

Toxicity effects of latex gloves on boar spermatozoa

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Summary — It is known that several materials used in semen collection have been found to be detrimental to spermatozoal motility. In this study, examinations for toxic effects of latex and vinyl gloves, used with and without talcum powder on boar spermatozoa, were performed. Ten boars of known fertility with $\geq 80\%$ sperm motility were divided into two groups ($n = 5$ boars each) for *in vitro* and *in vivo* studies. In the *in vitro* study, semen was collected from each of the five boars and was divided into five separate aliquots (5 mL each). One aliquot from each of the boars remained as the control, while the remaining aliquots were divided into individual treatments exposing the semen to a 1 cm² piece of latex or vinyl glove with or without talcum powder. In the *in vivo* experiment, semen from each of the five boars was collected using a gloved hand. During collection, the first half of the sperm-rich fraction was collected into a filtered sterile container, while the second half of the fraction was allowed to run through the palm of either a latex or vinyl powdered glove prior to collection in the container. In both experiments, semen sample motility was assessed by two independent observers at 1 minute after exposure. Results of both experiments consistently showed a significant ($P < 0.05$) effect of latex gloves (with or without talcum powder) on boar semen when compared with the control semen. Motility was at or near 0% at 1 minute after exposure to latex. No significant difference ($P > 0.05$) in motility was observed between the control semen and the semen exposed to talcum powdered vinyl gloves. These results show that latex gloves are detrimental to boar spermatozoa. Therefore, it is suggested that when collecting boar semen, vinyl gloves should be used.

Previous research has shown that certain materials used in semen collection and artificial insemination are detrimental to spermatozoa. Rubber liners used in artificial vaginas for semen collection in the stallion, bull, dog and boar have been found to be toxic to spermatozoa.¹⁻⁴ Additional research in equine reproduction has found that such materials as syringes, specimen storage vials and surgical gloves are detrimental to the sperm.⁵ Finally, in one study it was found that boar spermatozoa were more susceptible to toxic materials than bull spermatozoa.⁴

It is suggested that boar semen be collected with latex examination gloves while performing the glove hand technique.⁶ An earlier study, however, has shown that latex rubber used in the artificial vagina is detrimental to spermatozoa.⁴ Examination of latex gloves for this same detrimental effect has not been investigated previously. Latex gloves, like vinyl examination gloves, are commonly used for boar semen collection. However, possible toxic effects of vinyl on boar spermatozoa are not known. Therefore, the objectives of this study were:

- to evaluate the *in vitro* effects of short-term incubation of suspected toxic materials on boar spermatozoa from both latex and vinyl examination gloves; and
- to evaluate the *in vivo* effects of short-term exposure of boar spermatozoa to latex and vinyl examination gloves.

Materials and methods

Animals

A total of 10 healthy, 180–200 kg boars of known fertility (spermatozoal motility of $\geq 80\%$) were used in the study. All mixed-breed boars were housed indoors. Boars were randomly divided into two groups of five boars each to be used in the two experiments.

Experiment 1

In the *in vitro* experiment, semen was collected by electroejaculation into a sterile, pre-warmed container from five boars as previously described.⁷ Collected samples were immediately assessed for sperm motility and then placed in an incubator that was maintained at 37°C. The whole semen sample was then divided into six equal aliquots of 5 mL each. One sample remained as the control, while to the remaining aliquots the following suspected toxic materials were added for individual testing:

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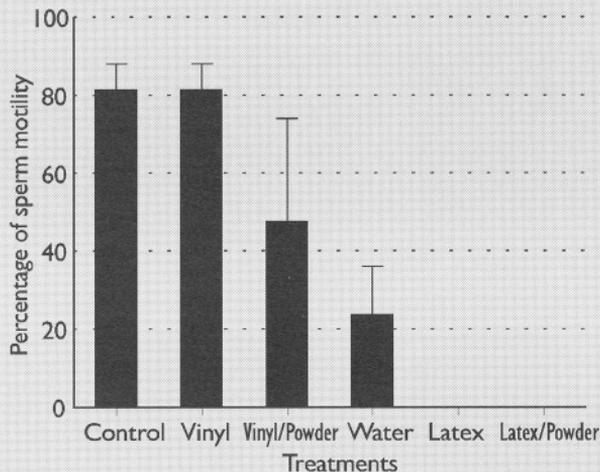


Fig 1. — The *in vitro* effects of toxic materials from either vinyl or latex gloves on spermatozoal motility in the boar (n=5).

- a 1 cm² portion of talcum powdered latex (Lite Tex, ABCO Dealers Inc., Milwaukee, Wisconsin),
- a 1 cm² portion of talcum powdered vinyl (Vinyl Examination Gloves, ABCO Dealers Inc., Milwaukee, Wisconsin),
- a 1 cm² portion of latex without talcum powder,
- a 1 cm² portion of vinyl without talcum powder, or
- 5 mL of water (37°C).

Treatment in which either latex or vinyl was used without talcum powder, the gloves were thoroughly washed for 10 minutes with running tap water and then allowed to dry overnight in an incubator set at 37°C. After the addition of one of the suspected toxic materials, the aliquot was gently mixed for 1 minute and then it was immediately assessed for sperm motility by placing a drop of semen on a prepared slide over which a cover slip was applied. The slide was then examined at 200x and 400x magnification using a phase-contrast microscope with slide warmer. Motility was assessed by two independent observers.

