



UNITED STATES  
CONSUMER PRODUCT SAFETY COMMISSION  
WASHINGTON, DC 20207

Memorandum

DATE: JUN 28 1999

TO : The Commission  
Sadye E. Dunn, Secretary

FROM : Jeffrey S. Bromme, General Counsel *JB*  
Stephen Lemberg, Assistant General Counsel *SL*

SUBJECT: Dive Sticks: ANPR

*July 9, 1999*  
~~JUN 30 1999~~

VOTE SHEET

BALLOT VOTE DUE

Attached is a staff briefing package recommending that the Commission issue an advance notice of proposed rulemaking ("ANPR") addressing a risk of injury associated with certain dive sticks. Tab F of the package contains a draft Federal Register notice that would commence a rulemaking proceeding by issuing an ANPR.

Please indicate your vote on the following options.

I. Approve the Federal Register notice as drafted.

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Date)

II. Approve the draft Federal Register notice with the following changes (please specify).

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Date)

NOTE: This document has not been reviewed or accepted by the Commission.

Initial ML Date 6/24/99

CPSC Hotline: 1-800-638-CPSC(2772) ★ CPSC's Web Site: <http://www.cpsc.gov>

CPSA 61(b)(1) Cleared  
*6/24/99*  
No Mfrs/PrvtLbrs or  
Products Identified  
Excepted by \_\_\_\_\_  
Firms Notified, \_\_\_\_\_

III. Do not approve the draft Federal Register notice.

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Date)

IV. Take other action (please specify).

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\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Date)

Attachment



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CONSUMER PRODUCT SAFETY COMMISSION  
WASHINGTON, DC 20207

CPSC/OFFICE OF  
THE SECRETARY

1999 JUN 24 P 12

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(Signature)

\_\_\_\_\_  
(Date)

Attachment



## BRIEFING PACKAGE FOR DIVE STICKS

June 1999

For Further Information, Contact:  
Scott Heh  
Project Manager  
Directorate for Engineering Sciences  
301-504-0494, ext. 1308

**NOTE: This document has not been reviewed or accepted by the Commission.**  
Initial rh Date 6/24/99

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Product Identified  
Exempted by \_\_\_\_\_  
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Comments Processed.

## TABLE OF CONTENTS

	<u>Page</u>
EXECUTIVE SUMMARY .....	ii
BRIEFING MEMORANDUM.....	1
I. ISSUE .....	1
II. BACKGROUND.....	1
III. DISCUSSION .....	2
A. Severity And Consequences Of Penetrating Injuries To The Perineum.....	2
B. Summary Of The Incident Data.....	3
C. Dive Stick and Pool Characteristics, Use Patterns, and Risk of Injury .....	3
D. Engineering Assessment of Dive Sticks.....	5
E. Market Information And Economic Considerations.....	7
IV. REGULATORY AND OTHER ALTERNATIVES.....	8
V. DISCUSSION OF ALTERNATIVES.....	9
VI. RECOMMENDATION .....	11
 <u>TABS</u>	
Tab A Memorandum from Suad Nakamura, Ph.D., EHHS, to Scott Heh, Directorate for Engineering Sciences, "Severity of Impalement Hazards Associated with Dive Sticks," June 22, 1999.....	12
Tab B Memorandum from Debra Sweet, EHHA to Scott Heh, Project Manager, ESME "Injury Data Related to Dive Sticks," June 22, 1999 .....	14
Tab C Memorandum from Catherine A. Sedney, ESHF, to Scott Heh, Project Manager for Dive Sticks, "Human Factors Assessment of Dive Sticks," June 22, 1999....	18
Tab D Memorandum from Thomas E. Caton, ESME to Scott Heh, ESME, "Description of Dive Sticks and Summary of ESME Analyses on Various Dive Stick Products," June 22, 1999.....	26
Tab E Memorandum from Robert Franklin, Economist, ECSS, to Scott Heh, Project Manager, "Market for Dive Sticks," June 22, 1999.....	30
Tab F DRAFT <u>Federal Register</u> Notice, Advance Notice of Proposed Rulemaking (ANPR) Request for Comments and Information," June 23, 1999.....	34

## Executive Summary

This briefing package addresses the question of whether the Commission should issue an Advance Notice of Proposed Rulemaking (ANPR) that initiates a rulemaking proceeding that could result in a rule banning dive sticks with certain characteristics that cause them to be hazardous.

Dive sticks are one of several types of devices used for underwater retrieval activities in swimming pools. They are typically made of a rigid plastic, and are, or can be weighted so that when dropped into water they sink and stand upright on the bottom of a pool. The U.S. Consumer Product Safety Commission (CPSC) staff is aware of six impalement incidents involving dive sticks that resulted in injuries to the vaginal or rectal regions of young children. These injuries occurred when the children jumped or fell backwards into a pool and landed on a dive stick that was standing upright on the bottom of the pool. Three females (ages eight to nine) sustained injuries when the dive stick penetrated the vagina. One male (age seven) and one female (age six) suffered injuries when the dive stick penetrated the rectum. In the sixth incident, a seven-year-old girl received lacerations around the rectum after landing on a dive stick.

These injuries prompted investigations by the CPSC Office of Compliance into various dive stick products. CPSC staff has sought and obtained voluntary corrective action agreements from 15 different manufacturers or importers of dive sticks that staff has determined pose a risk of impalement injury.

The common features of dive sticks that resulted in impalement injuries were: (1) they stood upright at the bottom of a pool, (2) they were essentially rigid, and (3) they were long enough and small enough in cross section to concentrate the force of impact and allow penetration of the body via the vagina or rectum. Additional factors that combine to create the highest risk of impalement injuries due to impact with dive sticks are the (1) use of the sticks in small shallow pools; (2) typical behavior of children in a recreational context; and (3) a perception among adult caretakers that the product is not hazardous.

A mandatory ban of hazardous dive sticks would be a more effective and efficient way of keeping hazardous dive sticks out of the market than reliance on corrective actions. If the Commission bans hazardous dive sticks, the staff only has to establish that the dive stick at issue fails the requirements set by the rule and enforcement action can be taken quickly.

The costs associated with modifying dive sticks to reduce or eliminate the injury risk are likely to be low. In addition, there are inexpensive substitute products for dive sticks that have similar utility and recreational value, but do not present the risk of impalement injury.

The staff recommends that the Commission publish an Advance Notice of Proposed Rulemaking (ANPR) in the Federal Register that initiates a rulemaking proceeding that could result in a rule banning hazardous dive sticks.



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**To** : The Commission  
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**Through** : Jeffrey S. Bromme, General Counsel *JB*  
 Pamela Gilbert, Executive Director *PG*

**From** : Ronald L. Medford, Assistant Executive Director, *RLM*  
 Office of Hazard Identification and Reduction  
 Scott R. Heh, Project Manager, *SK*  
 Directorate for Engineering Sciences,  
 (504-0494 ext. 1308)

**Subject** : Dive Sticks

**I. ISSUE**

This briefing package addresses the question of whether the Commission should issue an Advance Notice of Proposed Rulemaking (ANPR) that initiates a rulemaking proceeding that could result in a rule banning dive sticks with certain characteristics that cause them to be hazardous.

**II. BACKGROUND**

Dive sticks are one of several types of devices used for underwater retrieval activities in swimming pools. They are typically made of a rigid plastic, and are, or can be weighted so that when dropped into water they sink and stand upright on the bottom of a pool. The staff is aware of six impalement incidents involving dive sticks that resulted in injuries to the vaginal or rectal regions of young children. These injuries occurred when the children jumped or fell backwards into a pool and landed on an upright dive stick. Three females (ages eight to nine) sustained injuries when the dive stick penetrated the vagina. One male (age seven) and one female (age six) suffered injuries when the dive stick penetrated the rectum. In the sixth incident, a seven-year-old girl received lacerations around the rectum after landing on a dive stick.

In addition to the six incidents described above, a seventh incident involved a young girl who sustained a facial laceration below her eye that required four stitches. While attempting to retrieve the dive stick, the girl "bobbed" her head under the water and struck her face on the upright dive stick.

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 Initial rlh Date 6/24/99

CPSA 6 (b)(1) Cleared  
 Product Identified  
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As a result of an investigation by the Office of Compliance (Compliance) and product safety assessments by the technical staff, the staff has determined that certain dive sticks present a risk of impalement injury to children. Compliance has asked 15 manufacturers/importers of dive sticks to participate in an industry-wide voluntary recall.

As of June 21, 1999, all of these companies have agreed to recall their dive sticks through corrective action programs acceptable to the Compliance staff. Most of the firms have agreed to provide a refund to the consumer for dive sticks returned to the place of purchase. Two firms are offering replacement products, and one firm is offering a repair.

As the staff becomes aware of new dive stick products that may present a substantial risk of injury, Compliance will follow up with efforts to obtain voluntary corrective actions. In the meantime, the Commission may consider more comprehensive strategies to address the hazard posed by dive sticks. The following discussion summarizes technical staff analyses of the severity and health consequences of the injuries, the incident data, the use characteristics and risk factors, and the mechanical characteristics of dive sticks. The discussion also includes a summary of market information and economic considerations associated with issuing a regulation. The memorandum concludes with a discussion of options available to the Commission to reduce the risk of traumatic genital and rectal injuries associated with dive sticks and a staff recommendation to issue an ANPR.

### **III. DISCUSSION**

#### **A. Severity and Consequences of Penetrating Injuries to the Perineum**

The Directorate for Health Sciences (HS) discussed the severity and health effects of impalement injuries to the genitalia and rectum, and the medical interventions required for the clinical management of such injuries (Tab A). While penetrating injuries account for only a very small percentage of traumatic injuries in children, they are severe. Falls on vertical objects may result in traumatic injuries to the perineum (the region of the body extending from the anus to the scrotum in males and from the anus to the vulva in females). The severity of rectal or vaginal lesions after impalement depends on the degree of penetration by the object. This, in turn, is dependent on the force of impact and the physical properties of the involved object (size and surface characteristics). The severity of injury could range from laceration to the rectum and sphincter, to puncture wounds and tears of the colon. High impact forces may also cause injuries to the vulva, vaginal canal, and blood vessels beneath the perineal skin in females. In males, such impacts may cause perforation injuries to the genitalia, urethra, ureter and bladder. All these types of perforation or laceration injuries in males and females require hospitalization and surgery.

Because of the septic nature of the area, the main complication after perineum injuries is lesion infection, which may lead to abscess and possible sepsis in extreme cases. To avoid subsequent septic complications, the management of these pediatric injuries often requires aggressive and drastic surgical means. Perineal injuries (with or without rectal injury) often require fecal diversion (proximal colostomy), wound drainage, and the use of a broad-spectrum

antibiotic in pre- and post-operative stages. The damage caused by deep penetration into the rectal or vaginal area may have devastating effects on children's health. In addition to long term physiological effects on children, these types of injuries may cause long lasting emotional trauma.

## **B. Summary of the Incident Data**

The Directorate for Epidemiology, Division of Hazard Analysis (EPHA) provided information on the reported incidents associated with dive sticks (Tab B). From January 1990 to May 1999, the staff is aware of six impalement incidents resulting in injuries to the vaginal or rectal regions of young children. These injuries occurred when the children jumped or fell backwards into a pool and landed on an upright dive stick. Three females (ages eight to nine) sustained injuries when the dive stick penetrated the vagina. One male (age seven) and one female (age six) suffered injuries when the dive stick penetrated the rectum. In the sixth incident, a seven-year-old girl received lacerations around the rectum after landing on a dive stick. Medical attention was sought after each incident and four of the children required surgery to address multiple internal and external injuries. In one of the more severe injuries, the victim suffered a perforated intestine and required a temporary colostomy.

