Proceedings
of the
Society
for
Experimental Biology and Medicine

VOL. 76 JANUARY, 1951 No. 1

SECTION MEETINGS

BALTIMORE	
University of Maryland	November 29, 1950
ILLINOIS	
Northwestern University	November 28, 1950
MINNESOTA	
University of Minnesota	December 20, 1950
NEW YORK	
New York Academy of Medicine	December 6, 1950
PACIFIC COAST	
Stanford Medical School	November 29, 1950
SOUTHERN	
Tulane University	November 17, 1950

Biologic Decay Periods of Chloride in Man with Use of Long-Life Cl^{36} as Tracer.* (18371)

S. A. THREEFOOT, C. T. RAY, AND G. E. BURCH.

From the Department of Medicine, Tulane University School of Medicine and Charity Hospital of Louisiana at New Orleans.

From the data obtained in tracer studies with radiochloride,† Cl^{36} ($t_{.5} \simeq 2 \times 10^6$ yrs.), it was possible to estimate the biologic decay periods of this element for human subjects. A knowledge of the biologic decay rates of chloride in man is of importance in the understanding of the physiologic turnover and exchange rates in normal subjects, in patients with edematous states, including congestive heart failure, and in individuals internally contaminated as a result of military and peaceful applications of nuclear energy. From previous investigations with Na^{22} in man and Cl^{36} in dogs, estimations of biologic decay rates of chloride in normal man with relatively constant compartment size were made (2-5). The observed biologic decay rates agree with the estimated values.

Cl^{36} (10,000,000 CPM or approximately

* Aided by grants from the Life Insurance Medical Research Fund, a War Contract No. W-49-007-MD-389, and a Public Health Service Research Grant No. H-143.

† Obtained from Oak Ride National Laboratories through funds provided by the United States Atomic Energy Commission Contract No. AT-(40-1)-233.

2. Burch, George E., Threefoot, Sam A., and Cronvich, James A., *J. Lab. and Clin. Med.*, 1949, v34, 14.

3. Burch, G. E., Threefoot, S. A., and Ray, C. T., *J. Lab. and Clin. Med.*, 1950, v35, 331.

4. Burch, George, Threefoot, Sam, and Reaser, Paul, *Science*, 1948, v107, 91.

5. Threefoot, Sam, Burch, George, and Reaser, Paul, *J. Lab. and Clin. Med.*, 1949, v34, 1.

TABLE I.

Subject	Mean values in days $C_{.5}$*	$E_{.5}$†	$U_{.5}$‡	Injected Cl^{36} recovered, %
Control, 501	15	16	17	96
Mild congestive heart failure, 502	19.5	38	48	69
Severe congestive heart failure, 503	45	65	169	48

* $C_{.5}$ = Time in days required for concentration of Cl^{36} in serum to reach one-half at any time after equilibrium of distribution.

† $E_{.5}$ = Time in days required for one-half of total Cl^{36} administered to be eliminated from body by all routes (Feces, urine, vomitus, and pleural and ascitic fluids were collected in these studies).

‡ $U_{.5}$ = Time in days required for one-half of total Cl^{36} administered to be eliminated in urine.

50 μc) as NaCl in water was administered intravenously to 3 female subjects: Subject No. 501, 31 years old with previous hyperthyroidism controlled with propylthiouracil; Subject No. 502, 62 years old with arteriosclerosis, essential hypertension, mild diabetes and mild congestive heart failure, who was made to compensate or allowed to decompensate, as desired, during the course of the study; Subject No. 503, 59 years old with hypertensive and arteriosclerotic heart disease with severe congestive heart failure, who died during the thirty-seventh day of study. The other 2 subjects were studied for 70 continuous days.

Blood was collected once daily under oil and immediately centrifuged; the serum was assayed as described previously(1,3,5). Urine and stools were collected as excreted and were also assayed. Any vomitus or other fluids removed, such as ascitic or pleural fluid, were likewise studied in order to determine the total elimination of Cl^{36} from the body.

The *mean* biologic decay periods for the entire study for each subject are presented in Table I. Curves for the decrease in concentration of Cl^{36} in the serum, urinary excretion (percentage of Cl^{36} not excreted in the urine) and total recovered elimination (percentage of injected Cl^{36} not recovered) for Control Subject No. 501 are shown in Fig. 1. The relationships of changes in rates to changes in intake of Cl^{35} are evident. The importance of these influences as well as the importance of changes in compartment size have been discussed previously for radiosodium(2,5) and have been applied here. The biologic decay periods for Cl^{36} varied considerably, being influenced by intake of chloride, variations in size of the chloride compartments, state and progress of the congestive heart failure, and drugs (mercurial diuretics, desoxycorticosterone acetate, bromide, sodium, and cathartics). These and other considerations will be presented in detail elsewhere.

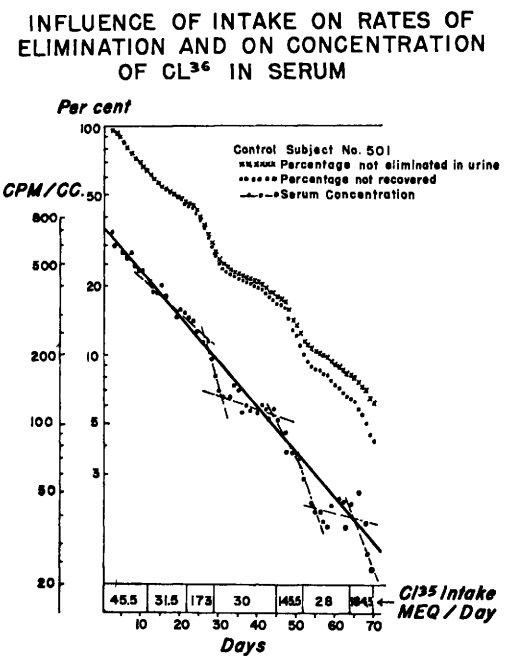

FIG. 1.

Graph of changes in concentration of Cl^{36} in the serum (CPM/cc), rate of urinary excretion of Cl^{36} (percentage of injected Cl^{36} not eliminated in the urine), and rate of elimination of total recovered Cl^{36} (percentage of injected Cl^{36} not recovered) in Control Subject No. 501. Influences of variations in intake of chloride upon these curves are indicated.

1. Burch, George, Reaser, Paul, Ray, Thorpe, and Threefoot, Sam, *J. Lab. and Clin. Med.*, 1950, v35, 626.

Received August 10, 1950. P.S.E.B.M., 1951, v76.