

Laura S. Blackwell, PhD

Director for Pediatric Neurotrauma Lab



Pediatric Neuropsychologist at
Children's Healthcare of Atlanta

- Dr. Blackwell has been conducting research within Traumatic Brain Injury since her fellowship at Boston Children's Hospital, where she began examining the impact of sports related concussion on children and adolescents, specifically interested in return to learn practices.
- Her current research interests within Children's Department of Neuropsychology include measuring and predicting outcomes following pediatric acquired brain injury and examining biological markers in children with traumatic brain injuries and predicting functional outcomes and recovery.

An Introduction to Biomarkers for Concussion

Laura S. Blackwell, PhD

Pediatric Neuropsychologist
Department of Neuropsychology
Children's Healthcare of Atlanta



Learning Objectives

- Demonstrate an understanding of the latest in concussion research and treatment, including biomarkers
- Demonstrate an understanding of the potential role of biomarkers in management of concussion



The problem...

- The diagnosis of a concussion depends on patients' signs and symptoms and clinical assessment
- There is no definitive tool to diagnose concussion
- Biomarkers may be able to help with diagnosis, reduce the amount of unnecessary radiation from CT scans, and eventually, assist in making safe return to play decisions for athletes

What is a biomarker?

Dictionary

Search for a word



bi·o·mark·er

/ˈbɪoʊˌmɑːrkər/ 

noun

a measurable substance in an organism whose presence is indicative of some phenomenon such as disease, infection, or environmental exposure.

"a biomarker that may predict aggressive disease recurrence in liver transplant recipients"



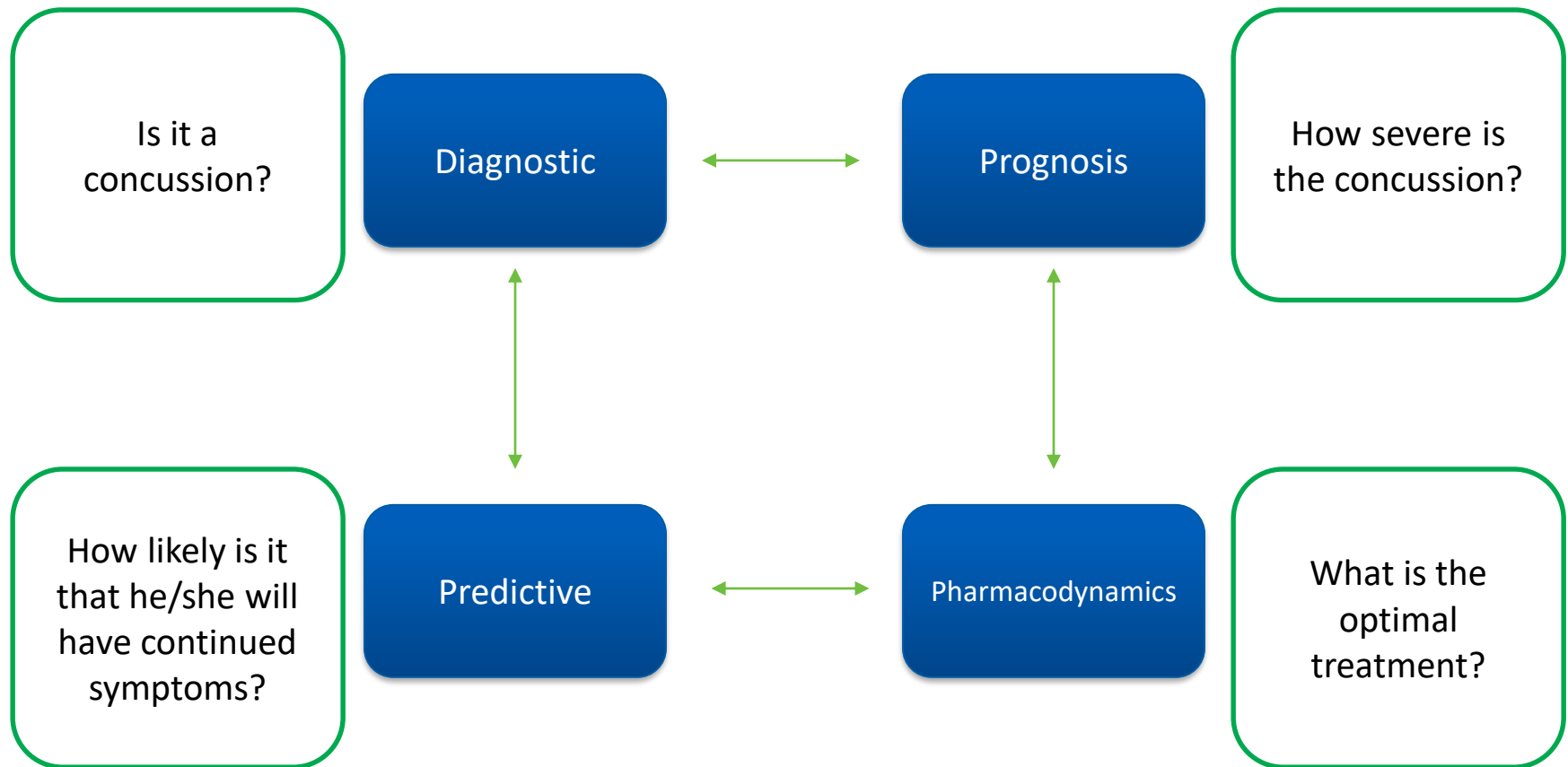
Translations, word origin, and more definitions

