CASE REPORT

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A False Report of Product Tampering Involving a Rodent and Soft Drink Can: Light Microscopy, Image Analysis and Scanning Electron Microscopy/Energy Dispersive X-Ray Analysis*

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ABSTRACT: The "Pepsi® Tamperings" of 1993 resulted in a large number of cases involving foreign objects reportedly found inside canned soft drinks. Although the majority of cases involved medical syringes and metallic objects, one case involved the report of a mouse found inside a can of Caffeine-Free Diet Pepsi. Using light and polarized light microscopy and computer-assisted image analysis, trace evidence and tooth structure from the suspect mouse were matched to scratches and indentions on the suspect can. Scanning electron microscopy and energy dispersive X-ray analysis were used to compare and match particles of gnawed metal from the lid of the suspect can to other particles recovered from the muzzle and stomach of the suspect mouse. The forensic analyses in this case proved the mouse could not have been canned in the soft drink product and refuted the defendant's sworn statements.

KEYWORDS: forensic science, light microscopy, image analysis, scanning electron microscopy, energy dispersive X-ray analysis, soft drink, mouse, tampering, false report of tampering

During the summer of 1993, the Forensic Chemistry Center (FCC) of the US Food and Drug Administration (FDA) received and analyzed more than 235 cases related to the "Pepsi Tamperings" or "Pepsi Crisis." Although referred to as the "Pepsi Crisis" because the initial cases involved Pepsi products, most US soft drink manufacture's received complaints of foreign objects in their canned or bottled product. Case reports listed finding various foreign objects in canned soft drinks. Most frequently found were syringes, both medical and industrial (including insulin-type, intramuscular, intravaginal, veterinary, and machine lubricant) from a variety of syringe manufacturers. The FCC also received soft drink cans allegedly containing pins, sewing needles, bullets (unfired), nails, screws, thumb tacks, safety pins, glass, metal and plastic shards, and rodents. The Federal Anti-Tampering Act of 1983 (1) clearly defines any act of product tampering including false report of tampering as a felony punishable by substantial fines and mandatory prison sentences. With the Fine Enhancements Statutes of 1985, the fines may be further increased (2). To date, nearly all of the more than 235 reported cases have been shown NOT to have had foreign objects inside the soft drink can prior to opening. In several cases, research at the FCC has been able to demonstrate conclusively that certain objects, such as specific syringes, could not have been processed in the soft drink product (3).

Case Report

On July 13, 1993, the Food and Drug Administration was notified of a consumer complaint involving a dead rodent in a 12-fluid oz aluminum can of Caffeine-Free Diet Pepsi. A female attorney in Somers, New York reported to have purchased the soft drink on April 8, 1993 and consumed about $^1/_3$ to $^1/_2$ of the liquid contents while driving in her car. Although she reported the product tasted "vile," she did not immediately discard the can since she was thirsty and maintained she held the opened can between her legs as she drove. When she stopped her vehicle, she stated she poured the liquid contents onto the ground and heard a "thud" from the draining can. She then noticed the "pink foot of a mouse" protruding from the mouth opening of the can. She stated she placed the empty can with the mouse inside in a freezer that same day due to the novel nature of the discovery. She further stated she became ill with nausea and vomiting for the several days.

The woman swore in her affidavit that a number of personal and family related matters prevented her from acting further on her discovery of a mouse in the soft drink can until June 17, 1993 when she saw a news broadcast discussing the "Pepsi Crisis."

She and her husband then contacted officials at PEPSICO who made the initial collection of the sample. Company officials sent the frozen can containing the suspect mouse to a private animal hospital where the mouse was removed from the can and shipped to a veterinary pathology laboratory for necropsy and pathological evaluation of tissues. The suspect can was retained by the animal hospital and subsequently returned to a company official.

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Following requests for financial compensation from the woman, the FDA's Office of Criminal Investigations was contacted and subsequently took custody of the suspect can. The consumer related her story and signed an affidavit after she was informed of the Federal Anti-Tampering Act statutes for false report of a tampering. The can (and later the suspect mouse) were then sent to the FDA's Forensic Chemistry Center (FCC) in Cincinnati, Ohio for analysis.

