



A More Humane Blood Sampling System

Supporting Research



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ART-5022-3 Rev04 / ECO #4097
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Reduced Plasma Corticosterone for Serial Blood Collection

Summary

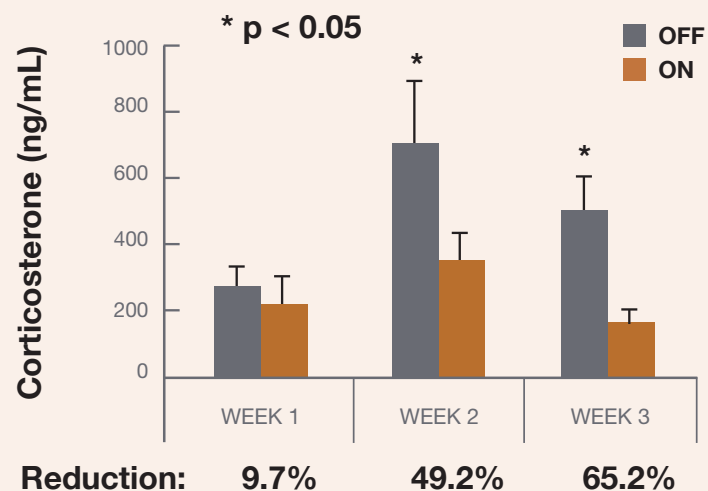
GentleSharp reduces the average plasma corticosterone concentration obtained from rat tail vein samples during serial blood collections.

Results

With GentleSharp ON during needle puncture (orange bar), the average plasma corticosterone concentration is reduced compared to GentleSharp OFF during puncture (gray bar) on week 2 (49.2% reduction) and 3 (65.2% reduction) of blood collections.

Repeated Measures Analysis of Variance, statistical significance of mean difference within week of collection:

* $p < 0.05$



Experimental Design

- > Sprague Dawley Rats ($n = 19$).
- > 9 total collection trials per subject - 3 sampling days (1 week apart) with 3 collections / day spaced 60 min apart.
- > Week 1 - ON group: $n = 19$ trials with 10 rats; OFF group: $n = 21$ trials with 9 rats; OFF vs ON groups, compared within week; Error bars = standard error of the mean.

Reduced Animal Movement and Vocalization for Serial Blood Collection

Summary

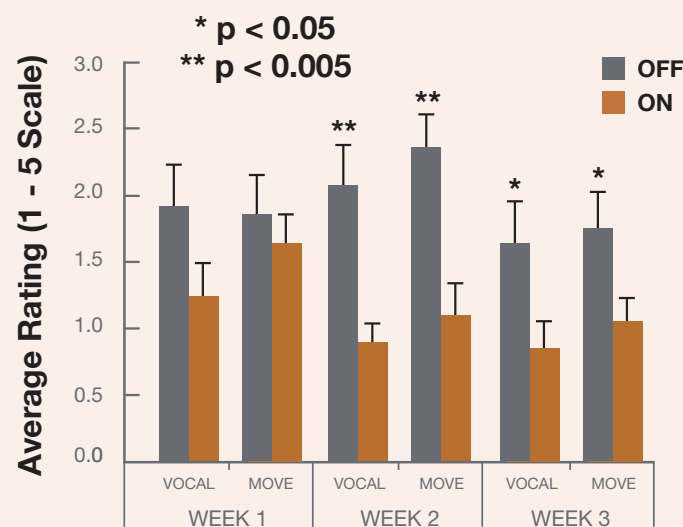
GentleSharp reduces the average animal vocalization (VOCAL) and movement (MOVE) during serial blood sampling from rat tail veins.

Results

With GentleSharp ON during needle puncture (orange bars), the average animal movement (MOVE) and vocalization (VOCAL) is reduced compared to GentleSharp OFF during puncture (gray bars) on weeks 2 and 3 of blood collections.