Experiment 2

For the *in vivo* experiment, semen from five boars was collected on two separate occasions using the gloved hand technique. Boars were randomly assigned to be collected with either talcum powdered latex or vinyl examination gloves. During semen collection, the first half of the sperm-rich fraction was collected into a filtered, sterile, prewarmed container, while the remaining portion of the sperm-rich ejaculate was allowed to run through the palm of either the powdered, latex or vinyl glove prior to collection in the container. Samples were then examined for spermatozoal motility 1 minute after collection. For assessing motility, the same protocol as outlined in Experiment 1 was followed.

Statistical analysis

Semen motility data, assessed in percentages, was analyzed using a one-way analysis of variances procedure.⁸ Additional analyses of the data using the least squares difference test were performed if significance ($P < 0.05$) was observed between treatment groups. Tukey's W procedure was used to detect interaction among treatment groups. Second and higher order interactions were considered negligible and were used to represent error.

Results

Experiment 1

Results for the *in vitro* experiment showed a significant ($P < 0.05$) effect between the control and the latex, latex-with-powder, vinyl-with-powder, and water treatments. No significant difference ($P > 0.05$) was observed in motility between the control and vinyl glove treatments. Significant ($P < 0.05$) interaction was observed between boars for the vinyl-with-powder and water treatment groups. No significant ($P > 0.05$) interaction was observed between boars for the control, latex-without-powder, vinyl-without-powder, and the latex-with-powder groups. Graphic presentation of these data means are presented in Fig 1.

Experiment 2

Results for the *in vivo* experiment showed a significant ($P < 0.05$) effect on motility between the control and the powdered-latex-glove treatment. No significant difference ($P > 0.05$) in motility was observed between the control and powdered-vinyl-glove treatment. Significant ($P < 0.05$) interaction was observed between boars in the powdered-latex-treatment group. No significant ($P > 0.05$) interaction was observed between boars in the control and powdered-vinyl-

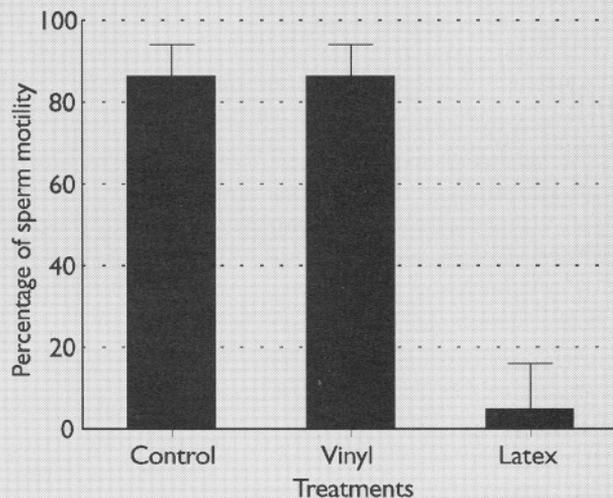


Fig 2. — The *in vivo* effects of powdered latex and vinyl glove treatments on spermatozoal motility in the boar (n=5).

treatment groups. Graphic presentation of these data means are presented in Fig 2.

Discussion

Results from our study strongly suggest that certain latex examination gloves currently recommended⁶ for the collection of boar semen are highly toxic to spermatozoal motility. Latex examination gloves, either with or without talcum powder, consistently showed a detrimental effect on spermatozoal motility, approaching 0% at 1 minute after exposure in both the *in vivo* and *in vitro* trials. The results for vinyl gloves did not show as close a relationship in the effect upon spermatozoal motility.

In the *in vivo* experiment, no detrimental effects of powdered vinyl gloves were observed on spermatozoal motility. However, in the *in vitro* studies, the vinyl powdered glove trials showed a significant effect upon sperm motility, while the vinyl-without-powder glove trials showed no effect on sperm motility. These *in vitro* results suggest that the powder from the vinyl gloves may have a detrimental effect upon sperm motility; however, the *in vivo* experimental results contradict this observation. This discrepancy may be due to the fact that the larger amount of seminal fluid *in vivo* may have possibly diluted the toxic effects of the talcum powder on the vinyl gloves, whereas the small amount of semen used in the *in vitro* experiment would not have had this same dilution effect. Additional research needs to be directed to this point.

Observations of the *in vivo* latex treatment groups which showed motility at the 1 minute post-exposure examination were examined again at 5 minute post-exposure for spermatozoal motility. In all samples, spermatozoal motility was recorded at 0%. This observation suggests that short-term exposure of semen to latex gloves may have a long-term influence on sperm motility. This long-term influence could cause a decrease in conception rates. Therefore, when collecting boar semen if latex gloves are used, extreme care should be directed to avoid the contact of the semen.

It is commonly accepted that water is detrimental to spermatozoal motility. In our study, the effect of a 1:1 ratio of water to semen upon spermatozoa was documented. However, this detrimental effect of water was surpassed by the toxic effects of latex upon spermatozoa. This observation further substantiates the toxic effects of latex gloves, used with or without talcum powder, on sperm motility. Thus, the use of vinyl gloves is recommended when collecting boar semen.

References

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