weight, recommended by Kleiber and others as "metabolic unit of body size," should be adopted, these conclusions are not altered.

Our results, obtained in intraspecific comparison, correspond to the results of interspecific comparison obtained by Krebs (which came to our attention only after the beginning of our study). The experiments seem to be a blow to the hypothesis that the decrease of basal metabolic rates with increasing size is due to cellular factors, as expressed by Weymouth *et al.* (*7*): "The regressions of the weight-specific rates for the different tissues apparently form, in the log-log plot, a family of parallel lines, some higher and some lower, corresponding to the intensity of respiration, but all showing the same slope as the regression of the weight-specific rate of the entire animal" (p. 68). None of these statements is substantiated by our experiments. It appears that the main regulative principle responsible for the systematic decrease of weight-specific basal metabolic rate with increasing size must be sought in factors lying in the organism as a whole.

A full presentation of the data obtained will be given elsewhere.

References

1. TERROINE, E. F., and ROCHE, J. *Compt. rend.*, **180**, 225 (1925).
2. GRAFE, E. *Deut. med. Wochschr.*, **51**, 477 (1925).
3. GRAFE, E., REINWEIN, M., and SINGER, F. *Biochem. Z.*, **165**, 102 (1925).
4. KAYSER, C., LEBRETON, E., and SCHAEFFER, G. *Compt. rend.*, **181**, 255 (1925).
5. KLEIBER, M. *Proc. Soc. Exptl. Biol. Med.*, **48**, 419 (1941).
6. WEYMOUTH, F. W., FIELD, J., II., and KLEIBER, M. *Ibid.*, **49**, 367 (1942).
7. WEYMOUTH, F. W., *et al. Physiol. Zool.*, **17**, 50 (1944).
8. KREBS, H. A. *Biochim. et Biophys. Acta*, **4**, 249 (1950).
9. MUELLER, J., and VON BERTALANFFY, L. Unpublished data.
10. KLEIBER, M. *Physiol. Rev.*, **27**, 531 (1947).
11. BENEDICT, F. G. *Carnegie Inst. Wash. Pub. 503*, 67 (1938).

Effect of Germination on the Carotene Content of Pulses and Cereals

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In our studies on the effect of germination on the vitamin content of pulses we have observed increased formation of ascorbic acid (*1, 2*), nicotinic acid (*3*), thiamine (*4*), and riboflavin (*5*), in different varieties of pulses during the process. In the present communication the effect of germination on the carotene content of different pulses and cereals is presented.

Five g of healthy dry seeds of pulses were germinated with distilled water in clean Petri dishes, which were kept away from direct sunlight. In the case of cereals, the seeds were embedded in earth soaked with water in Petri dishes for proper germination. After germination for varying periods the seeds were crushed. Carotene was extracted by the method of Guilbert (*6*), as modified by Peterson, Hughes, and Freeman (*7*), and estimated with a Lumetron photoelectric colorimeter using a 440-mμ filter. The results are shown in Tables 1 and 2.

TABLE 1

EFFECT OF GERMINATION ON THE CAROTENE CONTENT OF PULSES

Local name	Botanical name	Days of germination				
		0	1	2	3	4
		Mg/100 g of pulse				
Krishna mung	*Phaseolus radiatus*	3.75	4.35	4.40	4.70	4.75
Musuri	*Lens esculenta*	1.60	1.60	2.00	3.90	4.05
Hara chhola	*Cicer arietinum*	3.10	3.80	4.00	4.20	4.50
Golapi chhola	" "	1.95	2.10	2.40	2.75	3.00
Chhola	" "	2.95	3.35	4.20	4.30	4.35
Mung	*Phaseolus radiatus*	2.15	3.60	3.75	3.80	3.80
Barbati	*Vigina sineusis*	0.70	1.40	1.50	1.60	1.55
Pyra mator	*Pisum sativum*	1.50	1.60	2.00	2.25	2.30
Sona mung	*Phaseolus aurus roxburgi*	2.35	2.95	3.25	3.10	3.15
Kalai	*Phaseolus mungo*	1.25	1.68	1.85	2.10	2.30
Mas kalai	*Phaseolus roxburgi*	1.75	2.10	2.75	2.80	2.80
Kabuli chhola	*Cicer arietinum*	2.05	2.95	3.45	4.15	4.30
Pea	*Pisum sativum*	1.20	1.35	1.50	1.75	2.35

