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Mary Sue Newth
University of Nebraska - Lincoln

Donald G. Levis
University of Nebraska - Lincoln, dlevis1@unl.edu

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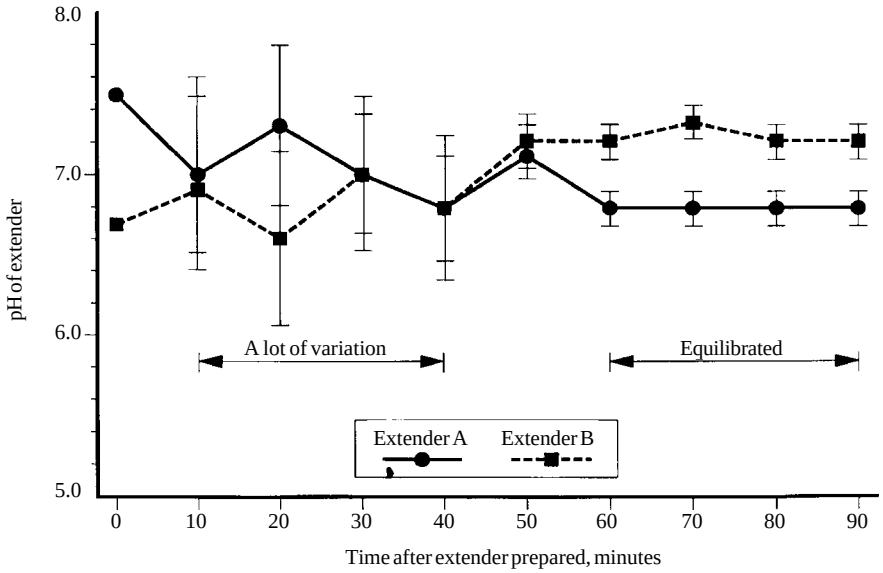
Changes in pH of Boar Semen Extenders

Mary Sue Newth
Donald G. Levis[1]

Summary and Implications

An experiment was conducted to examine the change in pH across time of five extenders (MR-A, VSP, BTS, Merck III and SpermAid). Type of extender and time of measurement affected (P < .01) the overall pH of liquid extender; however an interaction (P < .01) occurred between type of extender and time. BTS and MERCK III had a small increase in pH across time, MR-A and VSP had a linear increase in pH across time and SpermAid decreased in pH during the first 20 minutes before gradually increasing to a consistent level of pH at 50 minutes after preparation. Boar semen extenders do not have the same pattern of pH change across time. Semen should not be mixed with extender until a stable pH has been reached. In general, a liquid boar semen extender should be prepared 60 to 90 minutes prior to mixing with raw semen.



W.O. Flowers, NCSU

Figure 1. Changes in pH of two semen extenders during the first 90 minutes after preparation.

Introduction

Although artificial insemination application has rapidly increased in the last five years, numerous semen processing and storage procedures need additional research. For example, research at North Carolina State University indicates the pH of two boar semen extenders (identity of extenders was not given) require at least 60 minutes for the pH to equilibrate after distilled water was added to the powder (Figure 1). If spermatozoa are to be provided a "stable" environment of

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pH at the time of diluting, an extender should be prepared at least one hour prior to use. The objective of this experiment was to determine whether pH within an individual packet of semen extender varies across time for five different extenders.

Materials and Methods

The five extenders examined were MR-A, VSP, Beltsville Thawing Solution (BTS), SpermAid and Merck III. The total weight of the powder in an individual packet was divided into four equal portions. Each portion of powder was placed in a separate 500 mL beaker and 250 mL of warm (≈95 degrees F) distilled water was added. The pH of the liquid extender was taken immediately after mixing and every 10 minutes thereafter until 90 minutes had elapsed. All beakers were placed on a cardboard box (1" L x 10" W x 2" H) and kept at room temperature. One packet of each extender was used and data were analyzed for time effects by using analysis of variance for repeated measures.

Results and Discussion

The type of extender (Figure 2) and time at measurement (Figure 3) affected ($P < .01$) the overall average pH of liquid extender. However, an interaction ($P < .01$) occurred between type of extender and time of measurement. Two extenders had a small average increase in pH across time (Merck III 6.92 $\pm$ .04 to 6.97 $\pm$ .01; BTS, 7.07 $\pm$ .01 to 7.15 $\pm$ .01), two extenders had a linear increase in pH across time (MR-A 6.81 $\pm$ .03 to 6.99 $\pm$ .02; VSP, 6.70 $\pm$ .08 to 7.05 $\pm$ .07) and one extender (SpermAid) had a decrease in pH during the first 20 minutes before gradually increasing to a consistent pH at 50 minutes after preparation (Figure 4).

