Spinal tap: Using cactus spines to isolate DNA

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Isolation of DNA from some organisms is a routine procedure. For example, you can buy a kit at your local pharmacy or grocery store that allows you to swab the inside of your cheek and send the sample for DNA sequencing. However, for other organisms, DNA extraction is much more problematic. Researchers at Desert Botanical Garden in Phoenix, Arizona, have developed a novel procedure that greatly simplifies genomic DNA isolation from cactus tissue.

For members of the family Cactaceae, isolation of genetic material can be difficult due to the presence of polysaccharide-based mucilage content and other secondary compounds. Although important for water storage, these compounds necessitate the use of toxic chemicals and numerous modifications to protocols for DNA extraction. Lead author Shannon D. Fehlberg and colleagues describe a novel method for isolation of DNA using cactus spines in the March issue of *Applications in* Plant Sciences (available for free viewing at http://www.bioone.org/doi/pdf/10.3732/apps.1200013).

"I had worked with getting DNA out of cactus in the past where you use pieces of the epidermis, but it was messy and difficult to sample. It was also difficult to deal with in the lab because of the mucilage," says Fehlberg. "Now you can snip a spine and, while you have to grind the spine up, it is easy to collect and easy to store and you can follow the manufacturer's protocols for extraction—simplifying both the field and genetic work."

Considered to be modified leaves, spines contain significantly less mucilage content compared to other tissues commonly used for sampling in Cactaceae. Additionally, removal of cactus spines is less invasive than sampling epidermal tissue, which can damage plants and expose the underlying soft tissue to pathogens.

"Although you can cut a fairly small sample of epidermal tissue, this can be problematic if you are working with living collections or endangered species. Not only is it much easier to clip a spine, it is also more aesthetic and less harmful," comments Fehlberg.

As the cost of DNA sequencing has dramatically decreased, its use has grown exponentially. Because it allows the comparison of individuals within and between populations, DNA sequencing has played an important role in understanding genetic diversity. "For example, in the plant species I'm studying, the species boundaries are not clear," says Fehlberg. "Genetics is important for determining what can be considered a cohesive group. "

Knowledge of genetic variation among populations will provide insight to the persistence of a species and inform conservation efforts. Fehlberg notes, "Genetics is helpful in determining how similar populations are to one another and how connected they are. We're able to use both genetics and biological information to determine which populations are most unique and which are most threatened."

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