Each of the six impalement incidents involved vertical-standing dive sticks. The products were cylindrical batons, approximately  $7\frac{7}{8}$  to  $8\frac{5}{8}$  inches long and  $\frac{7}{8}$  inch to one inch in diameter.

In addition to the six incidents described above, a seventh incident involved a six-year-old girl who received a laceration below her eye requiring four stitches. This occurred when the girl "bobbed" her head under the water and struck her face on an upright, shark-shaped dive stick that she was attempting to retrieve.

Five of the seven incidents occurred in backyard wading pools. One incident occurred in an unspecified type of pool and another incident occurred in a family spa. An estimate of water depth was given in five incidents, and ranged from 12 to 27 inches. The water depth was not provided for the incident involving the spa, but it was reported that the dive stick was located on a step in the spa.

Tab B contains detailed summaries of each of the incidents discussed above.

## **C. Dive Stick and Pool Characteristics, Use Patterns, and the Risk of Injury**

The Directorate for Engineering Sciences, Division of Human Factors (ESHF) provided an assessment of the product, use patterns, and risks of injury associated with dive sticks (Tab C).

### Product and Pool Characteristics

The common features of the dive sticks which, in part, resulted in the injuries described above are that they: (1) were rigid; (2) stood in a relatively stable, upright position on the floor

in a pool of water; and (3) were long enough and small enough in cross section to concentrate the force of impact and allow penetration of the body via the vagina or rectum. The injuries resulted from the impact of a vulnerable part of the body with the top surface of the stick. The sticks pose a risk of injury because when force is applied in line with the long axis of the sticks, they do not move or flex.

The characteristics of the pool are a second factor affecting the risk of injury. In five of the six incidents for which the information is available, the pools were generally described as wading pools with relatively shallow depths. One was reported to be 12 feet in diameter, and another, a 6-foot spa. These features are important for two reasons. First, water creates resistance, or drag, against the travel of the body. The deeper the water, the slower the body speed at the point of impact with the stick. At sufficient depth, the body may slow and stop before reaching the stick. Conversely, the shallower the water, the higher the potential speed, and the greater the risk of injury on impact. Second, the space available affects the likelihood of impact with the stick. The smaller the area of the pool where a dive stick is placed, the greater the risk that a child jumping into the pool will strike the stick.

#### Use Patterns and the Risk of Injury

Unlike most products classified as “pool toys,” dive sticks serve both as toys and as training devices. They are used, for example, by training instructors for formal swimming instruction. They are also marketed as a game for use in less formal settings. Given these diverse purposes, they are likely to be purchased for use by both children and adults.

#### *Use in In-Ground Pools*

Water familiarization and swimming classes typically are conducted in a large pool with a section deep enough to accommodate diving, and a shallow area with water levels of 3 feet or greater. Where and when one may jump in the pool, the water depth in which the sticks are placed, and use of the product in general are presumed to be under the control of a trained instructor regardless of the age of the student-users of the product. Equipment control is the norm in such settings, and dive sticks are likely to be in the water only when in use. Because of the circumscribed conditions and typical water depths, the risk of injuries due to children landing on dive sticks is minimized in supervised swimming classes.

Such control is not typical in a recreational context, and use of the product is likely to be much more casual, as with other pool toys. Children (or adults) may use the sticks in novel ways, such as a game of “keep away,” as well as in competitive retrieval games. In in-ground pools, depending to some extent on the abilities of the players, placement of the sticks is likely to be in deeper water to make the play more challenging. The larger pool area, depth of the water, and the likelihood that the toys will be in deeper, rather than shallower, water, may make the risk of perineal injuries caused by landing on a dive stick quite low. Given that the exposure of children to dive sticks in in-ground pools is likely to be high, the lack of reported incidents in this setting supports the assumption of diminished risk. However, although the incidents define a clearly “unsafe” water depth for use of the sticks, insufficient information is available to specify a “safe” depth for use by children in the age group at risk.

### *Use in Wading Pools*

The estimated water depths reported in the incidents involving wading pools ranged from 12 to 27 inches. With the exception of the incident in which the young girl received a laceration to her face while attempting to retrieve a dive stick, the descriptions of the events which occurred in shallow pools suggest that the victims were not actively using the sticks when the injury occurred. The sticks simply happened to be in the way when the child jumped or fell into the pool. This is foreseeable in the informal atmosphere of backyard pool use. Play is the point of the activity. Toys and accessories are likely to be available in or near the pool for children to use at their discretion.

This is the scenario in which serious injuries are most likely to occur, because when children are engaged in other types of play, their attention is not on the sticks. Thus, during stereotypical play, such as jumping into the water, or pushing another child into the pool, children are unlikely to be careful to avoid hitting the sticks. Because of the refractive effects of water, even if children notice a stick at the bottom of the pool, they are likely to misjudge its position.

Impact with the genitals, anus, and eyes is less likely than other body parts, simply because they comprise a small proportion of the body, and the surface area of the end of the stick is correspondingly small. Impact with the eyes is perhaps the least likely, because head or face first entry of the body into the water is expected to be uncommon both among younger children, and in shallow pools because children must propel themselves over the vertical side of the pool. More to be expected is children jumping with the knees bent and raised to enter the water with the legs forward of the trunk in a semi-sitting position. This pattern would tend to account for the more serious rectal and vaginal injuries. The likelihood of serious injury resulting from impact with the rigid stick is high, as the tissues of the rectum and vagina are vulnerable, and form a canal through which the relatively unprotected interior of the body can be penetrated.

Adults (and children) are unlikely to assess accurately the risk posed by dive sticks in small shallow pools. Children's products in general, and, perhaps toys in particular, are assumed to be safe. The sticks are promoted as toys, and labeled for children as young as five. Because the injury potential posed by the sticks is not obvious, adults have no reason to remove them from the pool simply because they are not being used at the moment.

In summary, based on the information provided in the incident reports, the factors creating the highest risk of penetration injuries due to impact with dive sticks are (1) the characteristic shape, size and behavior of the sticks in water; (2) use of the sticks in small shallow pools; (3) typical behavior of children in a recreational context; and (4) a perception among adult caretakers that the product is not hazardous.

### **D. Engineering Assessment of Dive Sticks**

The Directorate for Engineering Sciences, Division of Mechanical Engineering (ESME) described the mechanical characteristics of various dive sticks and summarized ESME's assessments of these dive sticks (Tab D).

The dive sticks examined by technical staff can be divided into two categories: (1) pre-weighted and, (2) non-weighted (or weight adjustable). All of the reported injuries are associated with pre-weighted dive sticks. Pre-weighted dive sticks are weighted so that when dropped into water, they sink and stand upright, with the bottom of the dive stick in contact with the bottom of the pool. Pre-weighted dive sticks come in a variety of configurations. The most common types are made of rigid plastic and have a cylindrical profile. These cylindrical dive sticks come in two basic types. One has a solid, X-shaped cross section, and has a weighted end cap. The second type is a sealed tube with an inner segment that is filled partially with sand or a similar substance. Both styles are typically about 8 inches long and less than an inch in diameter at the ends. The hollow tube style is also produced in varying diameters (about 1/2 to 1 1/2 inches) and lengths (about 4 to 10 inches). Some pre-weighted dive sticks are not cylindrical, but instead have novel shapes, such as a shark or a dolphin.

Non-weighted dive sticks are similar to the tube-shaped, pre-weighted dive sticks except that they are provided completely hollow, and have removable end caps. Package instructions for non-weighted, hollow dive sticks ranged from no instructions to detailed instructions that described the effect of filling a dive stick with various amounts of water. The behavior of these dive sticks in the pool depends on how much water is used to fill the sticks. If the dive stick is empty, it will typically float on the water surface in a horizontal orientation. By varying the amount of fill water, ESME observed the following conditions:

1. The dive stick floats in a vertical orientation at the surface of the water, with its top either just below the surface or protruding slightly above the water surface.
2. The dive stick sinks to the bottom and stands vertically, with one end resting on the bottom.
3. The dive stick sinks and rests at an angle (not vertical) with the pool bottom.
4. The dive stick sinks and rests horizontally on the bottom.

As discussed above, some of the non-weighted dive sticks came with instructions to fill with water. At least one brand did not come with instructions. Should the consumer decide to fill a non-weighted dive stick with sand or other solid material, the dive stick could easily be made to sink and stand vertically on the pool bottom, just like a pre-weighted dive stick. However, with or without instructions, it is more likely that the consumer would decide to use water as the fill material.

#### Hazard Assessment of Various Types of Dive Sticks

ESME staff considered all of the cylindrical, pre-weighted dive sticks to pose a risk of injury due to impalement or perineal laceration. In addition, one pre-weighted dive stick that was shaped like a shark profile was also considered to pose an impalement and/or perineal laceration hazard.

For the non-weighted, hollow tube dive sticks, the ESME staff concluded that these also posed a risk for impalement injury and/or perineal laceration when they stand upright at the bottom of the pool. Given that the hazardous upright position is only one of several potential positions for hollow dive sticks, it is less likely that these dive sticks will present an impalement

hazard as compared to pre-weighted dive sticks. However, ESME staff found that it was not difficult to adjust the fill water in many of the hollow sticks to make them sink and stand upright on the bottom of a pool. In fact, some of these dive sticks came with package markings and/or instructions indicating that the sticks will stand upright at the pool bottom.

### **E. Market Information and Economic Considerations**

The Directorate for Economic Analysis (EC) completed an analysis of the dive stick market and discussed economic considerations associated with banning and/or redesign of the product (Tab E). Dive sticks are typically sold in sets of 3 to 6 sticks. They are often sold as part of a package that contains other toys, such as dive disks, eggs, and rings (e.g., a package may include 3 dive sticks, 3 dive rings, and 3 dive disks). They are also sold in conjunction with things such as masks, goggles, or snorkels. Retail prices are usually in the range of \$4 to \$7 per set or about \$1 per individual stick. Retail prices are almost always less than \$10.00, even when sold with other products such as disks, rings, and snorkels.

Dive sticks and other toys are widely available. They are often sold in the seasonal aisles of grocery and drug stores and can be purchased at many department and variety stores. Dive sticks are also available through some mail order catalogs and at various pool dealers.

#### Substitutes

A wide range of substitutes is available for dive sticks. The closest substitute may be dive rings since these are also weighted so that they stand up on the bottom of the pool. Other substitutes are dive disks, which are flat, plastic disks that sink to the bottom of the pool, but lie flat rather than on end. There are also a variety of dive eggs. In general, these substitutes are manufactured and sold by the same companies that manufacture and sell dive sticks, often in the same package. The retail prices of these substitutes are about the same as the retail prices for the dive sticks.

#### Sales and Number Available for Use

Dive sticks have been sold for over 20 years. However, historical sales data are not available to determine whether or not there has been a trend in their use. Based on information provided by several companies to the CPSC, over 19 million dive sticks have been sold. Current sales of individual dive sticks appear to be at least 4 million units annually. Since they are usually sold in packages of 3 to 6 sticks each, this indicates that around 1 million packages are purchased annually.

While the average product life of dive sticks is not known, many are likely to remain available for several years. Since several million dive sticks have been sold annually for the last few years, the total number available for use could easily exceed 10 million units. Assuming dive sticks are sold in sets of 3 to 6 each, this indicates that several million households are likely to own dive sticks.

## Suppliers

The CPSC staff has identified at least 15 firms that manufacture or import dive sticks into the United States. Most of the firms that import dive sticks obtain their product from China, Hong Kong, or Taiwan.