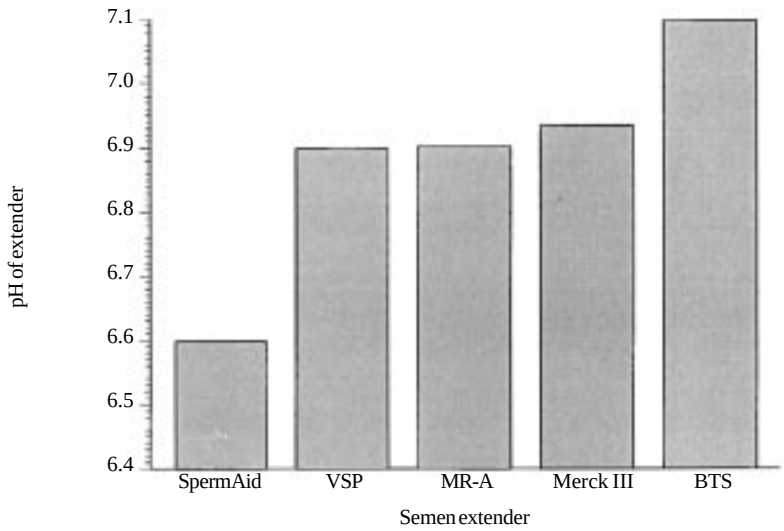

Figure 2. Overall average pH of five semen extenders.

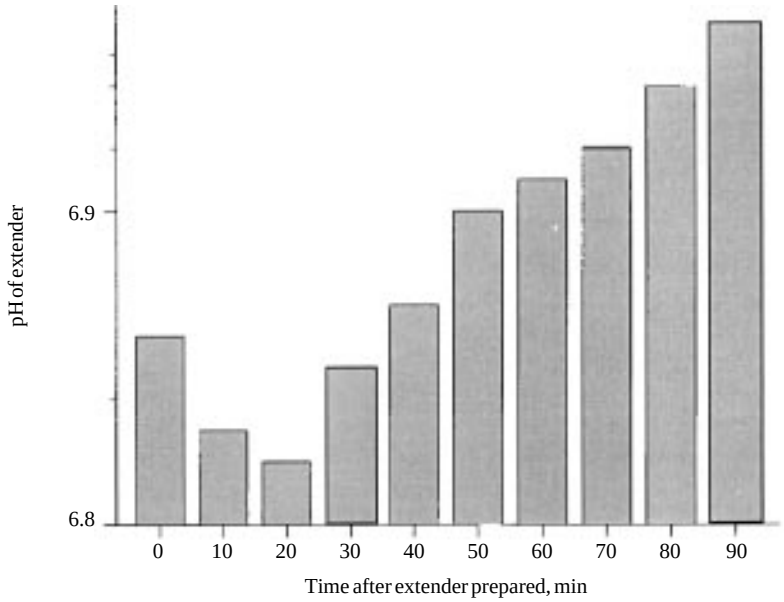

Figure 3. The main affect of time on average pH of semen extenders.

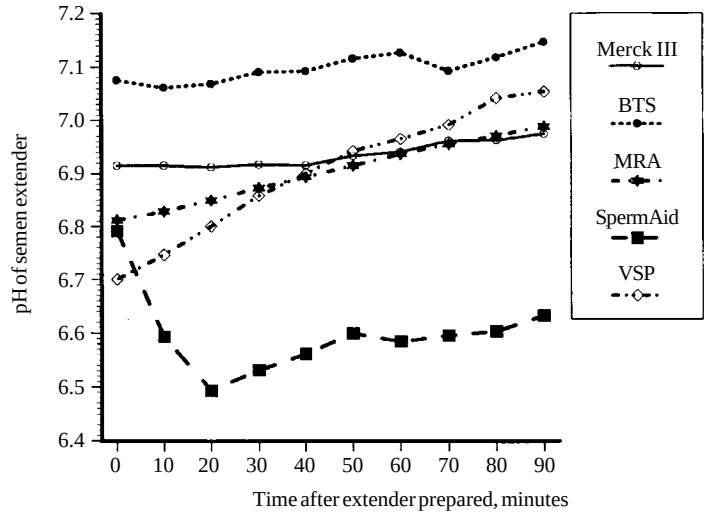

Figure 4. The interaction of time after extender prepared by type of semen extender.

