THE SAFETY HELMET SUCCESS STORY

By Jennifer Graham and Laurie Bonner

A common saying among equestrians is that "The hardest thing about riding is the ground." New Hampshire trainer Timothy J. Harvey can attest to that: Three years ago, his mustang spooked on a mountain trail, and Harvey came off. But his foot caught in the stirrup, and his head banged repeatedly against the ground as his horse dragged him down the hill.

Finally, Harvey's foot came loose, and he fell face-down and unconscious on the rocky trail. His ASTM/SEI-certified helmet was broken in three places but still firmly strapped to his head. "There's no question in my mind, that helmet saved my life," says Harvey, who has made a complete recovery.

Harvey is one of countless people who owe their lives to reliable protective helmets designed specifically to prevent the types of injuries that can occur around horses. And for that, he can thank a small group of equestrians who,

DUSTY PERIN

PHOTOILLUSTRATION BY CELIA STRAIN/IMAGES BY SHUTTERSTOCK

REPRINT

Editorial Committee note: Due to the recent injury of FHANA Board Member, Will Bron, we find this article to be a timely reminder of the importance of safety when enjoying your Friesian horse. Please heed the warnings contained in this article. We wish to sincerely thank the editors of Equus Magazine for their willingness to allow the reprint of this very poignant and informative article. We encourage all FHANA members to include Equus as a regular part of their equine education.

determined to make riding safer, began an effort that gave us the ASTM helmet safety standards 25 years ago.

Accidents still happen, and riders are still injured when they fall. But a properly fitting ASTM/SEI-certified helmet greatly reduces the risk of serious head injury. "I believe that the current helmets prevent almost 100 percent of injuries resulting in death or severe disability," says Roy Burek, managing director of Charles Owen & Co., the British helmet manufacturer founded by his grandfather. "If they don't, it is due to poor fitting, loose chin straps or [injury sustained] below the rim of the helmet."

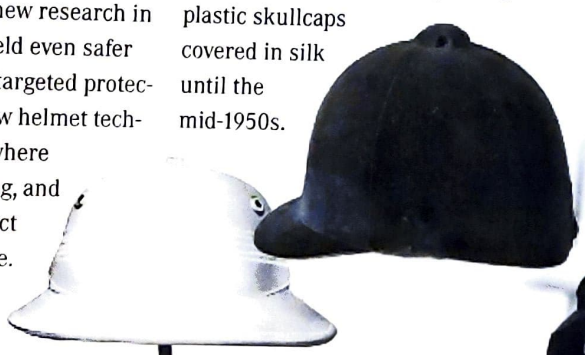
Today's state-of-the-art riding helmets are a far cry from the headgear of even a decade ago, and new research in the coming years will yield even safer technologies and better-targeted protection. Here is a look at how helmet technology has progressed, where the new designs are going, and what they can do to protect you as you ride your horse.

RISING AWARENESS

Since the first person climbed onto the back of a horse, riders have worn all sorts of protective headgear. But for thousands of years—really, up until the 20th century—equestrian helmets were largely for two purposes: style, or protection from the swords and arrows of ancient battles (judging by some of the specimens from past civilizations on view in museums, sometimes both at once).

But once motorized vehicles began taking over the job of basic transportation in the early 1900s, riding horses started to become more of a sporting and leisure pursuit, and the focus began to shift toward safety. Polo players were among the earliest horsemen to begin wearing protective hard hats, and in 1938, Charles Owen began making helmets for jockeys that quickly caught on and reduced injury rates in Great Britain.

In the United States, however, jockeys continued to ride in lightweight plastic skullcaps covered in silk until the mid-1950s.



SHUTTERSTOCK

Polo riders were among the first to begin wearing hard hats. But many early models of riding helmets contained little or no shock-absorbing material.

The January 1956 death of a young jockey named LeRoy Nelson from head injuries after a fall at Agua Caliente Racetrack in Tijuana, Mexico, spurred the track's executive director, John Alessio, to begin looking for ways to protect riders. Alessio backed a project to adapt helmets worn by motorcyclists and racecar drivers to the needs of jockeys.

Made of laminated fiberglass lined with foam and leather, the "Caliente safety helmet" was introduced in April 1956, and Alessio made it mandatory at his track in August of that year. After jockeys started walking away uninjured from falls and head blows that might have been fatal without the helmets, the new gear was quickly endorsed by the Jockeys' Guild and adopted as standard, if not mandatory, equipment at racetracks across the United States within a few years.

