

## Effect of Hydrochloric Acid Concentration on the Stabilization of Poliovirus at High Temperature

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**Abstract:** Attenuated poliovirus Sabin strains type 1 LSc 2ab and type 3 Leon 12a<sub>1</sub>b have been stabilized in different concentration of hydrochloric acid (HCl) between pH 1.3 to 3.0 at 50°C for 15 minutes. These strains were temperature stable at pH 2.0 which corresponds to the concentration of HCl in human stomach.

The infection route of attenuated poliovirus strains administrated in the form of oral vaccine to children is similar to that of natural infection by wild strains of poliovirus. The mechanism of poliovirus distribution in human has already been explained by Sabin (1956) and Bodian & Horstmann (1965). Both these theories mentioned that neurovirulent as well as attenuated strain reaches to gut through stomach. The pH of human stomach is 1.3 to 1.6, because the concentration of hydrochloric acid is about 0.18%. Wallis and Melnick (1962) reported that maximum stabilization of attenuated poliovirus strain was observed at pH 4.0 against heating for 15 minutes at 50°C. In this study, we demonstrated the stabilization of attenuated poliovirus strain by hydrochloric acid, at pH 2.0 at high temperature.

Attenuated poliovirus Sabin strains type 1 LSc 2ab and type 3 Leon 12a<sub>1</sub>b were diluted to  $6.5 \times 10^6$  PEU/ml in different concentration of HCl in physiological saline to final pH between 1.3 to 3.0, and samples were heated at 50°C for 15 minutes in a water bath. Control was also run in the same way but in saline without hydrochloric acid.

As shown in Table 1, maximum stabilization of poliovirus strains LSc 2ab and Leon 12a<sub>1</sub>b were observed at 0.0049 M HCl against 15 minutes heating at 50°C. This finding

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suggested that the attenuated poliovirus strains were mostly temperature stable at pH 2.0 which is closer to the concentration of hydrochloric acid in human stomach.

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Table 1. Effect of different concentration of hydrochloric acid on the stability of poliovirus heated at 50°C for 15 minutes.

Molarity of HCl	pH	Residual infectivity in log (PFU/ml)	
		LSc 2ab	Leon 12a <sub>1</sub> b
0.0493	1.307	1.5	2.5
0.0049	2.309	6.5	5.5
0.0024	2.619	3.5	2.5
0.0009	3.045	2.0	1.5
0.0000	7.0	3.0	1.5

Initial infectivity of the virus in log (PFU/ml): 6.8

#### REFERENCES

- 1) Bodian, D., & Horstmann, D. M.(1965): Polioviruses. pp 430-473. In F. L. Horsfall, Jr. & I. Tamm (ed.). Viral and Rickettsial Infections of Man. Lippincott, Philadelphia.
- 2) Sabin, A. B.(1956): Pathogenesis of poliomyelitis. Science 125, 1151-1157.
- 3) Wallis, C., & Melnick, J. L.(1962): Effect of organic and inorganic acids on poliovirus at 50°C. Proc. Soc. Exp. Biol. Med. 111, 305-308.

高温におけるポリオウィルスの安定化に対する塩酸濃度の効果

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ポリオウィルス弱毒株 Sabin 1型、LSc 2ab と 3型 Leon 12a<sub>1</sub>bを pH 1.3から3.0の間の種々の濃度の塩酸溶液中で50°C, 15分間処理してその安定性を検討したところ、ヒトの胃酸濃度に相当する pH 2.0で最も安定であるという結果が得られた。

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