Student's t-test, statistical significance of mean difference within week of collection:

* $p < 0.05$ ** $p < 0.005$



Experimental Design

- > Sprague Dawley Rats ($n = 19$).
- > 9 total collection trials per subject - 3 sampling days (1 week apart) with 3 collections / day spaced 60 min apart.
- > Videos of collections viewed and graded (Likert Scale, 1 - 5) by blinded reviewers.
- > ON group: $n = 30$ trials with 10 rats; OFF group: $n = 27$ trials with 9 rats; OFF vs ON groups, compared within week; Error bars = standard error of the mean.



A More Humane Blood Sampling System

Summary

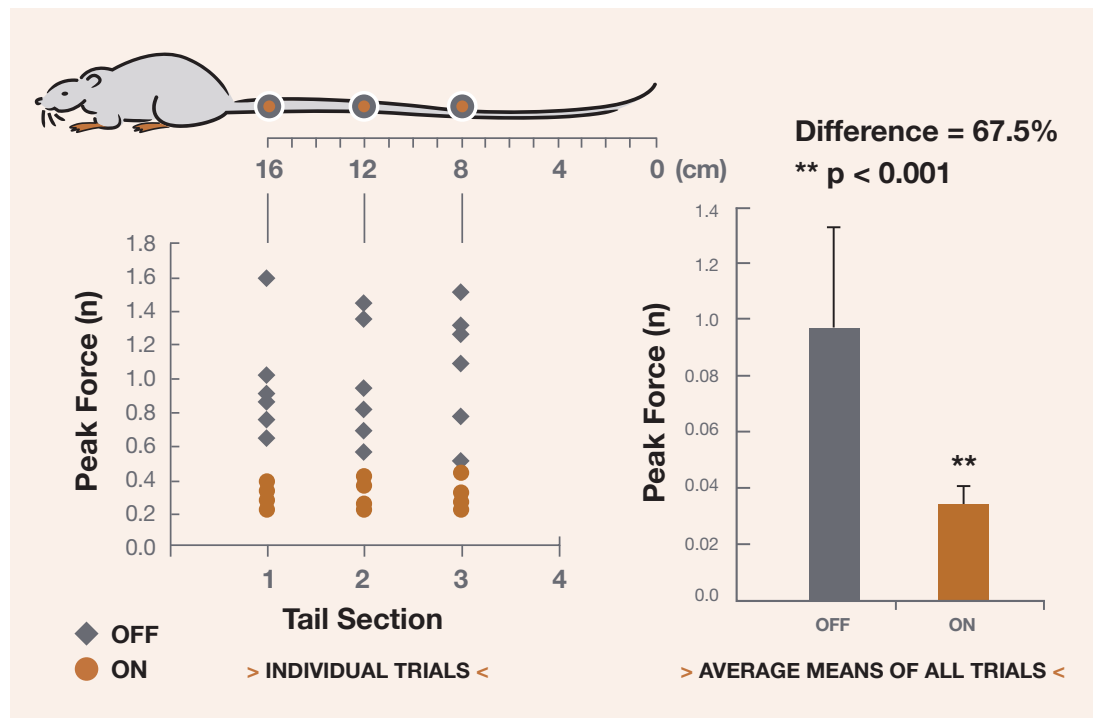
GentleSharp reduces the peak insertion force required for needle insertions into cadaver rat tails.

Results

With GentleSharp ON during needle puncture (orange bar), the average peak insertion force for needle insertions into rat cadaver tails was reduced by 67.5% compared to GentleSharp OFF during puncture (gray bar).

Student's t-test, statistical significance of mean difference:
** $p < 0.001$

Reduced Peak Insertion Force During Rat Tail Penetration



Experimental Design

- > Cadaver Sprague Dawley Rat Tails ($n = 6$) at 3 separate locations along length of tail as shown.
- > ON $n = 18$; OFF $n = 18$; Error bars = standard deviation.



