DMS infectious disease expert Peter Wright, M.D., was invited by the *New England Journal of Medicine* to assess a new way of growing avian flu vaccines; he hailed it as promising.

"You are what you eat" applies to lab animals

As researchers toil away in their labs, they carefully control all aspects of an experiment to prevent unexpected variables from tainting their findings. But what if something that never crossed their minds distorts their data?

Diet: A team of DMS researchers—led by graduate student Courtney Kozul and Joshua Hamilton, Ph.D.—discovered just such a factor: the degree to which a lab animal's diet can obscure the results of genetic studies. They set out to explore the effects of two amounts of arsenic—100 parts per billion (ppb) and 10 ppb—on gene expression in mice. But when they learned that a serving of nonpurified lab chow contains as much as 390 ppb of arsenic, they decided to take a close look at lab animals' diets.

The study showed that "diet has profound effects" on the body.

Nonpurified chow consists of cereal and assorted sources of protein, including fishmeal, which often contains arsenic and other contaminants. Many animal facilities use such chow because it's cheaper than a purified diet. Researchers may not even know what kind of food their lab animals get, and seldom is the information reported in scientific papers.

Poster: At a national meeting where the research was first presented, "hundreds of people came to my poster almost panicking," says Kozul. They didn't realize lab diets might be skewing their results. The findings have since been published in *Chemico-Biological Interactions*.

The study, funded by the National Institutes of Health, was conducted with male mice over a period of five weeks. The mice were divided into two groups; one ate regular chow and the other a purified diet with only 20 ppb of arsenic.

The experimental dose of arsenic was administered in the animals' drinking water; some mice in each group got water with 100 ppb of arsenic and some got 10 ppb. Then, using a technique called microarray analysis, Kozul analyzed all 20,000 mouse genes. In the purified diet group, it was clear the 100-ppb dose altered the expression of many genes in the animals' lungs and livers.

But in the regular-chow group, the contaminants "profoundly affect[ed] gene expression," says Hamilton, making it impossible to see the effects of the experimental doses. Of particular concern was the fact that the affected genes are involved in drug metabolism.

In previous studies, Hamilton's team—which has always used a purified diet—has shown that arsenic in drinking water disrupts important hormones and contributes to cancer, cardiovascular disease, and diabetes. In 2006, their work led to a lowering of the federal limit for arsenic in drinking water—from 50 ppb to 10 ppb.

The study showed that "diet has profound effects on how our body responds," says Hamilton. He has since left Dartmouth to be chief academic and scientific officer at the Marine Biological Laboratory in Woods Hole, Mass., but Kozul is continuing her research at DMS. Her latest finding was that arsenic affects genes that control the immune response of lung cells. LAURA STEPHENSON CARTER

JON GILBERT FOX

Kozul shows off regular chow, left, and purified.

A BP of 120 over ecstatic

It's hard to quantify happiness. Studies have shown that some nationalities, such as the Dutch, consistently report higher levels of contentment than, say, Germans, but cultural differences call those results into question. Dartmouth economist David Blanchflower, Ph.D., took a medical approach, arguing in the *Journal of Health Economics* for blood pressure (BP) as an indicator of well-being. He found in a survey of 15,000 people in 16 European nations that "happy countries seem to have fewer blood pressure problems." So if you're happy and you know it, your BP will surely show it.

Problematic polymorphisms

Scientists know smallpox vaccination can have side effects, but they don't know why. To find out, researchers at DMS and several other institutions examined polymorphisms—slight genetic differences—at 1,442 locations on the human genome during a vaccination trial. They identified 36 sites that seemed to be linked to adverse reactions; in a second trial, three of those polymorphisms again correlated with side effects. "The fact that the results of our first study were independently replicated in the second study," wrote the team in the *Journal of Infectious Diseases*, "strengthens the plausibility of these genetic associations." ■