Since the product is inexpensive and simple to manufacture, there may be other manufacturers or importers that the staff has not identified. Additionally, because of the simplicity of the product, it is relatively easy for firms to enter or leave the dive stick market. Therefore, some firms may have once supplied dive sticks but have since stopped doing so. Other firms, that have not supplied dive sticks in the past, may begin doing so.

Initial research indicates that most of the firms that have been identified are small businesses, according to the Small Business Administration guidelines, since they have fewer than 100 employees for importers or 500 employees for manufacturers. However, in all cases dive sticks probably account for a very small percentage of the firm's sales. Several of the manufacturers market various types of pool toys. Others have additional lines such as other types of toys or pool equipment.

## Economic Considerations

The societal costs of incidents involving dive sticks include primarily medical costs, lost productivity, and pain and suffering. The total societal costs of the incidents are likely to be relatively low since the incidents of concern appear to be relatively rare. However, while the aggregate costs may be relatively low, the average societal costs of the incidents requiring hospitalization may exceed \$100,000.<sup>1</sup>

The cost of modifying dive sticks to reduce or remove the risk is likely to be low. For example, dive sticks could be modified so that they lay horizontally on or at an angle at the bottom of the pool, rather than vertically. Such a change may involve some changes in tooling, molds, and design, but little in terms of production and material costs. Another option is to manufacture dive sticks from a material that is less rigid and unlikely to cause an injury to a person who falls on the product. The staff concluded that such modifications would not adversely affect the utility of the product for training or recreational use (Tab C-ESHF).

## **IV. REGULATORY AND OTHER ALTERNATIVES**

One or more of the following alternatives could be used to reduce the identified risks associated with dive sticks.

1. Mandatory rule. The Commission could issue a rule declaring certain dive sticks to be banned hazardous substances. This rule could define the banned products in terms of physical or performance characteristics, or both.

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<sup>1</sup> Based on estimates obtained from the Economic Directorate's Injury Cost Model for hospitalized cases involving punctures or lacerations to the victims' lower trunk area.

2. Labeling rule. The Commission could issue a rule banning dive sticks that did not contain specified warnings and instructions.

3. Voluntary standard. If a voluntary standard exists that adequately addresses the risk and there is substantial conformance to the standard, then the Commission could defer to the voluntary standard in lieu of issuing a mandatory rule.

4. Reliance on recalls. The Commission has obtained voluntary corrective actions with respect to certain dive sticks. The Commission could continue to rely on corrective actions, both voluntary and mandatory, in lieu of, or in addition to a mandatory rule.

## **V. DISCUSSION OF ALTERNATIVES**

### Require a Warning Label

ESHF addressed the option of a warning label at Tab C. Warnings and instructions are the last choice in a hierarchy of approaches to address product hazards. The first approach is to design the dangerous features out of the product. The second choice is to protect against the hazards by guarding or shielding. The third and last alternative is to provide adequate warnings and instructions for proper use and foreseeable misuse.

For a label to be fully effective, consumers must first notice, read, and understand it, then comply with it 100% of the time. Compliance with a label is influenced by a number of factors, such as consumers' familiarity with the product, how severe they perceive the hazard or potential injuries to be, how much and how often it costs (in terms of time, effort, attention, funds, etc.) to obey the warning. In this instance, an adequate warning may have a positive impact at the point of purchase because safer alternative products (e.g., discs or rings) are available, and compliance consists of a one-time decision to buy or not to buy. The criteria for adequacy, that is, for a warning to be potentially effective in persuading consumers not to purchase the product for use in a small shallow pool, are the prominence of the label and the explicitness of the message it contains.

Explicitness is necessary for any warning to be credible. People are less likely to comply with a warning if the connection between the product and the injury potential is not clear, if they cannot imagine what the injury is, or if they do not fully understand how to avoid the hazard. As the hazard presented by this product is not apparent, the label would have to convey clearly that severe and permanent rectal or genital injuries can result if children jump into the water and land on the sticks. Further, a 'safe' water depth would have to be identified to give consumers adequate information on which to base their purchasing decision.

There are obstacles to the post-purchase effectiveness of a warning label. For example, the product may be taken to the home of another child and used in a shallow pool. Also, as with any product, it may be passed on to others (e.g., at a yard sale). Without the packaging, the new owner would be unaware of the hazard. An on-product label is unlikely to be effective in addressing these circumstances. First, it would be difficult to develop a label that is highly

noticeable and easy to read because of the small and typically curved surface area of the stick. Second, a label may not last the life of the product because it is used in water.

ESHF concluded that a package warning label, if both conspicuous and explicit, may help reduce purchase of the product for use in small, shallow pools. Redesign of the product would be more effective in reducing or eliminating the potential for serious injuries.

#### Rely on Recalls

Reliance on recalls would be an inefficient approach to ensuring that hazardous dive sticks stay out of the marketplace. Recalls only respond to products that have already been distributed. To initiate recalls on dive sticks, the staff has to establish independently that each dive stick in question presents a hazard. Further, a recall of an individual manufacturer's dive stick has no binding effects on other manufacturers that may have similar products that present the same hazard.

Dive sticks are inexpensive and simple to manufacture. Therefore, it is easy for a company to enter or exit the market. This makes it difficult for the staff to monitor the marketplace for the sale of dive sticks that may pose an injury risk.

#### Defer to a Voluntary Standard

The Commission staff is not aware of any state, voluntary, foreign, international, or other standards dealing with the described risk of injury. If a voluntary standard were developed for dive sticks, the staff would need to assess the effectiveness that the standard would have in reducing the risk of injury. This would include an examination of the adequacy of the provisions in the standard and the likelihood that manufacturers and importers would conform to the standard.

#### Issue a Mandatory Rule that Bans Hazardous Dive Sticks

A mandatory ban of hazardous dive sticks is a more effective and efficient way of keeping hazardous dive sticks out of the market. If the Commission bans hazardous dive sticks, the staff only has to establish that the dive stick at issue fails the requirements set by the rule and enforcement action can be taken quickly.

While a detailed analysis of the costs and benefits of a rule would be necessary before a final rule is issued, preliminary analysis shows that the costs associated with modifying dive sticks to reduce or eliminate the injury risk is likely to be low. In addition, there are substitute products (e.g., dive rings and dive eggs) that have similar utility and recreational value as dive sticks, but do not present the risk of impalement injury. The same companies that sell dive sticks typically offer these substitute products at retail prices that are about the same as dive sticks.

## VI. RECOMMENDATION

The staff recommends that the Commission publish an ANPR in the Federal Register that initiates a rulemaking proceeding that could result in a rule banning dive sticks with certain characteristics that cause them to be hazardous.

The Office of General Counsel (OGC) prepared a draft Federal Register notice that issues a dive stick ANPR (Tab F). The rulemaking proceeding would commence under the Federal Hazardous Substances Act (FHSA). In the ANPR, the Commission solicits written comments from interested persons concerning the risks of injury associated with dive sticks, the regulatory alternatives, other possible ways to address these risks, and the economic impacts of the various regulatory alternatives. The Commission also invites interested persons to submit an existing standard, or a statement of intent to modify or develop a voluntary standard, to address the risk of injury described in the notice.

**TAB A**



UNITED STATES  
CONSUMER PRODUCT SAFETY COMMISSION  
WASHINGTON, DC 20207

Memorandum

Date: June 22, 1999

To : Scott Heh, Project Manager, Directorate for Engineering Sciences, Dive Stick Project

Through : Mary Ann Danello, Ph.D., Associate Executive Director, Directorate for Health Sciences *mad*  
Lori E. Saltzman, M.S., Director, Division of Health Sciences *W*

From : Suad Nakamura, Ph.D., Physiologist, Division of Health Sciences, x-1202 *W*

Subject : Severity of Impalement Hazards Associated with Dive Sticks

While penetrating injuries account for only a very small percentage of traumatic injuries in children, they are severe (Black, 1998, Jona, 1997, Vinsant, 1985 and Fry, 1994). The cause of these injuries is the direct transfer of energy at impact. Falls on vertical objects may result in traumatic injuries to the perineum (the region of the body extending from the anus to the scrotum in males and from the anus to the vulva in females). The severity of recto-vaginal lesions after impalement depends on the degree of penetration by the object. This in turn is dependent on the force of impact and the physical properties of the involved object (size and surface characteristics). The severity of injury could range from laceration to the rectum and sphincter, to puncture wounds and tears of the colon. High impact forces may also cause injuries to the vulva, vaginal canal, and blood vessels beneath the perineal skin in females. In males, such impacts may cause perforation injuries to the genitalia, urethra, ureter and bladder. All these types of perforation or laceration injuries in males and females require hospitalization and surgery.

Because of the septic nature of the area, the main complication after perineum injuries is lesion infection, which may lead to abscess and possible sepsis in extreme cases. To avoid subsequent septic complications, the management of these pediatric injuries often requires aggressive and drastic surgical means. Perineal injuries (with or without rectal injury) often require fecal diversion (proximal colostomy), wound drainage, and the use of a broad-spectrum antibiotic in pre- and post-operative stages (Beiler, 1998, Daroty et. al., 1994, and Reinberg, 1989). The damage caused by deep penetration into the rectal or vaginal area may have devastating effects on children's health. In addition to long term physiological effects on children, these types of injuries may have the potential to cause long lasting emotional trauma.

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**TAB B**



UNITED STATES  
CONSUMER PRODUCT SAFETY COMMISSION  
WASHINGTON, DC 20207

**Memorandum**

Date: June 22, 1999

TO : Scott Heh  
Project Manager, Dive stick Team  
Division of Mechanical Engineering

THROUGH : Susan Ahmed, Ph.D. *sa*  
Associate Executive Director  
Directorate for Epidemiology

FROM : Debra Sweet, EPHA *ds*

SUBJECT : Injury Data Related to Dive sticks

This memorandum provides a summary of injury and incident data related to dive sticks. Data on emergency room-treated injuries (provided by the National Electronic Injury Surveillance System (NEISS)) are reported for the period from January 1990 through May 1999. Incident reports (provided by the Injury and Potential Injury Incident file (IPII)) are included for the same time period. The data bases were searched under codes 1365 (Water Toys), 1392 (Toy Sports Equipment) and 5004 (Toys) and word searches for "baton," "stick," "stix" and "div."

**Impalement Injuries**

This document was prepared primarily to report impalement injuries with dive sticks. The U. S. Consumer Product Safety Commission (CPSC) staff is aware of six impalement incidents resulting in injuries to the perineal region. Three females (ages eight to nine) sustained injuries when the dive stick penetrated the vagina. One male (age seven) and one female (age six) suffered injuries when the dive stick penetrated the rectum. In the sixth incident, the seven year old female victim received external lacerations around her rectum after landing buttock first on the dive stick. Medical attention was sought after each incident and four of the injuries required surgery to address multiple internal and external injuries. Incident summaries are attached.

Each of the incidents involved vertical-standing dive sticks. The products were cylindrical batons, approximately  $7 \frac{7}{8}$  to  $8 \frac{5}{8}$  inches long and  $\frac{7}{8}$  to one inch in diameter. One of the involved dive sticks was white in color, another was blue; the colors of the remaining dive sticks are unknown. In one incident, it was reported that the victim could not see the dive stick because of the white color and the faded blue numbers.

The victims in five of the reported incidents were injured while playing in shallow depths of water. Of these, three occurred in small wading pools with water levels between 12 and 24 inches. Of the remaining two incidents, one occurred in a spa with unknown water depth and one occurred in a pool measuring three feet in height with approximately 27 inches of water.

The sixth incident (NEISS case) reportedly took place in a pool; however, neither the type of pool nor the water depth is known.

