

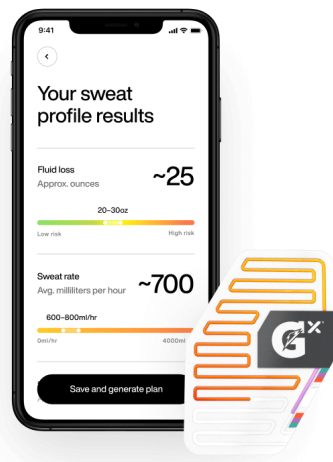
EPICORE
BIOSYSTEMS



Protecting Workers and Warfighters from Heat Injury with Wearable Technology

Epicore Biosystems

Products

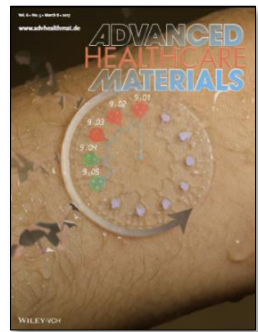
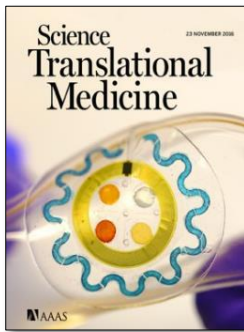


GX Sweat Patch (single use)



Connected Hydration (continuous)

Expertise



52 patents filed (US & International)
23 issued / allowed patents
35+ Peer-reviewed publications

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Investors



Research Partners



NORTHWESTERN UNIVERSITY

Climate Change is Hitting Workers and the Economy Hard

Heat has large macro safety & economic impact

\$500B heat-related **labor-productivity losses** projected annually by 2050 ⁽¹⁾

3% loss in efficiency and **1%** increase in injuries per **1°C** temp rise ^(2,3)

50+ more high heat days per year by 2050 ⁽⁴⁾

Heat injuries & illnesses likely very underreported

40x more deaths caused by heat estimated than reported by OSHA ^(5,6)

50x more injuries caused by heat estimated than reported ^(5,6)

Heat **reduces cognitive performance** and negatively influences decision making ^(7,8)

Dehydration is a significant factor in Heat Injuries

2% body weight loss in fluid leads to cognitive impairment ⁽⁹⁾

10x range of sodium concentration between individuals ⁽¹⁰⁾

Consecutive workdays in high heat **can further increase the risk of heat illness** ⁽¹¹⁾

Personalized hydration can decrease risk & costs

\$79K cost of a single labor heat injury ⁽¹²⁾

30% reduction in CA heat injuries after heat standard implemented, non-personalized ⁽¹³⁾

Proper hydration helps mitigate the effect of heat exposure ^(14,15,16)

(1) Atlantic Council 2021
(2) University of Chicago
(3) Syeda et al, 17 study meta-analysis
(4) Reidmiller et al

(5) Public Citizen 2022
(6) Institute of Labor Economics, 2021
(7) Graff Zivin et al. 2017
(8) Heyes and Saberian, 2019

(9) Chevront et al 2016
(10) Gatorade Sports Science Institute
(11) Notley et al 2018

(12) OSHA cost estimator
(13) Park et al 2021
(14) Armstrong et al. 1985
(15) Gonzalez-Alonoso et al. 1997
(16) Gopinathan et al. 1988

Hydration and Metabolic Health Vary Individually & Day to Day

Dehydration leads to heat injuries and poor health outcomes

2% body weight loss in fluid leads to cognitive and physical impairments⁽¹⁾

10x range of sodium concentration across individuals⁽²⁾

Consecutive days of intense activity in high heat **can significantly increase risk of heat illness**⁽³⁾

(1) Cheuvront et al 2016

(2) Gatorade Sports Science Institute

(3) Notley et al 2018

(4) Baker et al 2016



Single day variation in sweat biomarkers across a population

💧 **22x** range in sweat rate variation⁽⁴⁾

⚡ **15x** range in sodium concentration variation

Same environment, same activities, on same day give rise to staggering differences in hydration across individuals



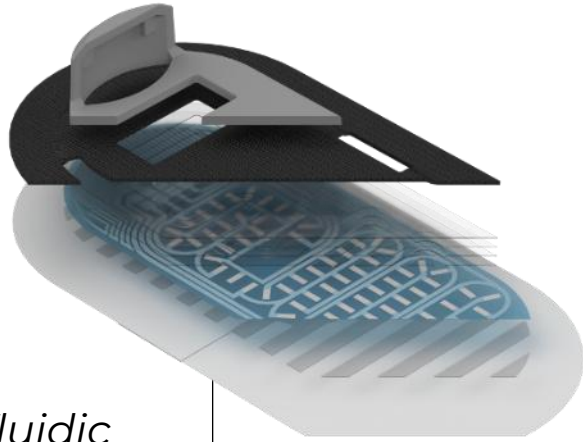
Many factors affect sweat loss

- Acclimatization status
- Hydration state
- Fitness level
- Body mass
- Dietary habits
- Alcohol consumption
- Workload strain
- PPE and athletics gear
- Temp & humidity
- Sleep and stress levels



Fluid and electrolytes are **critical for proper hydration and recovery**, but difficult to predict and manage

Epicore Patented Biosensor & Microfluidics



Microfluidic
electrochemical
sensing

Module
(reusable)



Patch
(one-time
use)



23 patents issued

35 peer-reviewed publications

WSJ

TED

Science

MoMA

nature

Offshore

TIME

Connected Hydration Measures Sweat Loss Directly

First-ever **personalized** hydration management solution providing:



