IN THE CIRCUIT COURT OF THE SEVENTH JUDICIAL CIRCUIT
IN AND FOR FLAGLER COUNTY, FLORIDA

STATE OF FLORIDA,

Plaintiff,

CASE NO.: 2018 CF 000169
JUDGE: TERENCE PERKINS

vs.

DEVIAUN ANTRIEL TOLER,

Defendant.
_____/

DEFENDANT'S MOTION IN LIMINE TO EXCLUDE FALSE AND UNRELIABLE EXPERT TESTIMONY & REQUEST FOR DAUBERT HEARING

NOW COMES the defendant, DEVIAUN TOLER, by and through his undersigned counsel, with this Motion *in Limine* to prohibit the State from introducing testimony that is unreliable, false, or both and request for Daubert Hearing.

In Daubert, the Supreme Court considered the admissibility of scientific testimony, holding that such testimony is admissible only if it is both relevant to the issues and reliable. **Daubert v. Merrel Dow Pharnaceuticals, Inc., 509 U.S. at 589, 113 S.Ct. 2786**. Daubert posits a "gatekeeper" role for judges, requiring them to consider as a preliminary matter to the admissibility of scientific expert testimony "whether the reasoning or methodology underlying the testimony is scientifically valid and of whether that reasoning or methodology properly can be applied to the facts in issue." Id. at 592–93, 113 S.Ct. 2786. Noting that many factors would bear on this inquiry, the Court set out some general factors to be considered in assessing the reliability of scientific expert testimony as follows: (1) whether the theory or technique can be

and has been tested; (2) whether the theory or technique has been subjected to peer review and publication; (3) the known potential rate of error of the particular scientific technique under consideration; and (4) whether the scientific theory or technique has achieved general acceptance in the relevant scientific community. Id. at 593–94, 113 S.Ct. 2786.

In Kumho Tire, the Court held that the principles announced in Daubert extended not only to scientific expert testimony but to all subjects of expert testimony, including matters involving technical or other specialized knowledge. **Kumho Tire Co. v. Carmichael, 526 U.S. at 147–49, 119 S.Ct. 1167**. The court's opinion in Kumho Tire makes clear that Daubert 's requirement that the trial court act as a "gatekeeper" to the admissibility of expert testimony "applies not only to 'scientific' knowledge, but also testimony based on 'technical' and 'other specialized' knowledge." Id. at 141, 119 S.Ct. 1167. **R.C. v. State, 192 So. 3d 606 (Fla. App. 2016)**

In response to various biological processes retinal capillaries break down and ooze blood. The processes leading to development of retinal hemorrhages (RH) are varied, thus RH develop in the context of unrelated conditions including birth (up to 50% of healthy newborn babies have retinal hemorrhages), intracranial bleeding, raised intracranial pressure (ICP), hypoxia, infection, and exposure to carbon monoxide poisoning and high altitude.

During the early 1970s radiologist John Caffey hypothesized that the mechanical forces from shaking a child (exposure) could cause the layers of the retina to rip apart producing RH (clinical finding). Since Caffey first proposed it, the shaken-eye theory has been the subject of great controversy:

> "This hypothesis has been subjected to debate because the causal connection between exposure and clinical findings has never been validated. It is unclear if shaking on its own is forceful enough to produce the clinical findings[.]"

Hogberg, CircularityBias in AHT Studies Egyptian Journal of Forensic Sciences (2016) 6, 6-10.

To this day, the shaken-eye theory remains a hypothesis. It may even be right. But it is no more than a hypothesis, and thus it is not "knowledge," nor is it "based upon sufficient facts or data" or the "product of reliable principles and methods ... applied ... reliably to the facts of the case." Fed.R.Evid. 702. **Tamraz v. Lincoln Elec. Co., 620 F.3d 665, 670 (6th Cir. 2010)**. *Daubert* and Fla. Stats. §90.702 preclude an expert from testifying to a theory that is not the product of reliable principles and methods:

Florida Statutes §90.702 (2020), Testimony by experts.—If scientific, technical, or other specialized knowledge will assist the trier of fact in understanding the evidence or in determining a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education may testify about it in the form of an opinion or otherwise, if:
(1) The testimony is based upon sufficient facts or data;
(2) The testimony is the product of reliable principles and methods; and
(3) The witness has applied the principles and methods reliably to the facts of the case.

Because the shaken-eye theory lacks scientific validation, and is not the product of reliable principles and methods, testimony related to shaken-eye etiology is inadmissible. The defense seeks to preclude evidence, and/or direct or indirect comment by the State that:

> 1)retinal H are directly caused by mechanical force of shaking as opposed to the result of am accidental injury
> 2)A significant amount of force is required to cause and/or that only a significant amount of force will produce severe retinal hemorrhages in an infant
> 3)any testimony by any expert as to mens rea would be inappropriate
> 4)Severe retinal hemorrhages reliably predict etiology **(abuse)**

STATEMENT OF FACTS

On February 13, 2018, T.T. was at home with Deviaun Toler's girlfriend, Ms. Luciana Celestin. The child was sleeping in the pack n' play in the father and girlfriends bedroom during the day while the father was at work and the girlfriend was in the other room tending to their newborn baby. T.T. woke up and had fallen from his pack n' play, however there were no witnesses to the fall as to its severity and as to what T.T. might have struck upon falling from the pack n' play. T.T. suffered from approximately three seizures while at home and the hospital and was diagnosed with a skull fracture, retinal hemorrhaging and subdural collections which could not be dated. A skeletal survey revealed no broken bones or other abnormalities other than the skull fracture. There were no long bone injuries to T.T.