ARNO BROUKHORST

FROM **RACETRACKS TO RIDING RINGS**

In 1964, the American Horse Show Association (AHSA, now called the United States Equestrian Federation, USEF) first published the rule that "Riders in all classes where jumping is required must wear protective headgear," and only in 1978 was the rule introduced that all riders in combined training (now called eventing) must wear protective headgear in the endurance (cross-country) phase of the event.

During those years a rising toll of injuries—especially among highly qualified riders in high-profile competitions—helped to raise the tide of public awareness of the need for protective gear. One prominent accident occurred at the World Three-Day Event Championships at the Kentucky Horse Park in 1978. During the show jumping phase of the competition, American rider Caroline Treviranus flipped over her horse's shoulder when he refused at a jump, and her helmet (which had no chin strap or restraint) flew off as she was falling. She hit the ground head first, and then a rail from the missed jump crashed down on the back of her head. She was comatose for a week, and she never returned to riding at the international level.

After jockeys started walking away uninjured from falls that might have been fatal without the helmets, the new gear was quickly endorsed by the Jockeys' Guild and adopted as standard equipment at racetracks across the United States.

In the wake of that accident, the United States Pony Clubs convened an ad hoc meeting on rider safety and helmets in January 1979. "Everyone was very concerned and felt something needed to be done," said Drusilla "Dru" Malavase, who was invited to participate in that first meeting. A former chairman of six national Pony Club committees as well as a riding instructor, Malavase was at the time recovering from an accident of her own, a spinal

CHERLY ANN QUIGLEY/SHUTTERSTOCK

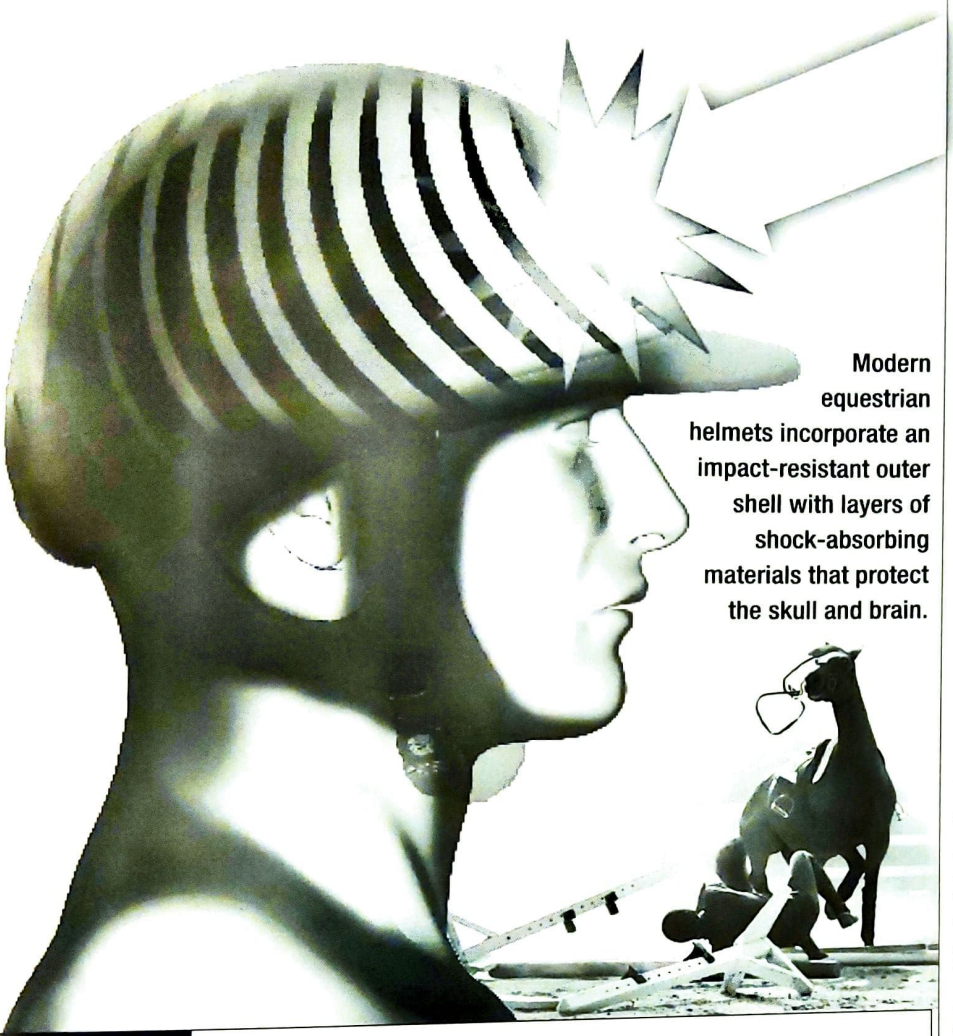
fracture sustained in a foxhunting fall. "They called me because they knew I didn't have anything else to do while I recovered," she says.

