Bacteriophage-typing designations of *Salmonella typhimurium**

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SUMMARY

The phage-typing scheme of Callow (1959) has been extended. The original number of types was 34; this has now risen to 207. Tables are presented which show the provisional type designations and the definitive designations now being introduced.

THE NEW TYPING SCHEME

The phage-typing of *Salmonella typhimurium*, first devised by the late Miss B. R. Callow (Felix & Callow, 1943; Felix, 1956; Callow, 1959; Anderson, 1964) has established itself as the method of choice for the epidemiological study of *S. typhimurium* infection. The source of such infection in man is usually the livestock he eats, although epidemic cycling may occur in man, especially in hospitals, paediatric units and day nurseries. Even in such outbreaks, however, the ultimate infective source is animal.

Since certain phage types predominate in particular animal hosts, human infection with these types usually originates in those animals. Phage-typing can thus greatly shorten the time taken to trace the animal sources of human outbreaks of *S. typhimurium* infection (Anderson, Galbraith & Taylor, 1961; Anderson, 1964, 1968, 1969, 1971) as well as assisting in the control of infection in the animals themselves.

The first phage-typing scheme of Miss Callow distinguished 12 types of *S. typhimurium* with 11 phages. Her second and greatly improved scheme initially distinguished 34 types with 29 phages (Callow, 1959). Once the revised scheme was adopted for routine use in the Enteric Reference Laboratory in 1958, however, it rapidly showed that its sensitivity was of a high order, and since then it has progressively expanded until it now distinguishes 207 types with 34 phages.

As the first types studied in the evolution of this scheme were those of the original scheme, their new designations were allotted as numbers following in general the order of the original scheme. However, the new system subdivided certain types of the old scheme. Moreover, many *S. typhimurium* strains that were untypable with the old method yielded clear-cut typing patterns with the new, and these

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Table 1. *Salmonella typhimurium* phage typing designations

Type designation			Type designation		
Definitive (DT)	Provisional (PT)		Definitive (DT)	Provisional (PT)	
	Old scheme	New scheme		Old scheme	New scheme
1	1	A.D.	50	3 var. 1	U159
2	1a	A.D.	51	5	U51
3 an*	1a var. 1	A.D.	52	1b var. 2	U59
3 aer*	1a var. 2	A.D.	53	2b var. 1	U128
4	1b	A.D.	54	1b var. 1	4a
5	3	A.D.	55	1b var. 5	U171
6	3a	A.D.	56	1b var. 3	U20
7	2d	A.D.	57	3a var. 2	U85
8	4	A.D.	58	2c	U56
9			59	2d	U134
10			60	2	U87
11	2	A.D.	61	2	U111
12			62	2b	U115
12a			63	2b	U139
13	2a	A.D.	64	4	U38
14			65†		
15	2c	A.D.	66	U	U101
15a			67	2	U103
16			68	2b	U162
17	2b	A.D.	69	U	U158
18			70	2c	U154
19			71	2c	14c
20			72	2c	U131
20a	2d	A.D.	73	2	U45
21	U	A.D.	74	2	U71
22			75	2	U136
23	5	A.D.	76	2	U182
24			77	2	U6
25			78	2	U141
26	U	A.D.	79	2	U113
27			80	U	U17
28	2c	A.D.	81	U	U96
29	2b or U	A.D.	82	2a	U55
30	4	A.D.	83	2b	U102
31			84	2a	U100
32	U	A.D.	85	2c	14b
33†			86	2b	14d
34†			87	2a	U84
35	U	A.D.	88	2b var. 2	U39
36	1 var. 11	A.D.	89	2b	U15
37	1 var. 6	U86	90	2b	U164
38	1 var. 9	U156	91	U	U30
39	1 var. 12	U178	92	2b	U180
40	1 var. 10	U165	93	2b	14a
41	1 var. 2	U41	94	2b	U148
42	1 var. 8	U153	95	U	U163
43	1 var. 1	U35	96	U	U24
44	1 var. 5	U9	97	U	U64
45	1a var. 7	U168	98	U	U25
46	1a	U149	99	U	U40
47	1a var. 6	U105	100	2	U137
48†			101	2	U80
49	1a	U57	102	2	U70

A.D. = As definitive.