### **Facial Lacerations Resulting from Submersion onto Dive stick**

In addition to genital and rectal injuries, one facial laceration was reported to CPSC where a six year old female was attempting to retrieve a dive stick. The child stuck her face in the water and hit her face on the product.

The victim was swimming in a wading pool with approximately 18 inches of water. The dive stick involved in the incident was a plastic object shaped like a shark, measuring 8 1/2 inches long and 1/8 inch thick.

The incident resulted in a laceration under the victim's eye which required four sutures.

### **Other Injuries**

Three incidents (NEISS-reported) occurred when the victims were struck by the dive stick. The two female (ages ten and seven) and one male (age nine) victims were each injured after being hit in the head with a dive stick. Two of the injuries were facial lacerations and the third incident resulted in an eye injury. A more detailed account of the injuries is attached.

### **Deaths**

There have not been any deaths reported to CPSC that occurred from contact with dive sticks.

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### **NOTES:**

The IPII data provide information about ways in which injuries happen, and can be used to note that some minimum number of cases of a particular type occurred. They are not, however, a statistically representative data base, nor a count of all incidents and injuries which have occurred. For this reason, while the information above is useful in identifying hazards and severe injuries, no conclusions about proportions or about overall size of the problem can be drawn from these data. Due to the small number of NEISS incidents, staff is unable to make a national estimate on dive stick-related incidents.

CPSC staff has been told of three additional incidents. However, these incidents have been excluded from this analysis because they either could not be verified or insufficient information was available to determine whether a dive stick was directly involved in the injury.

## INCIDENT SUMMARIES

### Impalement Injuries

- July 22, 1990 -- The seven year old female victim was playing with her cousins in an above ground swimming pool. She jumped up and out of the water, tucked her knees to her chest to do a "cannon ball" jump and re-entered the water. The victim entered the water buttocks first and rapidly descended to the bottom of the pool, where her buttocks came in contact with the upright, cylindrical dive stick. The dive stick caused lacerations around the victim's rectum. No stitches were required and the victim has recovered fully.
- July 22, 1993 -- The eight year old girl was sitting on the edge of her family's spa with her feet in the water. She used her arms to push off the edge and sit on a lower step of the spa, without seeing the vertical-standing, cylindrical dive stick on the same, lower step. The dive stick slipped past the victim's swimsuit and penetrated into her vagina. Immediate medical attention was sought and surgery was performed to repair multiple internal, vaginal lacerations. Additional surgery was necessary five months later. No recovery records are available.
- July 24, 1995 -- The nine year old female victim jumped into a swimming pool and landed on a dive stick; she landed on the perineum, causing deep vaginal lacerations.
- August 3, 1997 -- The six year old female victim jumped into her inflatable wading pool. The victim's buttock area landed on top of the vertical-standing, cylindrical dive stick. The product and the girl's swimsuit were projected into her rectum. The victim was admitted to a children's hospital for surgery to repair perineal and external sphincter lacerations. The victim has recovered from the incident but will be examined periodically.
- June 10, 1998 -- The eight year old female victim was playing with her brother in a wading pool. She fell backwards in the pool, landing on the cylindrical dive stick that was standing upright on the bottom of the pool. The dive stick penetrated the vagina. A physician surgically repaired the laceration with both internal and external sutures. The victim has recovered.
- June 28, 1998 -- The seven year old boy and his brother had been playing with the cylindrical dive sticks prior to the incident. The victim ran and jumped buttock first into the wading pool. He impaled himself via the rectum on a dive stick which was standing upright in the water. Surgery was performed to repair a laceration of the rectum and a perforated intestine. A temporary colostomy was performed to allow the intestine to heal. The victim healed well, but continues to complain of abdominal pain.

### Facial Lacerations Resulting from Submersion onto Dive stick

- August 13, 1998 -- The six year old female victim and three other children were in a small wading pool playing with dive sticks, shaped like sharks. The victim stuck her face into the pool to retrieve the dive stick and hit her face on the toy. She received a  $\frac{3}{4}$  inch laceration below her left eye, which required sutures to close. The victim has recovered.

## **Other Injuries**

- July 10, 1994 -- The nine year old male victim received a laceration to his forehead after being hit in the head with a dive stick.
- July 14, 1996 -- The ten year old female victim received an eye injury when she was hit in the eye with a dive stick.
- June 29, 1997 -- The seven year old female victim received a laceration to the face when she was hit in the head with a dive stick.

**TAB C**

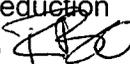


United States  
**CONSUMER PRODUCT SAFETY COMMISSION**  
Washington, D.C. 20207

**MEMORANDUM**

**DATE:** 22 June, 1999

**TO:** Scott Heh, ESME  
Project Manager, Dive Sticks

**Through:** Jacqueline Elder, <sup>je</sup>Deputy Assistant Executive Director  
Office of Hazard Identification and Reduction  
Robert B. Ochsman, Ph.D., Director,   
Division of Human Factors (ESHF)

**FROM:** Catherine A. Sedney, ESHF (x1282) 

**SUBJECT:** Human Factors Assessment of Dive Sticks

This memorandum provides a Human Factors assessment in support of the staff's effort to evaluate the risk of penetration injuries to children from a type of pool toy commonly called a dive stick. This effort is a follow-up to investigations initiated by the Office of Compliance following reports of injuries that occurred when children struck a dive stick after jumping or falling into small backyard pools. The following sections present (1) an assessment of the factors that may affect the risk of injuries to children; and (2) a discussion of product-related options to address that risk.

**Background**

General Product Information and Labeling

Dive sticks are one of several types of devices used for underwater retrieval activities in swimming pools. Based on a review of available products conducted in support of Compliance investigations, they are typically made of a rigid plastic, and are or can be weighted so that when dropped into water they sink and stand upright on the bottom. Frequently the sticks are marked with numbers for scoring, and are often made in bright colors. There are two common types of dive sticks. One is X-shaped in cross section and has a weighted end cap. The second type is a sealed hollow tube with an inner segment filled with sand or a similar substance. Both styles are typically about 8 inches long and less than an inch in diameter at the ends. The hollow tube style is also produced in varying diameters (about 1/2 to 1 1/2 inches) and lengths (about 4 to 10 inches), and may be empty, rather than weighted. The latter variety has a removable cap, and the package instructions typically indicate that it is to be weighted with water by the consumer. Depending on how it is filled, a stick of this type may float, sink at various rates, stand vertically on the bottom, or lay flat on the bottom. Also identified as dive sticks are products that have novel shapes, usually of a sea creature, such as a shark, dolphin, or sea horse.

The products are typically sold in packs of six, or multiple sticks combined with other types of dive toys, such as rings, disks, or eggs. They are often marketed with statements such as “excellent for training” or “recommended by swim instructors.” Some products are packaged with little information. Others detail various underwater retrieval games, and provide specific instructions, such as using only for in-the-water surface dives, and removing the sticks from the water when not in use. Most carry some warnings regarding small parts (in reference to the end caps), use only under the supervision of a competent swimmer, and/or diving in shallow water. When age grading is included, the products are generally labeled for children aged five and older.

#### Incident Data

The Commission is aware of 7 incidents<sup>1</sup> in which children struck a dive stick that was standing upright in a pool of water. The victims ranged from six to nine years of age. Six children jumping or falling into the water landed on an upright stick, striking the perineum, and/or penetrating the body through the rectum or vagina. Four of these resulted in injuries requiring surgery and hospitalization; in the most serious of these the victim suffered a perforated intestine and required a temporary colostomy. The fifth victim did not require stitches, and no information regarding medical treatment was reported in the sixth incident. The seventh incident occurred when a child trying to retrieve a shark-shaped dive stick from the pool bottom collided with it, and received a laceration requiring stitches below her eye.

Some product details are given in each of the seven incident reports. Six of the products were described as weighted sticks. No further information is reported on one of the products. The remaining five were either tubular or X-shaped in cross section, and had flat cylindrical ends. They were reported as measuring 7 7/8 to 8 5/8 inches long and 7/8 to one inch in diameter. The product in the seventh incident had a shark-shaped profile with an ellipsoid bottom. The overall length of the toy was 8 1/2 inches. The shark profile was 5 3/4 inches long and 1/8 inch thick, with a blunt tip measuring approximately 3/8 inch across.

Information on the pools in which the dive sticks were placed is available in six of the seven incidents. Water depth, or an estimate of it, is given in five incidents, and ranges from 12 to 27 inches. The sixth incident occurred in a spa pool, and the dive stick was located on the first step of the pool.

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<sup>1</sup>Six additional incidents were excluded from consideration. Three children were hit in the head, face or eye, presumably when a dive stick was thrown into the water. For the three remaining incidents little or no information is available.

## Discussion

### Product and Pool Characteristics

The common features of the dive sticks which, in part, resulted in the injuries described above are that they: (1) were rigid; (2) stood in a relatively stable, upright position on the floor of a pool of water; and (3) were long enough and small enough in cross section to concentrate the force of impact and allow penetration of the body via the anal or vaginal opening.

The injuries resulted from the impact of a vulnerable part of the body with the top surface of the stick. The sticks pose a risk of injury because when force is applied in line with the long axis of the sticks, they do not move or flex. The injury potential declines with the angle of impact relative to the long axis. The sticks stand upright because they are lighter at the top; this also means that if struck at an angle they will move in the direction of the applied force. Because the sticks move with a force applied at an angle, the body pushes the stick away, and the risk of injury is reduced.

The characteristics of the pool are a second factor affecting the risk of injury. In five of the six incidents for which the information is available, the pools were generally described as wading pools with relatively shallow depths. One was reported to be 12 feet in diameter, and another, a 6-foot spa. These features are important for two reasons. First, water creates resistance, or drag, against the travel of the body. The deeper the water, the slower the body speed at the point of impact with the stick. At sufficient depth, the body may slow and stop before reaching the stick. Conversely, the shallower the water, the higher the potential speed, and the greater the risk of injury on impact. Second, the space available affects the likelihood of impact with the stick. The smaller the area of the pool where a dive stick is placed, the greater the risk that a child jumping into the pool will strike the stick.

### Users, Use Patterns and the Risk of Injury

Unlike most products classified as "pool toys," dive sticks serve both as toys and as training devices. They are used, for example, for formal swimming instruction. They are also, as noted above, marketed as a game for use in less formal settings. Given these diverse purposes, they are likely to be purchased for use by both children and adults.

Sources indicate that the age-grading (five and older) on the products is reasonable, as children around four or five years of age are capable of learning to swim (Goodson & Bronson, 1985; p. 86), and of participating in underwater games (M. Carter, Aquatics Director, Bethesda/Chevy Chase YMCA; personal discussion, 2/2/99). Underwater exploration is included in the American Red Cross (ARC) aquatics program for children aged 6 months to 5 years, and underwater retrieval is included in early levels of the ARC "Learn to Swim" Program for children and adults.

### Use in In-Ground Pools

Water familiarization and swimming classes typically are conducted in a large pool with a section deep enough to accommodate diving, and a shallow area with water levels of 3 feet or

greater. Where and when one may jump in the pool, the water depth in which the sticks are placed, and use of the product in general are presumed to be under the control of a trained instructor regardless of the age of the student-users of the product. Equipment control is the norm in such settings, and dive sticks are likely to be in the water only when in use. Because of the circumscribed conditions and typical water depths, the risk of injuries due to children landing on dive sticks is minimized in supervised swimming classes.

