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3908

Sex and Seasonal Differences in Weight of Liver and Spleen.

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Neither sex nor seasonal differences in the weight of either liver or spleen seem to have been established hitherto in animals. Both of these relationships are demonstrated in ring doves (*Streptopelia risoria*) by the data submitted here. In the human it is considered that the weight of the male liver is roughly 50 to 60 ounces; that of the female, 40 to 50 ounces (Cunningham). This difference is apparently roughly proportional to sex differences in body weight. Adequate and comparable data from healthy humans are obviously not available. It is suggested that earlier failure to find sex differences¹ in the albino rat is due either to insufficient numbers of weights from adults, or, to the obliteration of differences by caging. The rats used for those measurements had probably been more closely confined than were the doves of the present study. In the livers from approximately 50 male and 50 female Leghorn fowls, killed from hatching to maturity by Latimer,² "there seems to be a tendency for the females (livers) to run higher (possibly 1% higher) than in the males. This is reversed for the 6 older chickens." Present data from fowls are inconclusive and evidently inadequate.

All the animals used in our calculations were free from obvious disease, and were sexually mature (6-30 mo.). All were killed by decapitation and the glands weighed at once. The weights were obtained during all months of the year. January, February and March constitute "winter"; April, May, June, "spring"; July, August, September, "summer"; October, November and December form the "autumn" period. The data obtained from 19 races or strains

were first plotted separately for sex and season. The mean for these 19 races is the figure used in Table I.

TABLE I.
Seasonal size of liver and spleen in healthy male and female ring doves.
(Means for 19 races.)

Seasons	No. birds	Age (mo.)	Weights (grams) of			
			Body	Gonads	Liver	Spleen
Males.						
Winter	128	15.7	160	1.022	2.870	.037
Spring	142	14.6	158	1.225	2.956	.039
Summer	98	17.6	155	1.142	3.169	.042
Autumn	131	17.9	160	0.912	3.047	.037
Females.						
Winter	129	15.6	158	.345	3.146	.046
Spring	112	14.8	155	.363	3.402	.053
Summer	83	15.5	153	.328	3.342	.048
Autumn	120	17.7	157	.307	3.291	.044

Sex difference. Female livers are heavier than those of the males of the corresponding season in all cases. They average 9.4% larger, despite the fact that the body weight of the males is greater by nearly 2%. The difference is not ascribable to age; the mean age of the males being 16.4 mo. and that of the females 15.9 mo.

The weight of the female spleens exceeds that of the males by an average of 23.5%. The female spleens are the larger at all seasons.

Seasonal difference. The livers of both males and females are smallest during autumn and winter; largest during spring and summer. The spleens follow precisely the same rule. In both sexes the body weight is slightly reduced at the period of largest size of spleen and liver. The male liver averages 10.4% larger in summer than in winter; the spleen, 12.0% larger. The female liver is 6.1% larger in summer than in winter; the spleen, 4.3% larger. There is thus some evidence that the seasonal fluctuation of size in liver and spleen is greater in the male than in the female.

The size of the gonads is also tabulated; with one exception among the females the figures show, as do those obtained from still other kinds of pigeons earlier described,³ that the ovaries and testes are largest in spring and summer—the period of smallest thyroid size. It is thus now shown that the spleen, liver, ovary and testis are largest at the season the thyroids are smallest. For the first time in any animal this association of size changes has been established for these several organs.

Summary: (1) Weights of liver and spleen obtained at all months of the year on 499 male and 444 females, healthy, adult ring doves demonstrate that a true sex difference exists. Though the male body weight is slightly larger, the male livers and spleens are smaller, 9.4%, and 23.5%, respectively. (2) A true seasonal increase in size of liver and spleen occurs in spring and summer in both sexes (10.4% and 12.0% in ♂♂; 6.1% and 4.3% in ♀♀). (3) These changes in spleen and liver are positively correlated with size changes in testis and ovary; and negatively correlated with size changes in the thyroids of these animals.

¹ Donaldson, H. H., *The Rat*, Philadelphia, 1924.

² Latimer, H. B., *J. Agr. Res.*, 1924, xxix, 363-397.

³ Riddle, O., *Am. J. Physiol.*, 1925, lxxiii, 5-16.

3909

Significance of Female Sex Hormone Reaction in the Male Blood.

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In 1925, simultaneously and independently, Loewe of Dorpat¹ and one of us with collaborators² demonstrated the presence of the female hormone in the circulating blood of females by means of the rodent vaginal spread test.³ Since then, in numerous publications we have attempted to simplify and standardize the method of extracting and testing human blood for the female sex hormone.⁴ Among other applications we advocated the use of this test to determine the sex of pseudo-hermaphroditic individuals in whom we regarded a positive reaction, appearing cyclically, as a proof of the presence of functioning ovaries and feminine sex.⁵ Our preliminary work had shown that large quantities of bull's blood (150-100 cc.) gave a negative reaction when extracted by our method. The same applied to concentrated lipoid, HCl, saline and watery extracts of bull's testes, as well as extracts of the hypophysis, thyroid and adrenal, liver, muscle, various proteins, etc.⁶ The work of Dohrn,⁷ who claimed to have obtained a positive reaction with male urine first called our attention to the possible non-specificity of the Allen and Doisy reaction. After our investigation on male bloods had been completed, the short article of Hirsch,⁸ who used our method,