TABLE 1
Survival ratio of cells of Shigella dysenteriae grown on base salt agar to those grown on polypeptone agar

Strain	Viable Count on Base Salt Agar	Viable Count on Polypeptone Agar	Survival Ratio
1755	188×10^6	163×10^6	1:1
1753	84×10^6	57×10^6	1:1
1823	28×10^6	16×10^6	1:1
1762	146×10^6	114×10^6	1:1
14-7	160×10^6	147×10^6	1:1
14-5	32×10^6	22×10^6	1:1
14-10	111×10^6	76×10^6	1:1
14-2	136×10^6	147×10^6	1:1
14-4	43×10^6	36×10^6	1:1
14-8	125×10^6	114×10^6	1:1
1820	62×10^6	144×10^6	1:2
14-9	12,000	63×10^6	1:5,000
14-3	209	209×10^6	$1:10^6$
1767	105	125×10^6	$1:10^6$
550D	87	196×10^6	$1:2 \times 10^6$

adsorbing twice with activated charcoal at 54 C and filtering before sterilization. Magnesium ion, in a concentration of 0.03 mg/ml and EDTA, in a concentration of 0.035 μg/ml were added aseptically to the medium just prior to pouring plates.

All plates were incubated 48 hr at 37 C in an atmosphere of nitrogen containing 10 per cent carbon dioxide.

The results (table 1) demonstrated that all strains contained organisms capable of growth on the base salt agar. Ten of the strains indicated survival on the base salt agar equivalent to polypeptone agar. The addition of either glutamic acid or cystine, in 0.05 mg/ml amounts, to the base salt medium provided growth of strain 14-3 equal to that of other strains requiring no amino acids.

It is concluded that this medium contains the minimal growth requirements for *S. dysenteriae* under anaerobic conditions. One strain, not showing a 1:1 ratio, was shown to contain variants requiring an additional growth factor.

It is recommended that this medium be used as a standard in assaying the growth requirements of any given strain of *S. dysenteriae* so as to afford some correlation of reports dealing with the nutritional requirements of this species.

ASSOCIATION OF PRODUCTION OF DIPHOSPHOPYRIDINE NUCLEOTIDASE WITH SEROLOGICAL TYPE OF GROUP A STREPTOCOCCUS[1]

PENELOPE D. LAZARIDES AND ALAN W. BERNHEIMER
Department of Microbiology, New York University College of Medicine, New York

Received for publication May 6, 1957

Diphosphopyridine nucleotidase (DPNase) has been found to be an extracellular product of growth of certain strains of streptococci belonging to groups A, C and G, but not of other streptococci nor of other bacterial species that have been examined (Carlson *et al.* J. Exptl. Med., **106,** 15, 1957; Bernheimer *et al.* J. Exptl. Med., **106,** 27, 1957). In a series of 58 randomly selected strains of group A streptococci, the frequency of DPNase producing strains was 55 per cent. The findings suggested a tendency for DPNase to be produced in cultures belonging to certain serological types and not in cultures belonging to certain other serological types, but the data were not extensive.

Through the kindness of Dr. Rebecca C. Lancefield, who has put at our disposal 142 additional strains of group A streptococci, as well as information concerning their type and source, it has been possible to test further the idea that capacity to elaborate DPNase is a type-associated property. The organisms were cultivated in neopeptone infusion broth containing 1 per cent horse serum. After incubation at 37 C for 24 hr, the cultures were streaked to check purity, centrifuged, and the supernatants assayed for DPNase according to the method described earlier (Bernheimer *et al.*). Cultures yielding supernatants containing more than 50

[1] This study was supported in part by grants from the Life Insurance medical Research Fund and the Masonic Foundation for Medical Research and Human Welfare.

units of enzyme per ml were regarded as positive for enzyme production; others negative.