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Decreased Needle Insertions for Serial Blood Collection

Summary

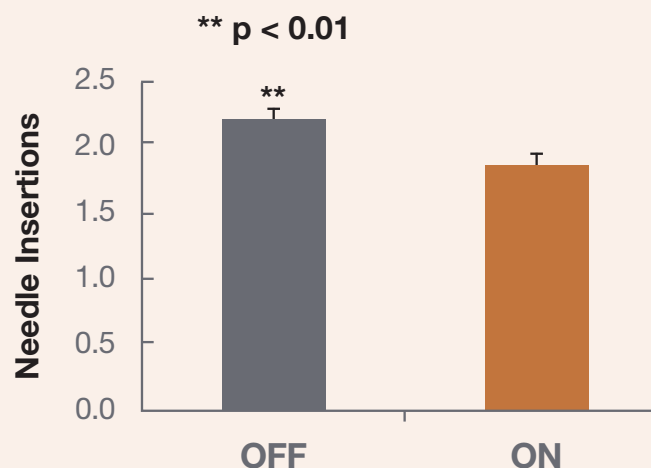
GentleSharp reduces the average number of needle insertions required to obtain a successful blood sample from mice tail arteries during serial blood collections.

Results

With GentleSharp ON during needle puncture (orange bar), the average number of needle insertions required to obtain a successful sample was significantly reduced compared to the GentleSharp OFF during puncture (gray bar).

Repeated Measures Analysis of Variance, statistical significance of mean difference:

** $p < 0.01$



Experimental Design

- > C57BL/6J mice ($n = 47$), starting at ~11 wks of age.
- > 9 total collection trials per subject - 3 sampling days (1 week apart) with 3 collections / day spaced 30 min apart; each trial limited to 3 insertion attempts.
- > ON group: $n = 216$ trials with 24 mice; OFF group: $n = 207$ trials with 23 mice; Error bars = standard error of the mean.



A More Humane Blood Sampling System

Increased Collection Success for Serial Blood Collection

Summary

GentleSharp increases the average success rate for serial blood collection from mice tail arteries.

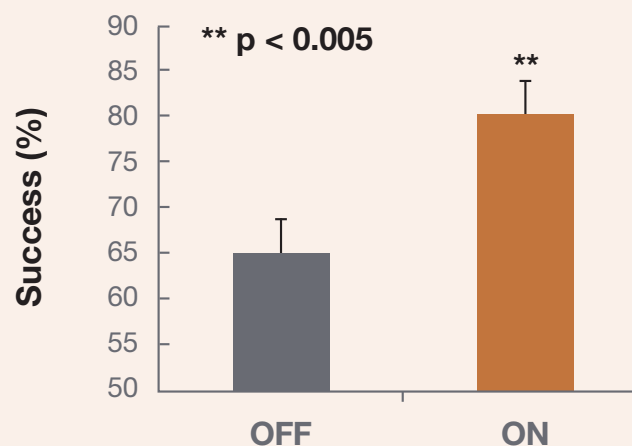
Results

For the group with GentleSharp ON (orange bar) during needle puncture, there was a significantly higher success rate compared to the group punctured with GentleSharp OFF (gray bar).

Success is defined as obtaining ≥ 0.01 g total blood mass ($\sim 10 \mu\text{l}$ blood) per trial; individual success rate based on 9 collection trials per animal (e.g. 9:9 = 100%).

Student's t-test, statistical significance of mean difference:

** $p < 0.005$



Average Success Rate	64.7 ± 3.4%	80.1 ± 3.5%
Proportion with 100% Success	0/23 = 0%	6/24 = 25%

Experimental Design

- > C57BL/6J mice ($n = 47$), starting at ~ 11 wks of age.
- > 9 total collection trials per subject - 3 sampling days (1 week apart) with 3 collections / day spaced 30 min apart; each trial limited to 3 insertion attempts.
- > ON group: $n = 24$ mice; OFF group: $n = 23$ mice; Error bars = standard error of the mean.