Malavase's interest in rider safety stemmed in part from her work as a first-aid instructor with the American Red Cross. "I was the person who got to be the medic at shows before we officially had medics on the field," she says. "In the Red Cross, a huge amount of our teaching revolves around prevention—and when you've seen the results of head injuries, prevention makes sense." In addition, her husband worked as a manufacturer's representative for sporting equipment companies, and her son played hockey and football. "We had helmets all around the house," she says, which raised a question: "Why should protective helmets be compulsory for other sports, but not for riding, which clearly was also potentially just as dangerous?"

Yet even riders who wanted to wear safety helmets faced a quandary. The quality of protective headgear available at the time varied widely—some hard hats labeled as "protective" had little or no padding to cushion the impact of falls, and many had no chin straps or any sort of restraints. Even in elite show jumping, most riders preferred to wear traditional black velvet hunt caps that were little more than fashion accessories. Western riders stuck to their cowboy hats, and pleasure riders weren't likely to wear anything at all. "We were seeing far too many head injuries, and we knew the helmets were insufficient," Malavase says.

The first step was to develop helmets for riders that would consistently provide a high level of protection. The initiative would begin with the Pony Club, which Malavase calls "the only brave place in the horse world" because at the

All sports helmets provide shock absorption but each is specially designed to protect against specific types of insult. For example, bicycle helmets must be able to withstand the mechanical energy generated when a rider falls against concrete or curbstones, while equestrian helmets are designed to also protect against impact with such things as horseshoes or jump standard edges.



Modern equestrian helmets incorporate an impact-resistant outer shell with layers of shock-absorbing materials that protect the skull and brain.

time it was the only equestrian organization, outside of racing, that was willing to require that all riders in all its competitions wear protective helmets. (Helmets were commonly worn but not mandatory in polo.)

At that meeting in 1979, Malavase began organizing an interdisciplinary effort to investigate how helmet standards developed for other sports could be adapted to riding. "We had engineers, equipment designers, biomechanical experts, lawyers and a number of different types of people working with us," she says. The group began by examining existing design standards for football helmets as well as polo. "The U.S. Polo Foundation had just paid a lot of money that year to have helmet standards created for their sport," says Malavase, "and the polo director was wonderfully helpful; he said feel free to borrow our standards."

SAFETY BY **DESIGN**

Designing protective helmets is a balancing act: On the one hand, the helmet must provide enough padding to prevent head injuries under serious impacts, but it must also be lightweight and comfortable enough that people will wear it as well as small enough that it doesn't impede the wearer's vision or neck movements. Football helmets are generally considered the safest of sports headgear—but that much coverage is overkill for the average rider, who won't be going up against a linebacker dozens of times a day.

Instead, helmet designers determine what kind of impacts people are more likely to experience in a particular sport—how hard they might be hit, as well as where on the head—and then create a helmet that provides the right level of protection over the most vulnerable areas. "Football and hockey

FAST **FACTS**

- An estimated 1.7 million people sustain a traumatic brain injury (TBI), from all causes, each year. Of these, 52,000 die and 275,000 are hospitalized. About 75 percent are concussions or other mild forms of TBI. (Centers for Disease Control and Prevention)
- Between 2001 and 2005, an average of 207,830 emergency room visits per year were the result of concussions and other TBIs incurred in sports and recreational activities alone; of those, 65 percent were children aged 5 to 18 years. Between 2001 and 2009, children under 19 made 3,638 emergency room visits per year for TBIs resulting from horseback riding accidents. (Centers for Disease Control and Prevention)
- Racing organizations require helmets, and as a result jockeys now sustain fewer head injuries than pleasure riders. The U.S. Pony Clubs lowered head injury rates 29 percent with mandatory helmet use. (Equestrian Medical Safety Association)
- You don't need to actually strike your head to sustain a concussion. Acceleration forces alone, if you whip your head too hard, can cause neural injury in your brain.

