

# Modified formula aims to prevent death in premature infants

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Transgenic soybeans in the last stages of tissue culture.

Necrotizing Enterocolitis, an infection and inflammation that causes destruction of the intestine, affects about 10,000 babies a year in the country, and mortality rates are roughly 40 percent.

University of Arizona plant scientists are studying a novel approach at halting the leading cause of death in [premature infants](#), adding a

particular protein to soybeans that can be used in formula as a preventative measure.

About 10 percent of infants in the United States are born premature and among the greatest risks those babies face is Necrotizing Enterocolitis, or NEC, an infection and inflammation that causes destruction of the [intestine](#). NEC affects about 10,000 babies a year in the country, and [mortality rates](#) are roughly 40 percent.

Awarded a \$275,000 National Institutes of Health proof-of-concept grant, Eliot Herman and Monica Schmidt are working to genetically modify soybeans to produce epidermal growth factor, or EGF, a protein that occurs naturally in mother's milk. EGF has been shown to prevent premature infants from developing NEC.

NEC develops when bacteria invade the cells of underdeveloped organs, and EGF effectively prevents the disease by sealing those cells so bacteria can't attack, says Herman. Prevention is key because once the condition develops, expensive surgery becomes the only [treatment option](#)

Herman and Schmidt's potential treatment is not a drug but a therapeutic [baby formula](#) made from soybeans modified to produce a particular protein that aids in cell development. The NIH grant will support the production of EGF and testing the protein in a [mouse model](#).



An early selection of transgenic soybean tissue, where there is a single green embryo (transgenic) among many non-transgenic white embryos.

EGF is a small protein – 53 [amino acids](#) – that initiates a signal cascade involved in cell growth, proliferation and differentiation. Herman and Schmidt are producing EGF in transgenic soybeans.

"It's almost an ideal vehicle to express foreign proteins," Schmidt says.

Soymilk formula can be derived from the modified beans, meaning no extraction of the proteins needs to take place. The soymilk can be diluted with other soybeans to reach the optimal concentration of EGF and given as formula to at-risk infants. Preventing NEC and thus eliminating surgery for premature babies could save untold millions in health-care costs.

"This is making a very effective, inexpensive way to administer the EGF to the babies," Schmidt says.

The discovery of EGF in the 1950s led to the 1986 Nobel Prize in medicine for biochemist Stanley Cohen, but EGF is now off-patent, an "orphan drug" that won't generate big profits for pharmaceutical companies. The formula is essentially a nutraceutical treatment, Schmidt says, providing a health benefit from a naturally occurring compound.

"We find ways to make these compounds in large doses cheaper," Schmidt says. "The [soybean](#) is ubiquitous in the U.S. diet, so it's a good vehicle to provide these compounds."

Herman and Schmidt were recruited to the UA in 2012 from the Donald Danforth Plant Science Center in St. Louis, joining the School of Plant Sciences and the BIO5 Institute.

At Danforth, Herman and Schmidt specialized in plant biotechnology to enrich and fortify crops, creating a hypoallergenic soybean after discovering the protein in soybeans responsible for soy allergies. Schmidt says the researchers were drawn by the interdisciplinary potential available at BIO5.

"What we really like about being housed at BIO5 is the access to the medical people," she says. "I'm constantly looking for a downstream partner to test the viability of these compounds."

Provided by University of Arizona

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