Eight New Serotypes of *Arizona arizonae* Kauffmann and Edwards

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Eight new serotypes of *Arizona arizonae* Kauffmann and Edwards (syn.: *Arizona hinshawii* Ewing) were characterized biochemically and serologically. The biochemical reactions of these serotypes were typical of the genus. The antigenic formulas determined serologically were 1,4:16,17,18; 5:1,6,7; 6:1,7 8; 10a,10b:16,17,18; 19:17,20; 22:1,3,11; 24:33;28; and 28:29;31.

The arizonae are members of the family *Enterobacteriaceae* and are closely related to the salmonellae and the citrobacters. Like the salmonellae, the arizonae apparently have no host barriers and are widely distributed. Farm animals from which most arizonae from the United States have been isolated are turkeys, chickens, and sheep. Isolations from reptiles and amphibians have also been common. Strains from some of the abovementioned hosts were received by the Serotyping Laboratories of the Animal and Plant Health Inspection Service, U.S. Department of Agriculture, for identification. Eight of the strains received were identified as belonging to new serotypes, which are described herein.

Bacterial strains. The eight strains reported here were identified as belonging to *Arizona arizonae* Kauffmann and Edwards (5) (syn.: *A. hinshawii* Ewing (2)). Four of the strains were isolated from different animals on one farm as follows: strain 921 from a horned toad, strain 970 from a lizard, strain 1035 from a snake, and strain 1099 from a ground squirrel. The isolations were made during a survey to identify possible reservoirs of arizonae that were infecting turkeys on the farm.

Strain 71 was isolated from chickens 3 weeks of age. It was recovered from four of five chicks submitted to the laboratory and was considered the cause of a 1% mortality in a flock of 18,000 birds.

Strain 79R was isolated from a western diamondback rattlesnake (*Crotalus atrox*), and strain 184 was from a rubber boa snake (*Charina bottae bottae*). These snakes were zoo animals, and their state of health was not reported.

Strain 766 was isolated from a water snake (*Natrix sipedon*) during a study of the snake's intestinal flora.

Biochemical media and procedures. The biochemical media used and the test procedures that were followed were described previously by Ewing and Davis (3).

Serological procedures. The antigen preparation, tube agglutination tests, and antibody absorption procedures used were those described by Edwards and Ewing (1).

Each of the eight strains was a gram-negative, asporogenous, rod-shaped, peritrichously flagellated bacterium. With minor exceptions, the biochemical reactions of the eight strains were typical of those obtained with a majority of the members of the genus *Arizona* (4). They failed to produce indole, were methyl-red positive and Voges-Proskauer negative, grew on Simmon citrate medium, and produced hydrogen sulfide in triple sugar iron agar. They produced lysine and ornithine decarboxylases and arginine dihydrolase but did not produce urease or phenylalanine deaminase. They liquefied gelatin after 3 or more days of incubation, reduced nitrates to nitrites, and failed to grow in potassium cyanide medium. Glucose was fermented with the production of acid and gas within 24 h. Mannitol, arabinose, maltose, xylose, trehalose, and glycerol were fermented. Sucrose, salicin, dulcitol, adonitol, inositol, and raffinose were not fermented. Mucate and sodium malonate were utilized, and tests for β -D-galactosidase activity (ONPG test) were positive. Additional tests which did not give the same results with each strain are listed in Table 1. These results show that these strains belong to *Arizona arizonae*. Results of the serological

TABLE 1. *Biochemical test results which varied for the eight new Arizona serotypes^a*

Substrate	Strain							
	1035	921	970	1099	71	79R	184	766
Lactose	(+)	(+)	—	(+)	+	—	+	+
Sorbitol	(+)	+	+	+	+	+	+	(+)
Cellobiose	—	—	—	(+)	—	—	—	—
Jordan's tartrate	—	—	—	—	—	—	—	+
Organic acids ^b								
Citrate	+	+	+	+	+	—	+	+
D-tartrate	—	—	—	—	—	—	(+)	(+)
I-tartrate	—	—	—	—	—	—	—	—
L-tartrate	—	—	—	—	—	—	—	(+)

^a +, Positive after 1 or 2 days of incubation; (+), positive within 30 days; —, negative for 30 days.^b Method of Kauffmann and Peterson (6).TABLE 2. *Analysis of O antigens of eight new Arizona serotypes*

Strain	Serum	Homologous titer	New serotype titer
1035	O 1,4 (292-53) ^a O 1,4 absorbed by 1035	1,280 ^b 40	1,280 <20
921	O 6 (S050) O 6 absorbed by 921	640 <20	1280 <20
970	10a, 10b (3970-53) O 10a, 10b absorbed by 970	1,280 <20	1,280 <20
1099	O 19 (PC 145) O 19 absorbed by 1099	320 <20	320 <20
71	O 5 (1840-54) O 5 absorbed by 71	1,280 40	1,280 20
79R	O 22 (2959-55) O 22 absorbed by 79R	5,120 20	5,120 <20
184	O 28 (3592-56) O 28 absorbed by 184	2,560 20	2,560 20
766	O 24 (PC 196) O 24 absorbed by 766	1,280 <20	2,560 <20

^a Parentheses enclose the identification number of the homologous strain.^b Titer is expressed as the reciprocal of the dilution of antiserum giving a definite agglutination.

TABLE 3. *Analysis of H antigens of eight new Arizona serotypes*

Strain	Serum	Homologous titer	New serotype titer
1035	H 16,17,18 (Ore. 181) ^a	10,240 ^b	20,480
	H 16,17,18 absorbed by 1035	<20	<20
921	H 1,7,8 (CDA1-184)	20,480	10,240
	H 1,7,8 absorbed by 921	<20	<20
970	H 16,17,18 (Ore. 181)	10,240	20,480
	H 16,17,18 absorbed by 970	<20	<20
1099	H 17,20 (PC107)	10,240	20,480
	H 17,20 absorbed by 1099	<20	20
71	H 1,6,7 (35)	10,240	20,480
	H 1,6,7 absorbed by 71	160	20
79R	H 1,3,11 (S39)	10,240	10,240
	H 1,3,11 absorbed by 79R	<20	<20
184	H 31 (1106-55)	2,560	5,120
	H 31 absorbed by 184	20	20
	H 29 (16019)	40,960	40,960
	H 29 absorbed by 184	40	<20
766	H 33 (466-52)	40,960	81,920
	H 33 absorbed by 766	20	20
	H 28 (PC110)	81,920	20,480
	H 28 absorbed by 766	320	40

^a Parentheses enclose the identification number of the homologous strain.^b Titer is expressed as the reciprocal of the dilution of antiserum giving a definite agglutination.TABLE 4. *Antigenic formulas assigned to the eight new Arizona serotypes*

Strain no.	Antigenic formula
1035	1,4:16,17,18
921	6:1,7,8
970	10a,10b:16,17,18
1099	19:17,20
71	5:1,6,7
79R	22:1,3,11
184	28:29:31
766	24:33:28

tests to identify the O and H antigens of these strains are presented in Tables 2 and 3. From the resultant antigenic formulas, it is evident that each of these eight strains belongs to a new serotype (see Table 4).

These strains have been referred to the Enterobacteriology Unit, Center for Disease Control, Atlanta, Georgia, and the results have been confirmed.

REPRINT REQUESTS

Address requests for reprints to: Dr. Billie O. Blackburn, U.S. Department of Agriculture, Animal

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