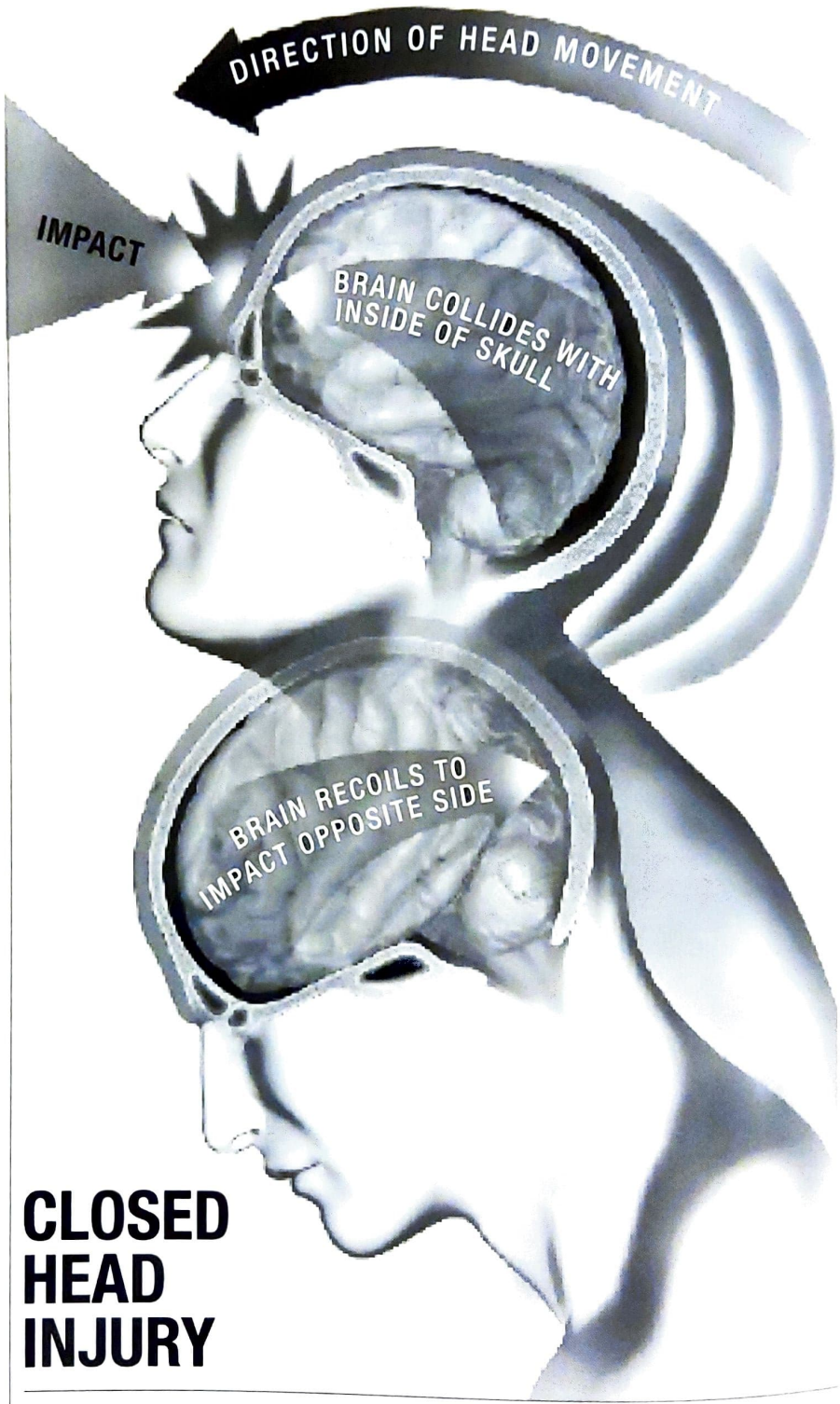
helmets have to withstand multiple impacts within a single game, so their liners are designed for that," says Malavase.

