

SEATO MEDICAL RESEARCH STUDY ON RENAL STUDIES

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Period of Report: 1 April 1966 - 31 March 1967

STUDY REPORTS

1. Title: Fluid Compartmentalization Studies in Thai Subjects

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Objective. There are firm data in the literature for normal values for various fluid compartments including total body water, extracellular fluid, intracellular fluid, and blood volumes. All these studies have been performed on American or European subjects. This present study is undertaken to measure fluid compartments in normal Thai subjects to determine if genetic, nutritional and environmental factors cause significant differences from accepted western standards.

Method of Study. Asymptomatic individuals who volunteered for the study were initially screened for organic disease by the following: complete history and physical examination, complete blood count, serology, stools for ova and parasites, and a chest x-ray. If none of the above revealed significant disease the patients were then admitted to a metabolic ward and subsequently studied in a post-absorptive state in the following manner. An indwelling venous catheter was inserted into a peripheral vein and was used to inject the following isotope: At time zero 250 micro curies of tritiated water. Blood specimens were drawn at 120, 180, and 240 minutes. These were processed according to the method of Werblin (1). Fifty (50) micro curies of NA S04 (S35) were then injected and blood specimens drawn at 20, 40, 50, 60 minutes and subsequently processed according to the method of Walzer et. al (2). Both the tritium specimens and the S35 specimens were then counted in a liquid scintillation counter and using standard dilution formula total body water and extra cellular fluid were calculated.

Red cell mass and plasma volumes were then determined according to the method of Albert (3).

Results. A total of 193 subjects have been studied to date in various age groups as shown in table 1.

To date the data have been completed and analyzed in only the initial 22 subjects. These were all young adult males and the data for this group are presented in table 2. Figure 1. Represents the correlation between the total body water and body weight. There is good correlation for T.B.W. and body weight although the regression coefficients have not yet been determined. Figure 2. Represents the correlation between extracellular water and body weight and figure 3 the correlation between intracellular water and body weight. There is good correlation between total body weight and intracellular fluid but to date correlation coefficients and regressions have not been completed.

Discussion. The use of tritiated water is the simplest and most reproducible method available to determine total body water. The mean value for this group is not significantly different from western standards compiled by Moore (4). In this relatively small group that has been analyzed, there were two grossly obese subjects which may be masking a slight increase in total body water in the remaining patients. This is suggested by the larger standard deviation for body weight than for the total body water determinations. Analysis of the remaining patients in this age group will be necessary to confirm this impression.

The values for extracellular fluid are slightly lower than western standards. Intracellular water is higher than the expected values taken from Moore's (4) series. Since intracellular water is the best parameter of lean body mass these higher values may reflect a better degree of physical conditioning for this group of subjects. Poor nutritional status would not account for this apparent increase in intracellular fluid and none of the subjects appeared malnourished clinically. Subsequent analysis of the data in the other patients that have been studied, should elucidate differences due to sex. Most interesting will be the differences produced by aging.

The values for red cell mass are below western standards while values for the plasma volume are in the expected ranges.

References

1. H. Werblin, I Chikoff M.R. Imada. Proc. Soc. Exp. Biol and Med. 102, 8, 1959
2. Walzer, M., Seldin D.W. and Grollan, A
3. Albert S.N., Blood Volume, Thomas, Springfield, Illinois 1963
4. Moore, F.D. Body Cell Mass, Saunders, Philadelphia 1963

