# VARIABILITY OF THE INTRATYPE ANTIGEN MARKER OF STRAINS OF POLIOMYELITIS

Yu. Z. Gendon

Moscow Scientific Research Institute of Virus Preparations
(Director, O. G. Andzhanaridze)
(Presented by Active Member AMN SSSR N. N. Zhukov-Verezhnikov)
Translated from Byulleten' Éksperimental'noi Biologii i Meditsiny, Vol. 56, No. 10,
pp. 67-69, October, 1963
Original article submitted December 7, 1962

Among the genetic features recognized at the present time in strains of poliomyelitis virus, the intratypic antigen marker which enables strains within a single type to be identified is considered to be the most stable [4, 9].

Recently it has been repeakedly demonstrated experimentally [7, 8, 10] that in mutations of the tobacco mosaic virus there is sometimes a change in the aminoacid composition of the protein membrane of the virus.

The specificity of the intratype antigenic marker is determined chiefly by the viral protein. In this connection it seemed to us interesting to study this feature in mutants of a single strain of poliomyelitis virus obtained by treatment of the RNA of the infective virus with certain mutagens (increase of temperature, nitrous acid, proflavine).

## EXPERIMENTAL METHOD

The experiments were carried out with virulent poliomyelitis strains (type 1 strain Mahoney and type 2 strain $MEF_1$) and with attenuated Sabin strains (type 1 LSc 2ab and type 2 strain P-712 ch 2 ab).

We treated the virus of the RNA with increased temperature and with nitrous acid by the method described previously [1-3]. When we used proflavine as the mutagen the RNA solution containing 5 μg of proflavine per ml was submitted to the photochemical action of daylight for a known time. Details of this method will be described in a separate communication.

We have previously described the method of studying the genetic features – N (neurovirulence for monkeys), M (morphological infection of the central nervous system), mN (neurovirulence for mice), S (diameter of vesicles), $rct_{40}$ (ability to multiply at 40°), d (ability to multiply in a low concentration of sodium carbonate) [4].

To study the intratypic antigenic marker we slightly modified the method of McBride [4] and Wecker [9].

## EXPERIMENTAL RESULTS

The table shows the characteristic genetic features of the various mutants of the poliomyelitis virus, as well as results of a study of the intratypic antigenic marker by the method of McBride and Wecker. Mutants having a common parent were studied with antiserum to the parent strain. In most mutants which showed a change in only one or two genetic features the antigenic marker remained unchanged. However in almost all the mutants which showed a change of any genetic of any genetic characteristics there was also a change in the antigenic marker, and most frequently this was found in mutants obtained by treatment of the infective RNA of the poliomyelitis virus with proflavine. Apparently in the use of this mutagen which induces in the code of the nucleic acid more extensive changes than are brought about by increase of temperature or by nitrous acid, more far reaching changes of the genetic features occur, including observation of the intratype antigen marker.

The results obtained concerning the possibility of change of the intratype antigen marker must be considered in an analysis of the strains of the poliomyelitis virus produced by human subjects immunized by a live poliomyelitis vaccine. If the strains liberated according to the antigen marker correspond to the vaccine virus both strains may be considered homologous. In this case, if the liberated and the vaccine strains differ in this feature the categorical conclusion that the viruses under study are of different origin cannot be made, because as was seen from the data given above, in many cases the antigen marker like other genetic features of the poliomyelitis virus may undergo alteration.

Results of a Study of an Intratype Antigen Marker in Mutants of the Poliomyelitis Virus

