

STORING URINE SAMPLES WITH WATER BATH PRESERVES URINE HYDRATION MARKER STABILITY FOR UP TO 21 DAYS

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BACKGROUND

- Urine samples are commonly collected and analyzed for hydration biomarkers (urine color, urine osmolality, and urine-specific gravity [USG]).
- However, immediate analysis might not be feasible for field research due to the large quantity of samples and accessibility of devices that require samples to be stored for an extended period of time before analysis.
- When urine samples were stored at 4°C without water bath, urine color (7 days), urine osmolality (7 days), and USG (3 days) measurement stability were maintained.
- However, refrigeration could produce a dry environment that could promote evaporation, potentially affecting the stability of these urine hydration biomarkers generate.
- Therefore, storing urine samples in a water bath could prevent changes in these hydration biomarkers; however, no research has determined the effect of this storage method on hydration biomarker.

PURPOSE

- To examine the effect of urine storage duration and method (with or without a water bath) on hydration biomarkers at 4°C.

METHODS

PARTICIPANTS

- 24 healthy men and women (age: 25 ± 5 yr, body mass: 72.1 ± 13.4 kg, height: 169.8 ± 8.0 cm)

STUDY DESIGN

- Participants provided urine samples between 9-10 A.M
- Urine samples were analyzed for urine osmolality, color, and USG within the first 2 hours (Day 0)
- Urine samples were evenly divided into two separate cups and capped.
- Two urine samples from each participant were stored either in a container with 1000 ml water (Water Bath) or in a container with no water (No-Water Bath), and the container was sealed shut (Fig. 1).
- These containers were then placed in a refrigerator (VWR, Radnor, Pa, USA) set to 4°C, with an average temperature of 3.2°C for 21 days.

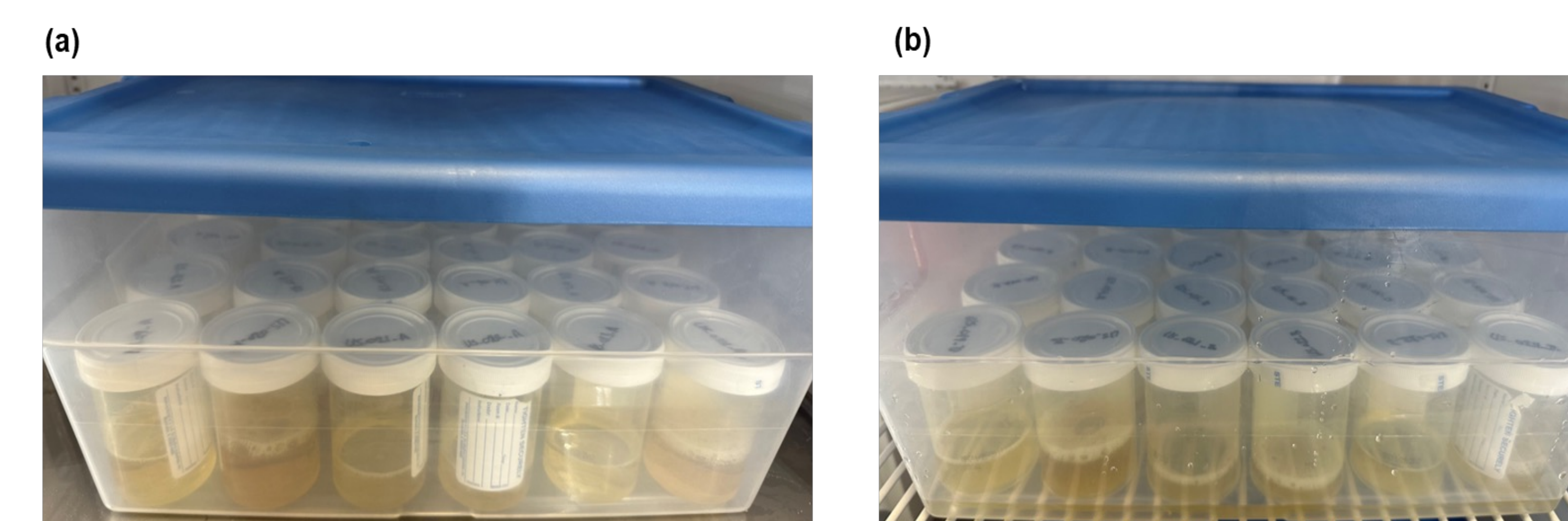


Fig. 1 Sample storage conditions with (a) No water bath and (b) Water Bath [1]

Water Bath at 4°C preserves urine osmolality and urine color for up to 21 days while it was able to preserve USG for up to 2 days.