Such control is not typical in a recreational context, and use of the product is likely to be much more casual, as with other pool toys. Children (or adults) may use the sticks in novel ways, such as a game of "keep away," as well as in competitive retrieval games. In in-ground pools, depending to some extent on the abilities of the players, placement of the sticks is likely to be in deeper water to make the play more challenging. The larger pool area, depth of the water, and the likelihood that the toys will be in deeper, rather than shallower, water, may make the risk of perineal injuries caused by landing on a dive stick quite low. Given that the exposure of children to dive sticks in in-ground pools is likely to be high, the lack of reported incidents in this setting supports the assumption of diminished risk. However, although the incidents define a clearly "unsafe" water depth for use of the sticks, insufficient information is available to specify a "safe" depth for use by children in the age group at risk.

#### Use in Wading Pools

Children's play with the product in wading pools is likely to be similar to that in deeper pools, at least to some extent. The estimated water depths reported in the incidents involving wading pools ranged from 12 to 27 inches. For young beginners, this is sufficiently deep to accommodate basic underwater retrieval (e.g., simply holding the breath and submerging long enough to obtain the toy). For children who are more comfortable and experienced in the water, it is still adequate for games, such as "diving" from a position in the water and crossing the pool underwater to retrieve the sticks. This type of use appears to pose little or no risk of penetration injury.

The risk of eye and facial lacerations during retrieval of dive sticks may be somewhat greater in shallow pools because of the low water level, and the possibility that the users may be younger and/or less experienced than the typical users of in-ground pools. Many children may be reluctant to keep their eyes open when submerged. They may engage in the type of "bobbing" behavior described in one incident, by sighting the toy from above, then closing their eyes to go under the water and grab it. Because of the distortion which occurs when objects are viewed through the surface of water, children may misjudge the stick's position and collide with it. This may pose a risk of eye injury if the toy has a sharp end, as was the stick shaped like a shark in one incident. The potential for eye injury under these conditions (i.e., "bobbing" down at a relatively slow speed with eyes tightly closed) is less certain with the more common sticks, which have flat round ends.

With the exception of the report mentioned in the preceding paragraph, the descriptions of the events which occurred in shallow pools suggest that the victims were not actively using the sticks when the injury occurred; the sticks simply happened to be in the way when the child jumped or fell into the pool. This is foreseeable in the informal atmosphere of backyard pool

use. Play is the point of the activity. Toys and accessories are likely to be available in or near the pool for children to use at their discretion.

This is the scenario in which serious injuries are most likely to occur, because when children are engaged in other types of play, their attention is not on the sticks. Thus, during stereotypical play, such as jumping into the water, or pushing another child into the pool, children are unlikely to be careful to avoid hitting the sticks. Again because of the refractive effects of water, even if children notice a stick at the bottom of the pool, they are likely to misjudge its position. Children are also unlikely to foresee the potentially serious consequences of impact with the stick.

Adults are also unlikely to assess accurately the risk posed by the product in small shallow pools. Children's products in general, and, perhaps toys in particular, are assumed to be safe. The sticks are promoted as toys, and labeled for use by young children. The warnings against use by children under three because of small parts are likely to be familiar to parents because of their ubiquity on toy packaging. The remaining warnings address *diving* in shallow pools, not *use* of the sticks in shallow pools. Beyond the hazards expressed in these warnings (presuming they are read), adult caretakers are likely to perceive the sticks as innocuous. Even among agency staff members, who are used to viewing consumer products with an eye toward obscure hazards, explanation of the injury scenario is necessary before the hazard is clear. Because the injury potential posed by the sticks is not obvious, adults have no reason to remove them from the pool simply because they are not being used at the moment.

Depending on the body position when falling or jumping into the water (e.g., jumping buttocks first, doing a "belly flop, or falling/jumping in sideways or face-up), a child may strike the stick at any angle with virtually any part of the body. The buoyancy of the body in water slows the speed of impact to some extent, and over the majority of the surface of the body, the tissues (skin, fat, muscle) are both somewhat elastic and compressible, and would tend to absorb the impact. Thus, bruises to various parts of the body (unlikely to be reported because of their low severity) are the most likely injuries in this scenario.

Impact with the genitals, anus, and eyes is less likely than other body parts, simply because they comprise a small proportion of the body, and the surface area of the end of the stick is correspondingly small.<sup>2</sup> Impact with the eyes is perhaps the least likely, because head or face first entry of the body into the water is expected to be uncommon both among younger children, and in shallow pools because children must propel themselves over the vertical side of the pool. More to be expected is children jumping with the knees bent and raised to enter the water with the legs forward of the trunk in a semi-sitting position. This pattern would tend to account for the more serious rectal and vaginal injuries. The likelihood of serious injury resulting from impact with the rigid stick is high, as the tissues of the rectum and vagina are vulnerable, and form a canal through which the relatively unprotected interior of the body can be penetrated.

In summary, based on the information provided in the incident reports, the factors creating the highest risk of penetration injuries due to impact with dive sticks are the (1) the characteristic

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<sup>2</sup>The small diameter of the sticks makes striking them less likely, but increases the likelihood of penetration on impact.

shape, size and behavior of the sticks in water; (2) use of the sticks in small shallow pools; (3) typical behavior of children in a recreational context ; and (4) a perception among adult caretakers that the product is not hazardous.

#### Options for Addressing the Risk of Injury: Warnings v. Design

Warnings and instructions are the last choice in a hierarchy of approaches to address product hazards (Fowler, 1980; Cooper & Page, 1989; Woodson, Tillman & Tillman, 1992; Sanders & McCormick, 1993):

- Design the dangerous features out of the product.
- Protect against the hazards by guarding or shielding.
- Provide adequate warnings and instructions for proper use and foreseeable misuse.

Simply providing information in the form of a warning is the least effective method. In order for a label to be fully effective, consumers must first notice, read, and understand it, then comply with it 100% of the time. Compliance is influenced by a number of factors, such as consumer's familiarity with the product, how severe they perceive the hazard or potential injuries to be, how much and how often it costs (in terms of time, effort, attention, funds, etc.) to obey the warning. In this instance, an adequate warning may have a positive impact at the point of purchase because safer alternative products (e.g., discs or rings) are available, and compliance consists of a one-time decision to buy or not to buy. The criteria for adequacy, that is, for a warning to be potentially effective in persuading consumers not to purchase the product for use in a small shallow pool, are the prominence of the label and the explicitness of the messages it contains.

Warnings often go unnoticed because they are written in small print in a lower corner, or on the back of, the package. To insure that the warning is noticed, it would have to be sufficiently conspicuous to compete successfully with the images and other text (including the brand name) on the package. Ideally, it would be the largest, boldest text on the front of the package, much like a newspaper headline.

Explicitness is necessary for any warning to be credible. People are less likely to comply with a warning if the connection between the product and the injury potential is not clear, if they cannot imagine what the injury is, or if they do not fully understand how to avoid the hazard. As the hazard presented by this product is not apparent, the label would have to convey clearly that severe rectal or genital injuries can result if children jump into the water and land on the sticks. Further, a "safe" water depth would have to be identified to give consumers adequate information on which to base their purchasing decision.

There are obstacles to the post-purchase effectiveness of a warning label. For example, the product may be taken to the home of another child and used in a shallow pool. Also, as with any product, it may be passed on to others (e.g., at a yard sale). Without the packaging, the new owner would be unaware of the hazard. An on-product label is unlikely to be effective in addressing these circumstances. First, it would be difficult to develop a label which is highly noticeable and easy to read because of the small and typically curved surface area of the stick. Second, a label may not last the life of the product because it is used in water.

When practical, redesign of the product is the preferred option for injury prevention, as its effectiveness does not rely on human behavior. Based on the opinions of technical staff (T. Caton, ESME; S. Nakamura, EHHS), an expert witness for a plaintiff injured by a dive stick (Dr. George Pearsol, Duke University), and an unnamed physician who performed surgery on one of the victims (IDI 981026CBB0050), various modifications could minimize or eliminate the potential for serious injury. Among those suggested include sticks (1) of a wider diameter; (2) made of a flexible material; and/or (3) designed to rest at an acute angle when under water, rather than vertically. Based on a limited review of currently marketed diving toys, as well as retrofits and prospective design changes proposed by manufacturers/importers of the products, these options appear feasible. It is the opinion of Human Factors that such modifications would not adversely affect the utility of the product for training or recreational use.

## **Conclusion**

The primary risk of serious injuries due to dive sticks occurs when they are used by children in shallow pools. Injuries resulting from impact with most parts of the body are expected to be minor; impact with the perineum can result in serious injuries. A package warning label, if both conspicuous and explicit, may help reduce purchase of the product for use in such pools. Redesign of the product would be more effective in reducing or eliminating the potential for serious injuries.

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**TAB D**



UNITED STATES  
CONSUMER PRODUCT SAFETY COMMISSION  
WASHINGTON, DC 20207

**Memorandum**

**Date:** June 22, 1999

**To** : Scott Heh, Dive Stick Project Manager,  
Directorate for Engineering Sciences

**Through** : Nicholas V. Marchica, Director, *NVM*  
Division of Mechanical Engineering,  
Directorate for Engineering Sciences

**From** : Thomas E. Caton, General Engineer, *T.C.*  
Directorate for Engineering Sciences,  
(504-0494 ext. 1305)

**Subject** : Description of Dive Sticks and Summary of ESME Analyses on Various Dive  
Stick Products

**Introduction**

This memorandum describes products referred to as dive sticks and summarizes ESME's examination of these products. In support of Compliance investigations on dive sticks, ESME assessed the laceration and impalement hazard of various dive stick product brands. As of May 21, 1999, ESME examined dive sticks sold by 15 manufacturers/importers to assess whether they posed a laceration or impalement hazard to the genital and rectal region. The characteristics of each dive stick were compared to those of a dive stick that was involved in an incident involving a six-year old girl who landed buttocks first on a dive stick. This child suffered a perineal tear that required surgical repair.

ESME examined these dive sticks samples in conjunction with ESHF and EHHS. ESME's examination consisted of selecting a sample of each dive stick brand by sample number. The length and diameter (or breadth) of these selected samples were measured and recorded. Each sample of a dive stick brand was dropped in a bucket of water of sufficient depth and diameter. The depth of the water was always greater than the length of the dive stick being tested and was typically at least 11 inches. The bucket's diameter was sufficiently large for the dive stick to lie down and rest horizontally on the bottom. The sample's behavior in water was recorded as to whether it floated horizontally, floated vertically with one end near the water surface, stood vertically on the bottom, rested at an angle to the bottom, or rested horizontally on the bucket's bottom.

The technical staff considered a dive stick that had all of the following characteristics to pose a hazard for traumatic injuries to the perineum, including laceration and perforation injuries associated with rectal and vaginal impalement:

- (1) The product is essentially rigid.
- (2) The product is weighted so that when dropped in water, it sinks to the bottom and stands upright (vertical) with the top end pointing toward the surface of the water.
- (3) The product has an elongated shape with a top end that is small enough in cross section to concentrate the force of impact and allow penetration of the rectum or vagina. (Examples: a hazardous dive stick could have a cylindrical shape with a blunt end or it may have a more pointed end such as one product that was shaped like a shark silhouette.)

### **Tubular Cross Section Dive Sticks**

The tubular cross section plastic dive sticks were provided either as pre-weighted sticks with non-removable caps or as non-weighted hollow sticks with removable end caps.

#### **Pre-weighted, Tubular Cross Section Dive Sticks**

The majority of the pre-weighted tubular cross section dive stick brands used flat topped cylindrical end caps. A few brands used other caps such as a winged-top cap, a semi-round cap, a fish-head top cap, and a fish-tail bottom cap. They were received in various lengths and outside tube diameter combinations. The lengths ranged from about 4 inches to 10 inches (10 centimeters to 25 centimeters). Outside tube diameters ranged from about 1/2 inch to 1-5/8 inches (1.25 centimeters to 4.1 centimeters). The 1/2 inch diameter by 10 inch long stick was intended to be used with a float as a target for a ring toss game. Without the float, this 10 inch long stick could act like a dive stick.

