disorders.

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*This paper was awarded Third Prize by the Technologist Section when it was presented in the technologist program at the Society of Nuclear Medicine 21st Annual Meeting in San Diego in June 1974.

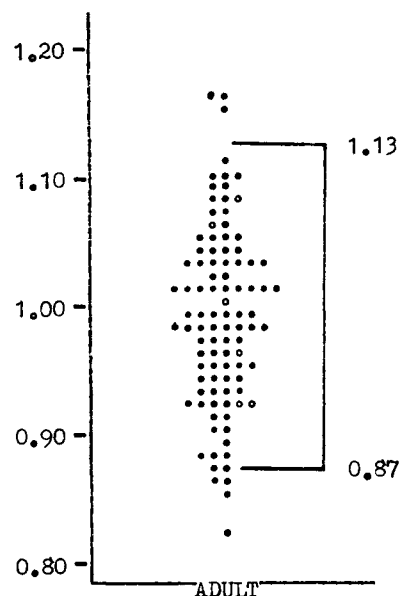


FIG. 1. Distribution of normal adult ETR values.

Results

Normal ETR values provided by the manufacturer were confirmed in our laboratory by the performance of 100 ETR determinations on euthyroid adults. The normal range of 0.87–1.13 ETR units hypothyroid to hyperthyroid, respectively, is shown with a mean value of 1.00 ETR units (Fig. 1).

The neonatal ETR values obtained were distributed as equally as the adult study but considerably elevated with a mean value of 1.24 ETR units (Fig. 2). Calculations revealed the neonatal ETR normal range to extend from 1.11 to 1.37 ETR units hypothyroid to hyperthyroid, respectively.

Although the distribution of data in each study appears equal, side-by-side comparison of their results reveals the difference (Fig. 3).

The obvious question now arises as to when the neonatal ETR value drops to the established "adult" normal range. Although our study was restricted to infants less than 7 days old, Fig. 4 shows by data smoothing that the level of circulating hormone begins to decrease after the fourth day. The exact time of the neonate's arrival at the "adult" normal range is beyond the limits of this study. It should be noted here that premature infants experience a longer physiologically thyrotoxic period than do full-term infants (1), and the ETR determinations should be interpreted in light of this fact.

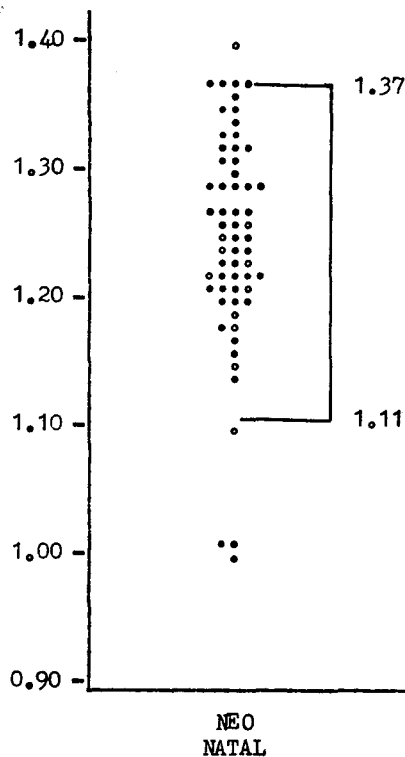


FIG. 2. Distribution of normal neonatal ETR values.

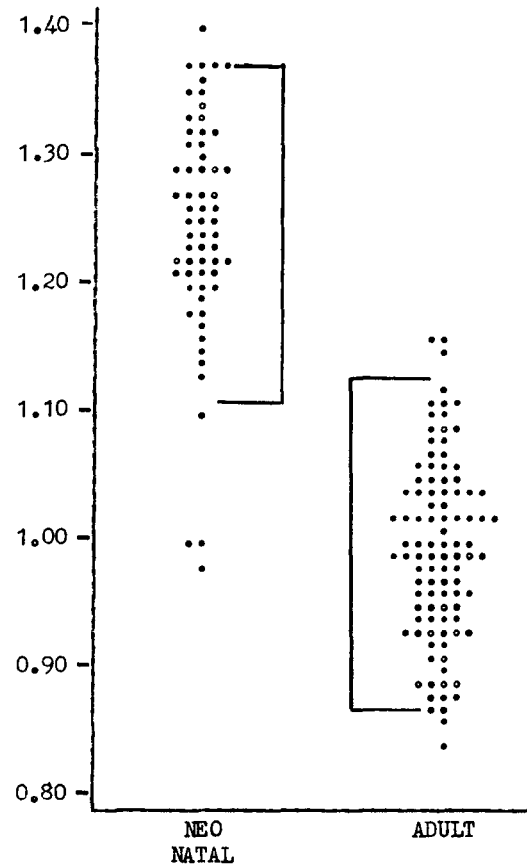


FIG. 3. Comparison of adult and neonatal ETR normal values.

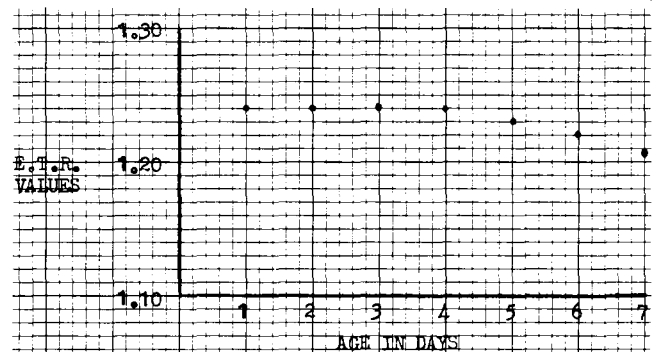


FIG. 4. Data averaging shows decrease in thyroxine. Concentration begins at 4 days.

Summary

Evaluations of neonatal thyroid activity using the RES-O-MAT ETR test is a rapid, single procedure that is extremely reliable in the evaluation of the thyroid status and is now available to the pediatric staff for their diagnostic use.

References

1. Lemarchand Beraud TL, Genazzani AR, Bagnoli F, et al: Thyroid function in the premature and full term newborn. *Acta Endocrinol* 70: 445-453, 1972
2. Mallinckrodt/Nuclear: Package insert