Direct, continuous monitoring of sweat loss & electrolyte concentration



On-body hydration reminders



On-body dehydration alarm



Skin & under-PPE temp



Activity level

...keeping workers

engaged, informed, and safe



Designed for Tough Environments

First-ever **personalized** hydration management solution providing:



Intrinsically Safe (Class 1, Div 2)



1,000+ hours battery life (no recharging needed)



On-board memory (no data connection needed)

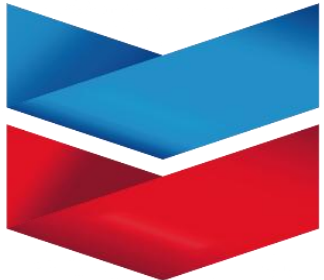


SOC 2 Type II compliant cloud



Tested in hot environments up to 65° C

Chevron



Deployed Globally by Chevron

Chevron and Epicore have signed a three-year agreement to deploy Epicore's Connected Hydration system to protect workers at upstream, midstream and downstream sites across the globe.



Connected Hydration in the Field: Tragedies Averted

Industrial Athletes

'I feel safer wearing the patch. I now keep an eye on my crew and make sure they stay hydrated. Now I notice when people are sweating.'
- Contractor team lead

"Wearing this made me more aware of my personal needs. Now that I follow the recommendations, I cramp less & feel better."
- Confined Space Worker

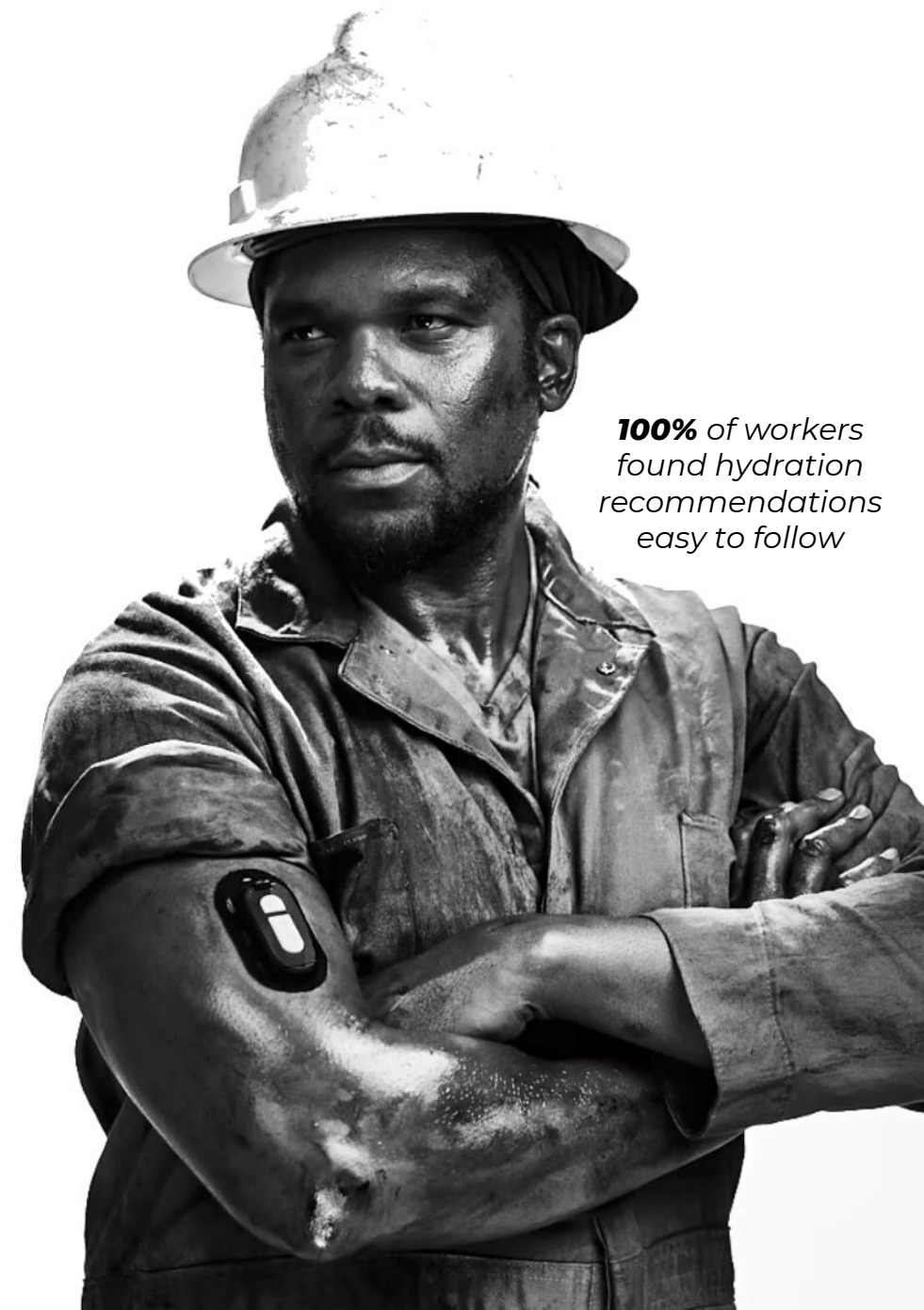
"I used to feel so drained. I feel much better now and more refreshed in the hot summers here."
- Oil & Gas Contractor

Health & Safety Managers

"It just works. I've had other sensors for 3 years that I've never been able to get working properly, these things were good on day one."
- HSE Director, Chemical Refinery

"In our eyes, this is a proven technology. I can see it becoming standard PPE." – Executive Director
HSE, Fortune 50 company

