EFFECTS OF PROSTAGLANDINS $F_{2 \alpha}$ AND $E_2$ ON THE CONTRACTILITY OF NON-PREGNANT HUMAN FALLOPIAN TUBE IN VITRO

M.T.M. JIFFRY* AND P. VIRUTAMASEN

Department of Obstetrics and Gynaecology,
Chulalongkorn Hospital,
Rama IV Road, Bangkok-Thailand

(Received on March 28, 1980)

Summary: The effects of PGF$_{2\alpha}$ and PGE$_2$ on the distal part of the isolated non-pregnant human fallopian tubes obtained from known menstrual phases has been investigated. Both PGF$_{2\alpha}$ and PGE$_2$ produced an increased contractility of fallopian tube. However, PGF$_{2\alpha}$ was found to be more potent than PGE$_2$ and also the contractions produced by the former compound showed wave forms of relatively high amplitude and low in frequency than that produced by the latter compound. These two compounds did not show a priming effect on each other. There was no discernible effect of phase of the menstrual cycle upon the contractile response to PG.

Key words: prostaglandin $F_{2\alpha}$ and $E_2$ contractility non-pregnant human fallopian tube

INTRODUCTION

The excitability produced by prostaglandin $F_{2\alpha}$ (PGF$_{2\alpha}$) on the myometrial and fallopian tubal musculature was undisputed, in human and animal studies conducted in vivo and in vitro (4,5,11). However, there were contradictory findings on the effect of the PGE series on the uterine and fallopian tube musculature. Early in vitro studies on non-pregnant human myometrium indicated that PGE series exerted an antagonistic effect to that produced by PGF$_{2\alpha}$ (1,2). However, later in vitro studies on pregnant and non-pregnant human myometrium showed increased contractility on exposure to PGE series (3,7,9). A few in vivo studies on both pregnant and non-pregnant human myometrium also showed spasmogenic effects produced by intravenous administration of PGE (6,8). Similarly, in vitro studies conducted on non-pregnant human fallopian tube showed excitatory effects at the proximal region and relaxation at the distal part due to PGE (9). In a later study, the same group demonstrated an increase in motility due to PGE, on the distal part of the non-pregnant human fallopian tube in vitro. However, there were no recent studies done to re-examine the reported contradictory findings on the effect of PGE on the distal part of the non-pregnant human fallopian tube obtained at known phases of the menstrual cycle. Therefore, the present investigation was conducted in vitro, as part of a continuous series of experiments to investigate the effect of PGE$_2$ as well as PGF$_{2\alpha}$ on the distal half of the non-pregnant human fallopian tube obtained at different phases of menstrual cycle.

*Present address: Department of Physiology, Faculty of Medicine, University of Peradeniya, Sri Lanka
MATERIALS AND METHODS

Distal portions of non-pregnant human fallopian tubes were obtained from patients who had undergone surgery of the uterus due to varied reasons. Specimens from patients with lesions in the fallopian tubes were rejected. The menstrual phase of the patients were assessed by the history.

The specimens were immediately placed in Tyrode's solution (137 mM-NaCl, 2.7 mM-KCl, 1 mM-MgCl₂, 0.35 mM-NaH₂PO₄·2H₂O, 12 mM-NaHCO₃, 1.8 mM-CaCl₂, 5 mM-glucose). Thereafter a 2 cm x 5 mm piece of the intermediate and inner muscular tissue from the most distal end of the specimen was carefully dissected out. This preparation was mounted in a muscle chamber filled with 50 ml of Tyrode’s solution at 37°C and allowed to stabilise while it was being bubbled with 5% CO₂ in O₂ so that pH was 7.3-7.4. Contractions of the strips were recorded isometrically with a 50 g strain gauge via an amplifier and pen recorder. Various concentrations of PGE₂ and PGF₂α were added separately and allowed to act only for a maximum period of 3 minutes. After each exposure, the muscle chamber was washed off twice with Tyrode’s solution and allowed to stabilise again in fresh Tyrode’s solution.

RESULTS

All the seven specimens in this series showed excitability due to PGF₂α as well as PGE₂ and 50 ng/ml and 100 ng/ml respectively were found to be the lowest concentrations required to initiate a change in the contractility (Table I).

TABLE I : Threshold concentrations of PGF₂₀, and PGE₂ to initiate a change in contractility in the distal part of the human fallopian tube at different phases of menstruation.