Results

Analysis of the suspect can at FCC involved stereoscopic light microscopy (SLM) of the lid and can body. The can was received cut open around the can body approximately $^1/_4$ down from the lid (Fig. 1A). The can lid was received with the mouth opening insert tab bent inward toward the inside of the lid with the lift tab intact and still held to the lid by the center rivet. The contact end of the lift tab showed an irregular edge with upturned metal and white filaments caught in the metal burrs (Fig. 1B). Numerous parallel striations and gouges in the metal were noted in the edge. There was a notable loss of metal on that edge of the tab which was outlined by image analysis and calculated to have approximately 7.1 mm^2 of lift tab missing (Fig. 1C). The white filaments caught in the metal burrs were analyzed by polarized light microscopy (PLM) and compared with known mouse hair standards (Fig. 1D). The filaments were determined to be mouse hairs.

Approximately two weeks later, the suspect mouse was recovered from the veterinary pathology laboratory (post-necropsy) in a fixed (preserved) condition and delivered to the FCC. All thoracic and abdominal organs had been removed with the exception of the stomach, small intestines, caecum, and most of the large intestines.

The muzzle and the mouth region including the dentition were carefully examined. The upper incisors were tightly abutted (nearly fused), immobile and chisel shaped with only a slight indention between the two teeth (Fig. 2A). Numerous indentions on the outside of the can lift tab and the outer rim of the mouth opening appeared to match the size and shape of the fused upper teeth (Fig. 2B). The lower incisors were not fused (characteristic of most rodents), independent and slightly movable. The lower incisors were both pointed on the inner edge of each tooth and had gray stains which were visible on the outside edges of both lower teeth. A gap of ~0.3 mm was measured between the points by image analysis (Fig. 2C). The inside of the can lid immediately around the mouth opening showed numerous paired conical indentions (Fig. 2D). Image analysis was used to measure the distance between several pairs of indentions which ranged from 0.22–0.24 mm between the indentions which closely matched the space between the lower teeth in the suspect mouse.

The matching of the upper incisors with flat scrapes and cuts in the metal on the outside of the can's mouth rim and the lower incisors with the separated conical indentions on the inside of the mouth rim along with the upward curl of the gnawed lift tab was compelling evidence that the mouse had been on the inside of the can and attempted to chew toward the outside. Morphometric measurements of the mouse head and body were compared with the widest diameter of the oval mouth opening of the can which confirmed the mouse could have easily passed through the mouth opening. The right lower incisor was removed from the mandible and analyzed by energy dispersive X-ray (EDX) analysis in the SEM. The gray stains on the sides of the incisor were determined to be primarily aluminum.

Stereoscopic light microscopy analysis revealed numerous small, metallic elongated particles caught in the hair around the mouth and nose (muzzle) of the suspect mouse (Fig. 3A). Following