Bicycle and riding helmets, in contrast, need to withstand only a single accident, but the forces involved might be much higher than a football player is likely to experience in one blow. Yet there are differences between biking and riding helmets, too: "Retention systems are more important to riders," says Malavase. "A bicyclist who falls is likely to hit his head once. A rider who falls might also be kicked by the horse or receive two or three additional blows from a collapsed fence, and so it's important that the helmet stay on after that first impact."

Designing the first protective riding helmets wasn't an easy task. "Foolish people that we were, we thought it would take six months," Malavase says. In 1984, she brought her task force to the American Society for Testing and Materials (ASTM), an independent nonprofit organization that develops and issues standards for product safety, for items ranging from paintbrushes to digital thermometers, and in 1988, the group finally published the standard officially known as "F1163, Specification for Protective Headgear Used in Horse Sports and Horseback Riding."

Manufacturers stepped up to produce helmets that met the new standards, and within a year, riders could purchase headgear with a label marked "ASTM/SEI certified," which means:

• *ASTM,* now called ASTM International, publishes very specific rules: To be certified, a helmet must be able to withstand blows of specified forces at four distinct locations around the head; it must reduce the acceleration of the head upon impact; it must



CLOSED HEAD INJURY

Concussion, a type of traumatic brain injury (TBI), occurs when a blow to the head or other sudden movement causes the brain to violently shift within the skull. The resulting impact with the interior of the skull and/or the stretching of the brain tissues lead to microscopic injuries that impair function. Initially, a concussion may cause confusion or a loss of consciousness. In the hours or days afterward, other symptoms may develop, including headache, nausea, vomiting, ringing in the ears, memory loss, slurred speech and fatigue.

TYPES OF **BRAIN INJURY**

Safety helmets are designed to prevent catastrophic traumatic brain injury (TBI), which is caused by external blows or forces (as opposed to nontraumatic brain injury, caused by stroke or loss of oxygen, for example). TBIs are typically classified as mild, moderate or severe.

• **Mild TBI,** better known as concussion, is the most common type of head injury equestrians sustain. It is a type of "bruising" of the neural tissue that impairs the function of the brain, and it can cause either a loss of consciousness or a generally "dazed" feeling for up to 30 minutes, often accompanied by memory loss that may persist for up to a day. Other symptoms may include headache, nausea, vomiting, ringing in the ears, blurred vision and emotional or behavioral changes, such as anxiety, irritability, confusion, slowed thinking or speech, and sleep disruptions.

People with mild TBIs may rest at home. The concussions generally heal on their own without any long-term effects, but it can take a minimum of six weeks to fully recover. During that time, damage from additional blows to the head would be cumulative: Two blows to the head weeks apart might prove fatal, even if neither injury alone would have been life threatening. For that reason, physicians often instruct patients not to ride again, or engage in other high-risk activities, until they have fully recovered from the first brain injury.

In some cases, even mild TBIs may produce long-term or permanent side effects, including personality changes and emotional disorders.

• **Moderate and severe TBI** may affect a wider portion of the brain and include much more stretching and tearing of neural tissue as well as swelling and internal bleeding. Moderate TBI is characterized by a loss of consciousness that lasts between 30 minutes and 24 hours and memory loss that persists from 24 hours up to seven days; severe TBI causes a loss of consciousness that lasts longer than 24 hours, memory loss of longer than seven days, or coma. Both require hospitalization to monitor the patient for secondary consequences, such as fluid accumulation under the skull, if not basic life support in an intensive care unit.

Moderate and severe TBI will almost certainly require time in rehabilitation, to help the patient relearn any lost functions. Chances of a full recovery depend on the nature and severity of the initial injury, but long-term effects are common and may include: *physical changes,* such as chronic pain, seizures, loss of bowel or bladder control and sleep disorders; *cognitive changes,* including difficulties with memory, concentration, impulsiveness and abstract thinking; *speech and language impairments,* including slurring, problems with reading comprehension and writing, and difficulty understanding or speaking words; *sensory issues,* such as lost or diminished taste or smell, blurred vision or blindness, ringing in the ears or difficulty interpreting the sense of touch; and *emotional changes,* such as aggression, depression, loss of inhibition, lack of motivation and irritability.

withstand blows on both a flat anvil as well as an anvil with a raised edge that simulates a horseshoe; it must perform just as well in low temperatures, high temperatures and when saturated with water, etc. The ASTM does not actually test any helmets; they simply publish the guidelines others must follow.