SDH is a Risk Factor for Seizure:

Any intracranial hemorrhage, independent of etiology, is a risk factor for seizures. **Bansal, *Predictors of Acute Symptomatic Seizures after Intracranial Hemorrhage in Infants*, Neurocritical Care, Vol. 15, No.8 (2014)** *See also* **Till, *SDH and Effusion in Infancy*, British Med. J., 17 (1968)** (60 infants with SDH presented with seizures). Likewise, infants suffering CSDH may develop clinical signs of seizures, vomiting, macrocephaly (large head circumference), and lethargy. See **Parent SD, *Pediatric Chronic Subdural Hematoma: A Retrospective Comparative Analysis*, Pediatr Neurosurg 1992;18:266-271**

Retinal Hemorrhages (RH) are a common non-specific finding, secondary to other biological processes; RH often develop in the context of intracranial bleeding:

Dr. Karen Alvarez, an ophthalmologist examined T.T. and found he had bleeding in the layers of his retina. The retina is very thin (.5 mm thick) and composed of ten layers (see diagram below). Within these layers are tiny capillaries. When these capillaries break down

(any cause) blood leaks (called retinal hemorrhages.) Retinal hemorrhages are associated with many conditions, including a well known clinical indicator that a patient has intracranial bleeding. **Till, *SDH and Effusion in Infancy*, British Med. J., 17 (1968)** Because RH occur in association with many conditions they are a non-specific finding, i.e., retinal hemorrhages do not indicate a specific disease process or involve an isolated body system. While child advocates have argued RH are evidence of abuse, it is uncontroverted there is no type, size, distribution, or location of RH unique to abuse: "Our study results are concomitant with the current literature: there is no pathognomonic type, size, distribution, or location of RH seen exclusively in AHT." **Mattheij, *RH in a University Hospital: not always abusive head* injury, Acta Neurol Belg (2017) 117:515-522, 521.**

What causes RH? What is the pathophysiology?

RH are non-specific because they develop in the context of various unrelated medical conditions. They are a secondary response to other complex biological factors, which alone or in concert contribute to RH development. These factors include hypoxia, edema (swelling), subdural and subarachnoid bleeding (from any cause), raised intracranial pressure, raised venous pressure, coagulopathies (blood disorders), the time and severity of the brain pathology, hypertension, hypotension, anoxia, resuscitation, increased transmural pressure (often associated with birth), prolonged reduction in perfusion pressure and ischemia, hypercapnia (high levels of carbon dioxide), toxicity (drugs, carbon monoxide poisoning) and, in the infant, the immaturity of the vessels themselves. ***See e.g.*** **Kaur, Fundus Hemorrhages in Infancy Survey of Ophthalmology Volume 37, no.1 91992)**

The more severe the brain pathology (such as swelling, raised intracranial pressure, hypoxia, or a combination of factors), the more severe the RH. ***See e.g.,*** **Binenbaum et al, *The Eye in Child Abuse*, Pediatr Radiol (Supp.4):S571-S577)(2014)** ("The severity of retinal hemorrhages is associated with the severity of hypoxic-ischemic brain injury and with the severity of neurological injury."); **Kaur, Fundus Hemorrhages in Infancy Survey of Ophthalmology Volume 37, no.1 91992)** ("the type and extent of intraocular hemorrhages depends on the severity of the acute neurologic injury and its resultant rise in intracranial pressure"); (retinal exam may be unnecessary as children free from intracranial injury very rarely develop retinal hemorrhages.) While some pediatricians argue that retinal hemorrhages "very rarely" occur in the absence of abusive injury, **Christian, *The Evaluation of Suspected Child Physical Abuse Pediatrics* Volume 135, no. 5 e1346 (2015)**, this medical literature provides a myriad of other causes of RH, including trauma unrelated to abuse (e.g. birth, accidents) and non-traumatic causes (e.g. disease, internal processes including Terson's Syndrome.

Examples of Conditions associated with RH:

Birth: Retinal hemorrhages are found in up to 50% of normal healthy newborns and in up to 75% of instrumental deliveries. The hemorrhages vary from mild to severe, can involve all layers of the retina, and extend to all zones including beyond the periphery. ***See,*** **Watts, et al, *Newborn Retinal Hemorrhages*, Vol. 17, No. 1 (2013); Emerson, et al, *Neonatal Retinal Hemorrhages*, Ophthalmology Vol. 108 no.1 (2001)** The pathophysiology (physiological process) of birth related RH is unclear. "It has been hypothesized that ... a resulting increase in intracranial pressure, stasis of blood flow in the central retinal vein, which combined with an

increase in pressure in the ophthalmic artery may thus precipitate the retinal bleeding." **Watts, et al, *Newborn Retinal Hemorrhages*, p.76 supra (2013)**

Terson's Syndrome/Intracranial bleeding/Raised Intracranial Pressure: In 1900 a French doctor (Terson) noted the association of intracranial bleeding and the development of retinal hemorrhages. Today, this phenomena ("Terson's Syndrome") is defined as "any intraocular hemorrhage associated with intracranial hemorrhage and intracranial pressure elevation" **Mena, *Ocular Findings in Raised Intracranial Pressure, A Case of Terson Syndrome in a 7-month old infant*, Am J forensic Med Pathol, vol XX, No. X (2010).** Infants with Terson's syndrome can develop severe retinal hemorrhages. **Bhardwaj, *Terson syndrome with ipsilateral severe hemorrhagic retinopathy in a 7-month old child*, Journal of AAPOS, Vol. 14 (2010)** Some child advocates have claimed that Terson's Syndrome does not occur in infants, but this is not the case; the phenomenon has been observed in infants and published in the medical literature.