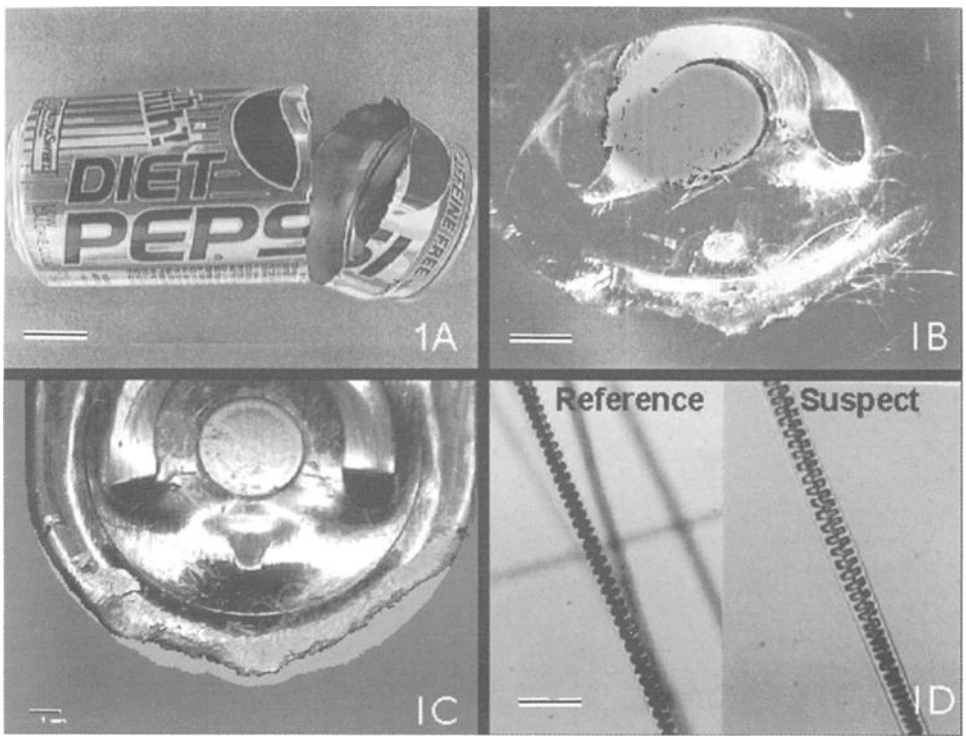

FIG. 1—*Suspect can cut open around the can body (1A); end of lift tab showed an irregular edge with upturned metal and white filaments caught in the metal burrs (1B); loss of metal on the edge of the tab determined by IA to be missing approximately 7.1 mm^2 of lift tab (1C); and white filament recovered from the metal burrs of the lift tab (right) determined by PLM comparison to laboratory standard (left) to be mouse hair (1D).*
Scale bar = (1A) 20 mm, (1B) 2 mm, (1C) 1 mm, and (1D) 50 μm.

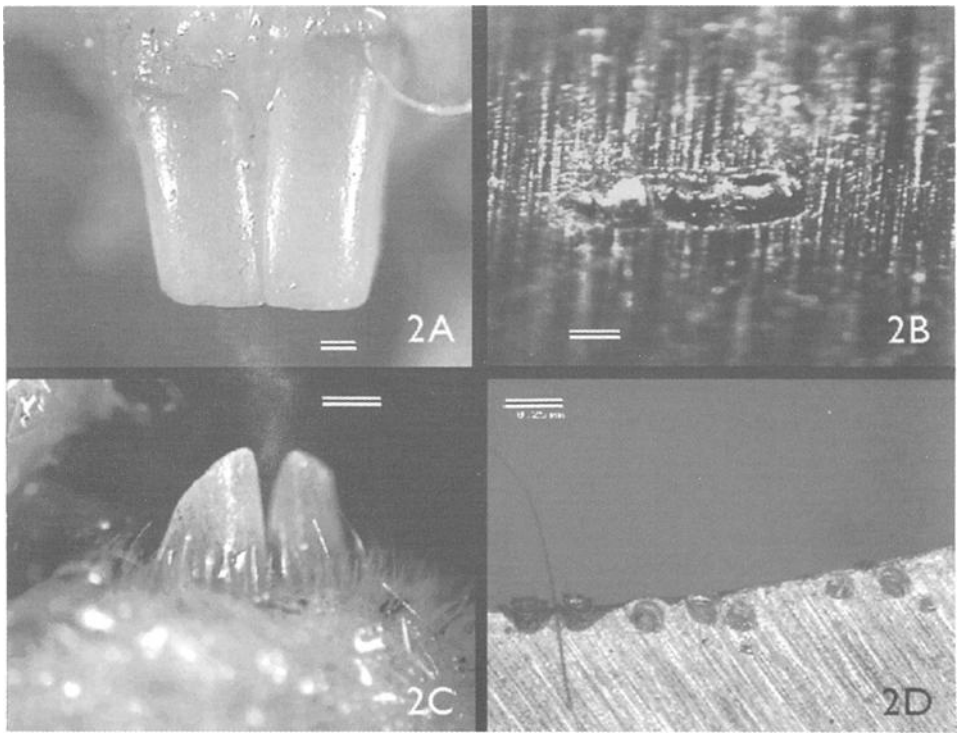

FIG. 2—*Upper incisors of suspect mouse with only a slight indention between the two teeth (2A); One of numerous indentions on the outside of the can lift tab and lid which matched the size and shape of the fused upper teeth (2B); Lower incisors of the suspect mouse with a 0.3-mm separation between the inside tips (2C); Paired conical indentions around the inside of the can lid mouth opening which closely matched the space between the lower teeth in the suspect mouse (2D).*