| | Mutants | | Genetic[1] features | | | | | Antigen marker (McBride) "K") | Antigen marker (Wecker) (diameter of the vesicles in the experiment compared with control, as %) |
|---|---|---|---|---|---|---|---|---|---|
| | | | N | mN | S | d | $rct_{40}$ | | |
| Mahoney type 1 (virulent strain) | — | Original strain | +[2] | | + | + | + | 41 | 0 |
| | Temperature 50° | M/50/30 | —[3] | | + | — | + | 38 | 6 |
| | » 50° | M/50/60/1 | — | | + | + | — | 43 | 0 |
| | » 50° | M/50/60/8 | — | | — | — | — | 39 | 0 |
| | » 50° | M/50/60/15 | — | | — | — | — | 16 | 44 |
| | Nitrous acid | M/4,2/3 | + | | — | + | + | 37 | 9 |
| | » » | M/4,2/5 | + | | — | — | + | 37 | 0 |
| | » » | M/4,7/4 | + | | — | — | + | 14 | 38 |
| | » » | M/4,2/6 | — | | + | + | + | 14 | 41 |
| | » » | M/4,2/2 | — | | — | — | — | 17 | 33 |
| | » » | M/4,7/6 | — | | — | — | — | 11 | 0 |
| $MEF_1$ type 2 (virulent strain) | — | Original strain | + | + | + | + | + | 29 | 0 |
| | Temperature 50° | MF/50/60/2 | + | + | — | — | + | 31 | 0 |
| | » 50° | MF/50/60/6 | + | — | — | — | + | 33 | 0 |
| | » 50° | MF/50/60/3 | — | — | — | — | — | 13 | 51 |
| | » 50° | MF/50/60/17 | — | — | — | — | — | 10 | 37 |
| | Nitrous acid | MF/4,2/1 | + | + | — | + | — | 26 | 0 |
| | » » | MF/4,2/9 | + | + | — | — | + | 27 | 11 |
| | » » | MF/4,7/6 | — | + | + | + | — | 33 | 6 |
| | » » | MF/4,2/2 | — | + | — | — | — | 12 | 31 |
| | » » | MF/4,2/5 | — | — | + | + | + | 9 | 40 |
| | » » | MF/4,2/3 | — | — | — | — | — | 31 | 0 |
| | » » | MF/4,7/5 | — | — | — | — | — | 7 | 48 |
| LSc 2 ab type 1 (attenuated strain) | — | Original strain | — | | — | — | — | 22 | 0 |
| | Nitrous acid | L/3,3/2 | — | | + | — | — | 24 | 0 |
| | » » | L/3,3/5 | — | | + | + | + | 24 | 8 |
| | » » | L/3,3/3 | + | | + | + | + | 21 | 0 |
| | » » | L/4,2/5 | + | | + | + | + | 8 | 32 |
| | Proflavine | L/n/2/3 | — | | + | + | + | 23 | 11 |
| | » | L/n/3/1 | — | | + | + | + | 9 | 48 |
| | » | L/n/3/6 | + | | + | + | + | 7 | 41 |
| | » | L/n/2/11 | + | | + | + | + | 8 | 48 |
| | » | L/n/4/4 | + | | + | + | + | 8 | 33 |
| | » | L/n/2/5 | + | | + | + | + | 10 | 52 |
| P-712 ch 2 ab type 2 (attenuated strain) | — | Original strain | — | | — | — | — | 33 | 0 |
| | Nitrous acid | P/3,3/3 | — | | + | + | — | 32 | 5 |
| | » » | P/4,2/1 | — | | + | + | + | 34 | 0 |
| | » » | P/4,2/9 | — | | + | + | + | 31 | 0 |
| | » » | P/3,3/6 | + | | + | + | + | 32 | 9 |
| | » » | P/3,3/10 | + | | + | + | + | 8 | 53 |
| | Proflavine | P/n/3/4 | — | | + | + | + | 36 | 0 |
| | » | P/n/4/7 | — | | + | + | + | 9 | 47 |
| | » | P/n/4/2 | — | | + | + | + | 30 | 10 |
| | » | P/n/3/3 | + | | + | + | + | 8 | 31 |
| | » | P/n/5/3 | + | | + | + | + | 11 | 35 |
| | » | P/n/3/8 | + | | + | + | + | 7 | 40 |
| | » | P/n/4/4 | + | | + | + | + | 7 | 37 |

[1]Method of determination of the genetic features has been described previously [1].

[2] + genetic sign, characteristic of a virulent strain.

[3] — genetic sign, characteristic of attenuated strain.

It should be noted that many authors [5, 6] have also obtained indications that in the poliomyelitis virus, after passage on a culture of tissue of rodents, or after multiplication in the intestine of vaccinized children in many cases the antigen marker undergoes alteration.

## SUMMARY

In the process of appearance of poliomyelitis virus mutants under the action upon the viral RNA of increased temperature, nitrous acid or proflavine in conditions of light, apart from the alteration of number of biological signs, there occur changes of the antigenic marker, determining the intratype antigenic specificity.

The change of this sign was mostly observed in proflavine induced mutants.

## LITERATURE CITED

1. Yu. Z. Gendon, Ya. E. Khesin, and A. T. Marchenko, in book: A live oral poliomyelitis vaccine. [in Russian] Moscow, p. 461 (1961).
2. Yu. Z. Gendon, Acta virol., 6, No. 5, p. 428 (1962).
3. Yu. Z. Gendon, and B. S. Diskina, Acta virol., No. 4, p. 289 (1962).
4. W. McBride, Virology, vol. 7, p. 45 (1956).
5. J. Melnick, Am. J. publ. Hith., vol. 52, p. 472 (1962).
6. S. Plotkin, B. Cohen, and H. Koprowski, Virology, vol. 15, p. 473 (1961).
7. A. Siegel, Virology, p. 212.
8. A. Tsugita and H. Fraenkel-Conrat, J. molec. Biol., vol. 4, p. 73 (1962).
9. E. Wecker, Virology, vol. 10, p. 376 (1960).
10. H. Wittmann, Virology, vol. 12, p. 609 (1960).

---



---