Birth defects jump when mom needs insulin

It's well known that babies of certain diabetic women face an increased risk of major birth defects. But new research shows that Type I diabetes – the insulin-dependent, juvenile-onset form of the disease – may pose more than double the birth-defect risk cited in previous estimates. The study also adds a new group of diabetics to the at-risk list: women who develop temporary, "gestational" diabetes during pregnancy.

Researchers at the Centers for Disease Control in Atlanta base their new estimates on data for 4,929 babies listed in the Atlanta birth-defects registry and information on 3,029 non-deformed babies matched for race, birth date and hospital. They found that diabetics who didn't need to take insulin had no increased risk over nondiabetics of delivering babies with major birth defects. But when women developed a need for insulin supplementation, their risks climbed dramatically – to 3.4 times the nondiabetic risk for Type II diabetics and 6.5 times the nondiabetic risk for gestational diabetics. Birth defects among Type I mothers occurred at 7.9 times the rate of nondiabetics, the team reports in the January PEDIATRICS. Previous estimates had placed the risk for Type I diabetics at only two to three times that of nondiabetics.

"We were particularly surprised by the findings for the gestational diabetics," says study leader Jose E. Becerra, because other studies suggested these babies ran no increased risk. "Even more interesting," he says, was the finding that the increased risk among insulin-using gestational diabetics involved only cardiovascular defects. Defects in babies of other diabetics taking insulin showed no such restriction.

Because supplemented insulin does not pass to the fetus, Becerra suspects diabetes-linked birth defects result from the major metabolic changes that create a need for insulin.

Lead's lasting legacy

Children, especially vulnerable to lead toxicity, can suffer a range of adverse neurological effects – including diminished IQ – from lead exposures once considered moderate or low. Do they ever fully recover from these early exposures? Probably not, researchers suggest in the Jan. 11 NEW ENGLAND JOURNAL OF MEDICINE.

A team led by University of Pittsburgh toxicologist Herbert L. Needleman reexamined 132 young adults an average of 11 years after researchers first noted that their academic and communications abilities correlated with early lead exposures, as evidenced by deposits of the heavy metal in the subject's baby teeth (SN: 4/7/79, p.230). Among the 10 retested individuals whose baby teeth had enough lead to signal "poisoning," half now read at a level two or more grades below the norm for their age. And among the seven who are old enough to have graduated from high school, three are dropouts.

Needleman and his colleagues divided the 122 remaining subjects into three groups: those whose baby-tooth lead levels had been low (under 10 parts per million), medium (10 to 20 ppm) or high (20 to 24 ppm). Individuals in the high-lead group proved six times more likely to drop out of school than those in the low group, even after the researchers accounted for 10 potentially confounding factors. Higher early lead levels also correlated with lower scores on vocabulary and grammatical reasoning tests, slower reaction times, poorer hand-eye coordination and lower reading scores.

"If you can still measure [lead-induced] changes in young adulthood, they're not going to go away. The brain will not repair itself, nor will the social changes that have occurred reverse," Needleman says. But the risk of lead toxicity "could be wiped out forever," he contends, if homeowners and landlords took aggressive steps to remove indoor lead – in particular by replacing old paint and plumbing.

Biological scavengers for radwastes

Radioisotope-laced medical wastes are usually buried in clay-capped trenches. Over time, decaying organic materials – which make up the bulk of these interred wastes – will decompose, creating methane (CH_4). This volatile gas can then seep through any fissures that eventually develop in the landfill's cap. And because tritium (^3H) – a radioactive form of hydrogen – constitutes at least 90 percent of the radioisotopes contaminating these waste sites, much of the methane they emit is also radioactive, observes Lenore S. Clesceri, a microbial biochemist at Rensselaer Polytechnic Institute in Troy, N.Y. It's a potential problem that could jeopardize air quality, she says.

But Clesceri's recent studies suggest there's a simple and inherently natural solution: harnessing several types of methane-loving bacteria, ubiquitous in soil, to transform the radioactive pollutant into water. Though still radioactive, most of the tritium-based water would ultimately drain into collection systems surrounding the monitored landfills.

Clesceri has confirmed the presence of methane-degrading bacteria in the thin layer of soil atop the trench caps at the West Valley low-level nuclear waste site near Buffalo, N.Y. However, she says, these bacterial communities appear malnourished. Though they crave methane as a dietary staple, they need additional nitrogen and phosphorus in order to work efficiently, her studies show. By fertilizing trench-covering soil with both nutrients, Clesceri has succeeded in doubling or tripling the rate at which indigenous microbes convert methane to water.

She recommends topping the thin soil layer now covering low-level radioactive wastes with another 18 inches of dirt, then adding fertilizer regularly. This lengthening of methane's escape route, she says, would ensure that plenty of microbes get a chance to prey upon the pollutant.

New additive scrubs away NO_x-ious gases

Flue-gas scrubbers to remove sulfur dioxide (SO_2) – a leading source of acid rain – are required today on most new utility and industrial boilers in the United States. But the scrubbers that remove SO_2 don't trap nitrogen oxides (NO_x) – a poorly controlled contributor to both acid rain and smog ozone. Commercially available stack-gas technologies are available to tackle NO_x, but these are costly and subject to efficiency-robbing engineering problems (SN: 4/29/89, p.271). Now, chemists at Lawrence Berkeley (Calif.) Laboratory have "lucked" onto what they say could prove a major engineering advance – the discovery of a simple additive that allows existing SO_2 scrubbers to efficiently remove NO_x as well.

The most widely used SO_2 scrubbers are towering structures that bathe exiting stack gases in a mist of limestone and water. The water-soluble SO_2 dissolves into the mist, becomes neutralized, and rains down the scrubber tower, eventually flowing out the bottom. Because nitric oxide (NO), which makes up about 95 percent of most NO_x emissions, is not water soluble, it passes through this limestone/water slurry and out into the atmosphere – unless, that is, yellow phosphorus is added to the scrubbing mist.

Phosphorus reacts with oxygen in the flue gas to form ozone. This in turn reacts with NO to form water-soluble nitrogen dioxide (NO_2), Shih-Ger Chang and D.K. Liu explain in the Jan. 11 NATURE. The NO_2 can then dissolve into the slurry mist for removal in the same manner as the SO_2. In one experiment, the researchers managed to remove all of the SO_2 *and* NO.

If the patented technology performs as well in field tests as it did in the preliminary bench-scale experiments, it should offer a "tremendous, commercially economic improvement" over existing industrial options for removing NO_x, Chang says.