In Terson's syndrome RH development is believed to be related to high intracranial pressures in the context of intracranial bleeding. **Bhardwaj, *Terson syndrome with ipsilateral severe hemorrhagic retinopathy in a 7-month old child*, Journal of AAPOS, Vol. 14 (2010)** (Intraocular hemorrhages are not an uncommon complication of sudden intracranial hypertension; intraocular hemorrhages result from transmission of intracranial pressure into optic nerve sheath; intraocular hemorrhage is the result of retinal venous hypertension and rupture brought on by obstruction); ***See also*** **Medele, *Terson's Syndrome in Subarachnoid Hemorrhage and Severe Brain Injury Accompanied by Acutely Raised ICP*, J Neurosurg Volume 88 (1998)** (multiple intracranial pathological conditions accompanied by acutely raised ICP may result in intraocular hemorrhage)

Raised intracranial pressure, independent of intracranial bleeding is also a fact in RH development. **Minns, *Raised Intracranial Pressure and RH in childhood encephalopathies,* developmental Medicine & Child Neurology 2017, 59: 597-604)** (The presence of RH is significantly related to the presence of raised intracranial pressure independent of etiology)

Infection and severe retinal hemorrhage. Extensive retinal hemorrhages have been documented in the context of infection. ***See*** **Salvatori & Lantz, *Retinal Hemorrhages Associated with Fatal Pediatric Infections*, Medicine Science and the Law (2014)** (infection-related RH in same pattern as that alleged to be indicative of abuse) and **Lopez, et al; *Severe Retinal Hemorrhages in infants with aggresive, fatal streptococcus pneumonia meningitis,* Journal of AAPOS, 210-02-01, Volume 14, Issue 1, pages 97-98 (2010)**

Natural Malformations Lead to RH Intracranial vein rupture due to natural malformation in the vasculature leads to severe RH. ***See*** **Shuman, *Severe Retinal Hemorrhages with Retinoschisis in Infants are not Pathognomonic for AHT*, J Forensic Sci (2016).**

RH of all types and severity develop as a secondary response to primary brain insult/pathology. A short fall or minor trauma can trigger the process leading to RH development.

The more severe the brain pathology (abnormality) the more severe the RH. Thus, persons sustaining minor trauma (like a short fall) that leads to serious neurological (brain) damage may develop severe RH. For example, an 18 month old fell from a shopping center train ride and hit his head. After the fall, he developed severe brain injury and severe RH, and eventually died. **Shuman, *Severe Retinal Hemorrhages with Retinoschisis in Infants are not Pathognomonic for AHT*, J Forensic Sci (2016)** (authors noted that had the fall not occurred in a public place, the findings would have resulted in child abuse accusations). ***See also*** **Gardner,**

***Witnessed Short Fall Mimicking Presumed SBS*, Pediatr Neurosurg 2007; 43: 433-435** (11 month old fell backwards striking head on carpeted floor-- the child had two retinal exams a week apart demonstrating development of progressively worse retinal hemorrhages) **Lantz et al, *perimacular retinal folds from childhood head trauma*, BMJ Volume 328 March 2004** (tv fell on head of 14 month infant, child sustained skull fracture, intracranial bleeding, and developed severe bilateral RH, retinoschisis, and retinal folds); **Atkinson, *Childhood Falls with occipital Impacts*, Pediatric Emergency Care 2017** (in 8 witnessed short falls all infants developed SDH, and RH ranging from mild to severe; "If witnesses to the events had not been present, a high suspicion of abuse in these cases would have been justified.").

The history of the shaken-eye theory

In the late 1960s a biomechanical engineer (Ommaya) conducted car accident experiments (rear end collisions) on monkeys. Ommaya observed that some monkeys exposed to whiplash motions (acceleration and deceleration), but not impact, developed SDH: as the head moved forward and back the bridging veins in the layers under the skull tore and bled. Ommaya's studies did not establish a range of minimum forces that would lead to injuries. ***See* Ommaya, *Whiplash Injury and Brain Damage*, JAMA vol. 204, No.14, 1968.**

Ommaya's experiments coincided with a growing nationwide public campaign encouraging doctors to report child abuse. This national movement started in 1962 with the publication of **Kempe's *The Battered Child Syndrome* JAMA, 1961; 181:17-24.** Within 5 years of Kempe's publication every state had adopted mandatory child abuse reporting laws. **Heins, *The Battered Child Revisited*, JAMA, 1984 Vol. 251-No.24 p.3295** Massive amounts of

money funneled into child abuse reporting, protection and advocacy and the incidents of reported child abuse skyrocketed. *Id.*

Against this backdrop a British neurosurgeon Norman Guthkelch read Ommaya's car crash studies. Guthkelch theorized that if a car accident could cause SDH, then a parent who gave a kid a good shaking could also cause SDH. **Guthkelch, *Infantile Subdural Haematoma and its Relationship to Whiplash Injuries*, British Medical Journal, 22 May (1971)**

American doctor John Caffey took the Guthkelch theory a step further, and hypothesized that both SDH and RH were *directly* caused by parental shaking. Caffey penned the "whiplash infant shaking" *theory* paper. ***See*** **Caffey *On the Theory and Practice of Shaking Infants*, Amer J Dis Child/vol. 124, 1972** and **Caffey *The Whiplash Shaken Infant Syndrome: Manual Shaking by the Extremities with Whiplash-Induced intracranial and Intraocular Bleedings*, Pediatrics Vol. 54 No.4 1974.**

No clinical tests or scientific experiments have ever validated Caffey's shaken-eye theory (i.e. when a child presents with SDH and RH we know the child was violently shaken). Despite lack of validation, the shaken-eye theory is treated as fact by child abuse clinicians and the child abuse literature: "We believe that retinal hemorrhage in children under 3 with or without other evidence of injury is pathognomonic of the battered child syndrome." **Eisenbray, *Retinal Hemorrhage in the Battered Child*, Child's Brain 5: 40-44 (1979); Greenwald, Traumatic Retinoschisis, Ophthalmology Vol. 93, No. 5 (1986)** ("we propose that splitting of the retina resulting from the direct mechanical effects of violent shaking was responsible for all of these findings"); and Lazoritz and Palusci "The presence of retinal hemorrhages is virtually diagnostic

of the violently shaken infant in the absence of severe accidental trauma." **Reichert, *Neurologic Sequelae of SBS*, Chapter 6 in "the Shaken Baby Syndrome, Lazoritz and Palusci, 2001**.

With such promotion and advocacy in the literature, and concern for protecting children, clinicians assumed RH were a marker that proved "abuse" despite the fact it was concomitantly acknowledged that doctors were "unable to discover any published account of autopsy findings in a battered child from which conclusions relevant to the patients [with retinal hemorrhage and vitreous hemorrhage] can be drawn." **Greenwald, Traumatic Retinoschisis, Ophthalmology Vol. 93, No. 5 (1986)**

Attempts to validate Caffey's Shaking Hypothesis Failed.