Table 1 shows the results together with some of the earlier findings for comparison. It is evident that streptococci belonging to types 3, 4, 6, and 12 tend to produce DPNase with considerable regularity, while streptococci belong to types 1, 5, 14, 19, and 24 tend not to produce the enzyme. The type 4 strain (C843) that failed to form DPNase was re-typed and found to possess type 4 antigens both by precipitation and slide agglutination techniques. The type 5 strain (Perez) that was DPNase-positive was isolated from the throat of a rheumatic fever patient in 1956. It was independently classified as type 5 in two different laboratories. The six type 12 strains that were DPNase-negative were unusual in that they all possessed the type 10 T antigen (Bernheimer *et al.*).

TABLE 1

Frequency of production of diphosphopyridine nucleotidase by strains of selected types of group A streptococci

Type	No. of Strains that Produced DPNase/ No. of Strains Examined		
	Previously tested	Newly tested	Total
1	0/8	0/25	0/33
3	5/5	18/18	23/23
4	13/14		13/14
5	1/3	0/19	1/22
6	3/3	17/17	20/20
12	52/56	0/2	52/58
14	0/1	0/12	0/13
19	0/3	0/35	0/38
24		0/14	0/14

The sources and dates of isolation, or acquisition, of the newly tested strains are as follows: *Type 1*: London, England, 1934; Tampa, Florida, 1944; Newport, R. I., 1943 to 1946; Boston, Mass., 1943; Bethesda, Md., 1944; New Haven, Conn., 1946; New York City and vicinity, 1931 to 1955; Arizona, 1957; *Type 3*: London, England, 1934; Boston, Mass., 1939; Newport, R. I., 1942; Philadelphia, Pa., 1948; New York, N. Y., 1931 to 1952; *Type 5*: London, England, 1935; Boston, Mass., 1951; New York City and vicinity, 1936 to 1953; *Type 6*: London, England, 1934; Newport, R. I., 1942; New York, N. Y., 1935 to 1954; *Type 12*: Dr. W. T. Longcope, 1926; Dr. Anna Williams, approx. 1927; *Type 14*: London, England, 1935; Orange, N. J., 1935; Bainbridge, Md., 1952; New York, N. Y., 1941 to 1952; *Type 19*: Texas, 1918; London, England, 1930 to 1937; Australia, 1941; Newport, R. I., 1943; Halifax, N. S., 1941; Chicago, Ill., 1942 to 1943; Minneapolis, Minn., 1948; Albany, N. Y., 1950; New York, N. Y., 1933 to 1955; *Type 24*: England, 1942; Newport, R. I., 1942; Boston, Mass., 1943; New York, N. Y., 1933 to 1944.

MITOCHONDRIALIKE STRUCTURES IN ULTRATHIN SECTIONS OF *MYCOBACTERIUM AVIUM*

CHIKATOMO SHINOHARA, KAZUE FUKUSHI, AND JUNJI SUZUKI

The Research Institute for Tuberculosis and Leprosy, Tohoku University, Japan

Received for publication May 9, 1957

Mitochondria have been demonstrated in *Mycobacterium thamnopheos* and *Mycobacterium tuberculosis* var. *hominis* by treatment with tetrazolium salts by Mudd *et al.* (J. Bacteriol., **62,** 459, 1951), who considered that tetrazolium reducing granules corresponded to electron dense granules.

Some years later it was reported by Takeya *et al.* (J. Electron Microscopy, **2,** 29, 1954), Glauert and Brieger (J. Gen. Microbiol., **13,** 310, 1955) and Mudd *et al.* (J. Bacteriol., **72,** 767, 1956) that examinations with both the light and the electron microscope of one and the same bacillus treated with tetrazolium salt or potassium tellurite had proved electron dense granules not to be necessarily identical with mitochondria.

The characteristic structure of mitochondria as revealed in plant and animal cells had not been detected in the use of ultrathin sections of bacteria.

The characteristic structure having a close resemblance to that of mitochondria of animal cells was found in *Mycobacterium avium* (The Institute for Infectious Diseases, University of