100% of workers found hydration recommendations easy to follow



Smartphone NOT Required

Without Phone

On-Body Alarms and Alerts



- Vibration alarm when sweat loss reaches 500ml
- Intense vibration alert when sweat loss exceeds 2% of body weight
- Press large button when you have drunk a bottle (500ml) of water
- Sync device once at end of shift

Simple, actionable feedback without a phone

With Phone

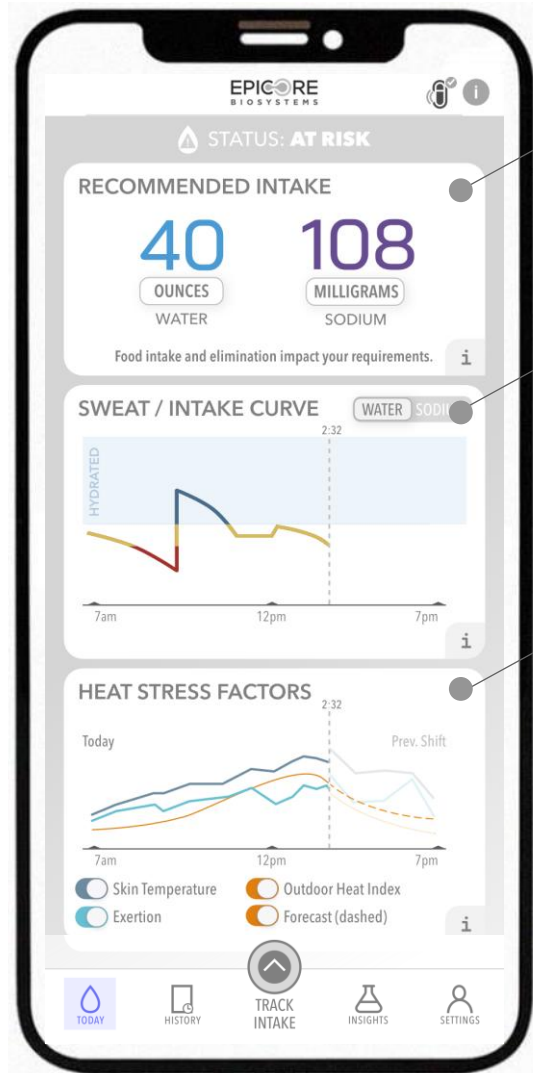
Additional Details



- Detailed display of fluid and sodium loss
- Graphical display of today's hydration trends
- Access to complete history
- Data synced continuously

Phone not necessary for primary safety features

Mobile Application: Sweat Profile Features



Recommended Intake

Fluid oz
Sodium mg

Sweat / Intake Curve

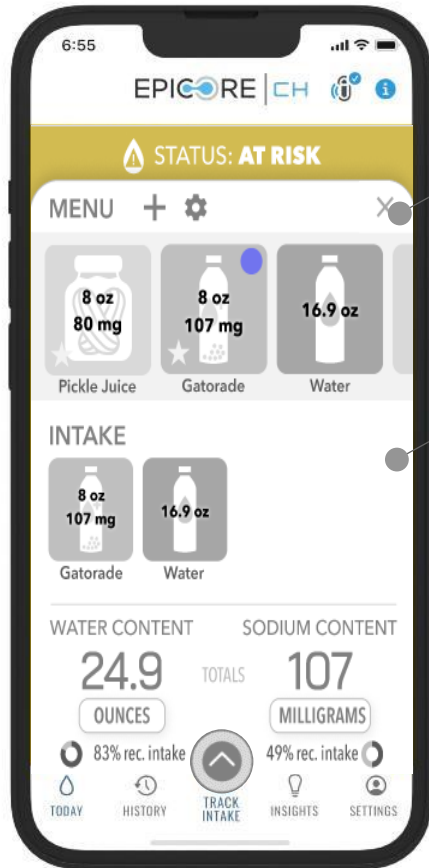
Gamified hydration tracking

Multimodal sensing features

Sweat & Electrolyte loss
Skin Temperature
Motion / Exertion
Heat Index + forecast



Mobile Application: Summaries & Reports



Drink Database

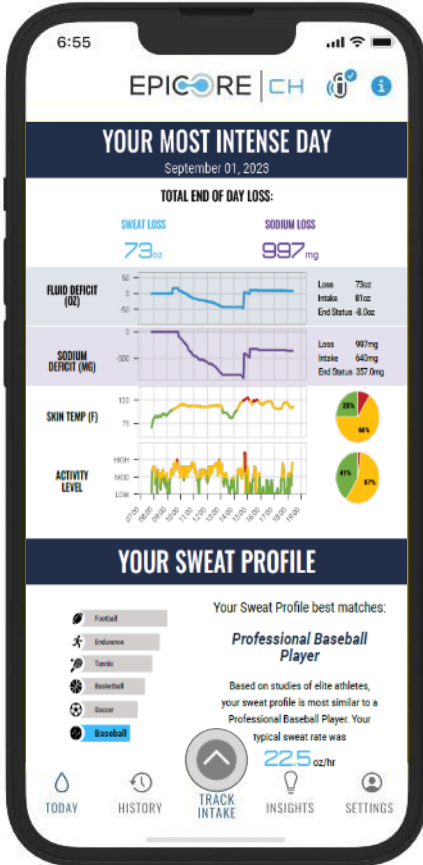
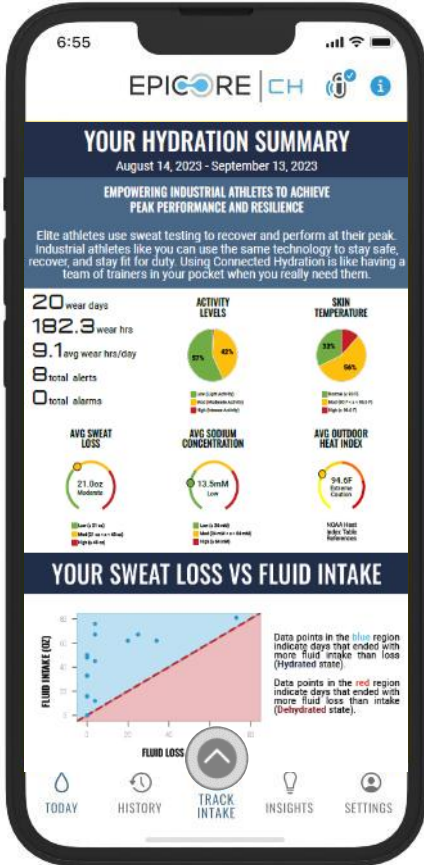
Saved Favorites
Scan or Enter