Decreased Needle Insertions for Serial Blood Collection - Repeated Sampling On Same Day

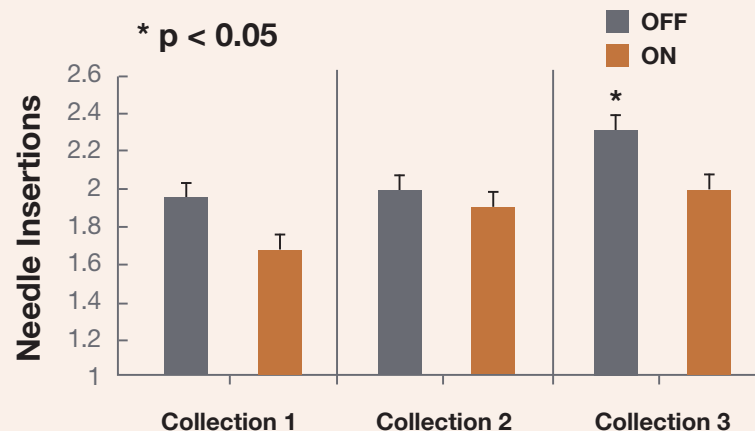
Summary

GentleSharp reduces the average number of needle insertions required for successful blood collection from mice tail arteries during serial blood collections within same collection day.

Results

With GentleSharp ON during needle puncture (orange bars), the average number of needle insertions required to successfully obtain sample was significantly reduced compared to the GentleSharp OFF during puncture (gray bars).

Repeated Measures Analysis of Variance, statistical significance of mean difference within collection:
* $p < 0.05$



Experimental Design

- > C57BL/6J mice ($n = 47$), starting at ~11 wks of age.
- > 9 total collection trials per subject - sampling days (1 week apart) with 3 collections / day spaced 30 min apart; each trial limited to 3 insertion attempts.
- > ON group: $n = 72$ trials with 24 mice; OFF group: $n = 69$ trials with 23 mice; OFF vs ON groups, compared within each collection separately; Error bars = standard error of the mean.

Increased Collection Success for Novice Collectors

Summary

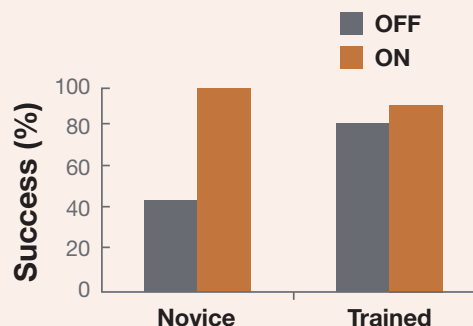
GentleSharp increases the average success rate for novice collectors to successfully obtain blood samples from mice tail arteries, enabling them to achieve the performance of a trained collector quicker.

Results

Novice collectors exhibited greater differences in success rates between collections completed with GentleSharp ON (orange bars) vs OFF (gray bars) during needle puncture compared to Trained collectors.

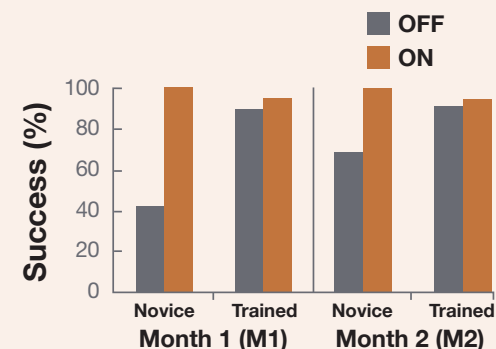
Where procedures performed with GentleSharp ON, the gap in success rate between Novice and Trained was essentially eliminated.

Experiment 1



	Novice	Trained
OFF	5/11	10/12
ON	12/12	11/12

Experiment 2



	Novice	Trained
M1 OFF	3/7	101/113
M1 ON	8/8	107/113
M2 OFF	10/15	117/129
M2 ON	16/16	122/129

Experimental Design

- > C57BL/6J mice, starting at ~11 wks of age; Target: Tail Artery.
- > Success is defined as obtaining sufficient blood for performance of RIA for plasma corticosterone; success rate based on successful collections / total collections attempted. Sample Sizes for Collections represented below each graph (successful trial / total trials).
- > Experiment 1 was completed within a single collection day.
- > Experiment 2 was completed over two months:
M1 = Month 1 totals; M2 = Month 2 cumulative totals.