Table 1

Total of 193 subjects studied to date in various age groups in each sex

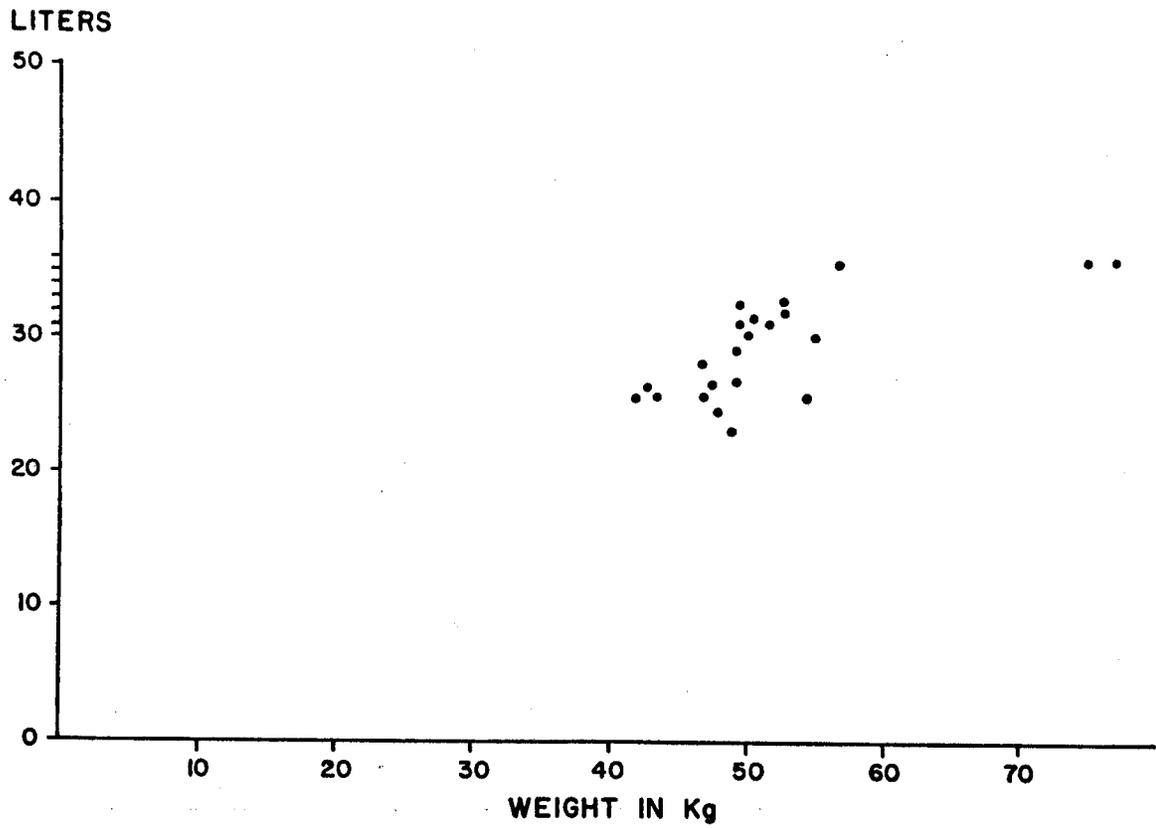
| <u>Age group</u> | <u>Male</u> | <u>Female</u> |
|------------------|-------------|---------------|
| 13-30 years | 36 | 45 |
| 31-60 years | 44 | 24 |
| 51-90 years | 28 | 16 |
| Total | 108 | 85 |

Table 2

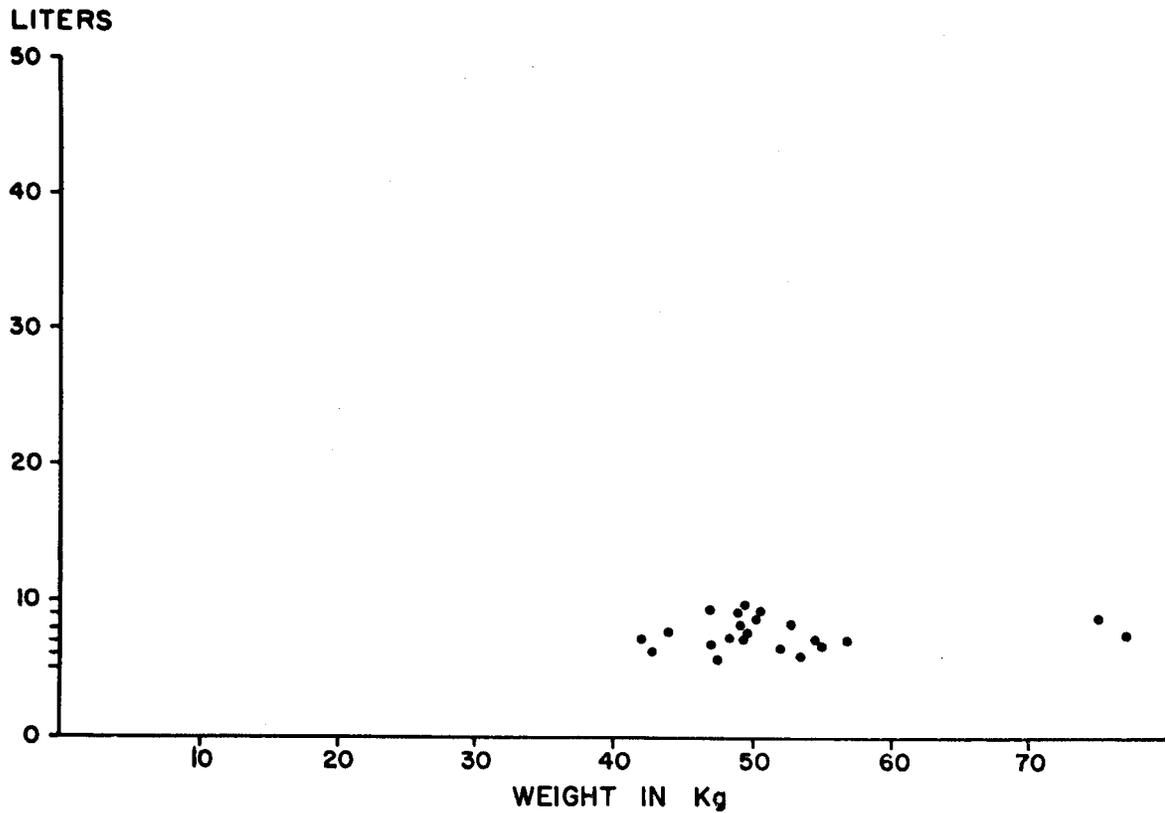
Fluid Compartments in 22 young adult Thai Subjects Confidence Limits