What is a biomarker?

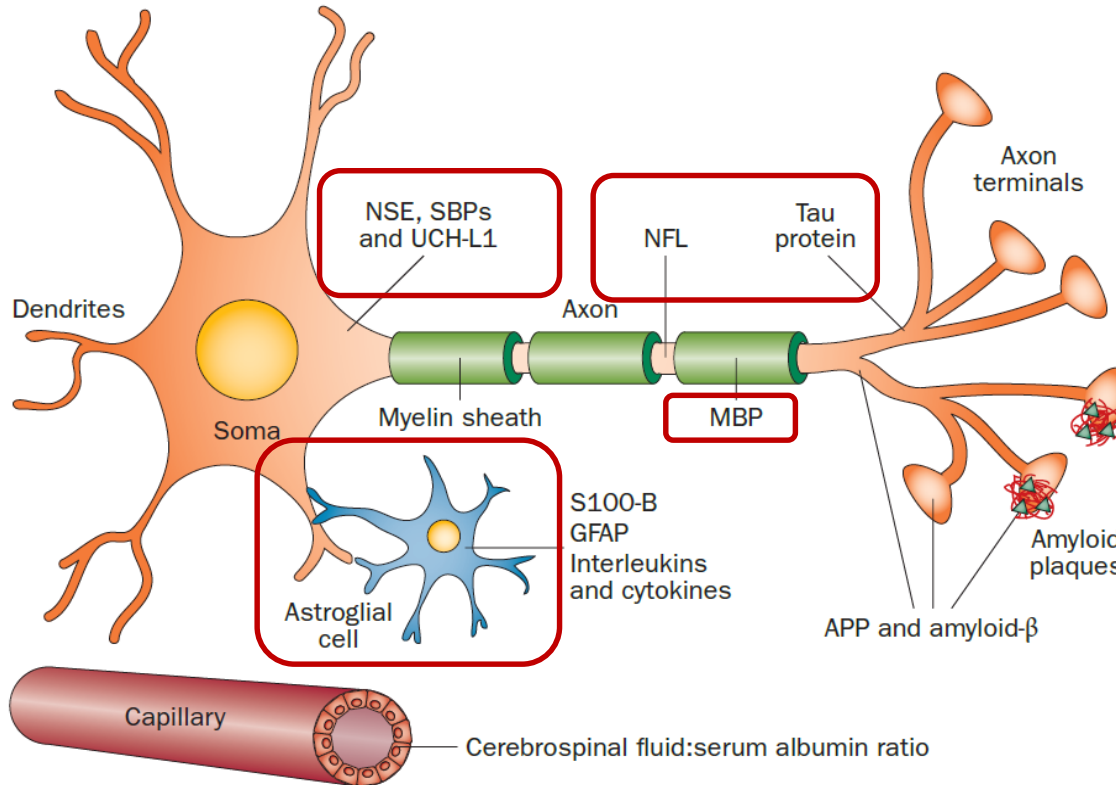
Biomarkers are measurable substances within our bodies that can indicate, with reasonable accuracy, that a disease or condition is present.



