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linked to cataracts," SN: 7/26/97, p. 60). One thing was missing from the article, though: dosages.

Just how often do you have to use the inhalers before these effects appear?

Patrick J. Murphy
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There is no clear-cut answer. "We just do not have enough data to say how many puffs a day and how many years of use are unsafe for the lens," replies Robert G. Cumming, an epidemiologist at the University of Sydney in Australia and lead author of the study. For posterior subcapsular cataracts, the most serious kind, more than 2 grams of beclomethasone, a corticosteroid, in a lifetime imparts about double the risk of a 1-gram dose, his research shows.

Asthmatics who use steroids should discuss proper dosage with their physicians, he says, but should remember that asthma, which can be fatal, is a more serious condition than cataracts, which can be treated surgically.

—N. Seppa

Gamma rays combat restenosis

In regard to Richard Petrasso's letter (SN: 8/23/97, p. 125) about "Unclogging arteries? Radiation helps" (SN: 6/14/97, p. 364), the distance from the Ir-192 source to the cells of the vessel at risk of restenosis can be measured in centimeters. As such, gamma rays are the treatment, not beta rays. Further, the iridium sources are encapsulated in metal, thereby attenuating and eliminating the beta emission. Indeed, when beta emitters are used, they are placed in contact with the vessel wall, usually by radioactive stent, because beta rays' effective range is so small.

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New vantage on theropod flight

Why hasn't anyone proposed that smaller theropods were arboreal ("A Fowl Fight," SN: 8/23/97, p. 120)? If kangaroos, leopards, and bears can climb trees, why couldn't those short forearms have been used to scramble up bare trunks?

Russ Agreen
Denton, Md.

Some paleontologists are beginning to explore the idea that small theropods climbed trees and evolved flight from this vantage point. Alan Feduccia, however, argues that the anatomy of theropod pelvic bones precluded them from climbing trees. —R. Monastersky

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Another approach taken by a group at the University of Texas Health Science Center at San Antonio is to use liquid crystal monomers. These molecules align themselves, creating a partially crystalline material. As they harden, the material becomes more disordered, which offsets the contraction.

Composites that expand upon reaction and wedge themselves into the cavity could do away with the need for an adhesive, suggests Antonucci. Currently, dentists etch the surface of the exposed dentin with a mild acid, roughening it so the adhesive can fill the spaces.

The acid removes the minerals in the dentin, however, leaving behind a shaky framework of collagen. "If the collagen fibrils collapse, you don't get a good interlocking system," Antonucci says. At the ACS meeting, T. Nikaido of the Tokyo Medical and Dental University described newly developed acids that both etch and stabilize the collagen structure.

Materials that bond directly to enamel and dentin would obviate the need for an adhesive, but the high protein content of dentin complicates the search for appropriate materials.

While materials with a paste-like consistency work best for filling cavities, ceramics can be shaped into other restorative features such as crowns. Ceramics tend to be brittle, though, so porcelain crowns are usually made with metal supports. Several groups are working toward materials that are tough enough to form more attractive, all-ceramic crowns.

At the ACS meeting, J. Robert Kelly of NIST and the Naval Dental School in Bethesda, Md., described a more flexible ceramic that is reinforced with polymer resin. The material is solid enough to be carved with a CAD-CAM machine, which a dentist can use to design and quickly make a crown or inlay in the office (SN: 12/10/88, p. 376).

In the future, dentists may not need to concoct artificial materials in a dish. Molecular biologists may be able to recreate the biological processes that generate teeth and thus grow perfectly matched replacements, Bayne suggests. Then, not even the most intimate observer will be able to distinguish an artificial tooth from one that nature made. □

Filling microchannels instead of cavities

Bacteria love to hide in the natural grooves and fissures of a tooth. Tucked safely away from the probing bristles of a toothbrush, they are free to form plaque and cause tooth decay. To forestall this process, dentists often apply surface sealants that physically block the hiding places for bacteria.

Now, researchers at the Karolinska Institute in Stockholm have applied this idea to teeth on the microscopic level. Tiny natural channels that run through dentin allow acids and other damaging substances to penetrate teeth. The scientists are filling these tubules with polymers called calcium alginate hydrogels. "If we can block the channels, we can make caries-resistant dentin," says Lars-Åke Lindén. He presented the findings at last month's American Chemical Society meeting in Las Vegas.

Scanning electron micrographs show that the tubules, about 2 micrometers in diameter, are completely filled by the hydrogels. In human trials, a 10-minute application cured people who had sensitive teeth, suggesting that the material could also guard against cavities if used as a preventive treatment. The gel penetrates more deeply than regular sealants and is permanent.

Lindén and his colleagues developed this approach after discovering that the insides of the tubules are coated with a natural hydrogel composed of a fibrous protein and water. Not much is known about the native substance, Lindén says, but they don't think it's collagen. Because the tiny amounts of hydrogel are bonded to the tubule walls, it's difficult to remove enough for thorough identification. —*C.W.*