**Supplementary Material**

 **Measurement of Sweat Lactate Levels in Exercise and Non-Exercise Activities using Capillary Electrophoresis System with Contactless Conductivity Detection and
Cyclodextrin-Modified Buffer**

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**Supplementary Material A**

**Personal information and heart rate measurements before and after two perspiration activities:
non-exercise and exercise for six volunteers**

**Table S1** presents the personal information of six volunteers, including their gender, age, height, and weight. Additionally, it provides heart rate measurements before and after two perspiration activities: non-exercise (after a sauna session at 60 ˚C, 70 % humidity, for 30 minutes) and exercise (after 30 minutes of treadmill running covering a distance of 3.0 km).

**Table S1** Personal information and heart rate measurements before and after two perspiration activities: non-exercise and exercise for six volunteers (V1 – V6).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Volunteer** | **Gender** | **Age** | **Height (cm)** | **Weight (kg)** | **Heart rate (bpma)\*** |
| **Non-exercise activity** |  | **Exercise activity** |
| **Before** | **After** |  | **Before** | **After** |
| V1 | Female | 25 | 170 | 85 | 80 | 80 |  | 80 | 148 |
| V2 | Female | 24 | 164 | 52 | 80 | 80 |  | 80 | 144 |
| V3 | Female | 29 | 171 | 62 | 64 | 80 |  | 76 | 140 |
| V4 | Male | 31 | 166 | 56 | 76 | 80 |  | 84 | 132 |
| V5 | Male | 24 | 183 | 68 | 72 | 80 |  | 80 | 136 |
| V6 | Male | 30 | 179 | 84 | 72 | 80 |  | 84 | 124 |
| Mean ± SD |  | 27 ± 3 | 172 ± 7 | 68 ± 14 | 74 ± 6 | 80 ± 0 |  | 81 ± 3 | 137 ± 9 |

abpm (beat per minute)

\*Heart rate measurements were conducted in triplicate for each volunteer by counting pulses within a 15 s interval and subsequently multiplying by 4 to determine the beats per minute (bpm).

**Supplementary Material B**

**Electropherograms of standard lactate solutions and
the calibration curve of peak area ratios**

**Fig. S1** shows a calibration curve constructed by plotting the mean of the lactate peak area ratio to the internal standard (IS) (1.0 mM maleate) against lactate concentrations ranging from 0.1 – 5.0 mM. The figure illustrates a wide concentration range of 0.1, 0.3, 0.5, 1.0, 3.0, and 5.0 mM with consistent IS peak areas and precise Average RMTs of 1.28 ± 0.00 (0.3 % RSD), 1.34 ± 0.00 (0.3 % RSD), and 1.48 ± 0.00 (0.4 % RSD) for standard electropherogram (a), (c), and (f), respectively (refer to intra- day precision of RMTs of lactate concentration at low, medium, and high in Table 4, 2nd column). Moreover, Precision of average migration time for standard electropherograms (a), (c), and (f) was 0.8, 0.9, and 1.0 % RSD for maleate (IS) and 0.8, 1.1, and 0.8 % RSD for lactate.





**Fig. S1 (A)** Electropherograms of standard lactate with maleate (1.0 mM, IS). Lactate concentrations are **(a)** 0.1 mM, **(b)** 0.3 mM, **(c)** 0.5 mM, **(d)**1.0 mM, **(e)** 3.0 mM, **(f)** 5.0 mM. The running buffer comprises 40 mM MES/L-His buffer (pH 6) containing 0.05 mM CTAB and 0.1 mM TRIME-β-CD.(See Section 2.4. for CE conditions). **(B)** The calibration curve of peak area ratios (lactate/maleate (IS)) for 0.1 – 5.0 mM lactate.

**Supplementary Material C**

**Measured lactate concentrations of sweat samples for
studying of stability of sweat samples and
the paired *t*-tests for all pairs of weeks**

**Table S2** The measured lactate concentrations of samples V1 – V6 at 1, 2, 3, 4, and 24 weeks of storage at 4 ºC. The samples were collected from volunteers who participated in the non-exercise activity.

|  |  |
| --- | --- |
| **Week** | **Measured lactate level (mM)** |
| **V1** | **V2** | **V3** | **V4** | **V5** | **V6** |
| 1 | 38 ± 1 | 23 ± 0 | 24 ± 1 | 24 ± 1 | 20 ± 1 | 14 ± 1 |
| 2 | 36 ± 1 | 25 ± 0 | 26 ± 1 | 23 ± 1 | 21 ± 1 | 14 ± 0 |
| 3 | 35 ± 1 | 24 ± 1 | 26 ± 0 | 23 ± 0 | 20 ± 1 | 14 ± 1 |
| 4 | 35 ± 0 | 23 ± 0 | 24 ± 2 | 23 ± 0 | 19 ± 1 | 15 ± 1 |
| 24 | 36 ± 2 | 22 ± 2 | 22 ± 2 | 23 ± 2 | 20 ± 0 | 15 ± 1 |
| Mean ± SD | 36 ± 1 | 24 ± 1 | 24 ± 2 | 23 ± 1 | 20 ± 1 | 15 ± 1 |

**Table S3** Paired *t*-tests for all pairs of weeks.

|  |  |
| --- | --- |
| **Pair** | **t-stata** |
| Week #1 | *vs.* | Week #2 | -0.59 |
| Week #1 | *vs.* | Week #3 | 0.28 |
| Week #1 | *vs.* | Week #4 | 1.31 |
| Week #1 | *vs.* | Week #24 | 1.84 |
| Week #2 | *vs.* | Week #3 | 2.49 |
| Week #2 | *vs.* | Week #4 | 2.32 |
| Week #2 | *vs.* | Week #24 | 1.60 |
| Week #3 | *vs.* | Week #4 | 1.27 |
| Week #3 | *vs.* | Week #24 | 0.97 |
| Week #4 | *vs.* | Week #24 | 0.96 |

at-critical = 2.57 for *n* = 6 samples, P = 0.05