| | Mean | SD | SE | 90 Lower | 90 Upper | 98 Lower | 98 Upper | |
|---------------------|------------|--------|-------|----------|----------|----------|----------|--------|
| Age | 26.4 | 11.7 | 2.5 | 22.1 | 30.6 | 20.1 | 32.6 | |
| Weight | 52.0 | 8.7 | 1.9 | 48.8 | 55.2 | 47.3 | 56.6 | |
| <hr/> | | | | | | | | |
| Total body water | Liters | 29.068 | 4.323 | 0.921 | 27.4826 | 30.653 | 26.745 | 31.391 |
| | % B.W. | 57.3 | 5.9 | 1.3 | 55.1 | 59.4 | 54.1 | 60.4 |
| <hr/> | | | | | | | | |
| Extracellular water | Liters | 7.703 | 1.151 | 0.245 | 7.281 | 8.125 | 7.085 | 8.322 |
| | % B.W. | 15.1 | 2.9 | 0.6 | 14.1 | 16.2 | 13.6 | 16.9 |
| <hr/> | | | | | | | | |
| Intracellular water | Liters | 21.365 | 3.808 | 0.812 | 19.963 | 22.761 | 19.319 | 23.410 |
| | % B.W. | 41.6 | 6.8 | 1.4 | 39.1 | 44.1 | 37.9 | 45.2 |
| <hr/> | | | | | | | | |
| Plasma volume | ml | 2242 | 316 | 67 | 2126 | 2358 | 2072 | 2412 |
| | ml/kg | 43.4 | 4.6 | 1.0 | 41.7 | 45.1 | 40.9 | 45.9 |
| <hr/> | | | | | | | | |
| Red cell mass | ml | 1431 | 199 | 42.5 | 1359 | 1505 | 1324 | 1538 |
| | ml/kg | 27.8 | 3.2 | 0.7 | 26.6 | 29.0 | 26.1 | 29.5 |
| <hr/> | | | | | | | | |
| Total blood volume | ml | 3674 | 488 | 104 | 3495 | 3853 | 3411 | 3936 |
| | ml/kg | 71.3 | 7.2 | 1.5 | 68.6 | 73.9 | 67.4 | 75.1 |
| <hr/> | | | | | | | | |
| Hematocrits | peripheral | 42.9 | 7.1 | 1.5 | 40.3 | 45.5 | 39.0 | 46.7 |
| | TotalBody | 39.0 | 2.3 | 0.5 | 38.1 | 39.8 | 37.8 | 40.2 |

TOTAL BODY WATER MALES 13-30 YEARS IN AGE.



EXTRA CELLULAR FLUID MALES 13-30 YEARS IN AGE.



INTRA CELLULAR FLUID MALES 13-30 YEARS IN AGE.