Scale bar = (2A) 0.5 mm, (2B) 0.5 mm, (2C) 0.25 mm, and (2D) 0.25 mm.

removal and analysis, these particles were determined to be metal fragments, presumably from the chewed can tab. Similar loose particles were observed and collected from the lid and tab region of the suspect can of Caffeine-Free Diet Pepsi.

Assuming the suspect mouse had chewed on the can and may have swallowed metal fragments, a second necropsy was performed at the FCC on the few remaining tissues in the suspect mouse. The stomach was distended and in good condition with no immediate evidence of necrosis. The stomach contents revealed the distention was due to chewed food material. In addition, numerous small particles which resembled the particles recovered from the can lid and tab region and mouse muzzle were observed mixed throughout the rather dry stomach contents (Fig. 3B).

Particles recovered from the stomach (Fig. 4A) were further analyzed by SEM/EDX and compared with similar particles recovered from the suspect can lid (Fig. 4B) and suspect mouse muzzle hair. The particles appeared to be elongated (~0.25–0.3 mm long by ~0.05–0.075 mm wide) and resembling a silver-gray metallic shard. SEM analysis and measurement of the particles showed parallel raised striations ~3.5 μm apart with regular perpendicular cross bridging between the striations measuring ~1.9 μm apart. Elementally, the particles all produced nearly identical spectra by EDX spot probe analysis; spectrum collected from particle from stomach (Fig. 4C) and spectrum collected from particle found on can lid (Fig. 4D). All particles were found to produce only a single major elemental peak for aluminum. Minor peaks were also produced for magnesium on particles from both the stomach and can lid. Minor to trace peaks for sodium, silicon, phosphorus, sulfur, chlorine, potassium, and calcium were noted on particles recovered from the stomach and are attributed to inorganic elements in the stomach contents.

Discussion

The overwhelming physical and inorganic chemical evidence demonstrated that the suspect mouse had gnawed on the lift tab and around the rim of the mouth opening of the suspect can from the inside of the can after the can had been opened at the lift tab. An inspection of the bottling facilities showed that during the actual soft drink canning process, empty cans are jet washed and dried with the can bodies being held inverted until filling. The can lids are attached to the can body and sealed within seconds of filling. Further, it would have been impossible for the mouse to have been canned inside with the soft drink product and chew on the exterior lift tab. The trace evidence further demonstrated that the suspect mouse was, in fact, *the* mouse that had gnawed on the can lift tab and mouth opening.

The production code date on the can showed the can had been filled and sealed three weeks prior to the alleged "discovery" by the woman. Since the suspect mouse was in good condition with little to no evidence of necrosis, it was further evidence that the mouse had not been sealed in the canned soft drink.

The Federal Anti-Tampering Act of 1983 was enacted to provide severe penalties for crimes involving product tampering including false report of tampering (1). Both product tampering and false report of product tampering are felony's under the Act. Product tampering, whether food, beverage or pharmaceutical, is an extremely malicious act of violence since the perpetrator often does not know who his victim(s) will be (4). The perpetrator may purposely cause several unknown victims to be killed in order to mask or hide a connection to an intended victim. Product tampering may also be committed as an act of sabotage against a product or company. The sabotage may be from within a company from a

