



## PR Lotion Significantly Improves High-Intensity Interval Performance

**Background:** Athletes continuously search for safe, effective and compliant ergogenic aids that will improve their performance and give them an edge on their competitors. Oral sodium bicarbonate (baking soda) use is a time-tested and effective method of providing that edge, but oral use causes a myriad of intolerable side-effects such as indigestion, gastric pain, vomiting, and diarrhea which limits use. PR Lotion (PR) delivers sodium bicarbonate transdermally. If proven effective, it will provide athletes the ability to use sodium bicarbonate, without the limiting side effects that come with oral use.

**Objective:** The objective of this field-testing exercise was to evaluate the impact of PR Lotion use on high-intensity interval cycling performance utilizing a randomized, controlled and blinded testing protocol.

**Testing Design:** Eight volunteer competitive cyclists who were current clients of the Source Endurance Training Center of the Rockies (SETCR) tested Control lotion versus Topical Edge PR Lotion in a controlled, randomized, blinded, cross-over design.

**Testing Methodology:** Cyclists were informed of the testing procedures and signed waivers prior to participation. All cyclists had an athlete profile already built that included a reliable measure of functional threshold power (FTP). A 20-minute time trial was performed prior to the test sessions to set power for test sessions. All testing was completed on personal bicycles on a *Wahoo Kickr* smart indoor bike trainer

being driven by *PerfPRO Studio* software. Two sessions of high-intensity Intervals were completed using PR Lotion (PR) or Control lotion (contained all ingredients except sodium bicarbonate) provided in blinded tubes (labeled A or B) by the manufacturer. To create the double-blind, cyclists and test administrators did not know the identity of each lotion. For the first testing session, the choice of Control or PR was randomized. For the second test, the alternate lotion, Control or PR, was used. Cyclists were instructed to apply 1 tablespoon of assigned lotion per leg 30 minutes prior to beginning a warm up. In order to prevent uncontrolled training schedules from confounding the testing results, the following schedule was adhered to:

**Day 1:** Cyclists completed 60 minutes of light riding at a recovery pace

**Day 2:** Cyclists completed a 20 minute time trial (see Table 1)

**Day 3:** Same as Day 1

**Day 4:** Cyclists completed high-intensity intervals until exhaustion (see Table 1)

**Day 5:** Same as Day 1

**Day 6:** Cyclists completed high-intensity intervals until exhaustion (same as Day 4 but with alternate sample used, see Table 1)

## Table 1. PR Lotion Product Testing Protocol

**Day 2:  
20 Minute Time Trial/ Power Test**

| Activity/Duration | Power           |
|-------------------|-----------------|
| <b>Warm Up</b>    |                 |
| 4 min             | self-selected   |
| 1 min             | 90% FTP         |
| 4 min             | self-selected   |
| 5 min             | 100% FTP        |
| 6 min             | self-selected   |
| <b>Begin Test</b> |                 |
| 20 min            | Time Trial (TT) |
| <b>Cool Down</b>  |                 |
| 10 min            | self-selected   |

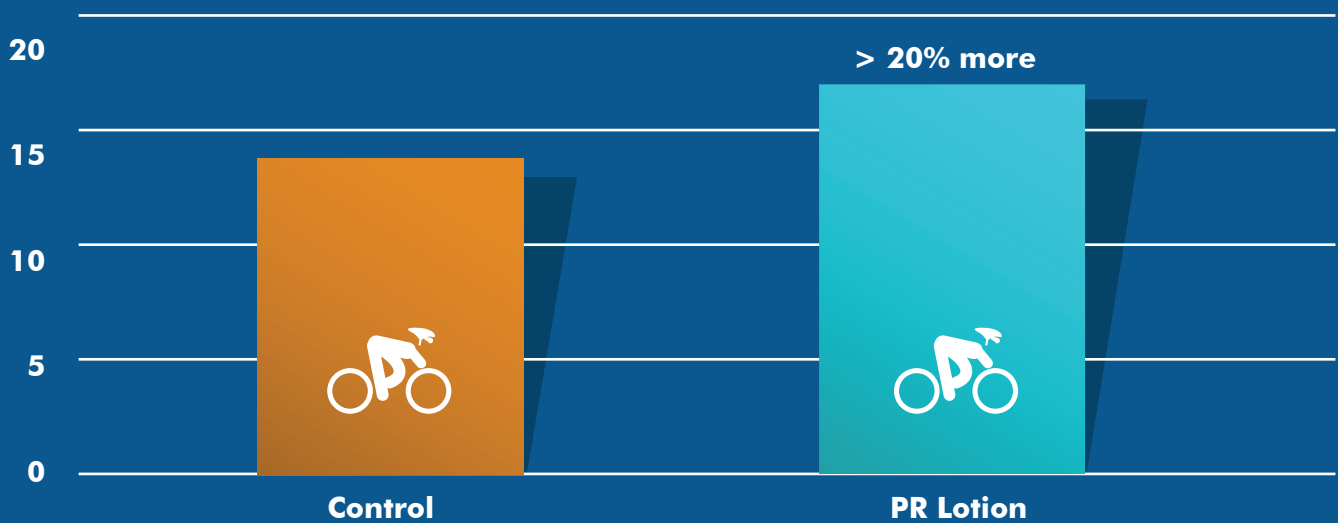
**Day 4/6:  
High-Intensity Intervals to Exhaustion (Failure)**

