Susceptibility of Bovine Rotavirus to Interferon

Brief Report

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Summary

Using the plaque assay or the CPE test (cytopathogenic effect), we investigated
the action of human, simian (rhesus), bovine and murine interferons on bovine
rotavirus adapted to grow on established Rhesus monkey kidney cell line (MA104)
or Georgia Bovine Kidney cell line (GBK). Except for the murine interferon we
used, which had no antiviral effect at all, the different interferons tested were
clearly active.

Three strains of bovine rotavirus were used: a Canadian strain PQ (kindly
furnished by Dr. M. E. Bégin, St-Hyacinthe, Québec) and strains S14 and S77
isolated in our laboratory. They were grown on MA104 and GBK cells (1). Vesic-
ular Stomatitis Virus (VSV), originally obtained from Dr. Youngner (Pittsburgh),
was produced in L929 cells.

Human fibroblast interferon (Hu IFNβ) was induced in FS4 cells of human
foreskin fibroblasts by-poly inosinate-polycytidylate (poly I:C) as described by
VILÉK and HAVELL (8) and partially purified by ammonium sulfate precipitation
and chromatography on Biogel P150 and CM Sephadex as described by KNIGHT (3).
The specific activity of the preparation used throughout this work was 1 × 106
international units per mg of protein.

Mouse fibroblast interferon (Mu IFNβ) was induced in L929 cells by NDV
virus (Newcastle Disease Virus, Koumaroff strain). The purification of this inter-
feron was achieved according to the method described by PAUCKER and STANCEK
(6). Its final specific activity was 1 × 106 international units per mg of protein.

Simian interferon (Rhesus IFN) was induced in MA104 cells by infecting them
with NDV (Koumaroff strain). The crude interferon, treated at pH 2 for at least
five days, was used without further purification, after neutralization and clarification by centrifugation.

For the production of bovine interferon (Bov IFN), GBK cells were induced with NDV (Koumaroff strain) and treated as the simian interferon.

The action of interferons on rotavirus was first tested on MA104 cells using the plaque assay described by Matsuno et al. (5) and Dagenais et al. (2). The cells were established in an antiviral state by incubation with IFN at 37°C overnight before inoculation with the bovine rotavirus. Then, the inhibitions by interferons of the cytopathogenic effect provoked either by VSV or by rotavirus were compared by the classical method using MA104 and GBK cells.

According to our results, human, simian and bovine interferons are active on bovine rotavirus grown in established Rhesus monkey kidney or Georgia bovine kidney cell lines, whereas one partially purified murine interferon is not active at all. Compared with VSV, bovine rotavirus does not appear to be less susceptible to bovine interferon as it was reported by La Bonnardière and coworkers (4). The choice of the experimental system is therefore important to ascribe the efficiency of interferon against bovine rotavirus in defined conditions. As the data obtained with the three strains of rotavirus are similar, Table 1 gives the comparison of the susceptibility to interferon of VSV and one strain of rotavirus.

The antiviral activity was destroyed by a pretreatment with trypsin and correlated well with the induction of 2′5′ oligoisonucleotide synthetase (7). This indicates that interferon is the active factor involved in the antiviral effect.

Our preliminary results show that human fibroblast interferon (Hu IFNβ) has an important heterologous antiviral effect in GBK cells infected with bovine rotavirus. It is therefore worthwhile to test the in vivo effect of human fibroblast interferon (Hu IFNβ) on neonatal calf diarrhoea provoked by rotavirus.

Table 1. Activity of different interferons on MA104 and GBK cells on bovine rotavirus (S77) and VSV multiplications

<table>
<thead>
<tr>
<th>Cell line</th>
<th>Virus</th>
<th>Interferon</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Hu IFN</td>
</tr>
<tr>
<td>MA104</td>
<td>VSV</td>
<td>1.00</td>
</tr>
<tr>
<td>GBK</td>
<td>VSV</td>
<td>1.17</td>
</tr>
<tr>
<td>MA104</td>
<td>Rota. S 77</td>
<td>1.39</td>
</tr>
</tbody>
</table>

Figures represent the relative titer of the different interferons in the different systems used, compared to the titer obtained in MA104 cells using VSV as challenge virus. The mean of two independent determinations are used to establish the comparison. Endpoints of titration are read as 50 per cent protection against CPE with a technique involving 0.5 log10 dilution steps. Reproducible data have been obtained using dilutions of interferon preparations titrating between $10^2$ and $10^4$ laboratory units/ml

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