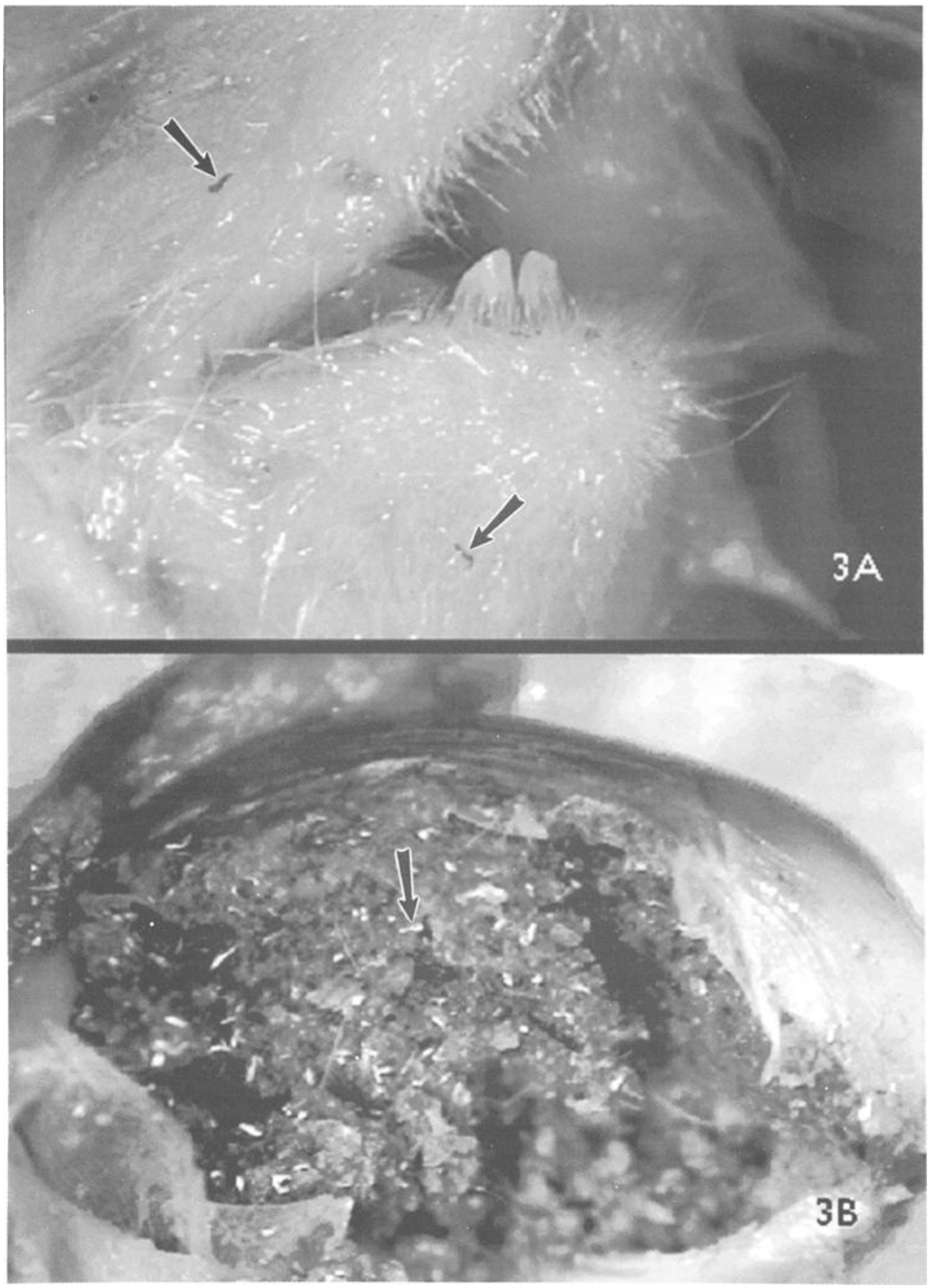

FIG. 3—*Small, elongated metallic particles (see arrows) caught in the hair around the mouth and nose (muzzle) of the suspect mouse (3A) and the opened stomach of the suspect mouse showing numerous similar small metallic particles (see arrow) mixed with the stomach contents (3B).*

disgruntled employee or from outside the company in order to damage a competitor or influence financial conditions (stock values, etc.).

