REFERENCES


APPENDIX 4

Sensitivity of Group A Streptococcus Cultures to Temperate Phages

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Studies on sensitivity of hemolytic streptococci to a phage were undertaken by Evans (1942, 1947), Kjems (1955), Krause (1957), Totolyan (1959), Wilson and Maxted (1962). The aforesaid investigators established a group-specific character of lysis of Streptococcus cultures. In addition, they revealed the absence of strict correlation between a serologic type of group A streptococci and sensitivity to a phage.

Different forms of streptococcal diseases (excluding glomerulonephritis) are not connected with a certain serologic type. Proceeding from this fact, there are good reasons for the search for additional marking of group A streptococcus cultures employing phages. Analogous assumption was suggested by Kjems (1955) and Maxted (1962). With this point of view, sensitivity of hemolytic group A streptococci to temperate phages was studied. In the present investigation, there were employed 25 temperate streptococcal phages isolated from lysogenic cultures of hemolytic group A streptococci by the method of ultraviolet induction. Their activity according to Cratia ranges between $1 \times 10^6$ and $1 \times 10^9$ cells per ml. While studying a lytic action, phages were used at the RTD dilution to exclude the nonspecific lysis without reproduction. Cultures of group A streptococci were isolated from patients with such Streptococcus cultures...
coccus infections as scarlet fever, nephritis, rheumatism, tonsillitis from several towns of the Soviet Union (Moscow, Alma-Ata, Gorky). Thirty-four cultures generously supplied by Prof. Köhler from GDR were also tested. A total of 327 cultures of hemolytic group A streptococci of different serologic types (4, 12, 1, 2, 25, etc.) were tested for sensitivity to the indicated phages.

Determination of Streptococcus sensitivity to temperate phages was carried out in Petri dishes in solid nutrient medium (1% MPA) with the addition of 0.25% normal inactivated cattle serum. Incubation lasted for 18 hours at 36°C.

Analysis of the obtained material showed the following:

1. The collection of phages employed is not complete. Only 168 of 327 (50%) tested cultures are sensitive to the given phages.

2. Streptococcus cultures are often lysed not by one but by several phages forming a certain phagomosaic for each of them. The number of phagomosaics is considerable and creates certain difficulty in attempts to group streptococci while using phagosensitivity as a marker.

3. Eleven of 25 tested phages did not possess specific individuality, Streptococcus cultures being lysed only in combination with other phages. Accordingly, they were excluded from further investigations.

4. A range of 12a/116H phage lytic activity appears to be of interest. The given phage was derived from lysogenic culture of group A streptococci of the 4th serologic type on the indicator strain of the 12th serologic type. Its activity was $5.6 \times 10^6$ cells per ml.

Sixty-three of 75 cultures sensitive to this phage were isolated from patients with nephritis or from members of their families. The disease had a sporadic character and was recorded in different regions of the town. Sixty-nine of 124 tested "nephrogenic" cultures were phagosensitive. Sixty-three of 69 sensitive cultures were lysed by 12a/116H phage.

On the basis of the findings obtained, we cannot speak about high sensitivity to phages of "nephrogenic" cultures as compared with cultures of streptococci of other origin, since percentage of lysobility of cultures
belonging to these groups is approximately the same (50%). However, one is left with the impression that the given group of cultures is rather homogeneous not only serologically (60% of them are related to the 12th serologic type) but also with respect to its phagosensitivity.

It seems to us that no matter which factor will appear responsible for phagosensitivity of "nephrogenic" streptococci (lysogeny, common receptors), cultures with the same degree of lysis should possess a certain common substance playing the role of phage receptor.

Proceeding from the fact that 12a/116H lyses not all the streptococci of the 12th type and that it lyses the cultures of streptococci of the 25th and 1st types, one may assume that this substance differs from the type specific one.

5. The mosaic character of Streptococcus sensitivity prompt us to suggest that one should mark Streptococcus strains in a manner analogous to that by which staphylococci are marked, i.e. not according to phagomosaics but to groups of phages which induce lysis. For this purpose, it is necessary to divide phages into groups. A similar range of lytic activity, namely the number of most frequently observed combinations of phage actions (Williams and Rippon 1952), might serve as an initial sign for grouping phages.

Data available appeared insufficient to divide 14 phages left into groups. Hence it follows that further investigation of a larger number of Streptococcus cultures is required.

REFERENCES

Evans, A. 1942. J. Bacter. 43:207.