The arsenomolybdate reaction employed in this study measures the presence of reducing substances present in the samples after acid treatment. Other reagents for determining reducing substances may be substituted for the arsenomolybdate reagent, including Fehling's reagent and the Folin-Malmros reagent. The arsenomolybdate reagent was preferred as smaller quantities of the antibiotics could be determined than when these other reagents were used.

References

1. BROSCHARD, R. W., *et al. Science*, **109**, 199 (1949).
2. TANNER, F. W., JR., *et al. Antibiotics & Chemotherapy*, **2**, 441 (1953).
3. MCGUIRE, J. M., *et al. Ibid.*, 281 (1952).
4. FINLAY, A. C., *et al. Science*, **111**, 85 (1950).
5. NELSON, N. *J. Biol. Chem.*, **153**, 375 (1944).

Manuscript received May 29, 1953.

Effect of Strenuous Physical Activity on Blood Vitamin A and Carotene in Young Men

William H. James and Ibrahim M. ElGindi[1]

Department of Agricultural Chemistry and Biochemistry, Louisiana Agricultural Experiment Station, Louisiana State University and Agricultural and Mechanical College, Baton Rouge

In a recent study of the effects of certain proteins in the diet on the utilization of carotene by growing albino rats (*1*), one of our metameters was the vitamin A content of the blood, micrograms vitamin A/100 ml serum. For groups of 11 rats the average values of this metameter, determined at 3-day intervals, changed in definite consistent patterns during the 38-day vitamin A depletion period and the subsequent 6-wk carotene repletion period. Unexpectedly, for each of the individual 44 experimental animals, puzzling irregular large fluctuations of the blood vitamin A values were observed throughout the experiment. The closely controlled conditions of the experiment and the magnitude and irregularity of the fluctuations suggested that a factor (or set of factors), readily available, immediately effective, and more potent than dietary protein in affecting the blood vitamin A level, existed within the body of the rat. A factor possibly capable of meeting these specifications is physical activity.

Since an estimate of the effect of physical activity on blood vitamin A values is more easily made with human beings as the subjects than with rats, a preliminary test of the effect of physical activity was made with the cooperation of Coach A. C. Moreau and twelve members[2] of the Louisiana State University track team. Vitamin A and carotene analyses were made by the method of Bessey *et al.* (*2*) on samples of finger blood collected from each man about 3 min before the start of a 40–50 min period of strenuous physical activity which consisted of a 15-min "warm-up" period, followed by running five or six 220-yd dashes at full speed (26–29 sec/dash, at intervals of 5 min). About 6 min after the completion of the last dash, the 2nd sample of blood was collected. The exercises were performed between 3 and 4 P.M. Samples of blood were collected also at these times from 2 controls who remained seated while the 12 men were running.

In Table 1 are given the observed levels of serum vitamin A before and after the exercise, as well as the per cent change following exercise; similarly, in Table 2 are given the carotene values.

TABLE 1

Subject no.	μg vitamin A/100 ml serum			Per cent change
	Before exercise	After exercise	Change	
1	25.2	43.7	18.5	73
2	30.4	62.7	32.3	106
3	44.9	61.6	16.7	37
4	51.0	74.8	23.8	47
5	46.4	36.0	−10.4	−22
6	48.4	68.6	20.2	42
7	39.3	69.1	29.8	76
8	55.9	67.0	11.1	20
9	34.3	44.0	9.7	28
10	31.2	49.0	17.8	57
11	40.7	56.8	16.1	40
12	29.4	48.9	19.5	66
Controls				
13	95.8	92.0	− 3.8	− 4
14	61.7	73.3	11.6	19

The average blood vitamin A level of the group increased 43% during the work-out with individual changes varying from an increase of 106% to a decrease of 22%; the average carotene level decreased 10%, with individual changes varying from +17 to −50%.

According to the coach, subject 2, whose vitamin A

TABLE 2

Subject no.	μg carotene/100 ml serum			Per cent change
	Before exercise	After exercise	Change	
1	63.1	60.3	− 2.8	− 4
2	79.9	93.4	13.5	17
3	93.4	85.6	− 7.8	− 8
4	101.4	98.6	− 2.8	− 3
5	113.5	56.8	−56.7	−50
6	131.4	103.1	−28.3	−22
7	104.7	113.9	9.2	9
8	154.4	141.0	−13.4	− 9
9	143.9	97.4	−46.5	−32
10	117.7	127.4	9.7	8
11	126.9	123.0	− 3.9	− 3
12	63.1	57.5	− 5.6	− 9
Controls				
13	143.4	133.7	− 9.7	− 7
14	94.6	109.3	14.7	16

[1] Present address: Faculty of Agriculture, Cairo University, Giza, Egypt.

