opposed by the fact that it was impossible to reproduce auricular fibrillation in 2 experiments for a long period after its reconversion into normal sinus rhythm by atabrine despite the presence of a normal electrocardiogram.

While there is no experimental proof as yet, it is reasonable to assume from the evidence submitted that the mechanism of the action of atabrine on auricular fibrillation is similar to that of quinine and quinidine.

Summary. 1. Experimentally produced auricular fibrillation in the dog was successfully restored to normal sinus rhythm by the intravenous infusion of atabrine (average 2.17 mg per kg). 2. The mechanism by which atabrine might produce this effect is discussed. It is suggested that its action is similar to that of quinine or quinidine.

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Effect of Penicillin on Growth and Toxin Production of Enterotoxigenic Staphylococci.*

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Little is known of the effect of penicillin on formation or activity of bacterial toxins. Ercoli, Lewis and Moench[1] demonstrated *in vitro* neutralization of diphtheria toxin-antitoxin mixtures; Boor and Miller[2,3] obtained protection *in vivo* against meningococcal and gonococcal endotoxin and Mason[4] demonstrated inhibition of plasma coagulation by enterotoxigenic staphylococci. Neter[5] failed to obtain neutralization of tetanus toxin and Blair, Carr and Buchman[6] found no inhibition of plasma coagulation and formation of hemolysin by staphylococci.

The present paper reports experiments on the effect of penicillin on formation of staphylococcal enterotoxin, hemolysins, lethal factor and dermonecrotoxin.

Tested by the tube dilution method,[7] the natural resistance of 15 enterotoxigenic strains of staphylococci was found to range from 0.05 units/ml to 500 units/ml of penicillin. Three enterotoxigenic (No. 147, 161, 196) and one nonenterotoxigenic (No. 43) strains used in the following experiments were naturally resistant to 500, 30, 100 and 0.1 units/ml of penicillin respectively. The resistance of strains 161 and 43 was further increased to 2000 and 10 units/ml respectively by growth in increasing penicillin concentrations. All strains were alpha hemolytic and strain 196 produced potent beta lysin.

Toxin production in the presence and absence of penicillin was tested in semisolid (0.7%) veal infusion agar and in liquid and semisolid media containing 1% Amigen,† 0.25% glucose, 1.2 μg/ml nicotinic acid, 0.05

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† Pancreatic hydrolysate of casein free of vitamins and carbohydrate. Product of Mead, Johnson and Co.

TABLE I.

Effect of Penicillin on the Production of Hemolysins, Lethal Factor and Dermonecrotoxin by Staphylococci.

Toxic factor	Staphylococcus strains*	Medium: Amigen liquid — Penicillin	Amigen liquid — No penicillin	Amigen agar — Penicillin	Amigen agar — No penicillin	Veal infusion agar — Penicillin	Veal infusion agar — No penicillin
Rabbit cell hemolysin (MHD/ml)†	161 N		64		128		
	161 R	<2	32-64	64	64	8	64
	147 N	<2	32-64	128	128	128	128
	196 N	<2	32-64	128	128	64	256
	43 N		32		64		128
	43 R	4	16	16	8	32	64
Sheep cell hemolysin (MHD/ml)†	161 N		<2		0		
	161 R	0	0	8	0	0	8
	147 N	0	0	<2	<2	0	0
	196 N	<2	32	32	128	64	512
	43 N		0		8		
	43 R	0	0	0	0		
Lethal factor.	161 N		4/4 (1)		4/4 (.5)		4/4 (.5)
	161 R	0/4 (1.0)‡	4/4 (1)	0/4 (1.0)	4/4 (.5)	4/4 (.5)	4/4 (.5)
	147 N	0/4 (1.0)	4/4 (1)	4/4 (0.5)	4/4 (.5)	4/4 (.5)	4/4 (.5)
	196 N	0/4 (1.0)	4/4 (1)	4/4 (0.5)	4/4 (.5)	4/4 (.5)	4/4 (.5)
	43 N		4/4 (1)		4/4 (.5)		4/4 (.5)
	43 R	0/4 (1.0)	3/4 (1)	4/4 (1.0)	4/4 (1.0)	4/4 (.5)	4/4 (.5)
Dermonecrotoxin	161 N		+§				
	161 R	0	+				
	147 N	±	+				
	196 N	0	+				
	43 N		+				
	43 R	0	±				