The end caps from several pre-weighted tubular cross section dive sticks were forcibly removed in order to observe their interiors. Some had an inner plug that prevented observation of the material used to weight the dive stick. Other dive sticks were not internally plugged and were found to be weighted with sand. In either case, these dive sticks were partially weighted, so that the remaining air space would be at the top of the dive stick. This configuration causes pre-weighted dive sticks to stand vertically on a pool bottom. The amount of fill sand was adjusted in two pre-weighted sticks in order to observe how this changed their behavior in water. When one was completely filled with sand, it sunk and rested horizontally on the bottom of a bucket of water. When some sand was removed from the second stick, it floated horizontally on the water surface.

The winged-top cap dive stick was a variation of the pre-weighted dive stick. The winged-top cap had a hole perforating it. Its tube wall was also perforated above the interior pre-weight. When this dive stick was dropped into a bucket of water, it sank, spiraling downward with air escaping from the perforated winged top, allowing water to fill the interior. It was claimed by the manufacturer/ importer that this dive stick would eventually fill with water and

rest horizontally on the pool bottom. Both winged-top cap dive sticks tested by ESME stood vertically at the bottom of the bucket and never settled to the horizontal position.

#### Non-weighted, Hollow, Tubular Cross Section Dive Sticks

All of the non-weighted, hollow, tubular cross section dive sticks had removable end caps. Two styles had essentially flat-topped removable end caps with either transparent or translucent tubes. The third style was a molded hollow tube with a removable top end cap shaped like a fish head and a bottom end cap shaped like a fish tail. Some of these hollow tube dive stick brands were received in packages that had no instruction about weighting the tubes. Other brands had instructions that the consumer should fill the tube with various amounts of water to alter a dive stick's performance. For example, an empty, as-received hollow dive stick will float horizontally. Filling a dive stick partially with water will usually result in it either floating vertically with its top near the water surface or its top sinking just below the water surface. Filling a dive stick almost completely with water, leaving a small air space at the top, will result in it sinking and standing vertically, with the bottom of the dive stick in contact with the bucket bottom. Filling a dive stick completely with water with no air space will result in it resting horizontally on the bottom.

Several trials with various amounts of water were typically necessary to fill a hollow, non-weighted dive stick with the proper amount of water needed to cause it to stand vertically on the bucket bottom. Usually, a partially water-filled dive stick would float vertically in the bucket of water with its top near the water surface. Under this condition, and if the water is slightly deeper than the dive stick's length, the dive stick would then hover vertically just off the bottom. In this condition, it is possible that a vertically floating dive stick could pose an impalement hazard similar to that of a dive stick that is standing vertically on the bottom of the pool.

The non-weighted, hollow dive stick with the fish head and fish tail end caps came with package instructions that said the speed of descent could be adjusted by varying the amount of water inside the tube. More or less water fill could result in it sinking or floating. This provided more variations than the other, non-weighted, hollow dive sticks. Depending on how it was filled, this fish head/tail dive stick floated on the water surface, floated vertically protruding out of the water surface, stood vertically on the bottom, stood on the bottom at an acute angle, or rested horizontally on the bottom. With this dive stick there was a limited range of water filling levels that could cause it to stand in the hazardous vertical position on the pool bottom. ESME considers this particular dive stick to be much less likely to present the impalement hazard as a pre-weighted dive stick.

Package instructions for non-weighted, hollow dive sticks ranged from no instructions to detailed instructions that described the effect of filling a dive stick with various amounts of water. One brand had instructions to fill the dive stick with water to a prescribed water-level line. There were no instructions that mentioned the use of other fill materials such as sand. However, for the hollow, tubular cross section dive sticks examined by ESME, if a consumer partially fills the dive stick with sand, the result could be similar to a pre-weighted dive stick because it will stand vertically on the bottom and present an impalement hazard.

## **Pre-weighted X-shaped Cross Section Dive Sticks**

The other typical dive stick examined by ESME has a solid X-shaped cross section. These dive sticks have a weighted, white-colored, plastic end-piece inserted over a snap clip on one end. The opposite end has no added weight. This results in a dive stick that stands vertically on the bottom of a swimming pool. The typical lengths of the X-shaped cross section dive sticks were about 8 inches (20.3 centimeters) and their breadths have ranged from about 3/4 inch to 13/16 inch (1.9 to 2.1 centimeters). All of the solid, X-shaped cross section dive sticks examined by ESME posed an impalement and/or perineum laceration hazard.

## **Other Dive Toys**

ESME examined other diving toy devices with unique shapes that did not resemble sticks that were made from semi-rigid or rigid plastic. One of these devices had a shark body silhouette top attached to a weighted semi-ellipsoid shaped bottom. This product stands vertically on the pool bottom like the pre-weighted X-shaped and tubular cross section dive sticks. Although not stick shaped, the shark body silhouette presents a perineal laceration and impalement hazard because it has a pointed top end.

Some of the other dive toys examined by ESME were in the shape of rings, eggs, animals, and bones. These devices can be used for comparable water activities that dive sticks are used. The behavior of these other dive toys in water varied from floating, sinking and standing on the bottom, to sinking and resting horizontally on the bottom. These other diving toys do not present the same hazard as the dive sticks.

# TAB E



UNITED STATES  
CONSUMER PRODUCT SAFETY COMMISSION  
WASHINGTON, DC 20207

**Memorandum**

Date: June 22, 1999

TO : Scott Heh, Project Manager, Dive Sticks  
THROUGH: Warren Prunella, AED, Directorate for Economic Analysis *WJ*  
FROM : Robert Franklin, Economist *RF*  
SUBJECT : Market for Dive Sticks

This memorandum provides an overview of the market for dive sticks and some of the economic issues that will need to be analyzed further, if the Commission decides to initiate rulemaking regarding this product.

**The Product**

Dive sticks are a type of dive toy intended for use in swimming pools. They are made from rigid plastic and are usually cylindrical in shape, but some have shapes that resemble such things as fish or sharks. Typically, the length is 8 inches or less and the diameter is one inch or less. Many dive sticks are pre-weighted so that they will sink to the bottom of the swimming pool and stand up on one end. Dive sticks and other toys are often numbered with a point value (e.g., 10 through 60) for counting up totals in games. In some cases, the units with the higher point values may be shorter than those with lower point values.

Several variations of dive games can be played with dive sticks. For example, the toys may be thrown into the pool and the player who collects the most toys or the toys with the highest total point value wins. Another game may involve one player at a time retrieving the toys from the pool bottom and the winner being either the one who was able to retrieve all the toys in the least amount of time or retrieved the most in a given amount of time. Dive sticks may also have uses in formal swimming instruction and relay events.

Dive sticks are usually sold in sets of 3 to 6 sticks. They are often sold as part of a package that contains other toys, such as dive disks, eggs, and rings (e.g., a package may include 3 dive sticks, 3 dive rings, and 3 dive disks). They are also sold in conjunction with things such as masks, goggles, or snorkels. Retail prices are usually in range of \$4 to \$7 per set or about \$1 per individual stick. Retail prices are almost always less than \$10, even when sold with other products such as disks, rings, and snorkels.

Dive sticks and other toys are widely available. They are often sold in the seasonal aisles of grocery and drug stores and can be purchased at many department and variety stores. Dive toys are also available through some mail order catalogs and at various pool dealers.

### **Substitutes**

A wide range of substitutes is available for dive sticks. The closest substitute may be dive rings since these are also weighted so that they stand up on the bottom of the pool. Other substitutes are dive disks, which are flat, plastic disks that sink to the bottom of the pool, but lie flat rather than on end. There are also a variety of dive eggs. In general, these substitutes are manufactured and sold by the same companies that manufacture and sell dive sticks, often in the same package. The retail prices of these substitutes are about the same as the retail prices for the dive sticks.

### **Sales and Number Available for Use**

Dive sticks have been sold for over 20 years. However, historical sales data are not available to determine whether or not there has been a trend in their use. Based on information provided by several companies to the CPSC, more than 19 million dive sticks have been sold. Currently, sales of individual dive sticks appear to be at least 4 million units annually. Since they are usually sold in packages of 3 to 6 sticks each, this indicates that around 1 million packages are purchased annually.

In trade publications, dive sticks are classified in the water/pool/sand toys category. This category includes products such as water guns, floats, wading pools, and sand buckets. Sales vary with season, more being sold in the summer than in the winter. Sales of water/pool/sand toys also tend to vary from year to year depending on how hot the summer or swimming season is. In 1997, retail sales of water/pool/sand toys exceeded \$450 million (Playthings, September 1998, p. 30). Since dive sticks retail for approximately \$1 per stick, dive sticks likely make up less than 1.0 percent of retail sales in this category.

While the average product life of dive sticks is not known, many are likely to remain available for several years. Since several million dive sticks have been sold annually for the last few years, the total number available for use could easily exceed 10 million units. Assuming dive sticks are sold in sets of 3 to 6 each, this indicates that several million households are likely to own dive sticks.

### **Suppliers**

The CPSC staff has identified at least 15 firms that manufacture or import dive sticks into the United States. Most of the firms that import dive sticks obtain their product from China, Hong Kong, or Taiwan.

Since the product is inexpensive and simple to manufacture, there may be other manufacturers or importers that we have not identified. Additionally, because of the simplicity of the product, it is relatively easy for firms to enter or leave the dive stick market. Therefore, some firms may have once supplied dive sticks but have since stopped doing so. Other firms, that have not supplied dive sticks in the past, may begin doing so.

Our initial research indicates that most of the firms that have been identified are small businesses according to the Small Business Administration guidelines since they have fewer than 100 employees for importers or 500 employees for manufacturers. However, in all cases dive sticks probably account for a very small percentage of the firm's sales. Several of the manufacturers market various types of pool toys. Others have additional lines such as other types of toys or pool equipment.

### **Economic Considerations**

The CPSC is aware of 7 injuries since 1990 involving dive sticks that were standing upright on the bottom of a pool. In 6 of the incidents the victims received vaginal or rectal injuries when they jumped or fell into the water and landed on a dive stick. Four of these incidents required hospitalization, and in one case a temporary colostomy was performed. In the other incident, a child received a laceration requiring four sutures to her face near her eye when she attempted to retrieve a vertical dive stick on the bottom of a pool. No fatalities are known to CPSC.

The societal costs of these incidents include primarily medical costs, lost productivity, and pain and suffering. The aggregate societal costs of the incidents are likely to be relatively low since the incidents of concern appear to be relatively rare. However, while the aggregate costs may be relatively low, the average societal costs of the incidents requiring hospitalization may exceed \$100,000.<sup>1</sup>

The cost of modifying dive sticks to reduce or remove the risk is likely to be low. For example, dive sticks could be modified so that they lay horizontally on or at an angle at the bottom of the pool, rather than vertically. Such a change may involve some changes in tooling, molds, and design, but little in terms of production and material costs. Such a change is unlikely to substantially reduce the utility of the product to consumers. Another option may be to manufacture dive sticks from a material that is less rigid and unlikely to cause serious injuries to a person who falls on the product.

To develop a Preliminary Regulatory Analysis, if necessary, the Directorate for Economic Analysis would need to obtain the following information:

- the number of dive sticks sold annually;
- the number of firms that manufacture or import dive sticks;
- the expected useful life of dive sticks;

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<sup>1</sup> Based on estimates obtained from the Directorate's Injury Cost Model for hospitalized cases involving punctures or lacerations to the victims' lower trunk area.

