

factors which increased the rate of growth of pigs. The same increase was observed with or without the addition of vit. B₁₂ which may indicate that the factor or factors in the alkali-treated material have a sparing effect upon vit. B₁₂. Whether or not crystalline aureomycin would have this sparing effect was not determined.

Summary. The data obtained show that B₁₂ is beneficial for pigs which were previously depleted on a corn-peanut meal ration. They also show that alkali-treated APF contains a factor or factors which promote growth of pigs and which may have a sparing effect upon B₁₂ needs of the pig.

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Biochemical Studies on the Iguana. (18429)

THOMAS HERNANDEZ AND ROLAND A. COULSON.

*From the Department of Biochemistry, Louisiana State University School of Medicine,
New Orleans, La.*

Although the iguana is one of the most common reptiles of tropical America, very little is known of the biochemical nature of these animals. Two species of Iguanidae were obtained from a biological supply house; 7 specimens were "black iguanas," *Ctenosaura acanthura*, from 80-93.5 cm and weighing 830-990 g, and 9 were "common iguanas," *Iguana iguana rhinolopha*, ranging from 111.5-148 cm and weighing 900-1910 g. The common iguana is easy to handle and harmless whereas the black iguana is more active and has to be handled with some caution because of attempts to bite, or to scratch with its sharp hind claws. Both species subsisted on a diet of cabbage.

The analyses reported here were done in August and September. Blood was obtained by cardiac puncture using a No. 19 gauge needle. Best results were obtained by holding the iguana on his back and inserting the needle in an intercostal space on either side of the thorax 1-2 cm caudal to the front limbs. Although some animals received as many as 10 cardiac punctures only 2 died as a result of this procedure. Urine was obtained by inserting a catheter along ventral wall of cloaca. The analytical methods employed were the same as those reported for the alligator studies(1,2), except for plasma magnesium content which was done by the method of Denis(3).

Results. Table I presents a summary of the general blood studies. The oval nucleated erythrocytes are of large size, the mean corpuscular volume (M.C.V.) for the black iguana being 338 μ^3 and for the common iguana 298 μ^3 . In comparison, the alligator corpuscles are larger(1), having an M.C.V. of 472 μ^3 . Table II reveals a number of differences between the two species of lizards in fasting blood and plasma CO₂, chloride, and pH values. Although the CO₂ and chloride contents are different for the two the sums of the anions are about the same. The lower plasma CO₂ of the black iguana is in keeping with the lower blood pH. The differences between the two in the plasma cations are probably not significant. Both species have plasma phosphorus concentrations which are considerably higher than those of the alligator.

The results of the urine analyses of the common iguana are summarized in Table III. In contrast to the alligator the pH of the urine is always more acid than the blood of the same animal and only 6 of the 36 determinations were above pH 7. There was only an occasional trace of chloride present. The values obtained for uric acid, the chief nitrog-

1. Coulson, R. A., Hernandez, T., and Brazda, F. G., *PROC. SOC. EXP. BIOL. AND MED.*, 1950, v73, 203.

2. Coulson, R. A., Hernandez, T., and Dessauer, H. C., *PROC. SOC. EXP. BIOL. AND MED.*, 1950, v74, 866.

3. Denis, W., *J. Biol. Chem.*, 1922, v52, 411.

TABLE I. Blood Studies.

	No. of animals		Cells, 10 ⁶ /mm ³	H ⁺ crit, %	O ₂ cap., vol., %	Hb, % (calc.)	M. corp. vol., μ^3	M. corp. Hb, g x 10 ⁻¹²	M. corp. Hb, conc., %
Black iguana	7	Avg	1.03	35	8.0	6.0	338	58	18
		Range	0.93-1.10	29-46	7.3-10.3	5.5- 7.7	274-422	52-70	12-26
Common iguana	9	Avg	1.03	30	9.5	7.1	298	68	23
		Range	0.72-1.28	25-36	5.1-16.1	3.8-12.0	257-368	52-93	14-37

TABLE II. Composition of Blood and Plasma.

No. of animals			Gluc., mg %	pH	CO ₂ , mM/L	Cl, mM/L	Urea, mg %	Uric a., mg %	Creat., mg %	
A. Composition of whole blood.										
Black iguana	5	Avg	192	7.22	12.9	107	1.83	3.53	1.20	
		Range	151-250	7.05-7.42	8.8-19.3	102-111	.28-2.83	1.53-5.16	.90-1.61	
Common iguana	9	Avg	155	7.48	20.8	94	.52	4.95	1.19	
		Range	132-195	7.38-7.57	11.5-27.0	88-162	.00-2.15	2.63-8.96	.54-2.12	
B. Composition of plasma.										
			Cl, mM/L	CO ₂ , mM/L	Na, mM/L	K, mM/L	Ca, mg %	P, mg %	Mg, mg %	Pr., %
Black iguana	5	Avg	133	14.5	159	2.92	11.7	7.0	2.32	6.79
		Range	128-137	10.5-21.8	158-163	2.42-3.18	9.2-13.7	5.5-10.3	2.07-2.56	4.13-9.51
Common iguana	9	Avg	118	24.4	157	3.49	10.6	6.1	1.90	4.98
		Range	110-124	14.6-32.7	142-165	2.88-4.32	9.5-11.5	4.9- 7.5	1.65-2.59	3.96-5.93

TABLE III. Composition of Urine of the Common Iguana.