The Caffey theory that one could assume shaking from the presence of SDH and RH went largely unchallenged and imbedded itself as "fact" in the medical community. Then, in 1987 Duhaime *et al* attempted to validate the hypothesis that people are capable of generating enough force to mechanically disrupt bridging veins in the subdural layer (SDH). Their results did not support historical dogma. As it relates to SDH, the study concluded that people cannot, by shaking alone, generate the amount of force necessary to tear bridging veins: "... the angular acceleration and velocity associated with shaking occurs well below the injury range."**Duhaime, *The Shaken Baby Syndrome*, J. Neurosurg. Vol. 66 March 1987** Duhaime (and later others[1])

[1] Later studies concluded that shaking is unnecessary, a short fall under the right conditions can produce serious trauma. *Minor trauma from short falls, a height of 3 feet or less, cause angular forces equal or greater than the angular fo rces achieved from scientific shaking experiments. "The measured angular velocity and acceleration during minor falls were similar to those associated with shaking"* ***Prange, Coats, Duhaime Antrhropomorphic simulations of falls, shakes, and inflicted impacts in infants. J Neurosurg 2003;99:143e50***.

concluded that an impact to the head is necessary to produce the force necessary to tear bridging veins leading to SDH.

As it relates to RH, Duhaime noted that one could not assume abuse from the presence of retinal hemorrhages. Duhaime emphasized that scientists do not know what causes retinal hemorrhages, or how much force is required. She cautioned that the shaken-eye (vitreo-retraction) theory is unreliable, because patients develop RH after trauma with no repetitive shaking. It is not the mechanical force generated by "shaking" that causes RH, but something else:

> "we have seen three additional patients with well-witnessed accidental head injuries who had acute retinal hemorrhages. Mechanisms included a nonfatal motor vehicle accident, a fall down stairs in a walker, and a fatal three-story fall. Thus, **b**ecause of the variable etiologies and unclear biomechanical thresholds for retinal hemorrhages, it is at the present time impossible to extrapolate a specific mechanism of injury for a given patient with this finding. Deciding whether a head injury in a very young child is accidental or non-accidental has always been problematic for clinicians....The presence of retinal hemorrhages is believed by some authors to be virtually pathognomonic for child abuse, **but for the reasons stated above this is unreliable.**"

Duhaime, *Head Injury in Very Young Children: Mechanisms, Injury Types, and Opthalmmologic Findings in 100 Hospitalized Patients Less Than 2 Years of Age*, Pediatrics Vol. 90 No.2 August 1992 ***See also*****, Levin, *Ocular Manifestations of Child Abuse*, Pediatric Opthalmology, Vol. 3 No.2 (1990)** ("Although some authors have suggested that retinal hemorrhage in children under the age of 2 or 3 years is pathognomonic of child abuse, RH can definitely occur in infants from nontraumatic causes, including severe hypertension, vasculitis, meningitis, endo-carditis, generalized sepsis, coagulopathy, and blood dyscrasia. Fundus appearance in such cases may be virtually indistinguishable from that seen is SBS.")

In 2002, the National Institute of Health convened a conference on Inflicted Childhood Neurotrauma to address the problematic lack of scientific foundation to support Caffey's shaking theory: "The debate over SBS continues to rage in our country. Because there is very little scientific experimental or descriptive work, the pathophysiology remains obscure and the relationship to mechanics even cloudier...**what we need is science--research and evidence that just isn't there right now.**" **Carol Nicholson, Preface to the Proceedings of the Inflicted Childhood Neurotrauma Conference, 2002**. As it relates to what causes RH, a prominent ophthalmologist noted: "despite numerous ideas put forth about the mechanism of RH in SBS, little is known about the pathophysiology". **Forbes, *Ophthalmic Manifestations of Inflicted Childhood Neurotrauma--Response*, NIH Proceedings of the Inflicted Childhood Neurotrauma Conference, 2002**.

In 2002 Ommaya (who published the monkey whiplash studies) criticized Caffey's shaking hypothesis. As it relates to RH, Ommaya explained that basic physics principles demonstrate the shaken-eye theory is biomechanically improbable:

> "The hypothesis of "intra-ocular" retinal haemorrhages caused by orbital shaking has not been tested experimentally. The eye has a relatively very small mass compared to the brain. Biomechanical calculations based on Holbourn's inverse ⅔ rule, previously discussed, predict that, smaller masses require higher levels of force to cause damage and larger masses require less; the levels of force required for retinal bleeding by shaking to damage they directly is biomechanically improbably. The work of Hansen & Helmke also indicates that the role of sudden rise of ICP is more likely to cause bleeding than the 'shaken eye' hypothesis.

Ommaya, *Biomechanics and Neuropathology of Adult and Pediatric Head Injury*, British Journal of Neurosurgery 2002 16(3): 220-242. A related criticism of the shaken-eye theory is that infants would sustain damage to the cervical spine well before the shaking thresholds for bridging vein

rupture and RH were met. ***See, e.g.***, **Matshes, *Shaken Infants Die of Neck Trauma, Not of Brain Trauma*, Acad For Path 2011 1(1): 82-91.**

A 2007 study emphasized the speculative nature of the child abuse shaken-eye theory:

> "... little is known about the ocular findings of child abuse... no animal or inanimate model has yet been described that adequately mimics injuries during child abuse. Until these difficulties are surmounted, **much of what we think we know about the systemic and ocular findings of child abuse will continue to be the result of speculation rather than based on sound evidence."**

2007 Emerson, Ocular Autopsy and Histopathologic Features of Child Abuse.

In 2009, the British Medical Journal published this criticism of the shaken-eye theory: "It seems unlikely that shaking of an infant would result in significant vitreo-retinal traction or that this would lead to retinal haemorrhage... the eye is "designed" to rotate for example during saccadic eye movements, during which angular accelerations of up to 700 degrees per second may be achieved, and the vestibulo-ocular reflex is likely to mitigate the effects of rotation of the head on the eye. RH are not observed after saccadic eye movements, nor in cases of nystagmus.... without a clearer understanding of the processes involved in the pathogenesis of these findings, it remains impossible, despite the assertions of some authors, to be certain that all infants demonstrating them have been the victims of attempted, or actual, murder." **Clarke, MP, *"Vitreoretinal Traction is a major factor in causing the hemorrhagic retinopathy of abusive head injury? No"* Eye (2009) 23, 1761-1763**.

