## Scientific Tinkering

The pathway described here is based on a paper published in 1991 in *American Biology Teacher*, the journal of the National Association of Biology Teachers. The authors described a catalase assay method using beakers to hold reactions of yeast and peroxide. We adapted the method to make it microscale, saving chemicals, glassware and clean-up time.

Scaled-up and scaled-down methods abound in research. We try small-scale experiments for considerations of expense and safety. Like a family recipe, you sometimes have to modify the process or amounts out-of- proportion.

Scientists read many papers in fields that sometimes do not appear to be related. What about this report jogs my mind? How can I apply that method to my project? Would I find the same result using my study organism? As we read, questions like these pop up. These incremental ideas help us to push the boundaries of knowledge.

Some discoveries open new gates and even new paths for further study. Figuring out the structure of DNA was one such feat. Another was the technological advance to chemically synthesize DNA segments of defined DNA sequence (the gene machine).

Figuring out how to prepare catalase enzyme so it remains stable and active at room temperatures for many months sealed in foil was another commercial feat. This helps many of us to wear soft contact lenses in relative freedom from irritating contamination, because with the formulated catalase neutralizing tablets, we can biochemically destroy the hardy hydrogen peroxide that is the active ingredient of chemical disinfection fluid.

The relative biological reactivities of hydrogen peroxide and water illustrate the simplest case of analysis of chemical analogues. On the one hand we have the molecule that is more than 80% of practically every life form. Adding just 1 oxygen atom converts water from the most needed chemical for life to one of the most poisonous! Our bodies are filled with catalases, made in a wide variety of cells, to destroy any peroxide that is generated through daily biochemical processes. Manufacturers have harnessed this common catalytic protector and put it to profitable medical, consumer and manufacturing use.

Organic chemists look at biochemical reactions and then search creatively for analogues that can be recognized as a substrate, but are easier to detect. As a result, researchers can use safer chemicals to detect reactions, substituting radioactivity for light emitting compounds, and pigmented products for ones we needed to use expensive UV spectrophotometers, e.g., the blue-white colony indicator (bluo-gal) for school transformation studies.