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Good Afternoon Representative Urban, Senator Bartolomeo, Representative Betts and Senator Linares and the distinguished members of the Children's committee. For the record, I am Robert C. Cantu, MD from Boston University School of Medicine Center for The Study of Traumatic Encephalopathy (CSTE) and Sports Legacy Institute (SLI). I am here to testify in support of House Bill 5113, AN ACT CONCERNING YOUTH ATHLETICS AND CONCUSSION.

40 year ago, Gronwall and Wrightson(1,2) first raised concerns about cumulative brain injury with repeated concussions. More than 25 years ago, when I published the first return-to-play guidelines for after a concussion, I stressed the need for further evidence-based research in this area(3). Since then, there have been 4 international concussion in sport conferences with published consensus statements, initial and updated concussion statements from the National Athletic Trainers' Association and the American College of Sports Medicine, and recent concussion statement from the American Medical Society for sports Medicine and American Academy of Neurology(4).

Today, head trauma at the concussion level is well recognized as an etiological factor for a spectrum of neurological conditions including post-concussion syndrome, second impact syndrome, and chronic traumatic encephalopathy (CTE).

As outlined in our book "Concussions and Our Kids"(5) our youth are at particular risk for brain damage from concussive and subconcussive brain trauma because children compared to adults have:

1. Brains that are still developing – lack complete myelination, less strength, nerve fibers more easily torn.
2. Brains are more sensitive to the excitotoxic shock of concussion (Second Impact Syndrome).

3. Weak necks that don't distribute force to the body well plus poor head/body ratio – human-bobble-head that increase risk of injury to brain and neck.
4. Lighter brain than adults so less inertia more acceleration for given force.
5. Weak torsos that don't keep the head from hitting the ground.
6. Poor equipment
7. Poor language skills to alert a coach to concussion symptoms.
8. Poor access to medical resources.
9. Coaches with various level of training.
10. NO INFORMED CONSENT

The role of subconcussive head trauma, defined as that which does not result in recognized concussion symptoms or signs, is not well known. Of grave concern is that in the last year alone, multiple reports in peer-reviewed journals have appeared showing significant differences in preseason versus postseason values in contact sport athletes using a variety of tests. This has included structural fiber tract damage by magnetic resonance diffusion tensor imaging (MRI-DTI) studies (6,7), metabolic brain function as measured by functional magnetic resonance imaging (fMRI)(8), neurocognitive testing (ImPACT) (8) and structural breakdown of the blood-brain barrier as manifested by S100B protein in the blood(9).

In our published work from the Center for the Study of Traumatic Encephalopathy at Boston University Medical School(10,11), we have seen cases of CTE in deceased athletes who never had a recognized concussion but did sustain many thousands, often more than 10,000, subconcussive blows during their athletic career. In athletes who did sustain concussions, including six high school athletes with CTE, it seems in our experience that the risk of the occurrence of CTE correlates best with total head trauma, both at the level of concussive and subconcussive blows. I believe the data are now compelling that all head trauma, even at the subconcussive level, can result in brain damage in susceptible individuals. It cogently makes the case that head trauma in sports should be reduced where ever possible.

I am proud of Connecticut for being one of the first states to endorse concussion legislation for our youth and now being the first state to address concussion prevention by limiting youth exposure to head trauma. This legislation is a dramatic positive step in the right direction and has my enthusiastic support.

Robert C. Cantu, MA, MD,FACS,FAANS,FICS,FACSM

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