tion of 12, 18, and 24% casein diets with 0.5% L-cystine markedly improved lactation performance as judged by weaning weights of young and mother. Cystine supplementation of 30% casein diet improved weaning weights of young significantly with less beneficial effects on maternal weight. The data indicate that total sulfur amino acid requirement for optimal lactation in the Long-Evans rat may be placed at slightly more than 1% of the diet and that cystine may furnish at least half of this requirement.

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Relationship between Pituitary Growth Hormone Content and Age in Rats.* (24479)

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The question of whether or not the amount of pituitary growth hormone varies with age has been asked by several laboratories using beef(1), swine(2), and fetal and infant rat pituitaries(3) in the tibia test assay. To date, there is no consistent opinion as to the relationship between growth rate and amount of growth hormone in the pituitary. To determine whether growth hormone potency of the female rat pituitary varies as the animal ages from 10 to 630 days of age, the following methods were employed:

Methods. Female rats descended from the Sprague-Dawley and Wistar strains were weighed and sacrificed with ether at 10, 42, 56, 70, 168, 308, 376, and 630 days of age. At necropsy, the pituitaries were removed, weighed, and placed in absolute acetone, dried and stored in a vacuum desiccator for use in the tibia test assay for growth hormone. The growth hormone potency of the pituitaries was determined according to the procedure of Evans *et al.*(4) using the parallel line method. For each assay, the whole dried pituitaries were weighed, triturated with saline and injected at 2 dose levels; and 3 groups of hypophysectomized rats received graded doses of a purified beef growth hormone preparation (Armour and Co.). Pituitaries from 2 age groups (42 and 70-day-old females) were assayed twice to test the accuracy of the procedure.

Results. Table I shows epiphyseal widths and statistical evaluation of growth hormone potency of the donor pituitaries. Table II is a compilation of data, using body and pituitary weights of the donor rats, and assayed growth hormone content of the pituitaries, expressed in terms of μg of growth hormone/mg pituitary, or per g rat.

Within the limits of the assay procedure,

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TABLE I. Pituitary Growth Hormone Potencies of Female Rats 10 to 630 Days of Age.

Source of pituitary preparation	No. of hypox. rats	Dose, μg/day	Epiphyseal width, μ	R value, μg/mg pituitary	Slope (b)	Stand. dev. (s)	Lambda (λ)
10-day-old rat	5	250	172 ± 9.28	79.8	188.48	20.76	.152
Idem	2	500	228 ± 14.68				
630-day-old rat	5	250	173 ± 9.28	102.0	375.87		
Idem	3	500	257 ± 12.00				
Beef growth hormone	"	10	154 ± 12.00				
Idem	5	25	191 ± 9.28		96.58		
"	"	50	221 ± "				
Hypophysectomized controls	"		145 ± "				
42-day-old rat	6	250	234 ± 7.84	127	93.02	19.19	.217
Idem	"	500	262 ± "				
56-day-old rat	"	250	203 ± "	94	141.20		
Idem	"	500	246 ± "				
70-day-old rat	"	250	214 ± "	116	177.74		
Idem	"	500	267 ± "				
Beef growth hormone	"	10	176 ± 8.58				
Idem	5	25	197 ± 7.84		61.60		
"	6	50	219 ± "				
Hypophysectomized controls	"		145 ± "				
42-day-old rat	6	250	230 ± 9.88	165.0	129.57	24.14	.220
Idem	"	500	269 ± "				
308-day-old rat	"	250	182 ± "	77.6	207.09		
Idem	"	500	245 ± "				
Beef growth hormone	5	10	179 ± 10.80				
Idem	6	25	195 ± 9.88		85.92		
"	"	50	239 ± "				
Hypophysectomized controls	5		142 ± 10.80				
70-day-old rat	5	500	236 ± 11.58	99.9	75.30	25.90	.216
Idem	6	1000	258 ± 10.58				
378-day-old rat	"	500	240 ± "	96.1	58.14		
Idem	"	1000	257 ± "				
Beef growth hormone	5	25	224 ± 11.58				
Idem	6	50	257 ± 10.58		146.46		
"	"	100	313 ± "				
Hypophysectomized controls	"		142 ± "				
168-day-old rat	4	250	169 ± 12.40	44.6	88.61	24.80	.695
Idem	5	500	195 ± 11.09				
Beef growth hormone	4	10	181 ± 12.40				
Idem	3	25	186 ± 14.32				
"	"	50	197 ± "		23.18		
Hypophysectomized controls	2		147 ± 17.54				

the values obtained for amount of growth hormone in the female rat pituitary indicate that growth hormone may vary in rats of the same age as well as between age groups. Since body and pituitary weights increase with time, while growth hormone potency remains relatively static, there is no consistent trend of increasing or decreasing activity per milligram pituitary or per gram rat.

Summary. Pituitary growth hormone content of female rats from several age groups was assayed in the tibia test; and it was found that the amount of growth hormone, expressed in either μg/mg pituitary or in micrograms growth hormone/g rat, does not follow an ascending or descending course but fluctuates within a relatively small range as the rat ages from 10 to 630 days of age.

TABLE II. Micrograms Growth Hormone per Milligram Pituitary and per Gram Rat.

Age, days	No. rats	A μg growth hormone/mg pituitary	B mg pituitary	C Body wt, g	$\frac{A \times B}{C}$ μg growth hormone/g rat
10	20	79.8	1.39	24.10	4.60
42	19	127.0	4.78	99.00	6.13
"	"	165.0	4.78	99.00	7.97
56	15	94.0	5.96	119.66	4.68
70	20	99.9	7.79	143.00	5.44
"	"	116.0	7.79	143.00	6.32
168	16	44.6	20.56	326.81	2.81
308	15	77.6	19.38	351.60	4.28
378	33	96.1	20.28	358.10	5.44
630	15	102.0	25.06	427.80	5.97

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Use of Glass Electrode for Measuring Sodium in Biological Systems.*† (24480)

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In seeking to trace the meaning of the relationship between sodium and blood pressure we have been hampered by difficulties inherent in estimation of small quantities of this cation. While it is true that sodium movements regularly accompany changes in blood pressure(1) the magnitude of the shifts lies just on the borderline of what can be determined without resort to statistical analysis of small differences. Similarly, while we have shown that pitressin has extrarenal actions on sodium, we were forced to demonstrate these with relatively large doses in order to produce effects measurable by existing methods (2). A further major problem in these studies has been the fact that the time course of ion shifts can only be crudely estimated by blood sampling procedures. Recently, Eisenman, Rudin and Casby(3) reported on preparation of cation sensitive glasses and indicated their potential usefulness as electrodes for biological studies. The important implications of this work led us to explore, with the cooperation of Dr. Eisenman, the technical problem of adapting the electrodes for use in biological systems. The present report concerns only the sodium electrode.

Methods. Amplifying and recording circuitry. The basic electronic problem involves suitable high gain amplification from a high impedance source. Since a change of 1 meq/l concentration from a base of 150 meq/l should ideally yield a potential change of approximately 160 microvolts it is evident that the drift and noise characteristics of the instrumentation are the limiting factors in sensitivity. The Cary vibrating reed electrometer is a very satisfactory basic unit to meet these requirements, having a limiting sensitivity of about 20 microvolts and a very low drift rate.

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