Getting the scoop from the poop of *T. rex*

Clues to the digestive habits of *Tyrannosaurus rex* have emerged from a 65-million-year-old lump of dinosaur dung, discovered on an eroding hillside in the badlands of Saskatchewan, Canada.

The whitish-green rock, 44 centimeters long, represents the first example of fossilized feces that clearly came from a carnivorous dinosaur, a group known as theropods, reports a team led by Karen Chin of the U.S. Geological Survey in Menlo Park, Calif. The rock, called a coprolite, is filled with broken bits of bone from an unfortunate herbivorous dinosaur. It "is rare tangible evidence of theropod diet and digestive processes," the team concludes in the June 18 NATURE.

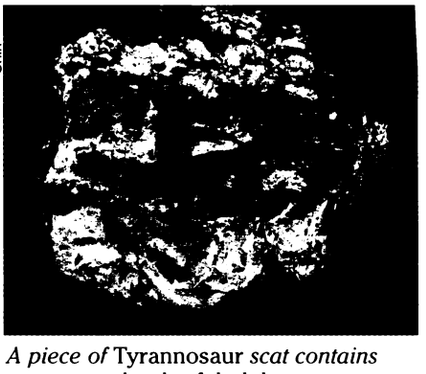
Paleontologists have previously found numerous examples of large plant-filled coprolites from herbivorous dinosaurs (SN: 9/21/96, p. 186). They have had difficulty, however, assigning coprolites to theropods because sites with dinosaur fossils often also contain skeletons of other carnivorous animals that could have produced bone-filled feces.

Chin and her colleagues say that they can confidently identify the producer of the Saskatchewan specimen because the coprolite is so massive—bigger than a loaf of bread. It must have come from a large theropod, and the only one known in these deposits is *T. rex*, says Timothy T. Tokaryk of the Eastend Fossil Research Station in Saskatchewan.

Other researchers agree with that conclusion. "It had to be from a tyrannosaur, given the size of it, unless one of those smaller predators was *very* sick one day," jokes James O. Farlow of Indiana-Purdue University in Fort Wayne.

Although *T. rex* has ruled the imaginations of children and paleontologists for over a century, researchers still debate such basic issues as whether the king carnivore captured live prey or scavenged carcasses. "It's very difficult to say much about their behavior," says Gregory M. Erickson of the University of California, Berkeley, a coauthor of the NATURE article.

The find offers new insight into the eating style of tyrannosaurs, Erickson says. It contains fragments of bone from a juvenile ornithischian dinosaur—perhaps part of the head frill of a *Triceratops*, one of the most common dinosaurs whose remains appear in nearby rocks, say Chin and her colleagues. This evidence supports recent work by Erickson suggesting that *T. rex's* teeth were strong enough to crunch through bone, a topic of much debate in the past. At the same time, the find contradicts speculations that theropods completely dissolved the bones of their prey, much like modern crocodiles, which have extremely acidic stomachs.



A piece of Tyrannosaur *scat contains numerous shards of dark bone.*

Because living reptiles often swallow large pieces of prey, the shattered condition of the bones in the coprolite came as a surprise, comments Peter Andrews, a paleontologist at the Natural History Museum in London. The bone fragments indicate that tyrannosaurs repeatedly crushed mouthfuls of food before swallowing, he says.

Paleontologists caution against drawing too many conclusions from one specimen, but the recent discovery raises hope that more examples will turn up. "This particular find gives us an image of what theropod coprolites might look like," says Erickson. —*R. Monastersky*

Healthy functioning takes social cues

People who hold stressful jobs and lead lonely personal lives experience elevated rates of physical illness and death. A new long-term study, based on a large sample of British civil servants, examines more closely the circumstances that may undermine physical, mental, and social functioning.

Over a 5-year period, employees of both sexes who felt that their on-the-job efforts had failed to generate appropriate career advancement or promotions exhibited the poorest overall functioning, contend epidemiologist Stephen A. Stansfeld of University College London and his coworkers. Nagging conflicts in close relationships outside the workplace exhibited a separate strong link to diminished well-being, the scientists add.

Most studies of psychological and physical functioning have treated the number of social relationships as a crucial influence, but they have rarely assessed the quality of intimate relationships.

Intriguing sex differences emerged from the study, Stansfeld's group reports in the May/June PSYCHOSOMATIC MEDICINE. Intense job demands were related to increased physical and psychological problems in female civil servants but not in their male counterparts. Instead, men who displayed lower overall functioning tended to have few friends and other social contacts away from work.

"The suggestion in these data that women are more vulnerable to demands of work, whereas men are more vulnerable to lack of social support, and to social isolation is an interesting commentary on our times and deserves additional attention," writes epidemiologist Lisa F. Berkman of Harvard University in an accompanying comment.

Stansfeld and his colleagues examined 9,302 London-based civil servants, 35 to 55 years old, at three points over an average of 5 years. Participants filled out a short questionnaire that probed general physical, mental, and social functioning. The usefulness of this questionnaire had been demonstrated in earlier studies of recovery among medical patients.

The participants also responded to inquiries about the amount and nature of social support outside of work, tendencies to interact in hostile ways with others, and job stress—such as whether they faced frequent time pressures and had the latitude to make independent decisions.

Physical examinations occurred at the beginning and end of the investigation.

The researchers statistically adjusted for the effects of physical illness at the outset of the study, as well as for cigarette smoking, exercise, and weight.

Having a hostile personality might underlie both unrewarded efforts at work and poor functioning. However, it could only partly explain the link observed between these two elements, the researchers note.

Psychological and social influences on functioning were similar for civil servants who entered the study either with or without physical illnesses. However, it remains unclear whether poor functioning in these arenas often precedes the onset of some medical ailments or appears in the early stages of illness, the investigators say.

The new findings underscore the idea that healthy functioning encompasses more than simply the absence of disease and disease-promoting behaviors, Berkman remarks.

"As populations age, a phenomenon that is happening globally, there is an urgent need to identify the determinants of health in this broader sense," she says.

Future work should look for combinations of work and personal experiences that bode particularly well or ill for overall functioning, the Harvard scientist maintains. —*B. Bower*