Hydration Tracking

Log & track
Compare against needs



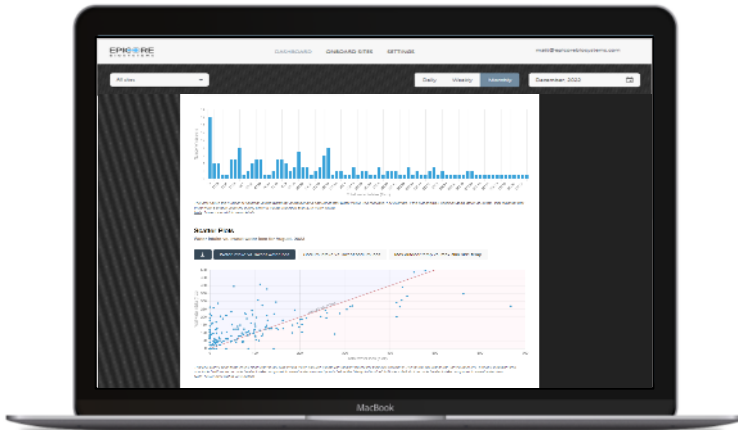
Mobile Application: Personalized Performance Summaries



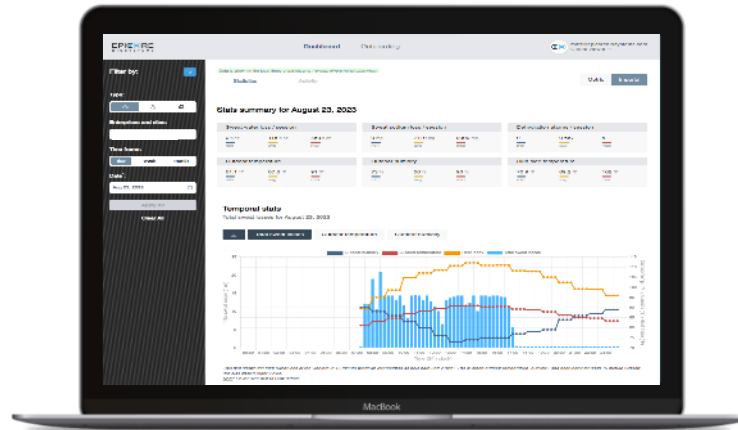
Cloud Solution & Advanced Analytics

Population statistics & predictive analytics drive data insights

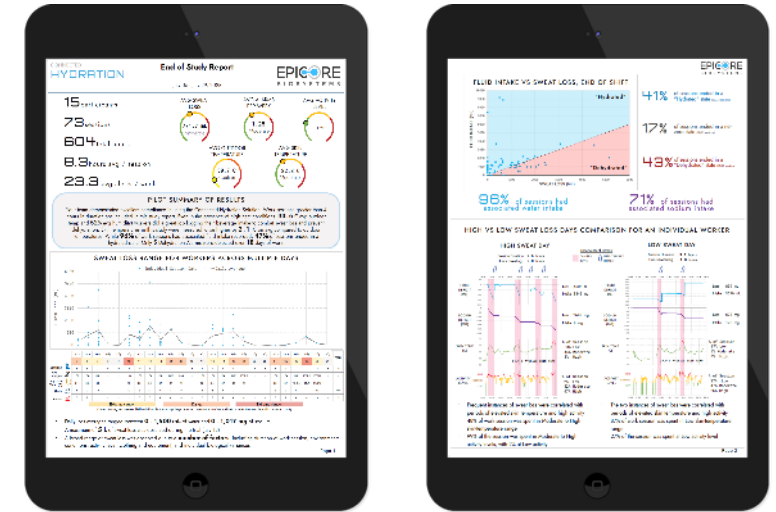