| Activity/Duration                           | Power         |
|---|---------------|
| <b>Warm Up</b>                              |               |
| 4 min                                       | self-selected |
| 1 min                                       | 90% FTP       |
| 4 min                                       | self-selected |
| 5 min                                       | 100% FTP      |
| 6 min                                       | self-selected |
| <b>Begin Test</b>                           |               |
| 30 second interval                          | 140% TT Power |
| 20 second rest                              |               |
| <i>repeat to failure, count repetitions</i> |               |
| <b>Cool Down</b>                            |               |
| 10 min                                      | self-selected |

Results were analyzed by using a paired t-test with a significance level set at  $p < 0.05$ . Results are presented as means  $\pm$  standard deviations.

**Results:** There was a significant difference ( $p=0.009$ ) between PR Lotion and Control lotion in the number of high-intensity cycling intervals completed before exhaustion. Cyclists completed an average of  $13.6 \pm 3.9$  intervals when using Control lotion versus  $17.0 \pm 4.9$  intervals when using the Topical Edge PR Lotion (see Figure 1).

### Figure 1: High-Intensity Interval Test Results



**Figure 1.** Cyclists performed significantly ( $p=0.009$ ) more high-intensity intervals before exhaustion when using PR Lotion (containing sodium bicarbonate) compared when using Control lotion.

**Discussion:** Strengths of this testing protocol included the tight control of exercise done before each day of testing and the temporal proximity of test sessions. In the Kern et al. study (in review) of PR Lotion, which was completed during a competitive season, training outside of the test sessions was uncontrolled resulting in test sessions falling variably after heavy training days, light training days or competitions. This led to cyclists being tested in different physiological states (e.g. exhausted, partially recovered or fully-recovered) and could have introduced variability into performance metrics. A limitation of this evaluation is the small number of cyclists tested (n=8). However, based on the data from this trial, the probability is 80% that a study of a similar cross-over design would detect a treatment difference at a two-sided 0.05 significance level with only 6 subjects, fewer than this study.

**Conclusion:** Testing of PR Lotion in this well-controlled and blinded evaluation demonstrated a significant ( $p=0.009$ ) performance improvement. Well-trained cyclists were able to complete significantly more high-intensity intervals before exhaustion when using PR Lotion compared to Control. The greater than 20% performance improvement observed (3.4 additional intervals completed) is similar to that demonstrated with use of oral sodium bicarbonate, but without the side-effects associated with oral use. Krustup, et al. (1) and Price, et al. (2) Krustup et al. (1) demonstrated a 14% improvement in performance (total number of meters ran before

failure) of high-intensity intermittent (intervals) exercise (20-meter runs with 20 seconds of active recovery jogging), and Price, et al. (2) demonstrated an 11% performance improvement measured as peak power during intermittent cycling sprints (10 repeated 3-minute blocks of intermittent cycling at 40%, 60% and maximal sprint separated by 16 seconds of recovery). The similarity of results between this test and that by Krustup, et al. (1) may be attributed to the similarity of testing protocols that are based on exercise to failure/exhaustion rather than measures of work done (power or wattage) during fixed testing as in that utilized by Price, et al. (2)

Additionally, no side-effects were reported. PR Lotion may, for the first time, allow athletes to use sodium bicarbonate for performance improvement without the fear of experiencing the typical side-effects associated with oral use.

## References

1. Krustup P, Ermidis G, Mohr M. Sodium bicarbonate intake improves high-intensity intermittent exercise performance in trained young men. *J Int Soc Sports Nutr.* 2015;12:25.
2. Price M, Moss P, Rance S. Effects of sodium bicarbonate ingestion on prolonged intermittent exercise. *Med Sci Sports Exerc.* 2003;35(8):1303-8.

**Acknowledgements:** Source Endurance would like to thank for providing blinded Control and PR lotions for testing.



**About Source Endurance:** Source Endurance is a group of professional coaches dedicated to the activities and lifestyles that make an endurance athlete, and work tirelessly to prepare each client for success. Our coaches leverage formal higher education in exercise physiology, nutrition, and humanities along with a multitude of certifications, practical experience at the elite level, and years of professional coaching experience to ensure that each client meets or exceeds their performance/ fitness goals.

**About the Source Endurance Training Center of the Rockies (SETCR):** The Source Endurance Training Center of the Rockies is dedicated to bringing the complete indoor cycling training facility to the athletes of Northern Colorado. With educated, well-trained coaches, a rounded indoor cycling training class schedule, weights and gym equipment, certified bike fitting, performance testing, plyometric classes, yoga and motor pacing, SETCR has what it takes to take athletes' training to the next level even in the coldest, darkest months of winter and no matter their goals.