CANADIAN CHEMICAL NEWS
L'ACTUALITÉ CHIMIQUE CANADIENNE

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Bacteria-battling chemist
Mario Monteiro

THE BUG DOCTOR

Microwaving COAL

GREEN CEMENT

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TALLULAH PHOTOGRAPHY

Chemical innovation usually flies under the public radar, but soars in the spotlight when it holds a possible solution to a seemingly insurmountable problem. Finding answers to chronic healthcare challenges has been the life work of Mario Monteiro, a world leader in microbial polysaccharide immunochemistry at the University of Guelph in Ontario, whom *ACCN* has dubbed The Bug Doctor. For the past few decades, Monteiro has created polysaccharide-based vaccines as a viable alternative to conventional, protein-based vaccines, meant to thwart life-threatening bacteria like *Campylobacter jejuni* and *Clostridium difficile*. But it is Monteiro's work in the area of autism that has sparked hope for thousands of desperate parents, who are often at a loss when dealing with the physical and social problems afflicting their autistic kids. He describes this as a mission close to his heart — developing a vaccine against these bacterial invaders and the gastrointestinal infections that have been linked to autism disorders.

ACCN also provides a tour of the Ontario facilities of Lafarge Canada, which is developing greener cement processing in a new $9-million pilot facility, testing the use of low-carbon fuels gleaned from waste materials as a replacement for petroleum coke and coal.

The West Coast is no stranger to innovation, and we present Vancouver venture-capital start-up MicroCoal Technologies, which hit upon the idea of microwaving coal to release the water, potentially turning billions of tonnes of relatively worthless, low-rank coal into a ready and saleable product.

Chemical News presents an intriguing range of stories, including how the genetic structure of the South American 'superfood' quinoa is being mapped to assess its ability to grow in Canada. We also look at how a few gold nanoparticles can enable bent and torn polymers to repair their own structural damage.

Finally, congratulations to the winners of the annual Chemical Institute of Canada and Canadian Society for Chemistry awards, who are listed on Page 43. Many of these awards will be presented at the upcoming, 97th Canadian Chemistry Conference and Exhibition in my hometown of Vancouver. Hope to see you there! accn

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TECHNIQUES

Analyzing quinoa DNA for growing on Canadian farms

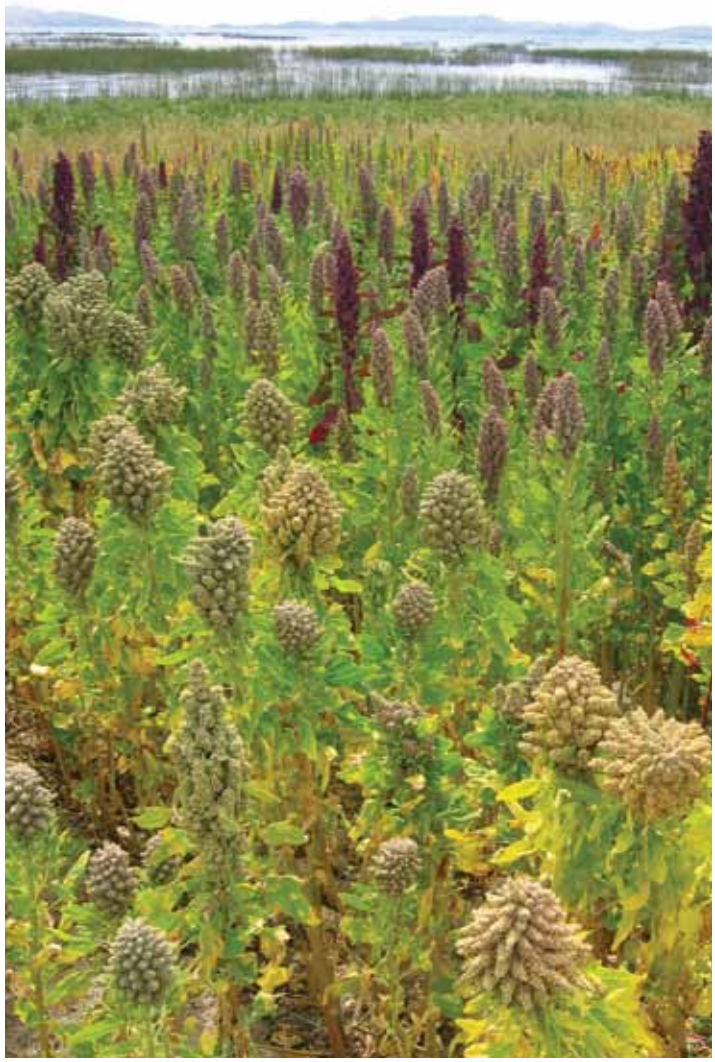
Although quinoa is widely regarded by foodies as an up-and-coming superfood, this nutrition-packed grain is currently grown only in South America's Andes Mountains. As Canadian tastes and markets for this mild-flavoured product expand, agricultural researchers are considering whether the plant can be adapted for cultivation here.

A traditional approach might have included studying generations of quinoa, looking for some variation that would allow it to survive our weather extremes. Suresh Neethirajan had a better idea. The University of Guelph engineer took some quinoa out to the Canadian Light Source in Saskatoon for a good look at its chromosomes under synchrotron radiation.

Neethirajan employed Scanning Transmission X-ray Microscopy (STXM), a technique that yields spectroscopic details of a target at the nanometre scale. The result was an accurate map of quinoa's genetic structure, and a short cut to determine how it should behave in a Canadian farmer's field. "We know the relationship between the chromosomal characteristics and their functional traits," says Neethirajan, adding that these features must be observed exactly as they appear in the natural setting. This is challenging, however, as quinoa has extraordinarily small chromosomes: less than 3,100 nanometres long and 200 nanometres thick.

Standard imaging techniques would call for chemical pre-treatments that would alter this arrangement and misrepresent the structure. But STXM captures this information with no such disturbance. "The beauty here is that we were able to chemically understand the characteristics inside these chromosomes," Neethirajan says.

The data are being added to extensive databases documenting the biomarkers associated with how quinoa responds to cold, diseases, insects, or other environmental factors. Having worked on similar databases for other key crops such a buckwheat and agave, Neethirajan suggests that we are well on the way to assembling a practical library of chromosomal information that could eventually be consulted in the field using hand-held scanning technology. A crop's vulnerability to current conditions could be identified before significant losses occur and farmers could take steps to address the problem well in advance. "There's a huge demand for novel tools," Neethirajan says. "The potential for developing precise molecular cytogenetic mapping using nanoscale technology is huge. It's possible to solve key challenges in plant breeding as well as in the biomedical field."



WIKI COMMONS

The highly nutritious grain quinoa is currently cultivated only in the Andes Mountains of South America, but agricultural researchers would like to see it grown in Canada.