False report of product tampering may involve individuals hoping to receive monetary settlements for false claims of damage from a company or attempts to discredit a company's product (and reputation). As it was a factor in this case, extortion may be an additional motive. Other individuals making claims of false tampering may do so for the thrill or attention such an action generates. An additional problem with any report of product tampering (actual or false) is the production of "copy cat" tamperers hoping to share the notoriety or to receive payment for alleged damages.

Of the more than 235 cases related to the "Pepsi Tamperings" of 1993 evaluated at the FDA's Forensic Chemistry Center, only one case involving a soft drink can was found to have a foreign object actually canned inside the soft drink product. In this one case, the foreign object was a stainless steel machine screw which was traced to a mechanical problem on a production line.

In the case detailed above, forensic analysis of the mouse and can proved the mouse could not have been canned in the soft drink. Further analysis demonstrated the suspect mouse had chewed

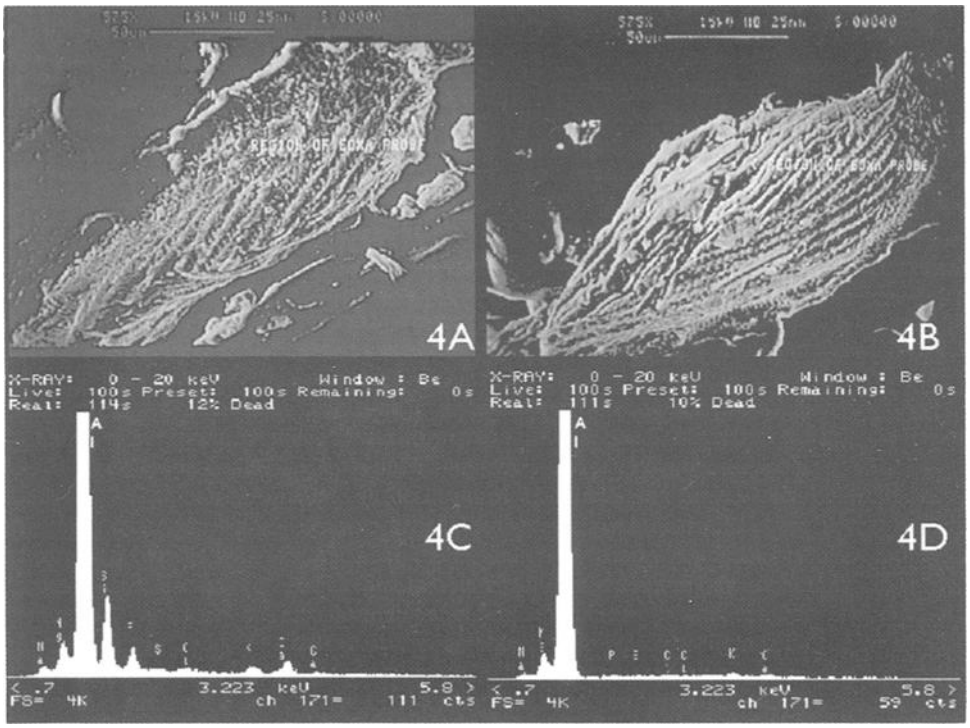

FIG. 4—*SEM photomicrograph of particle recovered from the stomach (4A) and resultant EDX spectrum collected from particle (4C); SEM photomicrograph of particle recovered from the lift tab of the can (4B) and resultant EDX spectrum collected from particle (4D). Both particles were found to produce only a single major elemental peak which was for aluminum. With only slight variation, minor to trace peaks were also produced for magnesium, sodium, silicon, phosphorus, sulfur, chlorine, potassium, and calcium.*
Scale bar = (4A) 50 μm, and (4B) 50 μm.

on the can and lift tab from the inside of the can. The defendant in this case was found guilty of falsely reporting a product tampering and was subsequently sentenced to 41 months in a federal prison.

This case described the use of light microscopy, SEM/EDX and image analysis to conclusively refute a consumer's claim that a mouse was found inside a sealed soft drink can. It further illustrates the extent of forensic analysis and resources that can be used to investigate product tampering and protect both the American consumer and legitimate producers.

References

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