Worker Hydration Statistics



Environmental Statistics



Enterprise Data Reporting



Real-time Interventions



Injury Prevention

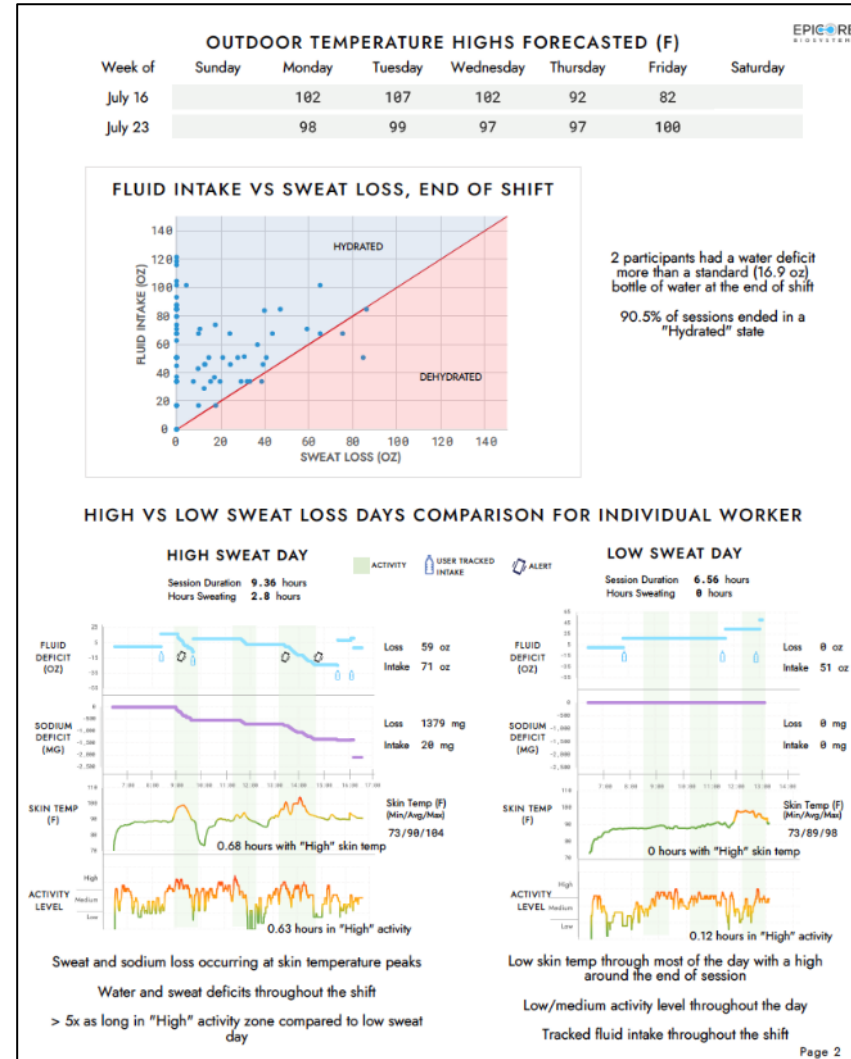
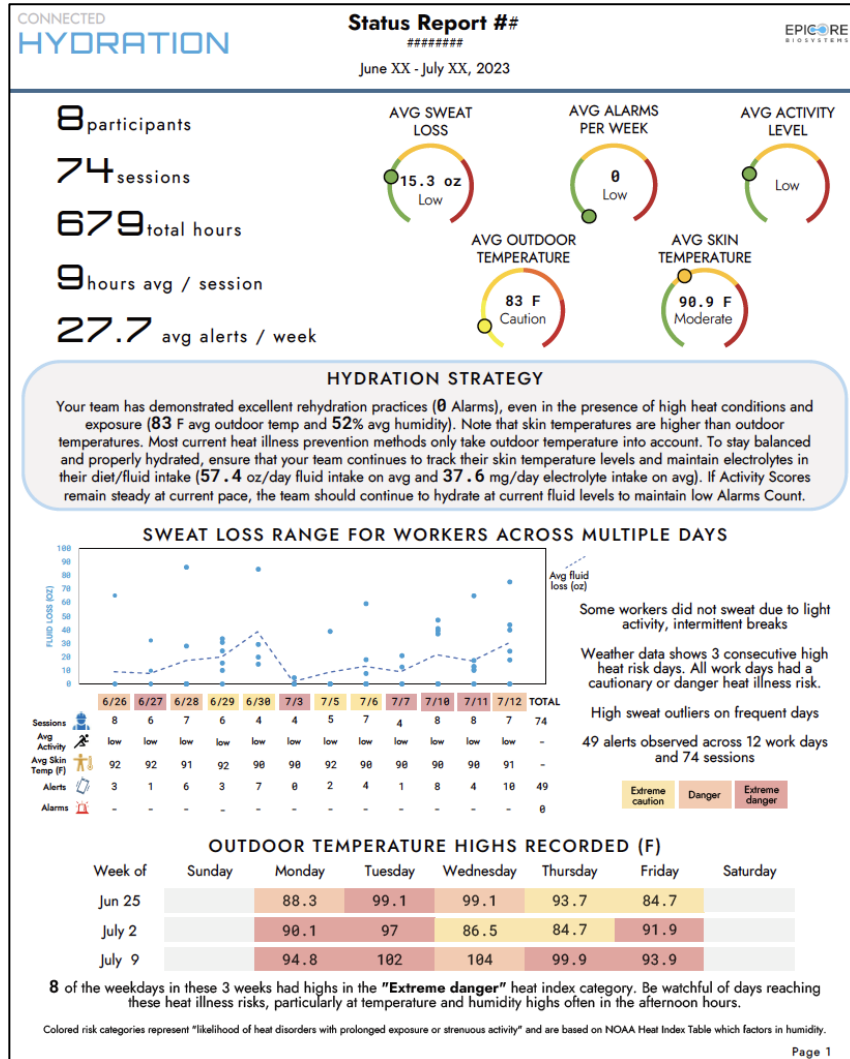


Cost & Operational Savings



Industry-Standard Data Security

Enterprise Cloud & Data Services (Hydration Report)