- comparisons of the utility obtained from dive sticks versus substitute products (e.g., dive rings or disks or dive sticks that lie horizontally, rather than vertically); and
- the costs to manufacturers involved in either redesigning dive sticks to remove the risk or removing dive sticks from the market.

# TAB F

**CONSUMER PRODUCT SAFETY COMMISSION**

**Dive Sticks; Advance Notice of Proposed Rulemaking; Request  
for Comments and Information**

**AGENCY:** Consumer Product Safety Commission.

**ACTION:** Advance notice of proposed rulemaking.

**SUMMARY:** The Commission has reason to believe that certain dive sticks may present an unreasonable risk of injury. Such dive sticks are constructed in such a manner that children can become impaled on them when jumping into shallow water where the dive sticks are oriented in an upright position. This impalement can result in serious injuries. Dive sticks are one of several types of devices used for underwater retrieval activities in swimming pools. They are typically made of rigid plastic, and are or can be weighted so that when dropped into water they sink and stand upright on the bottom. Dive sticks have a variety of shapes, but many have a hollow tube cross section or a solid X-shaped cross section. Dive sticks are sold under a variety names such as dive sticks, diving sticks, fish sticks, sticks and batons.

This advance notice of proposed rulemaking ("ANPR") initiates a rulemaking proceeding that could result in a rule banning dive sticks with certain characteristics that

cause them to be hazardous. This proceeding is commenced under the Federal Hazardous Substances Act.

The Commission solicits written comments concerning the risks of injury associated with dive sticks, the regulatory alternatives discussed in this notice, other possible ways to address these risks, and the economic impacts of the various regulatory alternatives. The Commission also invites interested persons to submit an existing standard, or a statement of intent to modify or develop a voluntary standard, to address the risk of injury described in this notice.

**DATE:** Written comments and submissions in response to this notice must be received by [insert date that is 60 days after publication].

**ADDRESSES:** Comments should be mailed, preferably in five copies, to the Office of the Secretary, Consumer Product Safety Commission, Washington, D.C. 20207-0001, or delivered to the Office of the Secretary, Consumer Product Safety Commission, Room 502, 4330 East-West Highway, Bethesda, Maryland; telephone (301) 504-0800. Comments also may be filed by telefacsimile to (301)504-0127 or by email to [cpsc-os@cpsc.gov](mailto:cpsc-os@cpsc.gov). Comments should be captioned "ANPR for Dive Sticks."

**FOR FURTHER INFORMATION CONTACT:** Scott R. Heh, Directorate for Engineering Sciences, Consumer Product Safety Commission, Washington, D.C. 20207; telephone (301) 504-0494, ext. 1308.

**SUPPLEMENTARY INFORMATION:**

**A. The Product**

Dive sticks are one of several types of devices used for underwater retrieval activities in swimming pools. They are typically made of rigid plastic, and are, or can be weighted so that when dropped into water they sink and stand upright on the bottom. Dive sticks have a variety of shapes, but many have a hollow tube cross section or a solid X-shaped cross section. Dive sticks are sold under a variety of names such as dive sticks, diving sticks, fish sticks, sticks and batons.

The Commission's technical staff preliminarily considers a dive stick that has all of the following characteristics to pose a hazard for traumatic injuries to the perineum, including laceration and perforation injuries associated with rectal and vaginal impalement:

1. The product is essentially rigid.
2. The product is weighted, or can be weighted, so that when dropped in the water, it sinks to the bottom and stands upright.

3. The product has an elongated shape with a top end that is small enough in cross section to concentrate the force of impact and allow penetration of the rectum or vagina. (As examples, a hazardous dive stick could have a cylindrical shape with a blunt end or it may have a more pointed end, such as one product that is shaped like a shark silhouette.)

**B. The Risk of Injury**

1. Description of Injury. When used in shallow water, serious rectal or vaginal impalement injuries can occur when a child accidentally falls on or jumps buttocks-first into the water, and lands on a dive stick. Facial and eye injuries are also possible when a child attempts to retrieve a dive stick under the water.

While penetrating injuries account for only a very small percentage of traumatic injuries in children, they are severe. Falls on vertical objects may result in traumatic injuries to the perineum. The severity of rectal or vaginal lesions after impalement depends on the degree of penetration by the object. This in turn is dependent on the force of impact and the physical properties of the involved object (size and surface characteristics). The severity of injury could range from laceration of the rectum and sphincter, to puncture wounds and tears of the colon. High impact forces may also cause injuries to the vulva, vaginal canal, and blood vessels beneath the perineal skin in

females. In males, such impacts may cause perforation injuries to the genitalia, urethra, ureter and bladder. All these types of perforation and impalement injuries in males and females require hospitalization and surgery.

Because of the septic nature of the area, the main complication after perineum injuries is lesion infection, which may lead to abscess and possible sepsis in extreme cases. To avoid subsequent septic complications, the management of these pediatric injuries often requires aggressive and drastic surgical means. Perineal injuries (with or without rectal injury) often require fecal diversion (proximal colostomy), wound drainage, and the use of a broad-spectrum antibiotic in pre- and post-operative stages. The damage caused by deep penetration into the rectal or vaginal area may have devastating effects on children's health. In addition to long-term physiological effects on children, these types of injuries have the potential to cause long-lasting emotional trauma.

2. Injury data. The Commission has learned of seven incidents in which dive sticks caused serious injury to young children. Six of these were impalement incidents that resulted in serious vaginal or rectal injuries. The seventh incident was a facial laceration just below the eye. All the victims were children ranging in age from six to nine years old. Each of the incidents occurred with vertical-standing toy dive sticks. The eye/facial injury was from a

shark-shaped dive stick. All of the vaginal and rectal injuries were from baton-shaped dive sticks, approximately 7-7/8 to 8-5/8 inches long and 7/8 to one inch in diameter. The victims were injured while playing in shallow water. Three incidents occurred in small wading pools with water levels between 12 and 24 inches. One occurred in a spa with unknown water depth and one in a 3-foot pool with approximately 27 inches of water. Another incident occurred in a swimming pool with an unknown depth of water. The incidents are as follows:

a. July 22, 1990 -- The 7-year-old female victim was playing with her cousins in an above-ground swimming pool. She jumped up and out of the water, tucked her knees to her chest to do a "cannon ball" jump and re-entered the water. The victim entered the water buttocks first and rapidly descended to the bottom of the pool, where her buttocks came in contact with the upright, cylindrical toy dive stick. The toy dive stick caused lacerations around the victim's rectum. No stitches were required and the victim has recovered fully.

b. July 22, 1993 -- The 8-year-old girl was sitting on the edge of her family's spa with her feet in the water. She used her arms to push off the edge and sit on a lower step of the spa, without seeing the vertical-standing, cylindrical toy dive stick on the same lower step. The toy dive stick slipped past the victim's swimsuit and penetrated

her vagina. Immediate medical attention was sought, and surgery was performed to repair multiple internal, vaginal lacerations. Additional surgery was necessary 5 months later. No recovery records are available.

c. July 24, 1995 -- The 9-year-old female victim jumped into a swimming pool and landed on a toy dive stick causing deep vaginal lacerations.

d. August 3, 1997 -- The 6-year-old female victim jumped into her inflatable wading pool. The victim's buttocks area landed on top of the vertical-standing, cylindrical toy dive stick. The product and the girl's swimsuit were projected into her rectum. The victim was admitted to a children's hospital for surgery to repair perineal and external sphincter lacerations. The victim has recovered from the incident, but will be examined periodically.

e. June 10, 1998 -- The eight-year-old female victim was playing with her brother in a wading pool. She fell backwards in the pool, landing on the cylindrical toy dive stick that was standing upright on the bottom of the pool. The toy dive stick penetrated the vagina. A physician surgically repaired the laceration with both internal and external sutures. The victim has recovered.

f. June 28, 1998 -- The 7-year-old boy and his brother had been playing with the cylindrical toy dive sticks prior to the incident. The victim ran and jumped buttocks first

into the wading pool. He impaled himself via the rectum on a toy dive stick that was standing upright in the water. Surgery was performed to repair a laceration of the rectum, and a temporary colostomy was performed to repair the perforated intestine. The victim healed, but continues to complain of abdominal pain.

g. August 13, 1998 -- The 6-year-old female victim and three other children were in a small wading pool playing with toy dive sticks that were shaped like sharks. The victim stuck her face into the pool to retrieve the toy dive stick and hit her face on the toy. She received a 3/4 inch laceration below her left eye, which required sutures to close. The victim has recovered.

### **C. Relevant Statutory Provisions**

This proceeding is conducted pursuant to the Federal Hazardous Substances Act ("FHSA"), 15 U.S.C. 1261 *et seq.* Section 2(f)(1)(D) of the FHSA defines "hazardous substance" to include any toy or other article intended for use by children that the Commission determines, by regulation, presents an electrical, mechanical, or thermal hazard. 15 U.S.C. 1261(f)(1)(D). An article may present a mechanical hazard if its design or manufacture presents an unreasonable risk of personal injury or illness during normal use or when subjected to reasonably foreseeable damage or abuse. Among other things, a mechanical hazard could include a risk of injury or illness "(3) from points or other protrusions,

surfaces, edges, openings, or closures, ... or (9) because of any other aspect of the article's design or manufacture." 15 U.S.C. 1261(s).

Under section 2(q)(1)(A) of the FHSA, a toy, or other article intended for use by children, which is or contains a hazardous substance accessible by a child is a "banned hazardous substance." 15 U.S.C. 1261(q)(1)(A).

Section 3(f) through 3(i) of the FHSA, 15 U.S.C. 1262(f)-(i), governs a proceeding to promulgate a regulation determining that a toy or other children's article presents an electrical, mechanical, or thermal hazard. As provided in section 3(f), this proceeding is commenced by issuance of this ANPR. After considering any comments submitted in response to this ANPR, the Commission will decide whether to issue a proposed rule and a preliminary regulatory analysis in accordance with section 3(h) of the FHSA. If a proposed rule is issued, the Commission would then consider the comments received in response to the proposed rule in deciding whether to issue a final rule and a final regulatory analysis. 15 U.S.C. 1262(i).

#### **D. Regulatory Alternatives**

One or more of the following alternatives could be used to reduce the identified risks associated with dive sticks.

1. *Mandatory rule.* The Commission could issue a rule declaring certain dive sticks to be banned hazardous

substances. This rule could define the banned products in terms of physical or performance characteristics, or both.

2. *Labeling rule.* The Commission could issue a rule banning dive sticks that did not contain specified warnings and instructions.

3. *Voluntary standard.* If the industry developed, adopted, and conformed to an adequate voluntary standard, the Commission could defer to the voluntary standard in lieu of issuing a mandatory rule.

4. *Reliance on recalls.* The Commission has obtained voluntary corrective actions with respect to certain dive sticks. The Commission could continue to rely on corrective actions, both voluntary and mandatory, in lieu of or in addition to a mandatory rule.

#### **E. Existing Standards**

The Commission is not aware of any state, voluntary, foreign, international, or other standards dealing with the described risk of injury.

#### **F. Market Information**

##### 1. The Product

Dive sticks are one of several types of devices used for underwater retrieval activities in swimming pools. They are typically made of rigid plastic, and are or can be weighted so that when dropped into water they sink and stand upright on the bottom. They are usually cylindrical in shape, but some have shapes that resemble such things as

fish, sharks, or other sea creatures. Typically, the length is 8 inches or less and the diameter is one inch or less. Dive sticks and other dive toys are often numbered with a point value (e.g., 10 through 60) for counting up totals in games. In some cases, the units with the higher point values may be shorter than those with lower point values.