A More Humane Blood Sampling System

Increased Blood Mass for Serial Blood Collection

Summary

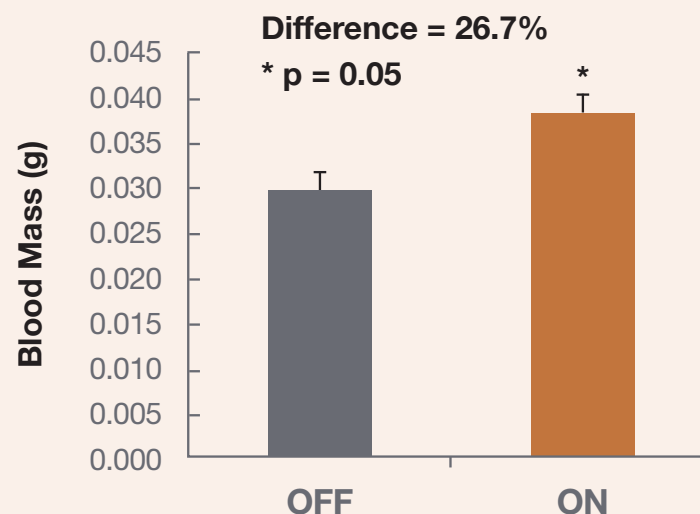
GentleSharp increased the average blood mass collected per trial during serial blood collections from mice tail arteries.

Results

With GentleSharp ON during needle puncture (orange bar), the average blood mass was 26.7% greater compared to GentleSharp OFF during puncture (gray bar).

Repeated Measures Analysis of Variance, statistical significance of mean difference:

* $p = 0.05$



Experimental Design

- > C57BL/6J mice ($n = 47$), starting at ~11 weeks of age.
- > 9 total collection trials per subject - 3 sampling days (1 week apart) with 3 collections / day spaced 30 min apart.
- > ON group: $n = 215$ trials with 24 mice; OFF group: $n = 205$ trials with 23 mice; Error bars = standard error of the mean.

No Significant Change in Mice Handling Time for Serial Blood Collection

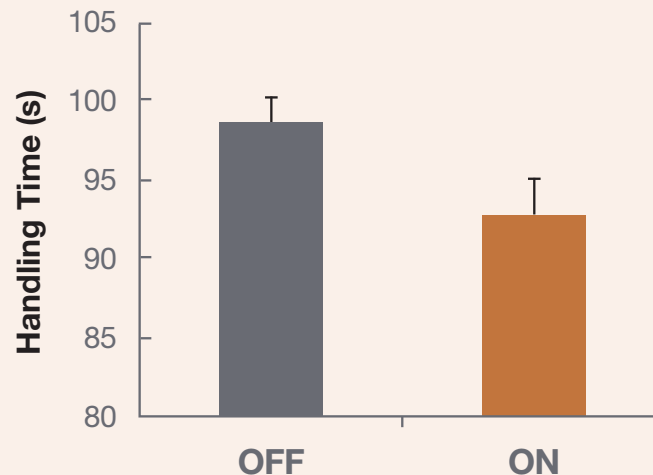
Summary

GentleSharp does not alter the animal handling time required for blood collections during serial blood collections from mice tail arteries.

Results

With GentleSharp ON (orange bar) during needle puncture, the mean handling time for collection trended to be reduced compared to the GentleSharp OFF during puncture (gray bar).

Repeated Measures Analysis of Variance, statistical significance of mean difference:
 $p = 0.19$



Experimental Design

- > C57BL/6J mice ($n = 47$), starting at ~11 weeks of age.
- > 9 total collection trials per subject - 3 sampling days (1 week apart) with 3 collections / day spaced 30 min apart.
- > ON group: $n = 212$ trials with 24 mice; OFF group: $n = 203$ trials with 23 mice; Error bars = standard error of the mean.