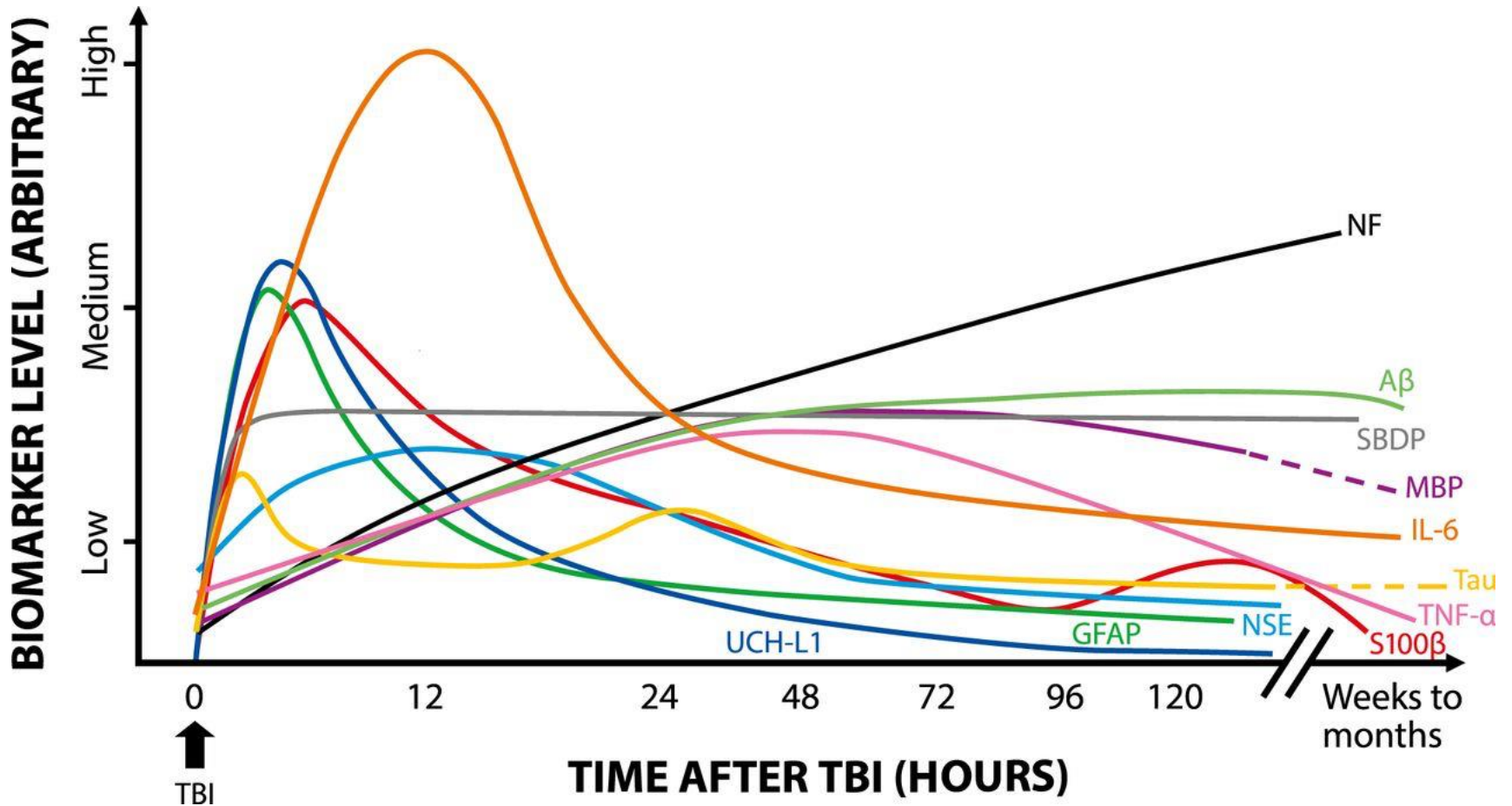
Utility of a biomarker



Types of blood biomarkers in TBI



What do fluid biomarkers do?