• *SEI* stands for the Safety Equipment Institute, a private, nonprofit organization whose goal is to make sure that manufacturers comply with the ASTM standards. Helmet makers must send their products out to independent, internationally accredited labs for initial certification testing. In tests, helmets are dropped from a height of six feet onto each type of anvil, while sensors placed inside measure the gravity (g) forces that would affect a rider's head. The helmets are retested on the anvils after being frozen to less than minus 20 degrees Fahrenheit, heated to over 120 degrees, or submerged in water overnight. If in any single test the g forces inside the helmet exceed 300 g, the minimum amount required to injure the brain, the helmet fails.

To ensure the manufacturer's testing is reliable, each year the SEI sends independent auditors, also internationally accredited, to examine each manufacturer's procedures and materials. The auditor selects random helmets from each maker's facility for follow-up testing. Any helmet that fails to meet the ASTM standard will be recalled under the rules of the U.S. Consumer Products Safety Commission. Since 1988, only one model has been recalled.

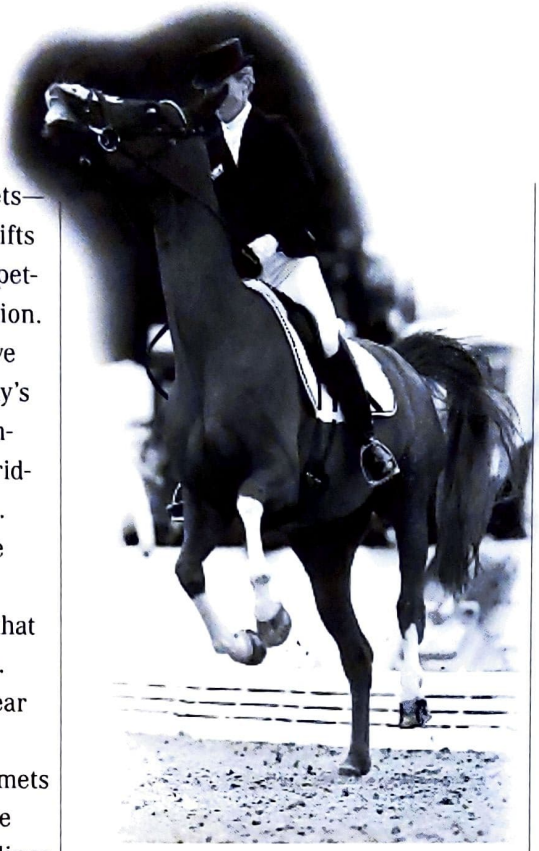
TOWARD **GREATER ACCEPTANCE**

Developing the standard and getting manufacturers to adhere to it was only the first part of the battle. Now Malavase and other advocates had to

convince more riders to wear helmets—this would require huge cultural shifts for people who had ridden and competed for decades without head protection. It didn't help that the early protective helmets were hot and heavy by today's standards, and especially when compared to the lightweight hunt caps riders of the 1980s had grown up with.

By the early 1990s, helmets were required by the Pony Club and in a few other equestrian competitions that require jumping and/or high speed. However, riders often chose headwear that did not meet ASTM standards. Younger riders weren't wearing helmets if they didn't have to, in part because the elite competitors in their disciplines weren't either. "Too many 'top' riders apparently believe themselves to be above the need to protect their heads," Malavase wrote in a February 1998 editorial for the *AMEA News*.

But, gradually, the tide began to turn. Led by high-profile advocates, such as Denny Emerson, a prominent eventer, trainer and coach, more people began wearing ASTM/SEI-certified helmets voluntarily. Over the next two decades, helmet rules appeared in more rulebooks. A few smaller organizations, such as the Eastern Competitive Trail Ride Association, made the use of ASTM/SEI-certified helmets mandatory for all participants of any age in their events, but more often the protective headgear was compulsory only for junior riders, and usually only in classes over fences. "Adults are often fine with making kids wear things that they won't," Malavase observes, "but then when those kids grow up, many will keep on wearing the helmets."



JACQUIE TOFFLEMIRE-BRONKHORST PHOTOGRAPHY

The use of helmets is still not universal, especially among riders in Western disciplines, where the traditional cowboy hat is widely preferred. Dressage riders, too, long resisted wearing helmets, favoring instead their classic top hats and hunt caps.