To this day child protection advocates acknowledge "[i]t is not known for certain whether RH represent a primary injury from impact and/or rotation, or alternatively result from secondary brain injury, either systemic (e.g. hypertensive) or intracranial (such as RICP, seizures, or

hypoxia or coagulopathy, etc). This lack of certainty has sometimes led to debate about the origin of RH in ITBI." **Minns, *RICP and RH in Childhood Encephalopathies*, Developmental Medicine & Child Neurology 2017, 59:5978-604.**

Biomechanical animal experiments consistently fail to create RH

Shaking animals has failed to produce retinal hemorrhages. "In our experiments (A. Levin unpublished data, 2003) even with extreme and prolonged repetitive acceleration-deceleration forces at frequencies well beyond that which a human could create, we did not observe retinal hemorrhage." **Levin, *RH: advances in understanding*; Pediatr Clin N Am 56 (2009) 333-344.** "Larger animals have shaken to death by other animals...no retinal hemorrhages were found." *Id.* ***See also*** **Finnie, *Neuropathological changes in a lamb model of non-accidental head injury*, Journal of Clinical Neuroscience (2012)** (no retinal hemorrhages in shaken lambs).

In a 2016 study piglets were shaken to determine whether shaking could directly affect the eye. Piglets were chosen because the porcine retinal anatomy is very similar to humans:

> "We selected the immature piglet as a potential model for the study of retinal hemorrhages, as the porcine retina is more similar to the human retina than other domestic animals. Specifically, the porcine retina … contains a well-developed vascular arcade, with the major retinal vessels lying within the nerve fiber layer and capillaries present throughout multiple layers of the retina. The vitreous base of the pig is comparable to the human vitreous base and straddles the ora.

Coats, Binenbaum, Peiffer, Forbes, Margulies *Ocular Hemorrhages in Neonatal Porcine Eyes from Single, Rapid rotational Events* (2010)

In the 2016 study the baby pigs were shaken for 10 seconds, 30 seconds, and some were shaken twice for 30 seconds 24 hours apart. The shaking failed to produce RH. **Coats,**

Binenbaum, Smith, Peiffer, Christain, Duhaime, Margulies *Cyclic Head Rotations Produce Modest Brain Injury* (2016).

Neither RH "Clinical Studies" nor "Clinical Diagnosis Experience" provide a scientific foundation for Daubert purposes

Lacking scientific validation of the shaken-eye hypothesis, the shaken-eye proponents rely upon the Caffey line of child abuse literature and *clinical* diagnosis experience (based on the Caffey line of child abuse literature) to validate the shaken-eye theory. ***See e.g.*** **Findley et al, *SBS, AHT and Actual innocence Getting it Right*, 12 Hous. J. Health L. & Po'y 209, 4 (2012)** (child abuse advocates suggest the courts rely on the clinical judgment of doctors, particularly child abuse pediatricians who endorse the SBS hypothesis and defer to the literature that assumes the accuracy of their diagnosis); *accord* **Turkheimer, The Next Innocence Project: SBS and the Criminal Courts, 87 Wash U.L. Rev. 1, 5 (2009)** (logical fallacy where researchers chose subjects based on presence of SDH and RH and with little or no investigation into other possible causes and simply conclude the infants were shaken).

Child abuse pediatricians and others who treat children are not objective clinicians, rather, they are advocates and protectors of children, aligned with child protective services and criminal investigations: "recognizing abuse and intervening on behalf of an abused child can save a life and can protect a vulnerable child from a lifetime of negative consequences." **Christian, *The Evaluation of Suspected Child Physical Abuse*, Pediatrics vol. 135, No.5, May 2015 e1349 (2015)** The American Academy of Pediatrics has instructed primary care doctors for decades to not only suspect abuse, but also immediately report suspicions to investigators to ensure the safety of children:

> "Information regarding symptom onset, as well as information regarding the chain of caretakers, needs to be quickly passed onto mandated law enforcement and child protection investigators. Physicians can provide interpretation of the likely scenario, timing, and nature of the injuries involved. If notified promptly, investigators may be able to provide reciprocal service by exploring the probable scene of the injury and eliciting information from the caretaker prior to the time that defensive reactions have developed...siblings or other children, when abuse occurs in settings outside of the home, may have findings of inflicted trauma or repeated shaking. Therefore, child protection assessments need to be available immediately to ensure the current and future safety of these children.

American Academy of Pediatrics, Committee on Child Abuse and Neglect, SBS: Inflicted Cerebral Trauma, Pediatrics Vol. 92 872, 874 (1993), accord **AAP Committee on Child Abuse and Neglect, Pediatrics Vol. 108 206 (2001)**, and **AAP AHT in Infants and Children, the Committee on Child Abuse and Neglect Pediatrics 2009; 123; 1409-1411**.