[2] We thank J. R. Burton, R. O. Dean, A. C. James, C. L. Johnson, J. L. Kepler, H. T. McBride, J. O. Phillips, J. H. Shirley, C. C. Smith, H. F. Sweeney, E. Z. Tucker, and J. T. Venable for performing the exercises and donating the blood.

level increased 106%, was in poor condition, while subject 5, the only runner to show a decrease in blood vitamin A, was in excellent condition.

Further studies using athletic subjects under controlled conditions of diet and exercise are being conducted.

References

1. JAMES, WILLIAM H., and ELGINDI, IBRAHIM M. *J. Nutrition*, **51**, 97 (1953).
2. BESSEY, OTTO A., *et al. J. Biol. Chem.*, **166**, 177 (1946).

Manuscript received August 10, 1953.

Chromosome Numbers of Some American Rodents

Sajiro Makino[1]

Zoology Institute, Hokkaido University, Sapporo, Japan, and Department of Zoology, University of Texas, Austin

While visiting several universities in this country, as an official representative of the Japanese Government, I was able to collect some mammalian material for chromosome research and I wish to report the chromosome numbers so far established for 16 species of American rodents with some comments. The results are summarized in Table 1.

The chromosomes of the deer mouse were investigated by Cross (1931, 1938) (*1, 2*), but his studies were confined to the spermatogonial chromosomes. The present study was made mainly on meiotic chromosomes. With the exception of *Peromyscus nasutus,* all species here reported show 24 chromosomes in the haploid set. *P. nasutus* has 26 haploid chromosomes. In all species there is always a heteromorphic XY-bivalent in the haploid complex, consisting of a large J-shaped X-element and a short rod-like Y. At metaphase the X and Y lie in side-by-side association coming together at their proximal dense part. The X and Y chromosomes disjoin at the first anaphase without exception. The diploid complement observed in 3 species shows 48 chromosomes, which consist of 2 pairs of large and medium J-shaped chromosomes, a pair of small V-shaped ones, together with rod-like elements.

The chromosomes of the muskrat (*Ondatra zibethica*) appear as rods, with the exception of a few chromosomes that have a constriction near their proximal ends. The chromosomes of the marmot (*Marmota flaviventris*) are characterized by J- and V-shapes of varying sizes. The prairie dog (*Cynomys ludovicianus*) shows also J- and V-shaped chromosomes varying in size. The diploid complement of the Mexican pocket mouse (*Liomys irroratus*) is remarkable in showing a pair of small J-shaped chromosomes together with rod-shaped elements of varying sizes. The porcupine (*Erethizon dorsatum*) is characterized by having the low number of 34 chromosomes in diploid cells, most of which are of J- or V-shape. The diploid complex of the chinchilla (*Chinchilla laniger*) shows chromosomes carrying submedian and subterminal centromeres, each one being a two-armed structure. The X chromosome is very prominent among the autosomes by being the largest V-shaped element. The Y comes next in size, also with a distinct V-shape.

TABLE 1

CHROMOSOME NUMBERS OF SOME AMERICAN RODENTS

Common name	Scientific name	Chromosome number		Sex chromosome
		2n	*n*	
Deer mouse (Cricetidae)	*Peromyscus polionotus polionotus*	—	24	X–Y ♂
	P. p. leucocephalus	48	24	"
	P. maniculatus maniculatus	48	24	"
	P. manic. blandus	—	24	"
	P. manic. bairdii	—	24	"
	P. manic. gambeli	—	24	"
	P. leucopus texanus	—	24	"
	P. truei truei	48	24	"
	P. nasutus	—	26	"
Muskrat (Microtinae)	*Ondatra zibethica*	54	—	"
Marmot (Sciuridae)	*Marmota flaviventris*	42	—	"
Prairie dog	*Cynomys ludovicianus*	52	—	"
Spruce squirrel	*Tamiasciurus fremonti*	—	25	"
Mexican pocket mouse (Heteromyidae)	*Liomys irroratus*	58	—	"
Porcupine (Erethizontidae)	*Erethizon dorsatum*	34	17	"
Chinchilla (Chinchillidae)	*Chinchilla laniger*	64	32	"

[1] Cordial thanks are due to T. S. Painter, M. J. D. White, W. F. Blair (University of Texas), L. R. Dice (University of Michigan), and W. H. Leonard (Colorado A. & M. College) for their kind assistance which enabled me to accomplish this work. Details will be published elsewhere with some additional data.

References

1. CROSS, J. C. *J. Morphol.*, **52**, 373 (1931).
2. ———. *Cytologia (Tokyo)*, **8**, 408 (1938).
3. MAKINO, S. *An Atlas of the Chromosome Numbers in Animals.* Ames: Iowa State Coll. Press, 1951.

Manuscript received July 31, 1953.