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Northern Illinois University

The Reproductive Effectiveness of  
Reindeer Bulls on Depo-Provera

A Thesis Submitted to the  
University Honors Program  
In Partial Fulfillment of the  
Requirements of the Baccalaureate Degree  
With University Honors

Department of Biology

By  
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## The Reproductive Effectiveness of Reindeer Bulls on Depo-Provera

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### **Abstract:**

Reindeer (*Rangifer tarandus*) are a domesticated variety of caribou, commonly bred and herded by humans in some northern countries. Use of Depo-Provera (DP) is of interest to many reindeer breeders and exhibitors across North America. While on DP, bulls are more easily handled and treated as they would be throughout the rest of the year. A regimen of injectable Depo-Provera (DP) appears to be effective in controlling extremely aggressive behavior of reindeer bulls during the rut. However, it is not known whether or not this lowers their ability to breed as many cows as would have without the DP shots. In this study, we examined the reproductive effectiveness of reindeer bulls on a regimen of DP. We asked 1) do reindeer bulls on DP breed their cows and 2) do they produce healthy calves as successfully as non-treated normal bulls on an annual basis? The data for this analysis come from North American reindeer breeder records. We found that normal bulls bred an average of 11.49 cows per year, whereas DP bulls bred 11.15 per year. Normal bulls yielded an average of 9.69 calves per year, whereas DP bulls produced 10.04 per year.

## **Introduction:**

Reindeer (*Rangifer tarandus*) are a domesticated variety of caribou (see Table 1), commonly bred and herded by humans in some northern countries for their milk, meat, and hides. Within the United States and Canada, some reindeer are bred and maintained for use in Christmas holiday exhibitions and other public performances. Having reindeer males in close proximity to audiences of human adults and children can pose some risk: while reindeer are domesticated, aggressive behavior in males is common during rut. This aggression can also be seen in the bulls' attitudes toward their handlers. Finding a successful regimen to control this behavior is of interest to many reindeer breeders and exhibitors across North America.

Within the last ten years, efforts to control this aggressive behavior with a new chemical therapy using Depo-Provera (DP) have been tried. While on DP, bulls are more easily handled and treated as they would be throughout the rest of the year. A regimen of injectable Depo-Provera (DP) appears to be effective in controlling extremely aggressive behavior of reindeer bulls during the rut. However, it is not known whether or not this lowers their ability to breed as many cows as would have without the DP shots. In this study, we examined the reproductive effectiveness of reindeer bulls on a regimen of DP. We asked 1) do reindeer bulls on DP breed their cows and 2) do they produce healthy calves as successfully as non-treated normal bulls on an annual basis? The data for this analysis came from North American reindeer breeder records.

## **Background:**

### Literature Review:

Research on caribou and reindeer typically involves issues on herd development and management (Barboza et al. 2004; Kofinas et al. 2003; Griffith et al, 2001; Staaland & White, 2001; Adams et al. 2001; Adams et al., 2001; Bubenik et al. 2000; Bubenik et al 1997; Maier & White, 1997; Bubenik et al., 1997; Cameron et al., 1993; Russell et al 1991; Klein, 1990; Staaland et al, 1986; Fancy & White, 1986; Fancy et al, 1986; Kokjer & White, 1986; White et al., 1984) or meat and milk production (Stimmelmayer et al. 2002; Holand et al., 2002a; 2002b; Gerhart et al., 1996; Allaye Chan-McLeod et al., 1994; Suttie et al., 1993). In reviewing the literature, however, no quantitative research on the use of DP in caribou or reindeer has been found.

Published reports of Depo-Provera applications are limited to primates (humans and monkeys) and artiodactylids (domestic pigs and caribou). The use of DP has gender-specific applications. In females, the applications relate to ovulation control, whereas in males, DP is used to control aggressive behavior. In swine, DP helps raise success of artificial insemination with frozen semen (Didion, 1998). Zumpe (1994) reported on the calming effect of combined treatment of DP and fadrozole in the sexual behavior of intact male cynomolgus monkeys. Poest (pers.comm; Poest, 1998a) relays the information that in the horse racing industry, DP is used to keep brood mares from coming into season (heat). Lowered aggression in human male sex-offenders resulted from injection treatments of DP (Kiersche (1999).

The majority of reports of DP use focus on human females as birth control (Becker & Hager, 1992; Earl, 1994; Hampton 2000; Moskowitz, 1995; Stehlin, 1993a, 1993b; Westhoff, 2003). Depo-Provera is a long-acting hormonal form of birth control. It contains medroxyprogesterone acetate (DMPA), which is similar to the natural progesterone produced by the ovaries during the second half of the menstrual cycle. It is given by injection (shot) in the muscle. Injections must be received on a regular basis every 12-13 weeks. When injections are received every 12-13 weeks, the effectiveness rate is over 99%. Depo-Provera works because it prevents the release of an egg from the ovary; thus, there is nothing to be fertilized by the sperm and a pregnancy cannot occur. Cervical mucus is thickened and it also thins the lining of the uterus, which would make the uterus less hospitable to a fertilized egg if ovulation should occur.