Dive sticks are usually sold in sets of 3 to 6 sticks. They are often sold as part of a package that contains other toys, such as dive disks, eggs, and rings (e.g., a package may include 3 dive sticks, 3 dive rings, and 3 dive disks). They are also sold with things such as masks, goggles, or snorkels. At retail they cost from \$4 to \$7 per set, or about \$1 per individual stick. Even when sold with other products such as disks, rings, and snorkels, they usually cost less than \$10.

Dive sticks and other dive toys are widely available. They are often sold in the seasonal aisles of grocery and drug stores and can be purchased at many department and variety stores. Dive toys are also available through some mail order catalogs and at various pool dealers

## 2. Substitutes

A wide range of substitutes is available for dive sticks. The closest substitute may be dive rings since these are also weighted so that they stand up on the bottom of the pool. Other substitutes are dive disks, which are flat, plastic disks that sink to the bottom of the pool, but lie

flat rather than on end. There are also a variety of dive eggs. In general, these substitutes are manufactured and sold by the same companies that manufacture and sell dive sticks, often in the same package. The retail prices of these substitutes are about the same as the retail prices for the dive sticks.

### 3. Sales and Number Available for Use

Dive sticks have been sold for over 20 years. However, historical sales data are not available to determine whether or not there has been a trend in their use. Based on information that several companies provided to the CPSC, over 19 million dive sticks have been sold. Current sales of individual dive sticks appear to be at least 4 million units annually. Since they are usually sold in packages of 3 to 6 sticks each, this indicates that around 1 million packages are purchased annually.

In trade publications, dive sticks are classified in the water/pool/sand toys category. This category includes products such as water guns, floats, wading pools, and sand buckets. Sales vary with season, with more sold in the summer than in the winter. Sales of water/pool/sand toys also tend to vary from year to year depending on how hot the summer or swimming season is. In 1997, retail sales of water/pool/sand toys exceeded \$450 million, according to a trade publication. Since dive sticks retail for

approximately \$1 per stick, dive sticks likely make up less than one percent of retail sales in this category.

A substantial number of dive sticks are likely available for use for several years after their purchase. Since several million dive sticks have been sold annually for the last few years, the total number available for use could easily exceed 10 million units. Assuming dive sticks are sold in sets of 3 to 6 each, this indicates that several million households are likely to own dive sticks.

#### 4. Suppliers

The CPSC's staff has identified at least 15 firms that manufacture or import dive sticks into the United States. Most of the firms that import dive sticks obtain their product from China, Hong Kong, or Taiwan. There may be other manufacturers or importers that the staff has not identified. Additionally, because of the simplicity of the product, there are few barriers to entry into the market.

The staff's initial research indicates that most of the firms that have been identified are small businesses according to the Small Business Administration guidelines because they have fewer than 100 employees for importers or 500 employees for manufacturers. However, in all cases, dive sticks probably account for a very small percentage of any firm's sales. Several of the manufacturers market various types of pool toys. Others have additional lines such as other types of toys or pool equipment.

## 5. Economic Considerations

The CPSC is aware of 7 injuries involving dive sticks since 1990 that resulted when a child hit a dive stick standing upright on the bottom of a pool. Although the number of injuries is low, some of the injuries are severe. Some of the injuries have resulted in damage to the victim's rectal or vaginal areas. At least four of these incidents required hospitalization, and in one case a temporary colostomy was performed.

The societal costs of these incidents include primarily medical costs, lost productivity, and pain and suffering. The total societal costs of the incidents are likely to be relatively low since the incidents of concern appear to be relatively rare. However, the severity of some of the incidents indicates that the average societal costs of the incidents requiring hospitalization may exceed \$100,000, based on estimates obtained from the Directorate for Economic's Injury Cost Model for hospitalized cases involving punctures or lacerations to the victims lower trunk area.

The cost of modifying dive sticks to reduce or remove the risk is likely to be low. For example, dive sticks could be modified so that they lie horizontally on or at an angle at the bottom of the pool, rather than vertically. Such a change may involve some changes in tooling, molds, and

design, but little in terms of production and material costs. Such a change is unlikely to substantially reduce the utility of the product to consumers. Another option may be to manufacture dive sticks from a material that is less rigid and unlikely to cause serious injury to a person who falls on the product. Moreover, commercial substitutes for dive sticks already are available. These substitutes are not dangerous but provide the same play experience. If hazardous dive sticks were banned altogether, there is little, if any, reason to doubt that these substitutes would enjoy increased purchases.

**G. Solicitation of Information and Comments**

This ANPR is the first step of a proceeding that could result in a mandatory rule for dive sticks to address the described risk of injury. All interested persons are invited to submit to the Commission their comments on any aspect of the alternatives discussed above. In particular, CPSC solicits the following additional information:

1. The models and numbers of dive sticks produced for sale in the U.S. each year from 1990 to the present;
2. The names and addresses of manufacturers and distributors of dive sticks;
3. The expected useful life of dive sticks.
4. Comparisons of the utility obtained from dive sticks versus substitute products (e.g., dive rings or disks

or dive sticks that lie horizontally, rather than vertically);

5. The number of persons injured or killed by the hazards associated with dive sticks;

6. The circumstances under which these injuries and deaths occur, including the ages of the victims;

7. An explanation of designs that could be adapted to dive sticks to reduce the described risk of injury;

8. Physical or performance characteristics of the product that could or should not be used to define which products might be subject to a rule;

9. The costs to manufacturers involved in either redesigning dive sticks to remove the risk or removing dive sticks from the market.

10. Other information on the potential costs and benefits of potential rules;

11. Steps that have been taken by industry or others to reduce the risk of injury from the product;

12. The likelihood and nature of any significant economic impact of a rule on small entities;

13. The costs and benefits of mandating a banning, labeling or instructions requirement.

Also, in accordance with section 3(f) of the FHSA, the Commission solicits:

1. Written comments with respect to the risk of injury identified by the Commission, the regulatory alternatives

being considered, and other possible alternatives for addressing the risk.

2. Any existing standard or portion of a standard which could be issued as a proposed regulation.

3. A statement of intention to modify or develop a voluntary standard to address the risk of injury discussed in this notice, along with a description of a plan (including a schedule) to do so.

Comments should be mailed, preferably in five copies, to the Office of the Secretary, Consumer Product Safety Commission, Washington, D.C. 20207-0001, or delivered to the Office of the Secretary, Consumer Product Safety Commission, Room 502, 4330 East-West Highway, Bethesda, Maryland 20814; telephone (301) 504-0800. Comments also may be filed by telefacsimile to (301)504-0127 or by email to [cpsc-os@cpsc.gov](mailto:cpsc-os@cpsc.gov). Comments should be captioned "ANPR for Dive Sticks." All comments and submissions should be received no later than [insert date that is 60 days from publication].

Dated:

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Sayde E. Dunn, Secretary  
Consumer Product Safety Commission

MSG-2



UNITED STATES  
CONSUMER PRODUCT SAFETY COMMISSION  
WASHINGTON, DC 20207

Memorandum

DATE: JUN 28 1999

TO : The Commission  
Sadye E. Dunn, Secretary

FROM : Jeffrey S. Bromme, General Counsel *JB*  
Stephen Lemberg, Assistant General Counsel *SL*

SUBJECT: Dive Sticks: ANPR

VOTE SHEET

BALLOT VOTE DUE JUN 30 1999

Attached is a staff briefing package recommending that the Commission issue an advance notice of proposed rulemaking ("ANPR") addressing a risk of injury associated with certain dive sticks. Tab F of the package contains a draft Federal Register notice that would commence a rulemaking proceeding by issuing an ANPR.

Please indicate your vote on the following options.

I. Approve the Federal Register notice as drafted.

*Mary Sheila Gall*  
(Signature)

*July 8, 1999*  
(Date)

*See attached statement*

II. Approve the draft Federal Register notice with the following changes (please specify).

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Date)

NOTE: This document has not been reviewed or accepted by the Commission.  
Initial *ML* Date *6/24/99*  
CPSC Hotline: 1-800-638-CPSC(2772) ★ CPSC's Web Site: <http://www.cpsc.gov>

CPSC 6(b)(1) Cleared  
*6/24/99*  
No Mfrs/PrvtlBls or  
Products Identified  
Excepted by \_\_\_\_\_

III. Do not approve the draft Federal Register notice.

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Date)

IV. Take other action (please specify).

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Date)

Attachment

Tm-2



UNITED STATES  
CONSUMER PRODUCT SAFETY COMMISSION  
WASHINGTON, DC 20207

Memorandum

DATE: JUN 28 1999

TO : The Commission  
Sadye E. Dunn, Secretary

FROM : Jeffrey S. Bromme, General Counsel *JB*  
Stephen Lemberg, Assistant General Counsel *SL*

SUBJECT: Dive Sticks: ANPR

*July 9, 1999*

VOTE SHEET

BALLOT VOTE DUE JUN 30 1999

Attached is a staff briefing package recommending that the Commission issue an advance notice of proposed rulemaking ("ANPR") addressing a risk of injury associated with certain dive sticks. Tab F of the package contains a draft Federal Register notice that would commence a rulemaking proceeding by issuing an ANPR.

Please indicate your vote on the following options.

I. Approve the Federal Register notice as drafted.

*[Handwritten Signature]*  
\_\_\_\_\_  
(Signature)

*7/8/99*  
\_\_\_\_\_  
(Date)

II. Approve the draft Federal Register notice with the following changes (please specify).

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Date)

NOTE: This document has not been reviewed or accepted by the Commission.  
Initial ML Date 6/24/99  
CPSC Hotline: 1-800-638-CPSC(2772) \* CPSC's Web Site: <http://www.cpsc.gov>

CPSC 6(b)(1) Cleared  
*6/24/99*  
No Mfrs/PrvtLbrs or  
Products Identified  
Excepted by \_\_\_\_\_

III. Do not approve the draft Federal Register notice.

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Date)

IV. Take other action (please specify).

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Date)

Attachment

AB-1



UNITED STATES  
CONSUMER PRODUCT SAFETY COMMISSION  
WASHINGTON, DC 20207

Memorandum

DATE: JUN 28 1999

TO : The Commission  
Sadye E. Dunn, Secretary

FROM : Jeffrey S. Bromme, General Counsel *JB*  
Stephen Lemberg, Assistant General Counsel *SL*

SUBJECT: Dive Sticks: ANPR

*July 9*

VOTE SHEET

BALLOT VOTE DUE JUN 30 1999

Attached is a staff briefing package recommending that the Commission issue an advance notice of proposed rulemaking ("ANPR") addressing a risk of injury associated with certain dive sticks. Tab F of the package contains a draft Federal Register notice that would commence a rulemaking proceeding by issuing an ANPR.

Please indicate your vote on the following options.

I. Approve the Federal Register notice as drafted.

X. Ann Brown  
(Signature)

June 30 1999  
(Date)

II. Approve the draft Federal Register notice with the following changes (please specify).

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Date)

NOTE: This document has not been reviewed or accepted by the Commission.  
Initial ML Date 6/24/99  
CPSC Hotline: 1-800-638-CPSC(2772) ★ CPSC's Web Site: <http://www.cpsc.gov>

CPSA 6(b)(1) Cleared  
6/24/99  
No Mfrs/PrvtLbrs or  
Products Identified  
Excepted by \_\_\_\_\_  
Notified.

III. Do not approve the draft Federal Register notice.

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Date)

IV. Take other action (please specify).

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Date)

Attachment