	No. of determinations	Avg	Range
pH	36	6.14	5.09-7.47
CO ₂ , mM/L	9	12.9	4.9-31.7
Cl, "	9	tr.	0 -tr.
Na, "	9	28.6	14.9-40.6
K, "	9	45.8	18.3-85.3
NH ₃ , mg %	22	12.1	1.0-52.8
Urea, "	22	10.9	0-87.2
Uric acid, mg %	15	132.5	40.0-247.7
Creatinine, "	20	3	0.9-6

enous end product, vary widely and depend on the amount of solid uric acid and urates removed from the bladder by catheterization. Two composite specimens of dried excreta were analyzed for uric acid, sodium, potassium, and calcium. Of the 2 specimens analyzed for uric acid one gave a value of 10.3% and the other 96.4% of dry weight of the excreta. The concentration of the constituents of the excreta is dependent apparently on the amount of undigested organic matter present and is therefore highly variable. The calcium was 8% and 21%, sodium 0.4% and 4.5%, and potassium 8% and 23% of the ashed weight of the 2 specimens.

Two iguanas were dried, then ashed at 500°C in an electric furnace. The results of the ash analyses are recorded in Table IV. The volume of the extracellular fluid may be estimated crudely by assuming all of the chloride found in the ash to have originated in the extracellular fluid. On this assumption the extracellular fluid of iguana No. 4 was 24.7% and of No. 8, 26.3% of body weight. Calculation of the extracellular fluid volume on the basis of the sodium content of the ash gives values which are in good agreement with the above.

Since the alligator shows a pronounced alkaline tide(2), it was of interest to see whether this might also be true of the iguana. Two common iguanas were force fed with skinned rats and the blood pH and plasma chloride, CO₂, and sodium determined at 2 hr., 4½ hr., 11 hr., and 23 hr. after feeding. There were no differences in values between the experimentals and 2 controls used. Apparently the pH and electrolyte changes, if any, are too small to be measurable. Similarly, experiments with histamine on the "alkaline tide" met with no success. Four iguanas were injected I. M. with dosages up to 2

TABLE IV. Composition of Iguana Ash.

Iguana No.	Sex	Wt, g	Dry wt, g	H ₂ O, %	Ash, g	Cl, mg	Na, mg	K, mg	Ca, g	Mg, g
4 (common)	F	932	252.3	72.9	57.88	1144.0	1054.0	1343.4	18.20	.513
8 (black)	M	867	253.4	70.8	50.23	1008.7	900.4	1340.2	15.75	.427

mg/kilo, and blood pH and plasma chloride, CO₂, and sodium were determined 1, 2, 3, 4, 11, and 23 hours after injection. The values obtained were of the same order of magnitude as those of the controls.

Summary. Two species of large lizards, *Iguana iguana rhinolopha* (common iguana) and *Ctenosaura acanthura* (black iguana) were studied. The following analyses were performed on blood and/or plasma of both species: pH, CO₂, Cl, Na, K, Ca, Mg, protein, urea, uric acid, creatinine, glucose, hema-

tocrit, oxygen capacity, and mean corpuscular volume. There was little difference in the average values for the two species with the exception of pH, CO₂, and chlorides. Although the total ionic concentration of the plasma was about the same for both, the Common Iguana appeared to be more alkaline than the Black Iguana. The urines and total ashes were analyzed for Na, K, Ca, Mg, and chloride. Uric acid, Na, K, and Ca analyses were done on dried excreta.

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Anatomic and Histologic Changes in Rabbits with Experimental Hypersensitivity Treated with Compound E and ACTH. (18430)

FREDERICK G. GERMUTH, Jr., GLEB A. NEDZEL, BARBARA OTTINGER, AND JIRO OYAMA.
(With the technical assistance of Kenneth Grow.)
(Introduced by Karl Habel.)

From the Microbiological Institute and the Experimental Biology and Medicine Institute, National Institutes of Health, Public Health Service, Bethesda, Md.

Previous work(1) has indicated that Compound E and ACTH inhibit the production of experimental hypersensitivity of the Arthus type in rabbits receiving daily intracutaneous injections of crystalline egg albumin. This inhibition results from the hormonal suppression of antibody formation. The present report describes the anatomic and histologic changes produced in these animals by Compound E and ACTH with emphasis on the histologic appearance of the Arthus reaction and on the organs possibly related to antibody formation.

Methods and materials. Twenty-four male albino rabbits weighing approximately 2 kg each were injected intracutaneously every day for 18 days with 0.2 ml of crystalline egg

albumin solution(2) containing 0.8 mg of egg albumin nitrogen. Simultaneously, 8 of the 24 animals were treated daily with a single intramuscular dose of 10 mg of Compound E and another 8 with 10 mg of ACTH per day administered in 4 intramuscular doses of 2.5 mg every 6 hours. Two to 3 ml of blood were drawn from the marginal ear vein at the beginning of the experiment and on the 4th, 7th, 9th, 11th, 14th and 16th days for the antibody studies previously reported (1). Total white blood counts and differential counts were performed on the 17th day. Eighteen days after the first injection of egg albumin, the surviving animals were bled from the heart and killed. The weights of the thymus, spleen, liver, adrenals and kidneys

1. Germuth, F. G., Jr., and Ottinger, B., *Proc. Soc. Exp. Biol. and Med.*, 1950, v74, 815.

2. Kekwick, R. A., and Cannan, R. K., *Biochem. J.*, 1936, v30, 227.