Table 1 (cont)

Type designation			Type designation		
Definitive (DT)	Provisional (PT)		Definitive (DT)	Provisional (PT)	
	Old scheme	New scheme		Old scheme	New scheme
103	2	U18	157	2c	U225
104	2c	U129	158	2	U147
105	2	U121	159	2a	U217
106	2e	U75	160	2a	U218
107	2	U114	161	2b	U19
108	2	U36	162	5	U133
109	2	U135	163	5	U251
110	2c	U130	164	U	U212
111	2	U11	165	2	U216
112	2b	U126	166	U	U254
113	2b	U89	167	2	U201
114	U	U142	168	2	U193
115	U	U173	169	2	U213
116	U	U68	170	2	U206
117	U	U119	171	2e	U242
118	U	U138	172	2e	U120
119	U	U167	173	2c	U219
120	U	U42	174	3a var. 3	U208
121	2b	U152	175	2b	U227
122	U	U122	176	2b	U221
123	2c	U151	177	2b	U189
124	U	U104	178	U	U191
125	1 var. 17	U214	179	U	U246
126	1 var. 18	U223	180	U	U250
127	1a var. 9	U230	181	2	U249
128	1 var. 13	U187	182	U	U253
129	1 var. 20	U239	183†		
130	1 var. 15	U207	184	2b	U228
131	1 var. 21	U240	185	2	U226
132	1a var. 5	U157	186	2b	U166
133	1 var. 19	U233	187	U	U197
134	1 var. 16	U209	188	U	U232
135	1a	U211	189	1a var. 11	U255
136	1b var. 6	U234	190	2c var. 1	U93
137	1b	U252	191	1 var. 22	U256
138	1b	U243	192	U	U257
139	1b	U247	193	U	U258
140	1b	U224	194	U	U259
141	1b var. 4	U65	195	U	U260
142	1a var. 10	U184	196	1b	U261
143	1a	U241	197	1 var. 23	U262
144	3a	U248	198	1 var. 24	U263
145	3a var. 1	U108	199	2b	U231
146	2b	U222	200	U	U264
147	2e	U169	201	2	U265
148	2b	U236	202	3 var. 2	U266
149	2	U235	203	U	U267
150	2	U229	204	U	U268
151	2	U244	205	1 var. 25	U269
152†			206	1 var. 26	U270
153	2	U73	207	U	U271
154	2c	U26	208	U	U272
155	2c	U203	209	2d	U273
156	2c	U204			

* an, anaerogenic, aer. aerogenic.

† These types have been abandoned.

NOTE. The first 36 definitive types have no provisional designation in the new scheme as they were directly allocated definitive numbers.

were allotted new typing designations. Since it was evident, because of the rapidly growing number of types, that it would be an error prematurely to finalize the designations, these were allotted provisional numbers, preceded by the letter U (= untypable): an indication that they did not correspond to any of the 34 basic types of the new Callow scheme.

It was clear that definitive numerical designations must eventually be given to the many types of the new scheme. This has now been done, and for some time we have been reporting the definitive type designations (DT) in addition to the provisional designations (PT) that have been used for a number of years.

The purpose of this article is to present the complete list of definitive phage type designations together with those that have been in provisional use, in order that equivalents can be apparent. The types are shown in Table 1.

The table shows the greatly superior discriminatory capacity of the new *S. typhimurium* phage-typing scheme over the original scheme. For example, strains identified simply as type 2 by the old scheme can be divided into no less than 37 distinct types by the new; 2b is divided into 27 types; and 2c into 17 types. Types designated as 'variants' of main types in the old scheme are allotted specific designations in the new. Thus, type 1 var 11 becomes type 36; type 1 var 6, type 37; type 1 var 9, type 38; type 1 var 12, type 39; and type 1 var 10, type 40.

As we have indicated above, these tables are published only as a key to the identification of the new type designations in terms of the old. Full details of the new typing scheme, together with information on the frequency distribution of types, will be given in a later paper.

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