Biomedicine

Football coaches: Watch head injuries

Young football players who receive blows to the head while on the gridiron can develop potentially deadly brain concussions even if they do not lose consciousness immediately after the injury, cautions a group of Colorado physicians.

In the Nov. 27 JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, neurologist James Kelly and his colleagues at the University of Colorado School of Medicine in Denver report the case of a 17-year-old high school football player who died from severe brain swelling hours after being struck on the helmet during a routine tackle. The physicians later determined that the boy's fatal injury resulted from a stronger blow to the head that he had received during the previous week's game. That concussion had gone undiagnosed because the player never lost consciousness.

Kelly's group warns that lethal brain swelling can develop rapidly in adolescents who experience head trauma, even though they do not always black out after the injury. "This phenomenon is most common in the pediatric age group," the researchers assert.

Kelly says the Colorado Medical Society has responded with new guidelines for determining the severity of head injuries among young football players. The society now advocates removing from the game any player who has received a severe blow to the head, and watching him for at least 20 minutes. If the player remains confused during that time, the society recommends sending him for medical treatment. Players who exhibit no signs of confusion or amnesia during those 20 minutes may return to the game. The society continues to recommend an immediate trip to the hospital for any player who loses consciousness after a play.

Alzheimer's: Slowing the decline

A naturally occurring compound named acetyl-L-carnitine may slow the worsening of dementia symptoms among people with Alzheimer's disease, a preliminary study suggests.

Researchers from 10 Italian hospitals found that year-long treatment with acetyl-L-carnitine improved overall attention span, long-term memory and verbal ability in 63 Alzheimer patients, with no serious side effects. In contrast, 67 Alzheimer patients receiving a placebo showed no such improvements, reports the team, led by Alberto Spagnoli of the Mario Negri Institute in Milan.

"Our findings should be considered preliminary but are encouraging," they conclude in the November NEUROLOGY.

All human cells make acetyl-L-carnitine. The Italian firm Sigma-Tau S.p.A. began selling the substance by prescription in Italy four years ago as a treatment for dementia. Some U.S. health food stores currently sell carnitine lacking an acetyl group as a general nutritional supplement. Previous laboratory and animal tests demonstrated that acetyl-L-carnitine can stimulate nerve cells to produce proteins and new cell membrane, and to release the neurotransmitter acetylcholine, Spagnoli's team notes.

Sigma-Tau's U.S. subsidiary has just finished enrolling 400 patients for a U.S. trial of acetyl-L-carnitine, says Susan Sauer of Sigma-Tau Pharmaceuticals Inc. in Gaithersburg, Md. The study, which the company expects to last one year, involves 27 Alzheimer's research centers across the nation. After the study's completion, the company plans to seek FDA approval to market the drug in the United States.

No drug therapy currently exists for Alzheimer's. Last March, an FDA advisory panel recommended against the approval of tetrahydroaminoacridine (THA), a potential Alzheimer treatment that inhibits the breakdown of acetylcholine (SN: 3/23/91, p.180). THA's developer, Warner-Lambert Co., is now amassing additional data on the drug.

Computers

Computing a chess game's end

The game was down to six pieces. Former world chess champion Anatoly Karpov, playing white, had a king, a bishop and two knights, whereas current world champion Gary Kasparov had only a king and a rook. In the end, the two combatants played to a draw. But was that the only possible outcome? Was there a way for Karpov to win?

Whereas chess experts would find themselves hard-pressed to answer such questions with any degree of certainty, a new, sophisticated computer program specifically designed for analyzing six-piece endgames can now provide the answers. Developed by Lewis Stiller, a graduate student in computer science at Johns Hopkins University in Baltimore, the program systematically works out the combinations of moves that produce various outcomes when given the identities and initial positions of six chess pieces, none of which is a pawn.

In this example, Stiller's program, running on a multiprocessor computer known as The Connection Machine, provided the answer in about 90 minutes. The program demonstrated that unless Kasparov made a mistake, Karpov could do nothing that would give him even a chance to win. This particular game, played at a tournament last month, was fated to end in a draw. Based on conventional chess wisdom, that's not really surprising, Stiller says. But computer analyses have in the past produced a number of counterintuitive results. "There's no way anybody can be sure until we actually solve the position," he says.

Stiller's most dramatic result so far concerns an endgame involving a king, a rook and a bishop versus a king and two knights. Chess experts generally assumed that the rook and bishop could not force a win. However, Stiller's program uncovered a winning line of attack 223 moves long, starting with the pieces in the position shown in the diagram. This represents by far the longest sequence of moves needed to win ever established in a chess endgame.

In performing such analyses, the computer program starts by constructing a huge, carefully laid out table with roughly 8 billion entries, each corresponding to a particular chess position involving a given set of six pieces. The program first finds and marks any entries showing positions in which the white pieces have already achieved a win. Then it works backward step by step to determine which combinations of moves lead to those winning positions, keeping track of each position unveiled during these moves by appropriately marking the requisite table entries. Once the table is fully annotated and summarized, Stiller can study particular sets of moves.

Stiller

Six-piece chess endgame.

Stiller's method isn't completely foolproof. The computer program itself may still contain errors, and other errors can slip into the data and the computer-generated tables. "Based on my experience, I feel very confident that the results are accurate," he says. "On the other hand, it's such a large database that even if there's only a one in a billion chance that a byte is wrong, already you would have a problem."

Besides the potential usefulness of the novel techniques required for writing the chess program, Stiller says, "I think there is scientific value in showing that there are so many surprises and such incredible depth in even a simple-seeming problem." He describes his program in the current JOURNAL OF SUPERCOMPUTING (Vol.5, No.2).