Hospital hero? This frog has the makings of a lifesaver

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A living germ killer … a green and golden bell frog at Taronga Zoo. It belongs to a species which secretes chemicals that can kill bacterial strains resistant to antibiotic drugs. *Photo: Nick Moir*

NUCLEAR scientists are using native frogs to thwart hospital superbugs in work that sounds more like the plot of a sci-fi thriller than legitimate research.

Sydney and Melbourne scientists are studying several species of Australian frogs - including the green-eyed tree frog and the green and golden bell frog - whose skin secretions are toxic to a range of bacteria, including multi-drug-resistant golden staph know as MRSA.

Antibiotic-resistant bacteria can occasionally be fatal and have become a global public health problem. Antimicrobial compounds known as peptides found in the milky secretions of some frogs may be a wonder drug.

The research leader, Frances Separovic, a biophysical biologist, said most antimicrobial peptides killed bacteria by puncturing or lysing (causing them to disintegrate) their membranes. This made it hard for bacteria to develop resistance to them, Professor Separovic, chemistry head at Melbourne University, said.

"On the other hand, most antibiotics inhibit protein synthesis in a bacteria and, over time, mutations in the bacteria lead to resistance to the antibiotics," she said.

To understand where and how the frog's anti-microbial peptides destroy a bacteria's membrane, the team use a specialised instrument called a neutron reflectometer at the Australian Nuclear Science and Technology Organisation (ANSTO) to fire a narrow beam of subatomic particles, called neutrons, onto the membrane.

Anton Le Brun, a post-doctoral research fellow at ANSTO, said the technique allowed scientists to see through the membrane and watch how the peptides worked.

"When you look at a brick wall you can see the surface, but the neutron reflectometer lets us look through it and see what is underneath," Dr Le Brun said.

They found the positively charged antimicrobial peptides were attracted to bacteria because they were negatively charged. "Specificity is really important. You don't want the peptides attacking a red blood cell," Professor Separovic said.

"By understanding the peptides' 3D structure and mechanism of action at a molecular level, we may be able to increase their antibiotic potency," she said.

Dr Le Brun said the team studied synthetic chemical versions. "I can assure you no frogs were harmed in these experiments."