On what basis do clinicians suspect abusive head trauma? Because there is no medical finding pathognomonic for head trauma, the child abuse diagnosis is heavily dependent on assumptions. For example, the American Academy of Pediatrics (AAP) instructs medical providers that ANY intracranial bleeding in a preambulatory infant suggests abuse (etiology). While the AAP does recognize that RH do not occur unless a child has brain pathology (regardless of the cause), the AAP skirts the pathophysiology of RH, and instead instructs clinicians that abused children are likely to have retinal hemorrhages. *Id.* (which may be true because children who develop SDH will also develop RH)

Because there are no medical findings pathognomonic for abuse, the AAP process (methodology) for diagnosing "abuse" is also heavily dependent upon assumptions related to individual judgment factors. These factors are subject to inconsistency among providers, and

unrelated to the scientific method. For example, the AAP instructs the following are "evidence" of abuse:

1. that a caretaker (generally with no medical training) cannot explain why a child developed a condition such as RH or SDH,

2. That certain conditions are assumed to be trauma related, therefore, a caretaker who does not report a traumatic event as an explanation for the child's condition is not credible,

3. the doctor believes the caretaker is not credible because the doctor determined the caretaker history changed (when the lay person may simply have offered possible explanations for what might have happened in response to child advocate questioning),

4. the doctor decides the caretaker's explanation is inconsistent with the doctor's assumptions related to the etiology of medical findings (i.e. doctor is trained to assume that only violent shaking could produce SDH and severe RH)

5. the doctor decides the caretaker explanation is inconsistent with the child's physical capabilities (i.e. doctor unfamiliar with the actual ability of the child assumes the child was not capable of rolling or climbing),

6. the doctor decides the caretaker has delayed seeking care (instead of recognizing the need for medical intervention may not have been obvious or the child may have decompensated over time).

Christian, *The Evaluation of Suspected Child Physical Abuse*, Pediatrics vol. 135, No.5, May 2015 e1349 (2015) *see also* **C. Jenny, "Modes of Presentation of Inflicted Childhood Neurotrauma" Department of Health and Human Services Conference on Inflicted Childhood Neurotrauma (2002)**("we use certain predetermined, generally accepted criteria to

determine if a child's injuries are inflicted or unintentional, such as delay in seeking care and presence of retinal hemorrhages.")

The use of these assumptions to arrive at an abuse diagnose has been criticized: "If all members of the [investigation] team are 'educated' to the fact that the presence of SDH and/or RH with 'no history accounting for patient's serious head injury' is dx of child abuse, then all cases will increasingly be so classified irrespective of what the caregivers say." **2002 Eva Lai Wah Fung, *Unexplained SDH in young children: Is it always child abuse?* Pediatrics International (2002) 44, 37-42** ***See*** **Billmire & Meyers, Pediatrics 1985; 75; 340** (6 cases deemed child abused b/c the provider felt the parents explanation was inadequate). **Ludwig and Warman, SBS: A Review of 20 cases, Annals of Emer Medicine, 13:2 p. 105 (Feb 1984)** (3/20 abused children has resuscitative shaking as a history--abuse assumed). See SBU at 29 ("it is reasonable to assume that the child's condition was already cause for concern before it was shaken and thus the symptoms were not attributable to the shaking"). ***See e.g.*** **Lynoe, *A diagnostic test can prove anything if you use incorrect assumptions and circular reasoning*, Acta Paediatrica, 107 pp. 2051-2053 (2018).**

For years, the American Academy of Pediatrics has instructed child abuse advocates that short falls and minor trauma cannot lead to serious injury, including RH, or death. *See*, **Technical Report: SBS: rotational Cranial Injuries, American Academy of Pediatrics Committee on Child Abuse and Neglect (2001)**("the constellation of these injuries **does not occur** with short falls"). Thus, for decades providers automatically assumed a caretaker was lying if the history included a short fall or minor trauma as playing a role in the child's presentation. *See e.g.*, **Ludwig** (in 8/20 cases labeled "abuse" the parents gave a history of a minor accident).

The AAP now recognizes that short falls can lead to severe RH and death (the 2009 statement removed the language saying otherwise) but a short fall history will be assumed false unless the fall is witnessed by a "credible" third party. If the fall is not witnessed by a credible 3d party, the conclusion is the child was abused. ***See*** **Atkinson, *Childhood Falls with Occipital Impacts*, Pediatric Emergency Care (2017)** ("if witnesses to the event had not been present, a high suspicion of abuse in these cases would have been justified"); **Shuman, *Severe Retinal Hemorrhages with Retinoschisis in Infants are Not Pathognomonic for AHT*, J Forensic Sci (2016)** (authors noted that had the fall not occurred in a public place, the findings would have resulted in child abuse accusations).

No one knows the diagnostic error rate of past or current "abuse" determinations. This concern for false positives (inaccurate diagnosis of abuse) is widely recognized: "The problem in all child abuse studies, and also in our study, is that there is no diagnostic gold standard for child abuse. This means that in most cases there is no way to have certainty if a certain child is abused or not." **Minns, *RH in a University Hospital: Not Always Abusive Head Injury*, Acta Neurol Belg (2017) 117:515-522** "[M]any instances of misdiagnosed AHT have been reported, but the true degree to which it occurs is not definitely known." **Greely, Chapter 47 *Conditions Confused with Head Trauma*, in Jenny Child Abuse and Neglect 2011**. "The major issue plaguing the description of abuse-related injuries to young children has been and continues to be accurate diagnosis." **Reece, Childhood head Injuries, Arch Pediatr Adolesc med vol. 154 (2000)**.

The unknown diagnostic error rate for the abuse assumption is especially problematic when the literature (i.e. child abuse researchers) assumes that 100% of past classifications (assumptions a child is abused) are correct:

> "**The classification of the children as abused was made by the treating hospital and was not questioned by the authors.** Detailed criteria were not listed...The other report..the classification of the children as abused was on the basis of several criteria, including no history accounting for patient's serious head injury, physical findings consistent only with abusive injuries...**It is therefore not clear to what extent these conclusions are a self-fulfilling prophecy, that is, defining child abuse on the basis of SDH and RH when there is 'no history accounting for patient's serious head injury" and then concluding that there is a high incidence of RH in child abuse."**
>
> **"If all members of the [investigation] team are 'educated' to the fact that the presence of SDH and/or RH with 'no history accounting for patient's serious head injury' is dx of child abuse, then all cases will increasingly be so classified irrespective of what the caregivers say."**
>
> "Do we really have sufficient knowledge of the magnitude of force required to result in such injuries and do we know the various modifiers that may influence this process?..It is perfectly feasible that in a very small proportion, b/c of the influence of one or more other factors, SDH and RH develop after minor injuries or apparent casual shaking."
>
> "We believe that, despite a magnitude of opinion to the contrary, the issue of whether 'trivial' head injury can cause SDH and RH is still unresolved. Clearly much more information on this very sensitive and serious issue is required[.]"