Certified helmets and helmet rules also became common in the noncompetitive equestrian world. They are compulsory in many mounted police forces and for riding in some national parks, and organizations such as the Girl Scouts of the USA require all of their members to wear helmets for their own organized trail rides and riding camps. The state of New York in 1999 passed helmet laws for riders under age 14; in

BOB LANGRISH

IT'S AN EMERGENCY IF . . .

In rare cases, a concussion may result in a dangerous blood clot. Seek immediate medical attention if, after a jolt or blow to the head or body, you develop:

- a headache that gets worse and does not go away
- weakness, numbness or decreased coordination
- repeated nausea or vomiting
- slurred speech.

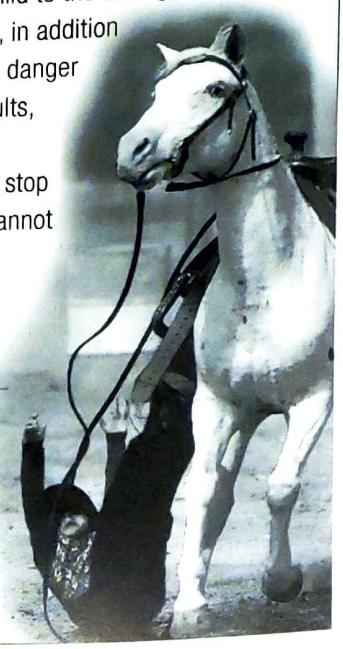
If you are monitoring someone who has struck their head, take them to the emergency room if they:

- appear drowsy and cannot be roused
- have one pupil that is larger than the other
- have convulsions or seizures
- cannot recognize people or places
- become increasingly confused, restless or agitated
- display any unusual behavior
- lose consciousness, even briefly.

Take a child to the emergency room right away if, in addition to any of the danger signs for adults, they:

- will not stop crying and cannot be consoled
- will not nurse or eat.

SOURCE: Centers for Disease Control and Prevention



BOB LANGRISH

2009, Florida became the second and only other state to mandate helmet use for all equestrians under the age of 16, although riders on private property are exempted. Large numbers of pleasure riders now wear their helmets at all times on trails and at home in the ring.

The use of helmets is still not universal, especially among riders in Western disciplines, where the traditional cowboy hat is widely preferred. But there have been some changes. The National Reining Horse Association allows participants to wear either a "Western hat or safety helmet," and the National Cutting Horse Association rules state, "Under the advance approval of show management, safety helmets are permissible in place of a western hat." Helmets are also an acceptable option for participants in barrel racing and other rodeo events.

Dressage riders, too, long resisted wearing helmets, favoring instead their classic top hats and hunt caps. But attitudes changed in March 2010 when a horse ridden by dressage rider Courtney King-Dye tripped during a schooling session, falling on top of her, while she was not wearing a helmet. King-Dye, who had competed in the 2008 Olympics, was in a coma for four weeks and spent three more months relearning how to walk and talk. She has residual speech and mobility impairments from which she may never fully recover.

The United States Dressage Federation responded in May 2010 with an official statement that "strongly recommends all riders wear protective helmets when mounted," and a rule change effective April 2013 mandates ASTM/FEI-certified headgear for all dressage competitors at all times when mounted on the show grounds. The rule also extends to trainers and noncompeting riders in the warm-up and stabling areas.

The dressage rule changes coincided with a cascade of similar new rules in other English disciplines. Effective April 2012, the United States Hunter Jumper Association requires "all persons mounted on a horse on competition grounds" to wear an ASTM-approved helmet, and in April 2013, a new USEF rule went into effect requiring a properly fastened ASTM helmet for participants in all Federation hunter or jumper competitions "when mounted anywhere on the competition grounds."

At the international level, the Fédération Equestre Internationale (FEI) passed stricter new helmet rules, which went into effect in January 2013, for events under its jurisdiction. With some exceptions, protective headgear is now mandatory for all participants in FEI-level jumping, eventing, dressage, para dressage, endurance and driving; however, helmets are not mandatory for FEI-level reining or vaulting.

"These new rules that require headgear for everybody at shows—even the trainers, the warm-up riders and the moms in the stabling areas—that's terrific because we know those people are getting injured, too," says Malavase. "Unfortunately, we are at risk every time we get on a horse and every time we handle one. We used to believe that only about 10 to 20 percent of horse-related head injuries happened to people on the ground. Now we have new research that suggests the number is much higher—about a third of the head injuries we get from horses happen on the ground."