The first and only-known written reports of DP usage in reindeer were related by Poest (1998a, 1998b). These two articles in issues of The ROBA Review are the only known reports in literature for Depo-Provera use in reindeer or caribou. Poest reports briefly on the lack of going into rut, normal antler growth, appearance of the bulls, dosages, attitudes of the bulls, DP drug cost issues and the need for statistics and more quantitative research.

#### Current practice with DP therapy:

Depo-Provera is a hormone used in human birth control. In humans, Depo-Provera is given to females in an injectable form four times a year to prevent pregnancy. In reindeer, Depo-Provera is given to males in an injectable

form twice during the rutting season, not to prevent pregnancy in females but rather as a behavior modifier. The purpose of giving Depo-Provera to reindeer bulls is to control their extremely aggressive behavior while they are in rut. During rut, reindeer bulls are aggressive towards other bulls, which can be seen in their fighting displays (Russell 1998). Their aggressiveness can also be seen in their dangerous attitudes towards humans. It is not known though whether or not this lowers their ability to breed as many cows as they would have without the Depo-Provera shot. This drug appears to be effective in almost all cases. It allows bulls, otherwise thought of as extremely dangerous during the rutting season, to be handled and treated, as they would be throughout the rest of the year. It still allows the bulls to come into rut to a large enough extent that they are still able to breed their cows and produce healthy calves.

Ideally, the bulls are given the first shot on the day they start to shed their velvet, which is thought to be the first sign of rut. Other signs of the bull going into rut include the development of a mane below the neck and chest and the thickening of the neck. This increase in the size of the neck is not associated with deposition of fat, but with the temporary growth of muscle tissue, a very unusual physiological occurrence (Chapman 1991). The second shot should be given about two to two and a half months into the rutting season.

### **Materials and Methods:**

Data on breeding records and Depo-Provera usage regimen were collected from North American reindeer breeders and members of ROBA

(including the Anderson family reindeer herd). After originally requesting herd pedigrees and breeding records, it was discovered that data would be difficult to obtain from some breeders. A questionnaire (see Appendix 1) was written in order to increase efficiency in the data collecting process. After an initial phone conversation with each breeder, the questionnaire was sent via e-mail.

Once all questionnaires were returned from the breeders, it was possible to analyze the data. The data was compiled and divided into two groups (bulls receiving Depo-Provera and bulls not receiving Depo-Provera). The treatment group for this study consists of those individual bulls that received the DP treatment. The control group consists of those normal bulls that did not receive the treatment. It was necessary to calculate an average of number of cows bred per bull each year and an average of calves born per bull each year. Then it was possible to compare the ratio of reproductive effectiveness between bulls receiving Depo-Provera and those not receiving Depo-Provera.

### **Results:**

We asked 1) do reindeer bulls on DP breed their cows and 2) do they produce healthy calves as successfully as non-treated normal bulls on an annual basis? The data for this analysis come from North American reindeer breeder records. We found that normal bulls bred an average of 11.49 cows per year, whereas DP bulls bred 11.15 per year. Normal bulls yielded an average of 9.69 calves per year, whereas DP bulls produced 10.04 per year.

Breeding records of 94 reindeer bulls were obtained. Each bull was given a sequential number to maintain confidentiality of its herd owner (at some of their requests). Analysis of this breeder data found 51 bulls in the non-DP treated or normal condition and 43 bulls under DP treatment. Breeders reported that normal bulls and DP bulls bred naturally and normally. Their average number of cows bred per year and the average number of calves born per year are listed in Tables 2 and 3. This breeding and calving effectiveness data constitutes / represents a captive breeding North American population of 94 males.

Normal bulls bred with an average of 11.48 cows per year. DP bulls bred with an average of 11.15 cows per year. Normal bulls produced an average of 9.69 calves per year, whereas DP bulls produced 10.04 calves per year.

The data was then analyzed separately by hypothesis testing. Research question 1 (do reindeer bulls on DP breed their cows) was looked at first. The null hypothesis ( $H_0$ ) for this portion is that there is no difference between the average number of cows bred per year by bulls on DP and bulls not on DP. The alternative hypothesis ( $H_1$ ) for this portion is that there is a significant and precise difference between the average number of cows bred per year by bulls on DP and bulls not on DP. A two-tailed z-test with a level of significance of .05 was utilized for analyzing whether the null hypothesis is true or false. The analysis can be seen in Table 2. From this data, the critical value of .4744 was found. Due to the fact that it is greater than the .295 z-value, we can accept the null hypothesis.

Research question 2 (do they produce healthy calves as successfully as non-treated bulls do on an annual basis) was then analyzed. The null hypothesis ( $H_0$ ) for this portion is that there is no difference between the average number of calves produced per year by bulls on DP and bulls not on DP. The alternative hypothesis ( $H_1$ ) for this portion is that there is a significant and precise difference between the average number of calves produced per year by bulls on DP and bulls not on DP. A two-tailed z-test with a level of significance of .05 was once again utilized for analyzing whether the null hypothesis is true or false. The analysis can be seen in Table 3. The critical value for this data was also .4744. Due to the fact that this was greater than the .348 z-value, we once again accept the null hypothesis.