TABLE 2

EFFECT OF GERMINATION ON THE CAROTENE CONTENT OF CEREALS

Cereal	Days of germination							
	0	1	2	3	4	5	6	7
	Mg/100 g of cereal							
Paddy (*Oryza sativa*)	0.35	0.40	0.75	1.35	2.15	2.85	3.25	3.95
Wheat	0.45	0.43	0.70	1.50	2.25	3.25	4.50	4.65
Corn	4.00	4.00	4.35	4.95	5.25	5.75	5.95	6.15

Pulses contain a good amount of carotene in the dry condition. Paddy and wheat, however, do not contain much carotene, whereas corn is a rich source of carotene in the dry condition. In all cases, the carotene content increased considerably as the germination proceeded. In cereals, on the first day of germination there is not much change in the carotene content, probably because the seeds do not sprout well. But as the shoots develop the carotene content increases gradually. After the third day of germination the color of the shoots is changed from yellow to green, which probably indicates that chlorophyll and other plant pigments increase during germination; carotene being a pigment, also, increases simultaneously with the other pigments. From the results obtained it is clear that the rate of increase in the carotene content of both pulses and cereals depends on the rate of growth of their seedlings. Pulses form an important ingredient in the Indian diet. The germinated pulses are, therefore, nutritionally superior to the unger-

minated for their increased carotene content as well as for their content of other vitamins (*1–5*).

References

1. BANERJEE, S., and NANDI, N. *Ann. Biochem. Exptl. Med., India,* **9**, 217 (1949).
2. NANDI, N., and BANERJEE, S. *Indian Pharmacist,* **5**, 63 (1949).
3. *Ibid.,* 13.
4. CHATTOPADHYAY, H., NANDI, N., and BANERJEE, S. *Ibid.,* 121.
5. NANDI, N., and BANERJEE, S. *Ibid.,* 202.
6. GUILBERT, H. R. *Ind. Eng. Chem., Anal. Ed.,* **6**, 452 (1934).
7. PETERSON, W. J., HUGHES, J. S., and FREEMAN, H. F. *Ibid.,* **9**, 71 (1937).

Deviations from Beer's Law in the Ultraviolet Absorption Spectra of Some Organic Compounds

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In the course of an orientation study of 3-substituted diphenyl ethers, deviations from Beer's law were observed in the absorption spectra of phenols and acetamino compounds derived from diphenyl ether.

Although instrumental deviations occurred at the high-intensity absorption bands, the major part of the deviations resulted from density values below 1.5, which are considered due to fluorescence (*1*). In an effort to trace the chromophore responsible for the deviations, absorption spectra were determined in various concentrations (0.002–0.00001 moles/l) for phenol, nitrobenzene, acetanilide, diphenyl ether, 4-nitrodiphenyl ether, and 3-acetaminodiphenyl ether. The results indicate that some of these substances show deviations from Beer's law in alcoholic solution even at these low concentrations. If instrumental deviations are disregarded, the largest anomalies are observed with phenol (Table 1). The deviations are believed to account at least in part for the discrepancies among the absorption values reported in the literature (λ_{min}, 236–241 mμ; log ε_{min} 1.69–2.0; λ_{max}, 262–274 mμ, log ε_{max} 3.1–3.3) (*2–5*). Acetanilide has λ_{max} 242 mμ (log ε 4.11), and nitrobenzene absorbs maximally at 260 mμ (log ε 3.90), λ_{min} 225 mμ (log ε 3.40). Both compounds show deviations only in high concentrations, and the absorption values agree with the literature (*6*).