LOOKING FORWARD

ASTM has revised its standards for equestrian helmets several times over the years as researchers continue to investigate how brain injuries occur

and how they can be prevented. This year, the committee has put through another change, adjusting the weight of the test headforms used, says Malavase: "We have been using headforms that were the same weight for all sizes, even though children's heads are more forgiving than adults' and smaller sizes don't need as heavy a headform. As a result, testing will be more realistic, reflecting the actual average weights of different heads."

Research on head trauma in other sports, especially football and hockey, may also lead to changes in equestrian helmets over the coming years. Researchers are now able to monitor head blows in real time, using tiny sensors inside the helmet. And studies of professional athletes are shedding new light on the long-term impact of concussions—return-to-play rules are leading to better informed recommendations for when equestrians can safely return to riding after a head injury.

"We used to believe that only about 10 to 20 percent of horse-related head injuries happened to people on the ground," says Dru Malavase. "Now we have research that suggests the number is much higher—about a third of the head injuries we get from horses happen on the ground."

"Helmets still have a long way to go, but we are only starting to really understand the mechanism of brain injury compared to skull fracture," says Burek, who with Malavase also co-chairs the Equestrian Headgear Subcommittee of the ASTM. "Studies that involve onboard computers inside the helmet are at last allowing us to correlate injury with forces, energies and location of impact. Without these scientific studies, any improvements would be stabs in the dark and could reduce protection in an unintended way."

Helmets of the future may cover the face, as well as the head, Burek says: "Impacts to the face cause a lot of injury, disfigurement and pain." And ambitious developers envision "smart helmets" that change in stiffness, relative to the type of accident, and inflating helmets that create "a protective bubble" around the upper body. "There are even helmets in development that mimic noise-canceling headphones," Burek says. "Instead of creating antinoise to cancel out the background drone, they create antimotion to try to cancel out the damaging jolts to the brain upon impact."

Of course, the best-designed helmet still does nothing if a rider won't wear it. So safety advocates are looking for new ways to encourage helmet use. After King-Dye's fall in 2010, lifelong

riders Lyndsey White and Jeri Bryant founded Riders4Helmets, a nonprofit group to educate people about ASTM/SEI helmets and the importance of wearing one that is properly secured and fitted. "If you wear a helmet that doesn't fit, you might as well not be wearing one," White says.

In just a few years Riders4Helmets has had an impact. June 8, 2013, will be the third International Helmet Awareness Day, featuring live streaming webinars on helmet safety, and on which retailers will sell helmets at a discount. In February of this year, the organization hosted its fourth annual safety symposium to bring together representatives of different disciplines to discuss equestrian safety.

"Obviously, [these symposia were] something needed and necessary, and we're organizing an international one for this summer, which will be the first of its kind," says White, who hopes that the coming years will see new initiatives, such as competitions offering cash incentives for riders wearing certified helmets.

Riders who want to wear protective helmets have never had more options. "When we started there were just a handful of protective helmets available to riders," says Malavase. "Now, the SEI lists more than 100 approved helmet models from makers all over the world. All those choices mean that anyone can find one at any price that fits well."

Helmets also now come in a wide variety of colors and styles, from girl-friendly pinks and purples, to saddle-seat bowlers, to leather-look casuals. "Troxel now has a line of Western-look helmets with jazzy designs," says Malavase. "They are making a concerted effort to make helmets that appeal to the casual rider." Recently, Troxel introduced a cowboy hat/helmet system that consists of a wide-brimmed, wool cowboy hat placed over a low-profile protective helmet—to offer a safer choice to riders who don't want to give up their traditional Western look.

As demand for safe, protective riding helmets continues to grow, the number of different choices on the market will also increase. People who choose to wear ASTM/SEI-certified helmets can ride confident that decades of research and consumer activism have made their sport safer than it has ever been.

"ASTM helmets make the great activity of horse owning, riding and competing safer," said Richard M. Timms, MD, Troxel's chairman and founder. "Not all, but most deaths and injuries can be prevented."

To learn more about helmet safety contact the Equestrian Medical Safety Association, 866-441-2632, www.emsaonline.net; and Riders4Helmets, www.riders4helmets.com.