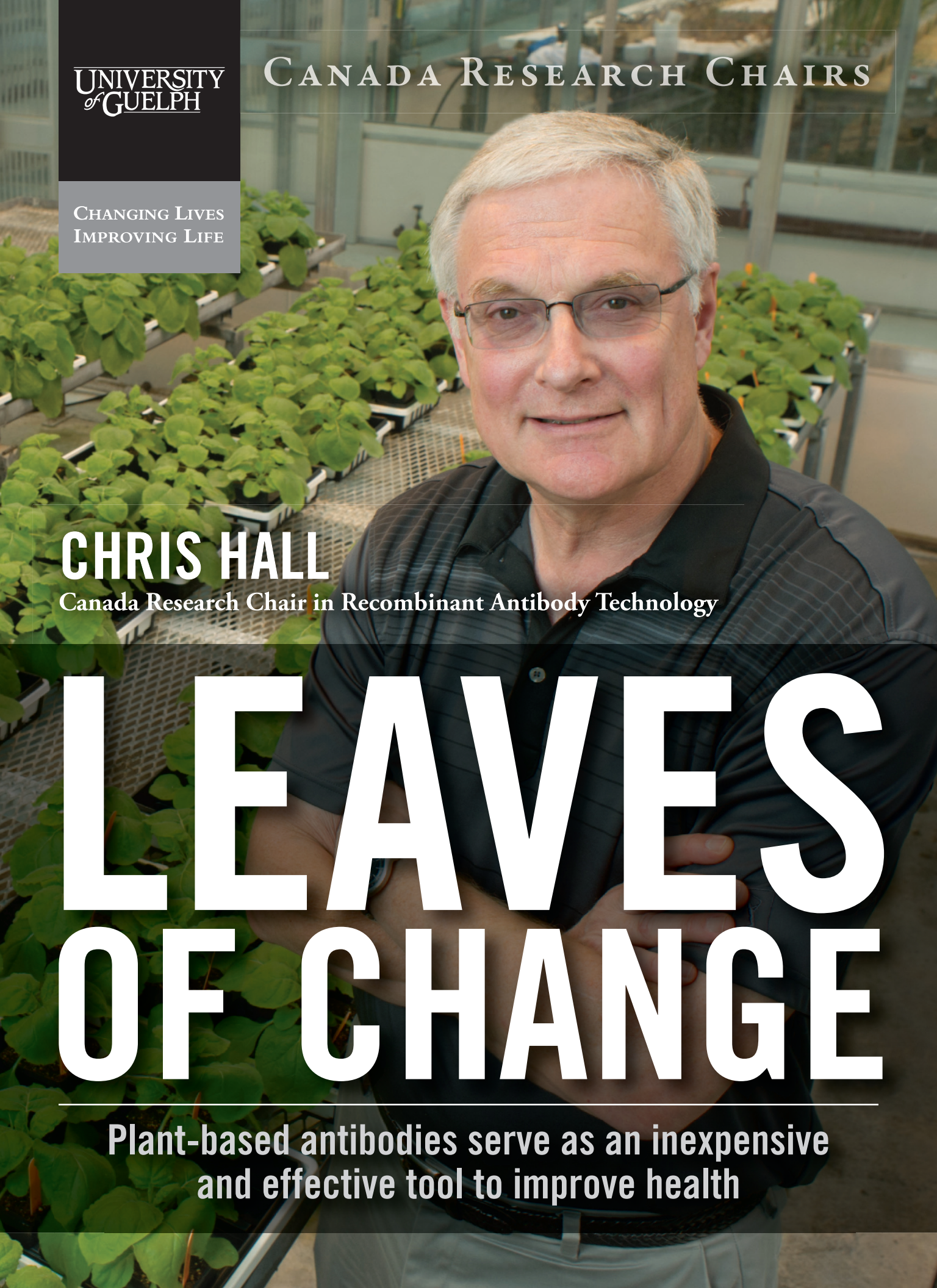


A photograph of Chris Hall, a man with grey hair and glasses, wearing a dark polo shirt, standing in a greenhouse. He is surrounded by rows of green plants growing in trays. The background shows the structure of the greenhouse with glass panels and metal frames.

UNIVERSITY
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CANADA RESEARCH CHAIRS

CHANGING LIVES
IMPROVING LIFE

CHRIS HALL

Canada Research Chair in Recombinant Antibody Technology

LEAVES OF CHANGE

Plant-based antibodies serve as an inexpensive
and effective tool to improve health



Using plants to their full potential

All mammals produce antibodies – proteins that work to keep our bodies healthy by targeting and fighting viruses, bacteria and disease. Modern medicine uses antibodies, produced in animal-cell manufacturing systems, to fight devastating diseases such as cancer. But the downside to such medicines is their high cost, requirement for sterile growth conditions and the possibility of contamination by pathogens.

A better solution to antibody production has emerged in the lab of University of Guelph professor Chris Hall, the Canada Research Chair in Recombinant Antibody Technology. Hall and his lab group have found a way to produce antibodies in fast-growing tobacco plants – a system with higher yields and much lower costs.

The cost difference between manufacturing in whole plants versus animal cells grown in a bioreactor is immense – up to 90 per cent less expensive.

“Using tobacco plants as bioreactors produces life-saving antibodies faster, more easily and more cheaply than traditional systems,” says Hall.

Hall and his lab have found a way to produce antibodies in plants that grow quickly, have higher yields and cost less.

Plants don't naturally produce antibodies, so the genetic material for a specific antibody must be introduced to the plant using a process called infiltration. The antibodies then grow within the plant until it is harvested. The next step is to grind up the plant material like a giant green smoothie, after which the antibody material is extracted, purified and packaged as an injectable drug – a process that takes about eight weeks from start to finish.

The manufacturing technology is being commercialized by PlantForm, a company Hall co-founded and for which he serves as chief scientific officer.

The company's first product will be a biosimilar (generic) version of the breast-cancer drug Herceptin (trastuzumab), used to slow

the growth of tumours and aid the immune system. Herceptin's patents begin to expire next year, and PlantForm aims to bring its plant-based version of the drug to market by 2017. An efficacy study in mice has shown that PlantForm's biosimilar trastuzumab drug is as effective as Herceptin in reducing the size and growth rate of breast cancer tumours. Human clinical trials are next.

PlantForm, which licenses Hall's technology from the University, is also developing other biosimilar antibodies for cancer, innovator antibodies for HIV/AIDS and anti-bioterrorism products.

Hall and his team recently received a patent from the United States – a PlantForm first – for their plant-produced antidote to cobra venom, the most common cause of fatality due to snakebite. In total, PlantForm is advancing four families of patents related to the technology.

And there's more. Another serious and global health issue is that of food and water-borne pathogens. In North America alone, 325,000 hospitalizations and 5,000 deaths occur each year because of foodborne disease. In total, this costs the North American economy \$35 billion.

PlantForm's technology could offer a solution to this problem. Hall is looking to create plant-based antibodies that have the ability to determine if food is contaminated or not.

With Hall's innovative plant-based antibody technologies, PlantForm can create effective, low-cost products to improve the lives and environments of people everywhere.

“When it comes to this technology, the sky's the limit,” says Hall.

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By Alaina Osborne

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