TABLE 1

ABSORPTION SPECTRA OF PHENOL IN 95% ALCOHOL

Moles/liter	λ_{max_1}	log ε_{max_1}	λ_{min}	log ε_{min}	λ_{max_2}	log ε_{max_2}
0.00008	219	3.44	No absorption*		275	2.86
.00016	219	3.62	"	"	275	3.08
.00042	220	3.64	238	1.78	275	3.22
.00085	222	3.68	239	1.81	275	3.43
0.00212	225	3.00	240	0.67	272	3.05

* Between 235 and 258 mμ.

Contrary to published data (*7*) diphenyl ether gives absorption curves even in alcohol which show the characteristic fine structure, three sharp maxima at 265, 271, and 278 mμ, and three minima at 252, 267, and 276 mμ. Isosbestic points are observed at 260 and 280 mμ and small deviations from Beer's law in the region of the maxima (log ε_{max_1} 3.18–3.24, log ε_{max_2} 3.26–3.31, log ε_{max_3} 3.21–3.26).

Deviations in 3-acetaminodiphenyl ether (λ_{max} 277 mμ, λ_{min} 276 mμ) occur at the maximum, in 4-nitrodiphenyl ether (λ_{max} 302, λ_{min} 248) only over the region of the minimum.

It appears from the present data that deviations from Beer's law can occur also with diphenyl ethers and phenols in addition to hydrocarbons (*1*), acrylic acids, and esters (*8*), dyes, and other substances (*9*). The increasing number of compounds with concentration-dependent light absorption emphasizes the need for reporting of concentrations, which is unfortunately rarely done in the literature.

References

1. BRAUDE, E. A., FAWCETT, J. S., and TIMMONS, C. J. *J. Chem. Soc.,* 1019 (1950).
2. WOLF, K. L., and HEROLD, W. *Z. Physik. Chem.,* **B 13**, 201 (1931).
3. KLINGSTEDT, F. W. *Compt. rend.,* **174**, 812 (1922); **176**, 674, 1550 (1923).
4. ROBERTSON, W. W., SERIFF, A. J., and MATSEN, F. A. *J. Am. Chem. Soc.,* **72**, 1542 (1950).
5. HODGSON, H. H. *J. Chem. Soc.,* 380 (1943).
6. SCHEIBE, G., BACKENKOHLER, F., and ROSENBERG, A. *Ber.,* **59**, 2617 (1926).
7. RAMART-LUCAS, MME., and HOCH, J. *Compt. rend.,* **194**, 96 (1932); ROBERTSON, W. W., *et al. J. Am. Chem. Soc.,* **72**, 1539 (1950).
8. UNGNADE, H. E., and ORTEGA, I. *Ibid.,* **73**, 1564 (1951).
9. MELLON, M. G. *Analytical Absorption Spectroscopy.* New York: Wiley, 98, 318 (1950).

Arginase Activity in Human Skin[1]

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Arginase activity in mammalian skin has been demonstrated by Greenstein (*1*), who found that the normal skin of mice contained about 1/10 the amount found in the liver, and roughly ½ that found in pigmented melanomata of the same animals.

In the present study it was attempted (1) to ascertain the presence of arginase in human skin, and (2) to determine its variations and distribution in normal skin and in cutaneous lesions.

Skin samples from fresh biopsies were crushed in a piston-cylinder apparatus, suspended in normal saline, and then incubated with manganous ion to activate the enzyme (*2*). Incubation was then carried out with arginine as a substrate for ½ hr, and the reaction stopped by the addition of sulfuric acid (*3*). The

[1] This work was aided by an institutional research grant from the American Cancer Society.

[2] The author is indebted to Stephen Rothman for valuable advice in carrying out the experiments and in preparing this manuscript.