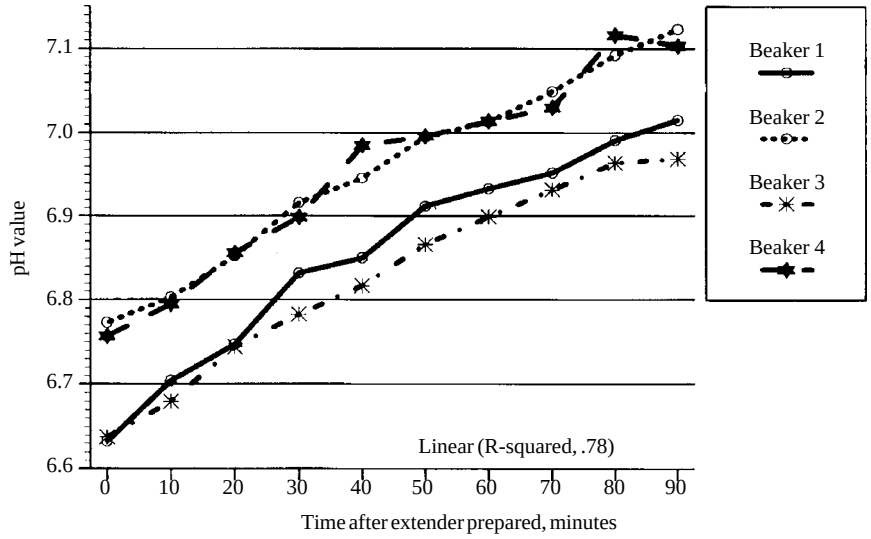

Figure 5. Pattern of change in pH over time for VSP semen extender.

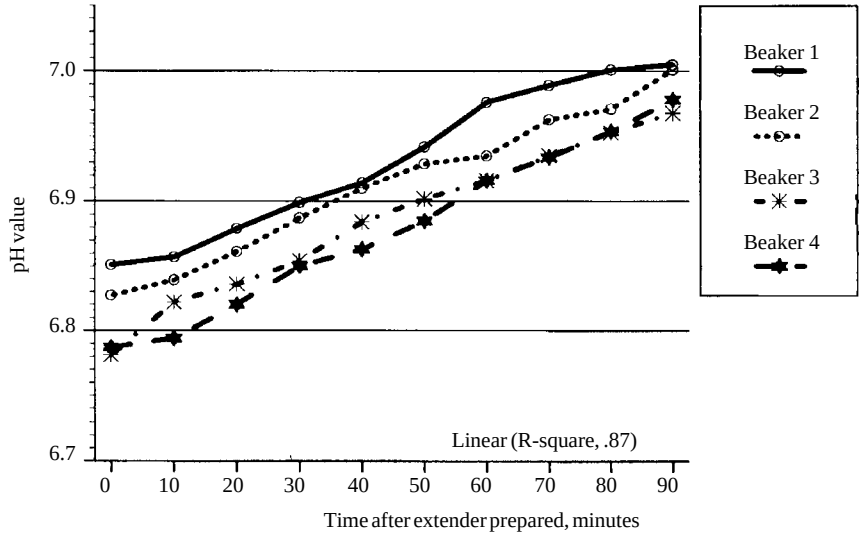

Figure 6. Pattern of change in pH over time for MR-A semen extender.

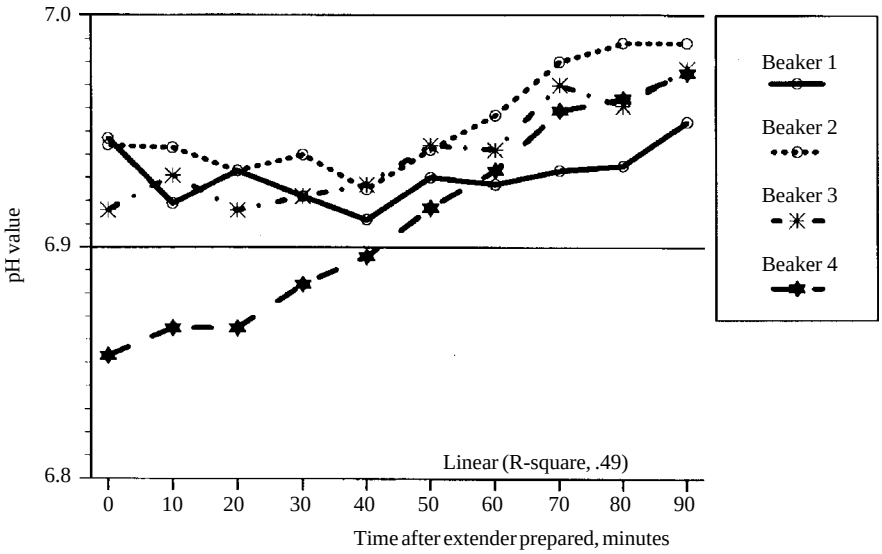

Figure 7. Pattern of change in pH over time for Merck III semen extender.

