is conceivable that naturally occurring substances (for example, *l*-amino acids) have transport mechanisms available in the body which are not present for unnatural compounds. Thus, *l*-amino acids might serve as carriers for the active isopropylhydrazide moiety through natural barriers (such as the blood-brain barrier).

A. PLETSCHER
K. F. GEY

Medical Research Department, F. Hoffmann-La Roche and Company, Basle, Switzerland

References and Note

1. E. A. Zeller, J. Barsky, J. R. Fouts, W. F. Kirchheimer, L. S. van Orden, *Experientia* 8, 349 (1952); E. A. Zeller, J. Barsky, E. R. Berman, J. R. Fouts, *J. Lab. Clin. Med.* 40, 965 (1952); E. A. Zeller, J. Barsky, *Proc. Soc. Exptl. Biol. Med.* 81, 459 (1952); G. Viollier, E. Quiring, H. Staub, *Helv. Chim. Acta* 36, 724 (1953); R. W. Schayer, *Proc. Soc. Exptl. Biol. Med.* 84, 60 (1953); E. A. Zeller, J. Barsky, E. R. Berman, *J. Biol. Chem.* 214, 267 (1955); S. Udenfriend, H. Weissbach, D. F. Bogdanski, *Ann. N.Y. Acad. Sci.* 66, 602 (1957); *J. Pharmacol. Exptl. Therap.* 120, 255 (1957); A. Pletscher, *Experientia* 12, 479 (1956); ———, *Helv. Physiol. et Pharmacol. Acta* 14, C76 (1956); ———, *Schweiz. med. Wochschr.* 87, 1532 (1957); S. Spector, D. Prockop, P. A. Shore, B. B. Brodie, *Science* 127, 704 (1958); E. A. Zeller, J. Barsky, J. R. Fouts, J. C. Lazanas, *Biochem. J.* 60, v (1955).
2. The compounds were synthesized by Dr. B. Hegedüs of the chemical department of F. Hoffmann-La Roche & Co., Ltd., Basle.
3. D. F. Bogdanski, A. Pletscher, B. B. Brodie, S. Udenfriend, *J. Pharmacol. Exptl. Therap.* 117, 82 (1956).
4. There was no difference in activity noted, regardless of whether the amino group is free or acetylated.
5. E. A. Zeller, L. A. Blanksma, J. A. Carbon, *Helv. Chim. Acta* 40, 257 (1957).

13 May 1958

Estimation of Total Body Fat from Roentgenograms

Measurements of the thickness of the subcutaneous fat can be used for estimating man's fatness, and percentile norms for judging the relative fatness of individuals in this way have been provided (*1*). For some purposes, however, an estimate of body fat is desired in absolute rather than in relative terms. Such an absolute estimate can be made with the rather complicated methods of body water and body density measurements. This estimate, in turn, can be used to establish predictions for total fat based on the simpler measurements of subcutaneous fat (*2*). This procedure has proved satisfactory in obtaining estimating equations for total fat from skinfold measurements in young and middle-aged men (*3, 4*).

In the study described in this report the thickness of subcutaneous adipose tissue (plus skin) was measured on soft-tissue roentgenograms, taken at a distance of 72 in. between the tube and the film. No correction for triangular distortion was applied. Data are reported for four sites: (i) upper arm, at the level of the deltoid insertion (see *5*); (ii) upper arm, one-third of the distance between olecranon process and acromion; (iii) forearm; and (iv) calf, at the level of maximal width. All projections were anteroposterior. At site No. 1 the measurements were made vertically to the skin, and at the other three sites they were made vertically to the long axis of the limb. At sites No. 2, 3, and 4 both the lateral and medial thicknesses were measured and summated. Total body fat was estimated from body density, the body volume being obtained by underwater weighing with individual corrections for air remaining in the lungs and respiratory passages at the moment weight was recorded.