<table>
<thead>
<tr>
<th>Specimen</th>
<th>Day of the menstrual cycle</th>
<th>Lowest concentration of PGF₂₀ ng/ml</th>
<th>Lowest concentration of E₂ ng/ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>14</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>26</td>
<td>75</td>
<td>200</td>
</tr>
<tr>
<td>4</td>
<td>7</td>
<td>100</td>
<td>300</td>
</tr>
<tr>
<td>5</td>
<td>7</td>
<td>75</td>
<td>200</td>
</tr>
<tr>
<td>6</td>
<td>20</td>
<td>75</td>
<td>200</td>
</tr>
<tr>
<td>7</td>
<td>22</td>
<td>100</td>
<td>200</td>
</tr>
</tbody>
</table>

Figure 1 shows the increase in rhythmic contraction of the fallopian tube when PGE₂ was added to the solution in different concentrations. The characteristics of excitation produced by PGE₂ is different from that produced by PGF₂α. PGE₂ produced spasmogenic
Specimens were obtained from patients. Specimens from patients in the menstrual phase of the patients were dissected out. This preparation was obtained from 37°C and 7.3-7.4. A strain gauge via an amplifier were added separately and after each exposure, the muscle allowed to stabilise again in

PGF\(_{2\alpha}\) produced wave forms of low frequency with a higher amplitude (Fig. 1)

![Graph showing the effect of PGF\(_{2\alpha}\) and PGE\(_2\) on Fallopian Tube](image)

**Table:**

<table>
<thead>
<tr>
<th>Lowest concentration of PGF(_{2\alpha})</th>
<th>E(_2) ng/ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td></td>
</tr>
<tr>
<td>500</td>
<td></td>
</tr>
<tr>
<td>200</td>
<td></td>
</tr>
<tr>
<td>300</td>
<td></td>
</tr>
<tr>
<td>200</td>
<td></td>
</tr>
</tbody>
</table>

PGF\(_{2\alpha}\) and PGE\(_2\) on Fallopian Tube

In four specimens obtained from different subjects, when PGE\(_2\) was added in the presence of PGF\(_{2\alpha}\), there was no resultant increase in the excitation other than what was produced as a result of PGF\(_{2\alpha}\) (Fig. 2). It was the same when PGF\(_{2\alpha}\) was added in the presence of PGE\(_2\).

![Graph showing the effect of PGF\(_{2\alpha}\) and PGE\(_2\) on Fallopian Tube](image)

**Figure 1:** Comparison of the effect of PGE\(_2\) and PGF\(_{2\alpha}\) on the rhythmic contraction of the non-pregnant human fallopian tube (distal part).

**Figure 2:** Rhythmic contraction of the isolated fallopian tube on exposure to PGF\(_{2\alpha}\) (300 ng/ml) and PGE\(_2\) (400 ng/ml) together.
DISCUSSION

It is evident from our findings that while confirming the classical excitatory effect produced by PGF$_2\alpha$, PGE$_2$ also produced a definite excitatory effect on the distal part of the human fallopian tube. This is in contradiction to the findings of some other works (1,2,9) where they showed that the excitatory effect produced by PGE$_2$ was confined to the proximal region of the non-pregnant human fallopian tube and that in the distal region it produced relaxation. However, PGE$_2$ needed a relatively higher concentration than that of PGF$_2\alpha$ to produce the same effect. Since the contradictory findings were only related to the distal region, we confined our investigations only to the distal region.

PGF$_2\alpha$ produced characteristic wave forms with higher amplitude and low frequency, whereas the PGE$_2$ produced wave forms of low amplitude and higher frequency, characterising a spasmogenic nature.

When one prostaglandin (either PGE$_2$ or PGF$_2\alpha$) was introduced in the presence of the excitation effect produced by the other, there were no increase in the contraction pattern due to the second prostaglandin (either PGE$_2$ or PGF$_2\alpha$). This shows that although PGE$_2$ and PGF$_2\alpha$ produced excitation when introduced separately, there were no priming effect of one prostaglandin on another (between PGE$_2$ and PGF$_2\alpha$). Furthermore, it should be noted that since there were consistency in the contractions exerted by any one type of PG in all the seven subjects, different phases of the menstrual cycle apparently do not produce an effect on the response elicited by PGE$_2$ and PGF$_2\alpha$.

ACKNOWLEDGEMENTS

This study was conducted during the tenure of a UNFPA Fellowship offered to MTMJ. The authors wish to thank Prof. V. Basnayake of the Department of Physiology, Faculty of Medicine, University of Peradeniya for his comments. The assistance given by Mr. R.A.D. Nicholas and Miss S. Mathiaparanam is appreciated.

REFERENCES

confirming the classical excitatory effects of the distal part of the Fallopian tube and that in the distal region it was confined to the distal region. Furthermore, it should be noted that higher amplitude and low frequency, characteristic of endog- 


S U P P L . :


and Gynaecology. Philipp, EE et. al. (ed.)


This shows that although PGE2, there were no priming effect of PGF2α. Furthermore, it should be noted that the action pattern apparently do not produce an increase in the presence of PGF2α. In the presence of an increase in the presence of PGF2α, it has been suggested that the effect of PGE2 and PGF2α on the distal region of the Fallopian tube is due to an endogenous, possibly prostaglandin-mediated mechanism.


