

**A** GROWING BODY of scientific evidence is encouraging infertility patients and practitioners to pay more attention to environmental chemicals and their impacts on reproductive health. Most of this new science comes from animal studies, and it isn't yet clear in most instances how these results apply to fertility challenges people face. But human studies that build on clues from the animal research reveal cause for concern — and reason for hope. Scientific certainty on these complicated, controversial issues is likely to take many more years, but the weight of the evidence tells us that if some cases of infertility can be caused by environmental contaminants, they can also be prevented. It suggests further that reduction of chemical exposures generally may be important for safeguarding reproductive health in future generations.

The evidence comes from many and different sources. Following are some key pieces.

The number of couples treated for infertility has risen significantly in

a 12% increase for 25- to 34-year-olds and a 6% increase for 35- to 44-year-olds.<sup>12</sup>

Laboratory studies prove that many man-made chemicals cause fertility-related damage in animals, sometimes at very low doses.

These substances can be found in wildlife and people at levels similar to those causing adverse effects in lab animals.

Numerous field studies link environmental contaminants to a whole range of reproductive abnormalities in wildlife, and to reduced reproductive rates/population size. These data come from many species, including birds, fish, mollusks and mammals.

There are upward trends, varying by region and over time, in human health conditions negatively affecting fertility: poor sperm quality and counts; increased incidence of several male genital birth defects; and apparent rises in endometriosis (which may or may not be due to increased diagnosis). These outcomes can be created in lab animals by exposing them to toxic chemicals. Given the exposures humans face, it isn't implausible man-made chemicals are influencing trends

be of concern.<sup>34</sup> Many of these compounds are known to undermine reproductive health. Some persist in the environment for years or decades. Many bypass the placenta and reach the developing fetus.

The vast majority of commercial chemicals have never been tested for health effects or reproductive toxicity. There is no requirement for manufacturers to do so, except for a few classes of chemicals. Most of the testing that has been done has been on adults at unrealistically high levels of exposure, one at a time. This approach ignores several important conclusions from research over the past decade and means toxicities could be underestimated:

- Exposures in the real world are never limited to one compound at a time, and contaminants interact as they cause effects;
- The fetus during development is vastly more sensitive to exposures than is an adult.
- Fetal exposures can have life-long consequences for reproductive health;
- Low level exposures can cause sig-

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recent decades. This is often attributed to increased diagnosis and by the availability of assisted reproductive technologies—within a generation of baby boomers who have tended to delay childbearing. But there are indications that the actual incidence rate of infertility is rising too. A 1998 report of the US National Survey of Family Growth found that the rate of “impaired fecundity” (difficulty conceiving or carrying a child to term) rose significantly between 1982 and 1995 in all reproductive age groups. Surprisingly, and contrary to the “baby boomer” hypothesis, the biggest rate increase occurred in women under 25 years-old — 42% — compared to

in some human reproductive health conditions. It must be noted, however, that there are likely multiple explanations—not just chemical—for these trends and experts disagree about what might be causing them.

Some 85,000 synthetic chemicals have been registered for use in the US. Every year 1,000–2,000 more are added to the list. They've become inescapable, pervading air, water, food, homes—and our bodies. Actual measurements, called “body burden surveys,” of contaminants in people show that average Americans have hundreds of manmade chemicals in their tissues (including amniotic fluid and umbilical cord blood) at levels high enough to

nificant effects that can't be predicted from high dose experiments because the former work through different mechanisms.<sup>5</sup>

Thousands of examples from the scientific literature show that chemical exposures cause reproductive damage in lab animals and wildlife populations.<sup>6,7</sup> At high doses, this surprises no one. But within the last decade, new types of research have made it clear that even low levels of contamination can interfere with hormones and the processes they control.<sup>8,9,10</sup> Hormone signals are one of the most important ways that genes get

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# TOXINS AND FERTILITY

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*Toxins and Fertility, continued from p. 12*  
 turned on and off. When a gene is switched off abnormally, or turned on at the wrong time, a wide range of negative effects can result. So the discoveries that chemical contaminants alter the expression of genes critical to reproduction in animals are worrisome—because animals and humans share many genes.

Virtually none of the toxicity testing of manmade chemicals upon which public health standards are based has taken the above vital factors into account. Fortunately, research efforts involving people are beginning

to use these findings from the lab to guide the design of fertility-related investigations. It will take decades of carefully planned epidemiological studies to reach firm conclusions, just as it took decades to document the adverse effects of smoking. This is illustrated by a 2003 publication of a new evaluation involving the insecticide DDT. Using new analytical chemistry techniques on decades-old frozen samples of newborn umbilical cord blood, it was revealed that women whose cord blood at birth reflected higher DDT exposure while they were in the womb took longer to achieve

pregnancy as adults."

There are two categories of impact where chemicals and fertility are concerned: The first involves adult exposures. Many of these should be reversible, depending upon the mechanism and severity of impact. (Visit [www.resolve.org/toxic](http://www.resolve.org/toxic) and view Table 1 for examples of exposures that have been shown to impair fertility in humans. Some of these impacts are well established (confirmed by other studies), some less so.