2002 Eva Lai Wah Fung, *Unexplained SDH in young children: Is it always child abuse?* Pediatrics International (2002) 44, 37-42.

The assumption that abuse is the cause of certain medical findings means there is no attempt to discover a pathophysiological causation of the clinical findings, **Hogberg**, *supra* at 9, and a diagnosis of etiology based on unverified SBS belief system perpetuates:

"Virtually none of the articles that I have read on SBS are based on witness observations or a credible confession close in time to the alleged criminal act. Instead, the articles often refer to multidisciplinary consensus decisions, such as 'evaluated by the hospital's child abuse evaluation team. In addition to basing their decision on the triad, the articles refer to a lack of credibility on the part of the individual who was alone with the infant when he/she became ill. According to one algorithm, failure of the individual to provide a plausible history of trauma that could account for the findings is sufficient to strengthen suspicion. According to another algorithm, it renders a diagnosis of shaken baby syndrome 'highly probable' These algorithms are based on previous literature in which the basis for the diagnostic criteria does not appear to have been scientifically validated. It is likely that diagnosis on the basis of these algorithms will also feature in future articles, which will then be added to the existing literature as further evidence of shaking -- constituting circular reasoning."

Wester, *Has a "Shaken Baby" always been shaken?* Tidsskr Nor Legeforen 2018 Doi: 10.4045/tidsskr.18.0583.

Circular reasoning is a well known methodology problem in the child abuse literature: *See, e.g.*, **Laskey, Epidemiological Issues in Child Maltreatment Research, Surveillance, and reporting (2011)** (circularity is a particular problem in child abuse research; concluding that intracranial hemorrhage (ICH) is a sign of AHT when the clinical team only suspected AHT because of the presence of ICH is an example of circular reasoning).

Studies that classify a child as abused, based on the presence of RH, are especially prone to circular reasoning: "The importance of an RH for the diagnosis of child abuse is well established; however, the evaluation of its incidence in child abuse is almost impossible because the diagnosis of child abuse is in great part based on the presence of an RH, providing a circularity bias....**In the construct of our study...we could not obviate the circularity bias, and the evaluation of the incidence of RH in child abuse remains a self-fulfilling prophecy."** **Vinchon 2005, Accidental and Non-Accidental Head Injuries in Infants;** *See also,* **C.**

Jenny, "Modes of Presentation of Inflicted Childhood Neurotrauma" Department of Health and Human Services Conference on Inflicted Childhood Neurotrauma (2002)("One resounding criticism in this body of literature poses a methodological dilemma when attempting to study mode of presentation of inflicted head trauma. This dilemma is the problem of circularity of reasoning. That is, we use certain predetermined, generally accepted criteria to determine if a child's injuries are inflicted or unintentional, such as delay in seeking care and presence of retinal hemorrhages. Then, when we describe the mode of presentation, those criteria are found to occur most frequently in abused children.")

In 2016 the Swedish Government concluded the evidence base suggesting RH is a marker of "abuse" is of poor quality

In 2016, the Swedish government published the results of a comprehensive two year study assessing the scientific foundation and diagnostic accuracy of the individual components (SDH, RH and encephalopathy) of SBS. "The main objective of this systematic review was to determine the diagnostic accuracy of the triad in detecting that an infant had been violently shaken." **Lynoe, *Insufficient evidence for SBS -- A systematic Review*, 106 Acta Paediatrica p. 1021-1027 (2017)**; See, **SBU (Swedish Agency for Health Technology Assessment), *Traumatic Shaking the role of the triad in medical investigations of suspected traumatic shaking, A systematic Review*, Report 255E/2016**

The Swedish study found very few articles of scientific quality; and noted the child abuse literature was plagued by circular reasoning:

> The child protection team's criteria are based primarily on a clinical approach. Problems arise later, when and if these criteria are not tested unconditionally by researchers in systematic studies of the association between the triad and traumatic shaking. This means that interpretation made by the child protection team characterizes the scientific

> investigation and hypothesis testing and this, in turn, means that the conventional approach is reinforced instead of being tested. However, if before the study it has already been assumed that the question to be addressed by the study has been answered, i.e. the association between the symptoms and signs of the triad and traumatic shaking has already been described (according to the child protection team's criteria) then circular reasoning occurs. Applied in this context, the reasoning results in a high risk of bias.
>
> **SBU at p.30**

RH and SBS prosecutions in the courts:

Because of the complex subject matter, and infrequent experience with SBS prosecutions, a nationwide prosecutor and investigator training apparatus developed to disseminate information on how to prosecute SBS cases through an advocate's lens. *See, e.g.,* **Turkheimer, The Next Innocence Project: SBS and the Criminal Courts, 87 Wash U.L. Rev. 1, 5 (2009)**

This advocacy approach, as opposed to objectivity, did not go unnoticed. In 2011, Dr. Norman Guthkelch, the pediatric neurosurgeon who first raised the shaken baby hypothesis in 1971, cautioned against the assumption that presence of SDH and/or RH are diagnostic of abuse. Dr. Guthkelch warned "it is unwarranted to go from this possibility [of abuse] to the assumption that unexplained SDH with or w/out RH or encephalopathy, are caused by violent shaking or other forms of abuse … **It is wrong .. to fail to advise parents and courts when these are simply hypotheses, not proven medical or scientific facts.**" **Guthkelch, AN, *Problems of Infant Retino-Dural Hemorrhage with Minimal External Injury;* 12 Hous.J.Health L. & Policy.**

In the legal context, courts have recognized RH are non-specific and that the shaken-eye theory is nothing more than a hypothesis. In *State v. Del Prete* the State called Dr. Brian Forbes, a well-published pediatric ophthalmologist from Children's Hospital of Philadelphia to testify to the cause of retinal hemorrhages. In its opinion the court emphasized that

> "[o]n cross examination, Forbes admitted that ophthalmologists cannot identify the precise mechanism in the body that causes retinal hemorrhaging and that medicine has not established a causative relationship between abusive head trauma and retinal hemorrhages. **He hypothesized** that the hemorrhages **may be** the result of the vitreous pulling back and forth against the retina as the baby is being shaken, but he admitted that this **hypothesis** would not explain retinal hemorrhages from other causes, such as blunt force trauma. Forbes admitted that ophthalmologists have not yet identified any mechanism to explain why or how motor vehicle accidents could cause retinal hemorrhages that extend to the ora serrata. … Finally, like Dr. Barnes, Forbes testified that prosecution expert Dr. Flaherty was incorrect when she testified at Del Prete's trial that hemorrhages to the ora serrata are caused only by acceleration or deceleration forces."