Epicore vs. Other Wearables



Direct Hydration Measurements



Sweat loss
Sweat rate
NaCl concentration
NaCl loss

Activity and skin temperature metrics provide **contextualized data**

Microfluidics create a controlled, stable analysis of sweat dynamics

Rehydration, performance, & behavioral feedback



Preventative and direct measure of hydration management

Other Wearables

Indirect Hydration Measurements



Heart rate
Respiration rate
Skin temp



PPG, HR, and Temp are indirectly related to rehydration feedback

Challenges

HR has delay with correlation to heat
Wrist is noisy location to assess temp

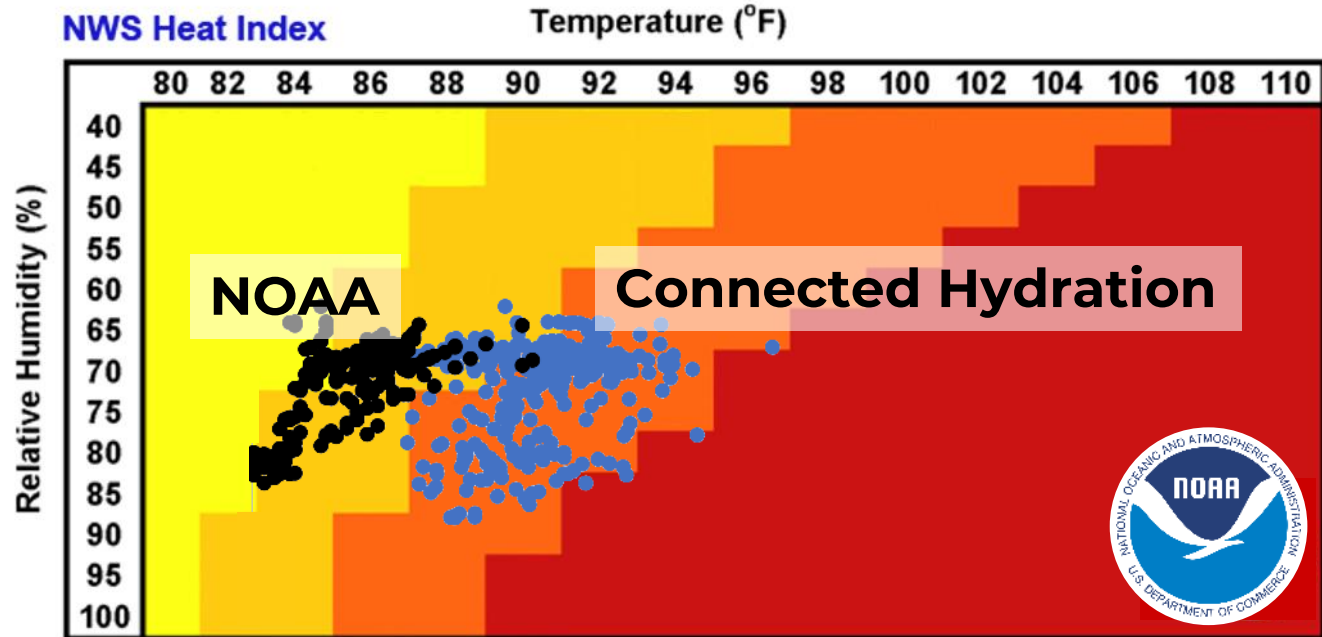
Indirect, late-stage noisy feedback

Risk More Aptly Characterized

Gold Standard tools lack personalized insights

Heat Index alone often under-predicts risk

Connected Hydration provides individually personalized real-time risk information



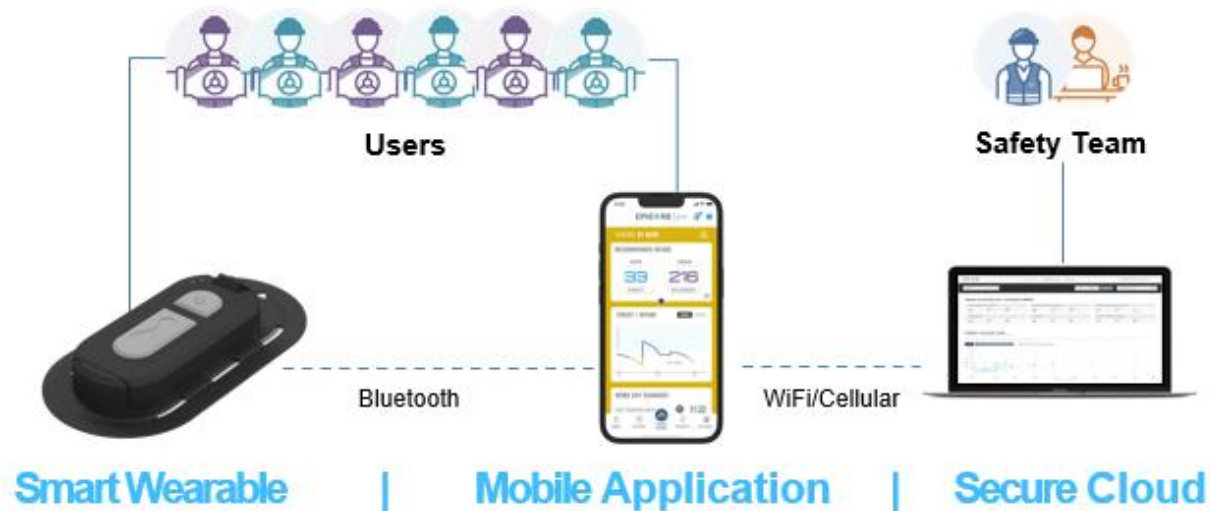
Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

● NOAA ● Connected Hydration

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

■ Caution ■ Extreme Caution ■ Danger ■ Extreme Danger

Functional Description



The solution works by creating a non-invasive seal over an area of skin between the bicep / tricep. Sweat is forced into the patch where sensors directly measure sweat volume, sweat rate, and sodium concentration. The device also measures skin-side temperature & motion.