The second category of impact involves fetal and early life exposures that affect the development of offspring up to reproductive maturity. Many of these impacts are irreversible, especially those involving abnormalities of the reproductive tract, impaired ability to respond to hormonal stimulation as an adult and decreased sperm production or function in the male offspring. Animal experiments show clear and consistent patterns of developmental impact. (See examples in Table 2 on [www.resolve.org/toxic](http://www.resolve.org/toxic).) Human studies are needed to confirm the effects of maternal exposure on the fertility of the offspring.

To better understand such problems over the long term, the US National Institutes of Health is planning a National Children's Study ([www.nationalchildrensstudy.gov](http://www.nationalchildrensstudy.gov)) that will enroll over 100,000 pregnant mothers, measure a range of important health factors including chemical exposures in the womb, and track the health of their babies through adulthood. The results, which won't be available for years, are expected to provide guidance to clinicians, parents and parents-to-be.

In the meantime, it is hard not to wonder if future generations might end up in "reproductive intensive care" if we aren't careful about chemicals research and regulation. It is troubling that while pharmaceutical manufacturers are required by the US Food and Drug Administration to investigate safety before marketing

## Steps You Can Take to Try to Reduce Your Exposures to Toxic Chemicals

- Don't smoke, and minimize your exposure to second-hand smoke.
- Contact your county's water authority to find out what's in your drinking water.
- If necessary, filter drinking, cooking and bathing water. There are whole home filters as well as faucet mounted ones and pitchers (bottled water is unregulated).
- Reduce your consumption of fish species containing high levels of mercury, dioxin and PCBs such as swordfish and albacore tuna. But don't stop eating fish. Make informed choices. Consider certified contaminant-free brands of fish oil pills to get important omega fatty acids you and your baby need.
- If possible, buy organic foods. Wash (and peel where you can) non-organic produce before eating to remove agricultural chemicals they may have on them.
- Reduce or stop use of pesticides and herbicides for home, lawn, garden and pet care where possible. Try non-toxic alternatives.
- Avoid environments that have been recently treated with pesticides and herbicides. Depending upon the product and conditions in the environment, pesticides and herbicides have a half-life of between one day and one year...
- Exercise caution: Some candies from Mexico; some food colorings, make-up and ayurvedic medicines from India; some Chinese herbal remedies; and some gumball toys/jewelry dispensed in the U.S. have been found to contain lead. There are few labeling requirements and only minimal regulation of these products.
- Avoid polycarbonate plastic baby and sports/water bottles, and other products made of polycarbonate that might come in contact with food, because they can leach bisphenol A.
- Make sure that PVC plastic "cling" wraps you put in contact with food do not contain phthalates (ask the manufacturer). Never microwave foods in plastic containers that might leach harmful compounds.
- Purchase personal care products (shampoos, make-up, lotions, etc) without phthalates and other toxicants.
- Use "green" carpet, dry cleaning and landscape/garden/lawn care services. If you can't, air out dry-cleaned clothes before bringing them into your car/home, and be sure to ventilate well during and after carpet cleaning.
- Use non-toxic, earth-friendly home cleaning products.
- Keep your home well ventilated when vacuuming, cleaning, painting, doing arts and hobbies to clear out indoor air pollutants that get stirred up during these activities, and disperse vapors from glues, paints, resins and lacquers used in crafts and home projects.
- If pregnant, avoid pumping fuel, remodeling your home, painting, and hobbies that involve solvents and glues. Be careful to use non-toxic nail and hair products.
- Avoid use of synthetic chemical air fresheners, fabric softeners and fragrances.
- Consult an occupational/environmental medicine specialist if you are concerned about and want to pursue an evaluation of your personal exposures at work, home, school or in general.

their products, for the most part chemical companies (and personal care and home cleaning product companies that use toxic chemicals) are not.

There are precautionary steps one might consider to reduce personal exposures (see Sidebar page 26). But some personal contamination is unavoidable, simply because toxic chemicals are so ubiquitous. As noted earlier, manmade chemicals permeate air, water, soil, food, homes, schools and workplaces. They are in our beauty, pet, home, lawn and garden care products. This means it is also important for individuals and infertility groups to consider supporting larger-level public policy improvements that could reduce harmful exposures more generally, such as enhanced research agendas and funding; shifting the burden of proof regarding chemical safety from government and citizens after the fact to manufacturers before commercial introduction; improved disease tracking and toxic release reporting; and expanded surveys of human toxic chemical "body burdens."

Promising news is that RESOLVE recently announced new headquarters in Washington, DC, where the organization intends to step up advocacy efforts on behalf of the infertile. What an opportunity for RESOLVE to have a voice in support of "environmental repro health." As male infertility researchers Richard Sharpe and Stephen Franks wrote in a 2002 *Nature Cell Biology* review titled *Environment, Lifestyle and Infertility: An Intergenerational Issue*: "A failure of science to meet this challenge...will hand the poisoned chalice of infertility to the next generations." ☺

For a list of resources including books, reports and websites, please visit [www.resolve.org/toxic](http://www.resolve.org/toxic).

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## Do You Need Donor Eggs?

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