***Del Prete v. Thompson*, 10 F.Supp.3d 907, 931-2 (N.D.Ill. 2014)**.

The New York Courts have also recognized that RH are non-specific finding: "By 2010 it was recognized that retinal hemorrhages could have multiple causes and be present in many situations. Therefore, retinal hemorrhages are non-specific." ***People v. Bailey*, 999 N.Y.S.2d 713, 722 (2014)**. The court in *Bailey* also noted that child abuse had previously been diagnosed on incorrect beliefs: "The credible evidence adduced at the hearing also established that doctors view retinal hemorrhages very differently today than they did at the time of trial. Even Dr. Forbes, a prosecution witness, admitted that the relevant medical community knows more about retinal hemorrhages in 2014 than it did at the time of trial...at the time of trial ophthalmologists believed that only the acceleration, and deceleration forces generated by violent shaking could cause retinal hemorrhages. At the hearing, Dr. Forbes agreed that doctors now know that other events, such as trauma intracranial pressures and many other events can cause retinal hemorrhages." ***id at Bailey***.

Reliance on groups that endorse a particular hypothesis is antithetical to Daubert, which requires an objective assessment of the scientific evidence. **Findley *et al*, *SBS, AHT and Actual***

***Innocence: Getting it Right*, 12 Hous. J. Health L. & Po'y 209 (2012)** A conviction based on "invalid" science is a violation of due process. **Han Tak Lee v. Glunt, 667 F.3d 397 (3d Cir. 2012)**(arson).

When expert testimony is involved, courts are to rigorously examine the validity of facts and assumptions on which the testimony is based, as well as the principles, research, and methodology underlying the expert's conclusions and the manner in which the principles and methodologies are applied by the expert to reach the conclusions…An expert's opinion might be unreliable, for example, if it is based on assumed facts that vary from the actual facts…or it might be conclusory because it is based on tests or data that do not support conclusions reached…Further, each material part of an expert's theory must be reliable. **Whirlpool Corp. v. Camacho, 298 S.W.3d 631, 637 (Tex. 2009).**

Florida's Rule 403 provides: "Relevant evidence is inadmissible if its probative value is substantially outweighed by the danger of unfair prejudice, confusion of issues, misleading the jury, or needless presentation of cumulative evidence."

Shaken Baby Syndrome, Abusive Head Trauma, Retinal Hemorrhaging to support a finding of abuse are extremely controversial topics and litigated throughout the world. On December 7, 2020, District Court Judge David Wahlberg in Texas, hit the nail right on the head with his finding in limiting the experts as to what they could and could not testify to at trial. The Court stated:

> "The "CSI effect" is well known in criminal cases. Juries have come to expect scientific or forensic evidence to "solve" cases and generally put a high value on such evidence. This is particularly true when testimony comes from medical doctors. In this manner the State seeks to offer testimony from medical doctors that the child's injuries were the result of "abuse" or "non-accidental" or "intentionally inflicted." This proffered non-psychiatric testimony goes directly to the Defendant's state of mind and therefore causes confusion of the issues. The Texas Public Policy Foundation, a conservative think tank, recently

published a paper entitled "Reforming the Use of Child Abuse Pediatric Teams in Child Protective Cases" in which they offered the following observation:

> Most disturbing, however, is the apparent eagerness of child abuse pediatricians to take on an advocacy role and offer a legal opinion as though it were settled science. Ultimately, whether or not a child was abused is a legal question for the courts to answer. While the opinions of medical professionals can be helpful to the courts in determining the likelihood that a child's injuries were the result of abuse, medical professionals testifying in court must be careful not to overstep by offering an opinion that is outside of their area of expertise. A child abuse pediatrician stating unequivocally that 'this is abuse" from his or her clinical perspective, to say nothing of taking the extra leap of recommending the removal of the child, is unfairly prejudicial as it gives a false air of scientific fact to a legal concept."

Wherefore, in light of the fact there is no scientific basis for SBS and RH, the defense seeks to preclude evidence, and/or direct or indirect comment or testimony by the State that:

1)retinal H are directly caused by mechanical force of shaking as opposed to the result of am accidental injury
2)A significant amount of force is required to cause and/or that only a significant amount of force will produce severe retinal hemorrhages in an infant
3)any testimony by any expert as to mens rea would be inappropriate
4)Severe retinal hemorrhages reliably predict etiology **(abuse)**

Allowing such testimony based upon assumptions, untested theories and mere guesswork should not be allowed to be presented to the jury, as the reliance on such notions is highly prejudicial and the probative value of such testimony does not overcome the unfair prejudicial effect that such testimony would have on the jury.

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that a true and correct copy of this Motion was electronically filed with Clerk of Courts and Assistant State Attorney, Melissa Clark, Esq. and via email to Honorable Terence Perkins on this 10th day of December, 2020.

Respectfully submitted by,

Hager & Schwartz, P.A.
The Kress Building
140 S. Beach Street, Ste 310
Daytona Beach, FL 32114
Telephone: (386) 313-8350
Facsimile: (888) 633-7595
pleadingsvolusia@defendyourcase.com

/s/ John S Hager

JOHN S. HAGER, ESQ.
Florida Bar No. 173967