These measurements are fed into our recommendation algorithm, comparable to the current gold standard of performance analysis used for elite athletes, outputting whole body sweat dynamic results.

The on-body device then uses that information, combined with the users' height & weight, to generate insights including on-body vibration alerts & alarms, and outputting hydration recommendations to an iPhone through a Bluetooth connection.

If there is no phone nearby, the worker can still receive real-time vibration alerts & alarms through onboard memory. The data is then synced during a break or end of workday.

Technical Specifications (Smart Wearable Hardware)

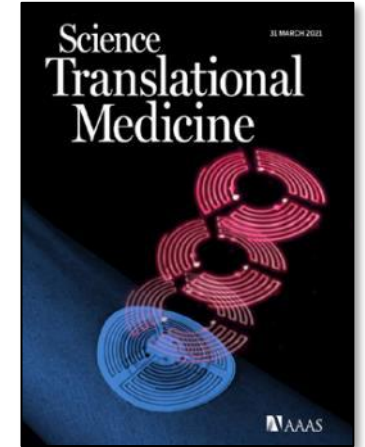
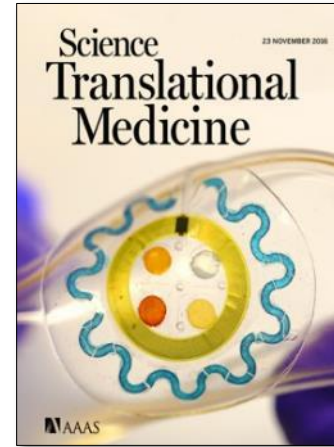
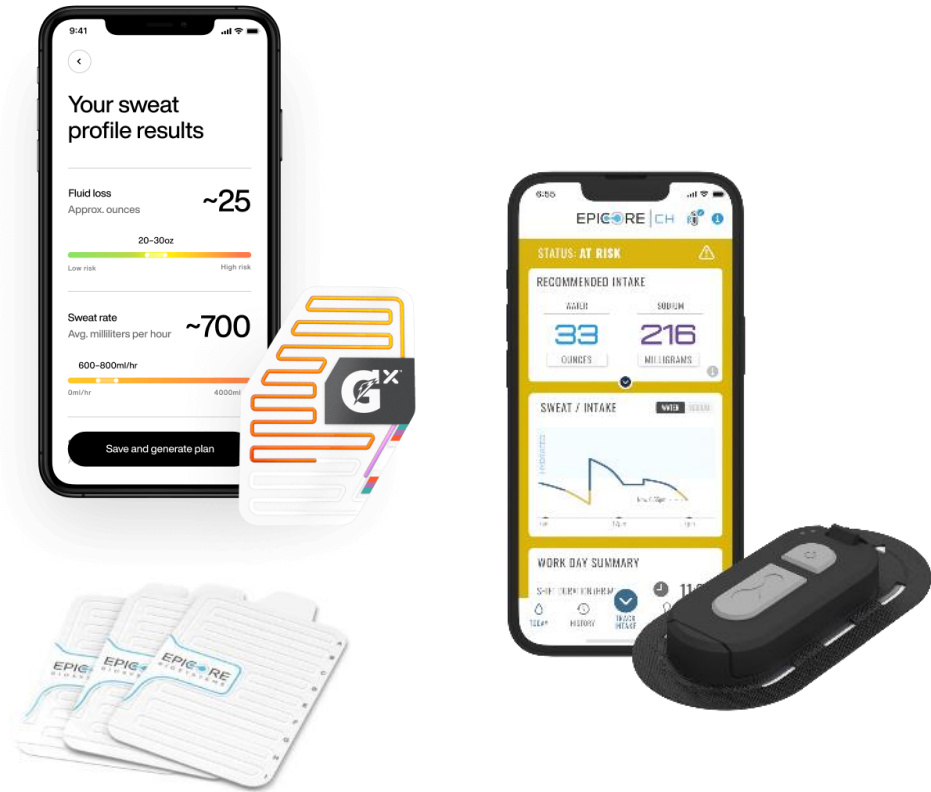
	Electronic Module: (Re-usable) CERTIFICATIONS: Class I, Div 2, Groups A, B, C, and D, T6; Class I, Zone 2, AEx ic IIC T6 Gc, Ex ic IIC T6 Gc UL/CSA60079 Part 0 and Part 11 pending; Class I, Div2, Groups A, B, C, and D; Class I, Zone 2, Group IIC ANSI/ISA/UL 121203-2011 (R2015). TYPICAL BATTERY LIFE (HRS): 1000 MAINTENANCE: battery-replacement TEMPERATURE RANGE: 5°C-45°C (41°F-113°F) SWEAT SENSOR RESOLUTION, UL (MIN): 4 SWEAT SENSOR ELECTROLYTE RANGE, mM (TYP): 15 -105 SKIN TEMPERATURE RESOLUTION (MIN): 0.2°C (0.36°F) MOTION SENSOR, G (MAX): 16 SIZE (CM): 6.6 x 3.0 x 1.0 WEIGHT (G): 21 LOG DURATION, BETWEEN SYNC (HRS): 16
	Patch: (Single-use) SIZE (CM): 9.4 x 4.8 x 0.076 SKIN ADHESIVE: Hypoallergenic SHELF LIFE IN PACKAGE, YEARS: 2 STORAGE TEMPERATURE: 5°C-50°C (41°F-122°F) OPERATING TEMPERATURE: 5°C-45°C (41°F-113°F)