* N = normal; R = artificially resistant strains. Strains, except No. 43, are enterotoxigenic.

† MHD (Minimal Hemolytic Dose) of hemolysin indicates least amount of toxin which lyses completely 1.0 ml of a 1% suspension of erythrocytes after incubation for 1 hour at 37°C (rabbit r.b.c.) followed by overnight refrigeration (sheep r.b.c.).

‡ Numerator—number of mice killed within 48 hours; denominator—number mice injected; parenthetic figures - dosage in ml.

§ + = area of necrosis and redness 5 mm or more in diameter; ± = area of redness <5 mm; 0 = no reaction.

μg/ml thiamine HCl, 1.0 μg/ml calcium pantothenate and inorganic salts.[8] All media were adjusted to pH 7.6. Cultures were incubated at 37°C for 3 days. Strains 161 R, 147 N, 196 N and 43 R were grown in 1000, 200, 50 and 5 units/ml of penicillin respectively. Toxins were produced and assays of enterotoxin and hemolysin were carried out by previously described methods.[9-11] Lethal factor was detected by the intravenous injection of mice; dermonecrotoxin by intracutaneous injection of rabbits with 0.1 ml of a 1:20 dilution of toxin in saline.

Counts of viable bacteria revealed no difference in the amount of growth in media containing penicillin compared to the same media without penicillin.

Positive tests for enterotoxin[9,10] were obtained in monkeys or cats with centrifugates of enterotoxic cultures grown in all of the above media with and without penicillin.

Results of assays for hemolysins, lethal factor and dermonecrotoxin are summarized in Table I. The potency of the hemolysins, lethal factor and dermonecrotoxin produced by strains naturally or artificially resistant to penicillin was markedly reduced in cultures grown in Amigen liquid containing penicillin. However, in semisolid Amigen and veal infusion agar cultures, questionable effect of penicillin was noted. Penicillin in the same concentration failed to neutralize preformed hemolysins, lethal factor and dermonecrotoxin.

Summary. The natural resistance of 15 enterotoxic strains of staphylococci to penicillin was found to range from 0.05 to 500 units per ml. Production of staphylococcal hemolysins, lethal factor and dermonecrotoxin, but not of enterotoxin, was inhibited by growing selected naturally and artificially resistant strains in Amigen liquid medium containing sublethal concentrations of penicillin. Inhibition was not observed in similar experiments using semisolid Amigen and veal infusion media.

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[9] Davison, E., Dack, G. M., and Cary, W. E., *J. Infect. Dis.*, 1938, **62**, 219.

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Studies on Thermal Sedation in Suppression of the Symptoms of Tetanus Toxin

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The following experiments on the physiological effects of temperature suggest that cold narcosis, as seen in reptiles and some warm-blooded vertebrates, will modify the development of symptoms resulting from tetanus toxin. It is possible that cold narcosis might be used as a method of sedation and as an adjunct to therapy in such diseases as rabies and tetanus.

Because of the wide range in temperature tolerance exhibited by the diurnal reptiles and because of their similarity to the mammals with respect to optimum temperature, which in many lizards range from 36°C to 41°C, and because of their thermal simplicity and the greater facility with which these animals can be utilized in temperature experiments, it was agreed that any common diurnal species of reptiles would be suitable for experimentation, and the northern crested lizard *Dipsosaurus dorsalis dorsalis* was selected as being most convenient as to size,