Middle-aged business men and professional men, participating in a longitudinal study of aging (*6*), were the subjects. The analysis was restricted to 52 men (mean age 57.1, S.D. = ± 2.7 years) whose weight did not change by more than ± 2 percent from the time of the density measurements to the time when the roentgenographic data were obtained 4 years later.

Equations for predicting body density from roentgenographic measurements and the coefficients of correlation between the two types of criteria of leanness-fatness are given in Table 1. The correlations here recorded must be considered to be slightly depressed from those that would be obtained with measurement of total fat and recording of the x-ray patterns on the same day. But the correlations in Table 1 are in the same general range as those reported when subcutaneous fat was measured with skinfold calipers (*3*). No precise comparison between the x-ray and the skinfold caliper measurements previously made is possible because of differences in the measurement sites.

The number of individuals for whom satisfactory x-ray data were available in all four sites was relatively small. Consequently, no attempt was made to relate body density to roentgenographic measurements in the form of a multiple-regression equation. This is a task for further research in which attention should be given also to some areas on the trunk, including those not readily measurable by skinfold calipers, such as the trochanteric area.

Table 1. Equations ($\hat{D} = a + bX$) for predicting body density from roentgenographic measurements (X, in millimeters) and coefficients of correlation (r) between density and roentgenographic measurements. N = size of the sample.

Site	*a* (intercept)	*b* (slope)	*r*	*N*
1. Deltoid insertion	1.07220	− 0.00186	−.60	42
2. Upper arm	1.07812	− 0.00219	−.75	41
3. Forearm	1.07294	− 0.00309	−.76	51
4. Calf	1.06447	− 0.00228	−.58	47

JOSEF BROZEK
HIROYOSHI MORI*
ANCEL KEYS

Laboratory of Physiological Hygiene, University of Minnesota, Minneapolis

References and Notes

1. J. Brožek, *Human Biol.* 28, 124 (1956).
2. A. Keys and J. Brožek, *Physiol. Revs.* 33, 245 (1953).
3. J. Brožek and A. Keys, *Brit. J. Nutrition* 5, 194 (1951).
4. L. R. Pascale, M. I. Grossman, H. S. Sloane, T. Frankel, *Human Biol.* 28, 165 (1956).
5. S. M. Garn, *Human Biol.* 26, 59 (1954).
6. This work was supported, in part, by grant H10(C12) from the National Heart Institute, U.S. Public Health Service.
* Present address: Tokushima University Medical School, Tokushima, Japan.

7 August 1958

Effect of Reserpine Pretreatment on Stimulation of the Accelerans Nerve of the Dog

Abstract. Pretreatment with two doses of reserpine (each 0.1 mg/kg, intraperitoneally) sensitizes the heart to the positive chronotropic action of norepinephrine and reduces the response to stimulation of the accelerans nerve. Ganglionic transmission remains unaffected. The results indicate that the presence of certain stores of peripheral sympathetic transmitter is essential for the production of tachycardia by stimulation of the accelerans nerve.

Recent experiments (*1*) show that reserpine is capable of causing a tachycardia in the heart-lung preparation of the dog by liberation of norepinephrine from its stores in the heart. Pretreatment of the dogs with reserpine prior to the isolation of the heart, by depletion of the stores of norepinephrine, prevented the positive chronotropic response of the heart-lung preparation to the challenging dose of reserpine. A dose of 0.1 mg/kg injected intraperitoneally 24 hours before the heart-lung preparation was set up was found to suffice for the pretreatment (*2*).

Other experimental evidence indicates that pretreatment with reserpine abolishes the stimulant action of nicotine on isolated rabbit atria (*3*); in this preparation nicotine acts presumably on ganglion cells or chromaffine tissue situated in the heart wall, or on both, and thus liberates sympathin. Reserpine has also been found to reduce the norepinephrine content of sympathetic ganglion cells (*4*).

The experiments described in this report (*5*) were undertaken in order to