Sweeter slumber for tots who sleep solo

Many a toddler has climbed into bed with mommy and daddy after waking from a nightmare or thunderstorm in the wee hours of the morning. While a new study gives that infrequent practice the nod, the researchers warn that tots who get in the habit of sleeping with their parents may suffer chronic sleep problems.

Pediatricians have long advised parents against allowing children in their bed, citing a host of dangers including behavioral problems for the child and in some cases sexual abuse. The new research, while not addressing the issue of abuse, offers reassurance that infrequent bed sharing usually causes no general adjustment difficulties for the child.

Deborah Madansky and Craig Edelbrock of the University of Massachusetts Medical School in Worcester interviewed 303 parents of 2- and 3-year-olds. In 55 percent of the households, they found, parents occasionally allowed children into their bed for at least part of the night. Another 25 percent reported frequent – more than once a week – bed sharing with young children.

Questionnaires administered to parents at the study's outset revealed no link between behavior difficulties and occasional bed sharing. However, toddlers who routinely slept with their parents more than once a week proved 10 times more likely to dislike sleeping alone and up to four times more likely to resist going to bed than children who rarely or never slept with their parents. Such difficulties persisted or worsened in children who continued to sleep with their parents regularly through the course of the year-long study, the team reports in the August PEDIATRICS.

While parents may think they're helping restless tots, the study suggests that habitual bed sharing makes it more difficult for the child to get a full night's sleep. People of all ages wake up periodically throughout the night, Madansky notes. She recommends that parents encourage small children to go to bed alone and to fall back asleep without waking the rest of the household.

"Most parents who are committed to solving their child's sleep problems can solve them," she asserts. Madansky advises parents to stop reinforcing the child's nocturnal visits and to offer a morning reward for a successful – and solo – night's sleep. *–K.A. Fackelmann*

UV damages base of Antarctic food web

Ultraviolet light damages some species of Antarctic plankton much more than others, a new study shows, suggesting that the yearly formation of an ozone hole over Antarctica could alter the region's rich marine ecosystem. However, the study's authors say it remains unclear whether the ozone depletions over the last 10 years have actually harmed life in that area.

Phytoplankton, one-celled floating plants, form a critical base for the oceanic food web. In the Antarctic, they provide the bulk of fodder for krill, a shrimp-like dietary staple of fish, birds and whales.

Deneb Karentz and David L. Mitchell of the University of California, San Francisco, studied nine species of phytoplankton collected from waters near the U.S. station on the continent's Palmer Peninsula. These species are among the most plentiful during springtime, when seasonal stratospheric-ozone losses over the Antarctic begin. The drastic depletions in the ozone layer allow high levels of ultraviolet radiation to reach Antarctic surface waters (SN: 4/15/89, p.228). In the laboratory, Karentz and Mitchell measured the DNA damage incurred by each species under exposure to ultraviolet light. They also assessed each species' ability to repair damage.

The plankton exhibited a broad range of sensitivity, with the most vulnerable species suffering 100 times as many defects as the most resistant. These results, due to appear in an upcoming issue of ANTARCTIC JOURNAL, were released last week by the National Science Foundation, which partially sponsored the work.

The findings suggest the ozone hole could alter the survival ratio of phytoplankton species, Karentz says. With such a wide variation in species responses, she predicts that the "species that are most resistant are the ones most likely to become abundant."

However, such a change may not harm the ecosystem, observes Robin Ross of the University of California, Santa Barbara. The new data indicate larger phytoplankton species incur less ultraviolet damage than do smaller species, and krill prefer to eat larger phytoplankton, Ross notes. Still, she cautions that krill may depend on smaller species for some nutrients.

Ozone holes, which began forming over the Antarctic in the late 1970s, may already have altered the planktonic ecosystem, although biologists have yet to make such a determination. Karentz says attempts to assess the damage are hampered by the lack of species-abundance records for the years before the hole first appeared. *– R. Monastersky*

Stretching liquid to its physical limit

Stretch a confined sample of water enough and it becomes unstable, rupturing violently into vapor. Researchers have now witnessed this bizarre scenario in tiny, water-loaded cavities locked within crystals. Their experiments provide a general route for studying liquids under exotic conditions of "negative pressure" and should yield a fuller understanding of the liquid state of matter, they say.

"In normal liquids, particles are buzzing around banging into each other, exerting forces on each other in a fairly random way," explains chemist C. Austen Angell of the Arizona State University in Tempe. "The average force acting on a particle is randomly directed."

That's why water in a glass doesn't spontaneously lurch into your face.

High pressure, on the other hand, can force a liquid's molecules close enough for short-range repulsive forces to kick into high gear so that the average force acting on a particle points away from the center of the sample. "They're all trying to push out and get to a larger volume," Angell says.

That's why squeezing the trigger of a water pistol yields a stream of liquid.

But Angell and his colleagues focus on what happens to liquids under tension, or negative pressure – a largely unexplored condition in which the average force on a particle pulls it in toward the center. Attractive rather than repulsive forces govern the stretched liquid's behavior.

In the Aug. 10 SCIENCE, the researchers describe their use of microscopic, liquid-containing cavities in quartz as windows onto stretched liquids. To build tension, they heat and then cool the crystals. When heated, the liquid expands to fill space formerly taken up by vapor bubbles at room temperature. During cooling, some of the liquid clings to the cavity walls as the rest tries to contract, causing a rise in tension. The cooler the temperature gets before bubbles repopulate the imprisoned liquid, the higher the negative pressure gets.

At tensions apparently equivalent to 800 to 1,400 negative atmospheres, Angell and his colleagues observe bubbles of vapor suddenly appearing throughout the liquid. Angell notes that the van der Waals equation – an enduring 19th-century formula describing gas behavior – predicts that liquids must break up and form vapor bubbles when stretched beyond a point at which their molecules hover between liquid and vapor states.

For a liquid, Angell says, that point "is like the edge of the world." And when he stretches his sample beyond the edge, "it looks like the whole thing suddenly becomes a froth." *– I. Amato*