Technical Specifications (Software & Cloud)

Mobile Application OPERATING SYSTEMS: iOS 15+ SUPPORTED PHONES: iPhone 8+ PRIVACY: Individual user data only visible to user PRIVACY CONTROLS: User has ability to keep their data private, or share anonymized data with Epicore Biosystems, or share anonymized data with Epicore Biosystems and Safety Team for population analytics	Secure Cloud (Web Portal) TYPE: Software as a Service (SaaS) PRIVACY: If anonymized data is shared with Safety Team, only aggregated group data (temperature, activity, sweat volume and sweat sodium losses) is reported. SECURITY ATTESTATION: Soc2 Type 2
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*Device has been tested **up to 65°C** and Epicore warrants our devices will operate normally up to this temperature.

Award Winning Validated Products and Services



52 patents filed (US & International)

23 issued / allowed patents

35+ Peer-reviewed publications

4 Partner research universities



Frequently Asked Questions

Q: Are the Epicore devices intrinsically safe?

A: Yes, we have obtained hazardous locations Class 1 Div 2 certification for our devices.

Q: Do we have to charge the battery every night?

A: No, the Epicore devices come with a 1,000 hour sealed battery. There is no need to charge the devices. Epicore will replace the battery for you once a year

Q: Is our data safe? Will workers be concerned about privacy?

A: We have obtained SOC 2 Type 2 certification for our cloud security. Data is anonymized and aggregated before being transmitted to the cloud, so only the individual worker can see their detailed personal data.

Q: Do we need an internet connection at the site?

A: It is not required, but if available it does allow for near real-time monitoring via the cloud. If internet is not available, we can ship a wireless cellular or satellite hotspot to provide internet access at no additional charge.

Q: Do the workers need to carry a cell phone to use Connected Hydration?

A: No, the Connected Hydration module is designed to operate independently of a smartphone. The device will vibrate at 500ml sweat loss, and provide a longer, more intense vibration at 2% body weight sweat loss. These alarms will work even when no phone is connected to the device. Also, the device has sufficient on-board memory to store several days' worth of data, and will synchronize the data whenever a Bluetooth connection is established. So, it's possible to use the device all day without a Bluetooth connection, and just sync at the end of the day.

Q: Are the Epicore devices rugged?

A: Yes, we have customers using our devices in a variety of harsh environments with demanding physical work, including offshore oil rigs, refineries, construction sites, mines and confined spaces.

Frequently Asked Questions

Q: Are the Epicore devices easy to use?

A: Yes, workers just apply the patch at the start of their shift directly to their outer bicep and then wear any PPE that they would normally wear.

Q: What if a device stops working?

A: You can call or email our customer support team. If they are not able to fix the problem remotely, we will ship a replacement device.

Q: Are there any special storage requirements?

A: No, the devices and patches can be stored anywhere you would store other safety equipment, such as gas monitors. There is no need for any temperature or humidity control.

Q: Can a device be re-assigned easily to different workers?

A: Yes, devices can be re-assigned to different workers. For example, if you have contractors who roll in and roll out of a site, you can re-assign the devices when the contractors finish their stint. You can also easily re-assign devices for turnarounds. We do not recommend re-assigning devices in between shifts, due to potential complications with Bluetooth pairing.

Q: Will you conduct training?

A: Yes, the price includes one on-site training session. Our engineers will come on site and train both the workers and the safety managers at the site on the application and operation of the devices, and of the software.

Q: Do we have to sterilize the modules every night?

A: No, the module does not come into contact with the skin or with sweat. However, the module may pick up indirect sweat and other contaminants as a result of normal use, and therefore it is recommended to wipe the modules with a clean cloth, tissue or paper towel.

Selected Scientific Papers

(click tile to read paper)

NOVEMBER 26, 2023



Continuous personal monitoring and personalized hydration recommendations...

Exposure to extreme heat during physical exertion may impair cognitive and physical abilities commonly known as heat stress. Industrial workers are vulnerable to the effects of extreme heat due to increasing ambient...

AUGUST 29, 2023



How Industrial Workers Can Drill Down on Safety This Summer with Wearables

Wearable technology is revolutionizing workplace safety with real-time, personalized insights mitigating the increasing risks of heat stress.

AUGUST 9, 2023



Wearable technologies helping to protect offshore personnel

Protecting the workforce is imperative to improving the overall effectiveness and productivity of offshore operations. Minimizing workplace injury is an important aspect of wearable technology, and this kind of...

JULY 16, 2023



Thermoplastic Elastomers for Wireless, Skin-Interfaced Electronic, and Microfluidi...

Wireless, skin-interfaced electronic and microfluidic devices have the potential to replace wired, bulky, and cumbersome technologies for personal and clinical health monitoring, allowing care to extend from...

JUNE 28, 2023



Connected Wearable Solutions for Construction Workers Amid Elevated Glob...

Increasing industry awareness of heat safety, advocating for regulatory improvements, and implementing next-generation wearable devices, researchers, clinicians, and industry leaders can develop advanced heat...

FEBRUARY 23, 2023



Sweat as a diagnostic biofluid

Skin-interfaced microfluidic systems help assess health status and chemical exposure. Eccrine sweat glands in the skin are key components of an ingenious system for evaporative cooling. Their action is controlled by...



Website

<https://epicorebiosystems.com>

Slide Deck

<https://ePCR.cc/deck>

Email

sales@epicorebiosystems.com

Schedule a Call

<https://ePCR.cc/demo>

