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March 10, 2000

Dr. Ruth Kirschstein, Acting Director
National Institutes of Health
Building 1, Room 126, MSC 0148
9000 Rockville Pike
Bethesda, Maryland 20892

Dear Dr. Kirschstein:

I am writing to seek your assistance in understanding the state of scientific knowledge concerning injuries caused by amusement park rides, particularly subdural hematoma, stroke and internal bleeding caused by riding roller coasters.

I am enclosing an article from a recent issue of the journal *Neurology*, for example, that discusses several case reports from Japan, concluding with the following:

> **"Our findings support the hypothesis by Fernandes and Daya that in the absence of any other predisposing factor, the acceleration forces associated with roller-coaster rides cause the tearing of bridging veins resulting in subdural hemorrhage. In turn, neomembrane formation leads to chronic subdural hematomas. <u>Riding giant roller coasters can cause chronic subdural hematoma even in a previously healthy woman"</u> (emphasis added).**

In addition, I am enclosing an article from the March 28, 1999 *Sunday Times (London)* which includes the following:

> **"Researchers are worried that the users of some rides might suffer hidden effects. Valerie Biousse, a Paris-based neurology specialist, has treated patients who complained of headaches after high-speed rides. She said subsequent examinations revealed ailments ranging from minor internal bleeding to small strokes."**

Last September, after four people died within one week on three different roller coasters, I wrote to Ann Brown, Chair of the Consumer Product Safety Commission, to inquire who was responsible for overseeing the safety of roller coasters. I also asked who was responsible for setting safe limits regarding "g-forces" (the multiples of the force one normally feels from gravity) experienced on coasters and other amusement park rides. To my surprise, I learned that no government body at any level is responsible for setting limits on how high "g-forces" should be allowed to rise on roller coasters, nor were there any consensus industry standards.

According to research undertaken by my own staff, not only has the average speed of new roller coasters risen dramatically in the last decade, but so has the willingness of park operators to accept designs that may be testing the limits of public health and safety. Steel technology now permits much

higher speeds and a variety of inversions and loops unheard of on older wooden coasters. We appear to be approaching the edge of the safety envelope, yet there is no agreement on where that edge may be crossed.

For example, the November 1999 issue of *Civil Engineering Magazine* reports that "[t]he generally accepted range of g forces is 0 to 4 – at 6g people begin to pass out." Yet my own research has found at least 18 roller coasters in the United States with g-forces above 4, and at least 3 more about to open. Interestingly, the body in Germany which is responsible for setting industry consensus standards has reportedly adopted a limit for the strain placed on passengers of roller coasters. That limit is 5 gs. Yet, in the United States, where there are no limits, at least 2 coasters exceed the German standard. One of these claims to have a maximum g-force of 6.5 – above the "pass out" threshold of 6. It is a German design exported to the United States.

To compound the problem, there is the issue of "lateral" (as opposed to "compression") g-forces, meaning the whip-like motion as the rider is hurled suddenly to the side. Two weeks ago, the amusement park operator at Playland in Rye, New York, decided not to open a new steel coaster after testing revealed that lateral g-forces would reach 4. The operator was guided, in part, by his understanding that the German industry standards recommend lateral g-forces not exceed 2.

Again, in the United States lateral g-forces are not reported to any government agency nor publicized by the amusement ride industry, so no one knows whether the Playland decision reflects the general view of the U.S. industry that we should not design coasters with lateral g-forces above 2, or whether this was an extraordinary and courageous decision compared to the rest of the industry.

In light of these uncertainties, I would appreciate any assistance you can provide regarding what science tells us regarding the potential for neurological and other traumas caused by g-forces on roller coasters and other amusement rides. In particular, I would like to know:

1. What does the medical and scientific literature tell us regarding the risk of subdural hematoma, internal cranial bleeding, stroke and other similar outcomes when riding today's high-speed, high-g-force coasters, or under circumstances of comparable force?
2. What research is currently under way at NIH or supported by NIH regarding this matter specifically, or research on similar injuries to the brain when subjected to comparable trauma?

Thank you for you attention to this matter.

Sincerely,

Ed Markey

Edward J. Markey
Member of Congress

cc: Dr. Gerald Fischbach, Director
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