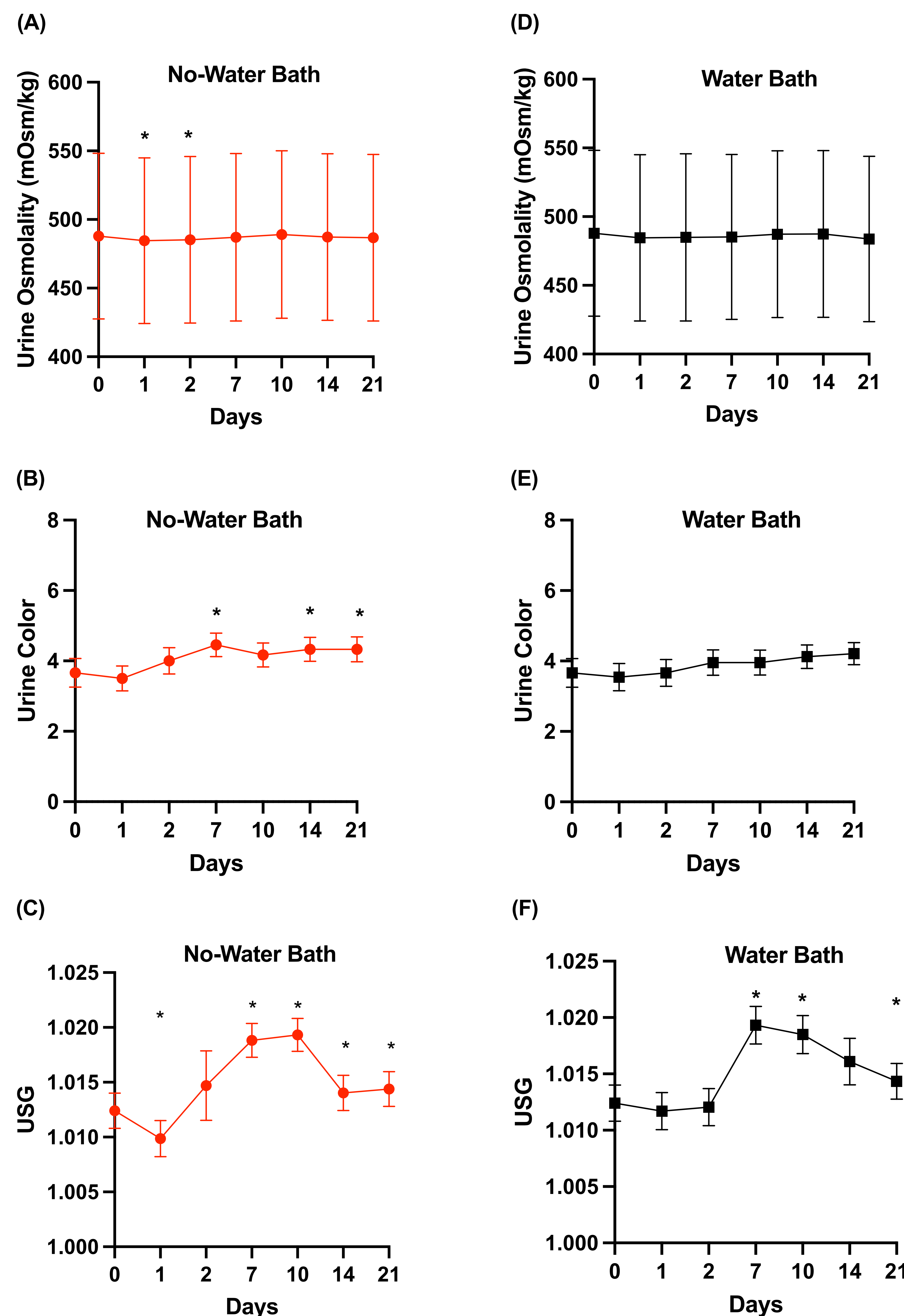


Fig. 2 Markers of hydration analyses for Urine Osmolality, Urine Color, and USG. Values are mean ± S.E. * P < 0.05 vs. Day 0 [1]

METHODS

- Urine osmolality was analyzed using Advanced Instrument Osmometer (Norwood, Ma, USA) in duplicate.
- Urine color was assessed by the same researcher for all-time points using the 8-point urine color chart
- USG was analyzed using an optical refractometer (ATAGO, Tokyo, Japan)



Statistical Analyses

- A two-way ANOVA (time × condition) with repeated measures on condition and time were performed for urine hydration markers.
- In addition, urine hydration markers were analyzed for time using repeated measures ANOVA for each condition.
- LSD post hoc tests were used for pairwise comparisons.
- The statistical significance was set at p < 0.05.
- Data are reported as mean ± SE.

RESULTS

Urine Osmolality

- Day 1 and Day 2 were significantly different from Day 0 for No-Water Bath (Fig. 2A).
- No significant differences for Water Bath (Fig. 2D).

Urine Color

- Day 7, 14, and 21 were significantly different from Day 0 for No-Water Bath (Fig. 2B).
- No significant differences for Water Bath (Fig. 2E).

USG

- Day 1,7,10,14 and 21 were significantly different from Day 0 for No-Water Bath (Fig. 2C).
- Day 7,10, and 21 were significantly different from Day 0 for Water Bath (Fig. 2F).

CONCLUSION

- Storing urine in a water bath appears to be an ideal storage condition compared to no water bath.
- The water bath maintained the stability of urine color and urine osmolality measurements for 21 days, whereas USG measurement was stable for 2 days compared to baseline.

PRACTICAL APPLICATIONS

- The ability to store urine samples for 21 days could benefit practitioners assessing hydration in sport setting environments that don't allow for immediate analysis.

REFERENCES

- 1) Jiwan, N. C., Appell, C. R., Keefe, M. S., Dunn, R. A., Luk, H. Y., & Sekiguchi, Y. (2023). Storing urine samples with moisture preserves urine hydration marker stability up to 21 days. *International urology and nephrology*, 55(6), 1413–1419. <https://doi.org/10.1007/s11255-023-03581-6>