The pattern of change in pH among the four beakers within an extender is shown in Figures 5 through 9. These data suggest boar semen extenders do not uniformly change in pH across time. Although only one packet of extender was used for each type of extender, it is likely all packets of the same extender have the same pattern of pH change. Research needs to be conducted to determine whether boar spermatozoa are damaged when diluted with an extender of unstable pH.

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[1]Mary Sue Newth was a recipient of a Howard Hughes Medical Institute grant for undergraduate research experience in biological sciences. Donald G. Levis is a professor and extension swine specialist, Department of Animal Science.

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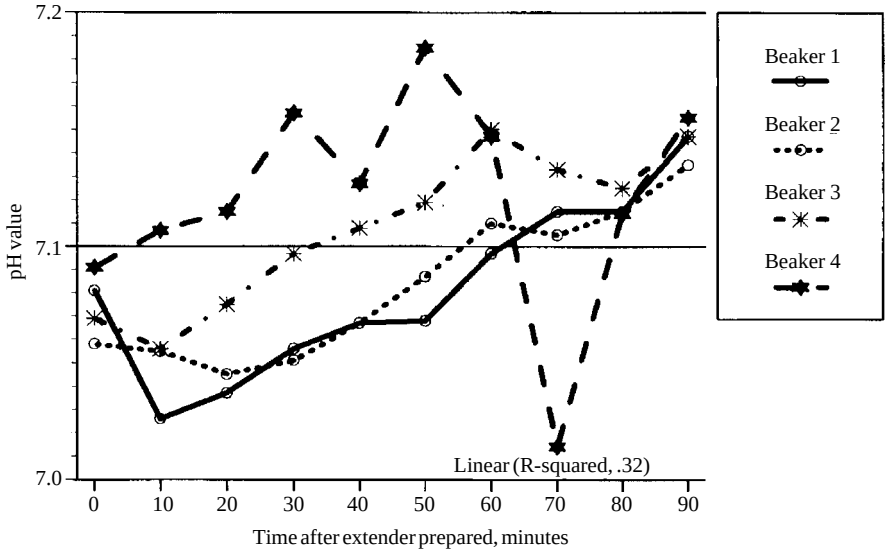

Figure 8. Pattern of change in pH over time for BTS semen extender.

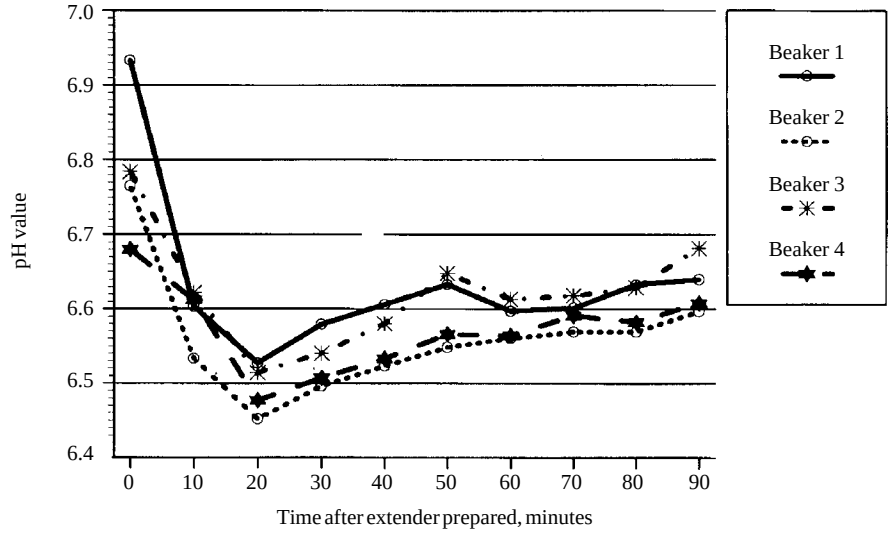

Figure 9. Pattern of change in pH over time for SpermAid semen extender.