FDA approved “test” for concussion

- FDA permitted marketing of first blood test to evaluate concussion
- “Brain trauma indicator” measures UCH-L1 and GFAP in blood within 12 hours of injury
- Data from prospective multi-center trial of 1,947 patients
- Predict positive CT scans 97.5% and negative CT scans 99.6% of the time

Biomarker Research at CHOA

- Pediatric Neurotrauma Lab
- Awarded a NIH funded grant to investigate serum biomarkers in children and adolescents
- Collaborating with Emory, GT and Morehouse to investigate other biomarkers and methodologies in head injuries



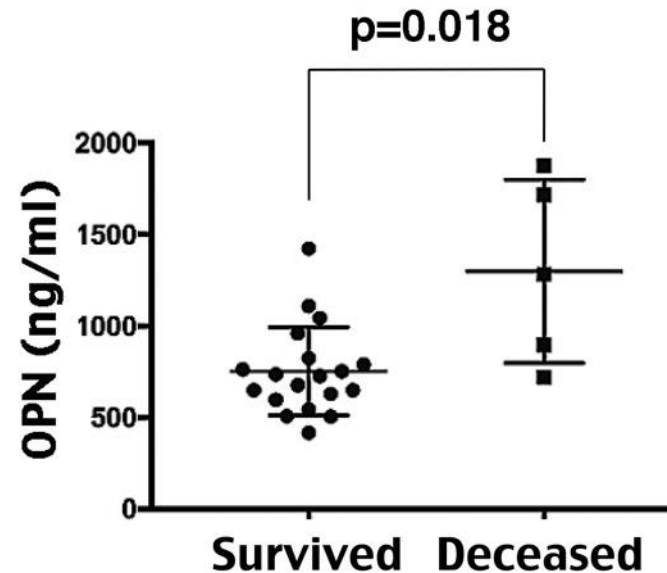
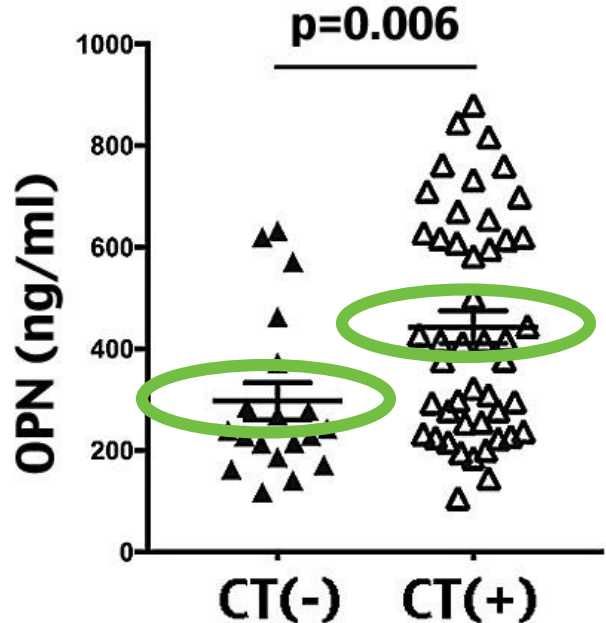
Blood Biomarker Research in TBI at CHOA

- Look at the relationship between certain blood biomarker levels to distinguish between mild TBI (concussion) and severe TBI
- Collected blood in children when they came into our emergency departments
- Collected information about the injury (severity, outcomes)



Blood Biomarker Research in TBI at CHOA

- We found a specific marker that is promising to distinguish between mild head injuries and more severe head injuries



Saliva biomarkers in concussion

Benefits of saliva collection compared to serum

- Non-invasive
- Simple collection protocols
 - ** and can be done by non medical professionals
- Non-infectious sample
- Easily disposal
- Easily transportable
- Cost effective
- Safe and effective
- Higher patient compliance



Saliva biomarkers in high school football players



- Baseline saliva in all players
- Baseline cognitive and balance

Athletic Trainer



Concussed Player

“Control” Player

Immediately following injury

1 week

4 weeks



Wallace H. Coulter Department of Biomedical Engineering
Georgia Tech College of Engineering and Emory School of Medicine



Children's Healthcare of Atlanta

Saliva biomarker results

Stayed tuned....coming soon!



Conclusion

- A biomarker is a measurable substance or process that indicated an ongoing phenomenon (in our case – head injury)
- Different biomarkers reflect different aspects or time courses of underlying pathophysiology
- Biofluid biomarkers (blood, saliva) MAY aid in diagnosis, management and predicting outcomes of mild to severe traumatic brain injury
- There likely will never be **1** marker, but rather a combination or panel of markers to predict diagnosis and outcome