### **Conclusion:**

From the data analysis, it can be seen that both of the null hypothesis were accepted. Overall, it can be seen that there is no statistical significance between DP bulls and non-DP bulls. The research questions were able to be answered as 1) the reindeer bulls on DP breed their cows and 2) they produce healthy calves as successfully as non-treated normal bulls on an annual basis.

### **Discussion:**

According to the The Reindeer Breeders and Owners Association (ROBA) Review, Depo-Provera prevents the reindeer bulls from going into rut (Poest, 1998a). However, shortly after this article was written, the lead author noticed

that Depo-Provera does not prevent the bulls from going into rut. This could be seen in the fact that cows that were living only with bulls on Depo-Provera were having calves. Rather, the more logical explanation for the bulls' amiable attitudes now seems to be that the bulls still go into rut, but their aggressive tendencies are not as strong.

This drug appears to be effective in almost all cases. It allows bulls, otherwise thought of as extremely dangerous during the rutting season, to be handled and treated, as they would be throughout the rest of the year. It still allows the bulls to come into rut to a large enough extent that they are still able to breed their cows and produce healthy calves.

Although the numbers of offspring produced each year may seem incredibly large, one must realize that the calf mortality rate for reindeer is rather large, estimated at 45% (ROBA, 1998a, 1998b). One must also realize that although the ratio of reproduction may seem quite large, reindeer bulls have the ability to successfully breed many more cows in the wild than they have access to under these controlled situations.

The Depo-Provera injection has an additional effect of lengthening the lifespan of reindeer bulls that have received the drug each year from a young age. Typical reindeer bulls have a lifespan of seven to eight years, while the reindeer cows have a lifespan of fourteen to eighteen years. This large difference is thought to be due to the extreme amount of hormones flowing through the bulls' bodies during rutting season each year. Eventually, the bull will go into rut and die of a heart attack. Due to the fact that Depo-Provera

seems to lessen the amount of hormones that rage through a bull's body during the rutting season, they seem to be living longer. Reindeer bulls that receive Depo-Provera have now been recorded as living up to the age of twelve.

This topic is of interest to many reindeer breeders and exhibitors across the country. It has been debated since the time at which Depo-Provera was first given to reindeer bulls, sometime in the mid 1990s. Improvements in the delivery and standardization in the dosage are being sought.

## **Appendix 1.**

### Reindeer Questionnaire

How many reindeer do you own?

How many of those reindeer are bulls?

Do you use Depo-Provera on your bulls?

If yes, do you use those bulls for breeding, exhibit, or both?

How many of your bulls are on Depo-Provera?

How long have you used Depo-Provera?

How much Depo-Provera do you give to your bulls and how many times a year do you give it?

How many calves do you typically have each year by your bulls not receiving Depo-Provera? How many cows have these bulls bred/had access to?

How many calves do you have each year by your bulls receiving Depo-Provera? How many cows have your Depo-Provera bulls bred/had access to?

Have your Depo-Provera bulls ever bred without Depo-Provera? If so, how many cows have your Depo-Provera bulls bred/had access to?

Are there any other reindeer owners or breeders that you can refer me to for more data on this topic?

## **Table 1.**

Classification of reindeer

|           |  |
|-----------|--|
| Kingdom   | Animalia   |
| Phylum    | Chordata   |
| Class     | Mammalia   |
| Sub-Class | Ungulata   |
| Order     | Artiodactyla   |
| Sub-Order | Ruminantia   |
| Family    | Cervidae   |
| Genus     | <i>Rangifer</i>  |
| Species   | <i>tarandus</i> (with about five holarctic subspecies, including reindeer) |

**Table 2.**

Z-Test statistics of cows bred per year

|                     | DP bulls    | Non-DP bulls |
|---------------------|-------------|--------------|
| Mean                | 11.14604651 | 11.48196078  |
| Known Variance      | 22.90027    | 38.7887      |
| Observations        | 43          | 51           |
| Hypothesized Mean   | 0           |              |
| Z                   | -.295398197 |              |
| P(Z<=z) one-tail    | 0.38384492  |              |
| z critical one tail | 1.644853476 |              |
| P(Z<=z) two-tail    | 0.767689839 |              |
| z critical two-tail | 1.959962787 |              |

**Table 3.**

Z-Test statistics of calves produced per year

|                     | DP bulls    | Non-DP bulls |
|---------------------|-------------|--------------|
| Mean                | 10.04418605 | 9.691372549  |
| Known Variance      | 19.97232    | 28.52791     |
| Observations        | 43          | 51           |
| Hypothesized Mean   | 0           |              |
| Z                   | .348681123  |              |
| P(Z<=z) one-tail    | 0.36366442  |              |
| z critical one tail | 1.644853476 |              |
| P(Z<=z) two-tail    | 0.727328841 |              |
| z critical two-tail | 1.959962787 |              |

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