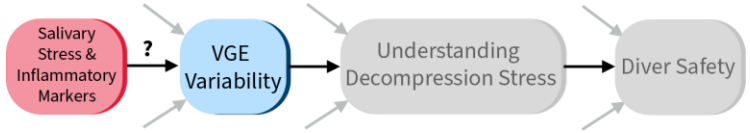
# Salivary Analyte Analysis For Correlation With Decompression Stress

Marina C. Kapitanov[a,b], Rhiannon J. Brenner[b], Joshua B. Currens[a,b], Grant Z. Dong, Catherine J. Harris[b], Virginie Papadopoulou[a], Frauke Tillmans[b]

[a]Joint Department of Biomedical Engineering, Thu University of North Carolina at Chapel Hill and North Carolina State University, NC, USA. [b]Divers Alert Network (DAN), Durham, North Carolina, USA.

## Introduction

**Objective: This study aims to understand inter- and intra-subject variability of salivary stress and inflammation markers as part of a larger study investigating diver variability in post-dive venous gas emboli (VGE) and possible contributing factors.**




- Pre- and post-dive changes in stress and inflammation markers are well documented for saturation but not for recreational divers.
- Cortisol is often measured to assess stress, C-reactive protein (CRP) as a marker of general inflammation, and uric acid (UA) as an oxidative stress response indicator.

## Methods


- Fourteen divers conducted the same standardized dive profile 6 times over twelve weeks.
- Participants provided saliva samples 60 min before and 30 min after diving. Samples were processed for CRP, UA, and cortisol levels (Salimetrics, LLC).
- Biomarker data were then analyzed for normality and significant difference per the figure above.
- Following normality testing, biomarker data were then also compared to peak VGE bubble grades (Eftedal-Brubakk) for each diver on each dive day using a Mann-Whitney test.

## Inter-Participant Salivary Biomarker Analysis

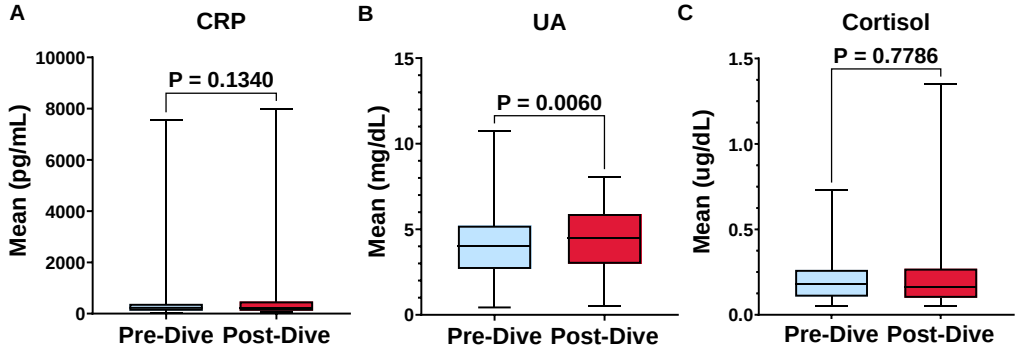
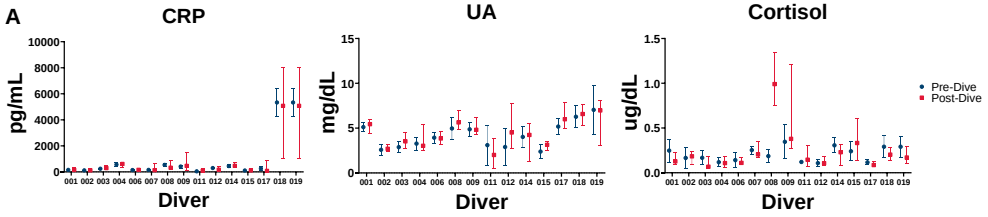



**Figure 1.** Pre- and post-dive biomarker analysis for n=84 total dives. Overall post-dive: (**A**) mean C-reactive protein (CRP) did not change, (**B**) mean salivary uric acid (UA) significantly increased, and (**C**) mean cortisol did not change (all $p<0.05$).

## Pre- and Post-Dive Salivary Biomarkers by Diver




B

| | CRP (pg/mL) | | UA (mg/dL) | | Cortisol (ug/dL) | |
|---|---|---|---|---|---|---|
| Study Median + IQR | 228.4 (111.4 - 382.5) | 233.5 (111.8 - 477.8) | 4.0 (2.7 - 5.2) | 4.5 (3.0 - 5.9) | 0.18 (0.11 - 0.26) | 0.16 (0.10 - 0.27) |
| Physiological Range | 114 - 6131[2] | | 0.29 - 6.11[3] | | 0.094 – 1.551[4] | |

**Figure 2.** (**A**) Salivary analyte median measurements separated by each diver. (**B**) Most divers' biomarkers fell within healthy physiological limits. Decrease in cortisol could be attributed to natural diurnal pattern. Increase in CRP and UA could indicate increased inflammation and oxidative stress post-dive, but more testing is needed.

## Biomarkers and VGE

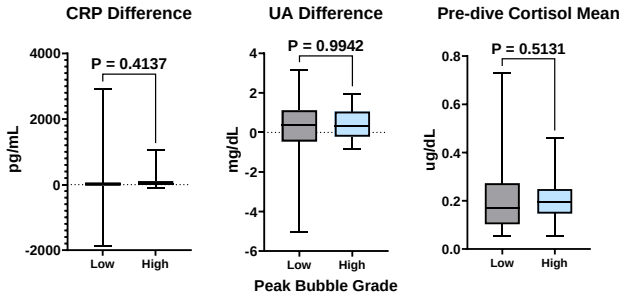



**Figure 3**. Bubble grades were separated into low (0-2) and high (3-5) grades. No significant differences were found between increased bubble grades and any pre-dive or post-dive biomarker levels nor post-dive biomarker changes.

## Conclusions

- Temporarily elevated levels of uric acid post-dive may be correlated with physiological stress and an inflammatory response to tissue damage.
- Salivary analysis still requires investigation as a non-invasive measure of stress and inflammation biomarkers.
- The study is ongoing, and further data collection and analysis may provide greater insight into VGE variability factors.

### Acknowledgements

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