Does immunocontraception in feral horses (Equus caballus) extend reproductive cycling beyond the normal breeding season?

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Does immunocontraception in feral horses (Equus caballus) extend reproductive cycling beyond the normal breeding season?

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Photo by Sue Stuska
Month
MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
Number of births
Before contraception
Non-recipients
Recipients
Reproductive cycling in mares

Uncontracepted female

Pregnancy

Breeding

Non-breeding

Time

Ovulatory cycling
Traditional forms of contraception
Reproductive cycling in mares

- Ovulatory cycling
- Breeding
- Non-breeding
- Uncontracepted female

Time

pregnancy

Breeding

Non-breeding
Reproductive cycling in mares

- Time
- Uncontracepted female
- Traditional contraception
- Pregnancy

Ovulatory cycling

Breeding

Non-breeding
Immunoccontraception
Porcine zona pellucida (PZP)
Reproductive cycling in mares

Time

Uncontracepted female

Traditional contraception

Ovulatory cycling

Breeding

Non-breeding

pregnancy
Reproductive cycling in mares

- Uncontracepted female
- Traditional contraception
- PZP contraception

Ovulatory cycling

Breeding

Non-breeding

Time

pregnancy

?
Shackleford Banks, North Carolina
Cape Lookout National Seashore, National Park Service

200 → 100 - 120
PZP contraception and foal removals
Wild horse behavior

• Harem groups
  – Harem male, females, offspring
  – Stable, long lasting
    • Bodily condition
    • Parasite load
    • Offspring mortality

• Non-territorial
PZP and behavior

- On few populations
- During the breeding season
- Without true controls

• Contracepted ♀ (n=22); Control ♀ (n=8)
• December 2005 - February 2006
- Number of group changes
- Number of groups visited
Number of group changes

Mean ± 1 SE Total group changes

Contraceptive status

0.0
0.5
1.0
1.5
2.0
2.5

Mean ± 1 SE Total groups visited

Contraceptive status

1.0
1.2
1.4
1.6
1.8
2.0
2.2
2.4

- PZP treatment, t = 2.11, P = 0.04
- PZP treatment, t = 2.42, P = 0.02

Generalized Linear Model; F_{2,27} = 6.73, P = 0.004
Generalized Linear Model; F_{2,27} = 6.83, P = 0.004
Reproductive interest

Generalized Linear Model; $F_{1,28} = 9.69$, $P = 0.004$
- PZP treatment, $t = 2.26$, $P = 0.03$
Reproductive cycling in mares

- Time

- Uncontracepted female
- Traditional contraception
- PZP contraception

- Ovulatory cycling

- Breeding
- Non-breeding

- Pregnancy
Extended reproductive cycling?

- Uncontracepted female
- Traditional contraception
- PZP contraception

Ovulatory cycling

Breeding

Non-breeding

Time

pregnancy
Foaling date as a proxy for reproductive cycling


- Gestation lasts 11-12 months
- Conception can be reliably estimated from foals’ birth date
- Birth dates of foals born before and after contraception management

Fligner-Killeen Test for Homogeneity of Variances:
Median Chi Square = 12.58, $P = 0.001$
Linear Mixed Effects Model: estimate = 1.98, $t = 5.51$, $P < 0.001$
Birth dates and PZP applications

Linear Mixed Effects Model: estimate = 0.83, SE = 0.23, t = 3.64, r^2 = 0.65, P = 0.0008

Photo by Sue Stuska
Potential consequences

Fall births
Potential consequences

Male contests

- Behavioral change in harem males due to behavioral changes in females
- Physiological changes in harem males (↑cortisol and/or testosterone)
Potential consequences
Group changes

<table>
<thead>
<tr>
<th>Number of group changes</th>
<th>Cortisol (ng/g feces)</th>
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</thead>
<tbody>
<tr>
<td>0</td>
<td>25</td>
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<tr>
<td>1</td>
<td>30</td>
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<tr>
<td>2</td>
<td>35</td>
</tr>
<tr>
<td>3</td>
<td>40</td>
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<table>
<thead>
<tr>
<th>Time period</th>
<th>Cortisol (ng/g feces)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before</td>
<td>25</td>
</tr>
<tr>
<td>During</td>
<td>30</td>
</tr>
<tr>
<td>After</td>
<td>35</td>
</tr>
</tbody>
</table>

Legend:
- Dusty
- Slug
- Wallace
- Zelda
- Carrot
Thank you

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IWEC organizers