Geckos found able to expel all manner of fluids and their skin can kill bacteria

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This gecko has good sticking power thanks to the van der Waals force. Credit: Public Domain/Wikipedia

(Phys.org)—A multinational team of researchers that recently published a paper describing how they had used a scanning electron microscope to discover that gecko skin actually ejects water into the air has now

published another paper where they have advanced their research on gecko skin even further. In their new paper published in *Acta Biomaterialia,* the team describes how they tested the liquid ejection abilities of box-patterned geckos with a variety of fluids and then discovered a bacteria killing capability as well.

Geckos are well known as wall (and ceiling) climbers of course, and a lot of research has been conducted to replicate their climbing skills, but the team working in Australia, home of the box-patterned gecko has found that the tiny lizard's skin is just as remarkable.

After discovering that the skin of the gecko is covered with dome shaped plates topped with spines that cause water to form into drops, which is then ejected into the air by the spines, the researchers decided to test the skin a little more. They tossed a variety of liquids (red wine, soy sauce, blood, vinegar, milk, cola and coffee) at a gecko volunteer and found the lizard's skin was able to slough them all off as easily as water. What's more, they found that because the skin ejects fluids so efficiently, it is able to keep its skin clean, a must for preventing fungal growth in its humid environment. Dust, dirt and other particles that made their way to the skin were sopped up by water droplets which were subsequently ejected, leaving the skin nearly pristine.

Even more impressive, the team found that when they deposited a bit of the type of bacteria that causes bad breath in people, onto the gecko skin, the skin somehow killed it after just one day, it—the researchers do not know how, but suspect it had something to do with the size and/or shape of the bacteria coming into contact with the spikes on the skin. Interestingly, human stem cells placed on the gecko were not killed, and in fact grew.

The researchers believe that gecko skin may have something to offer us—replicating it may lead to self-cleaning, antibacterial surface

coatings for places like hospitals, is just one example.

More information: The gecko skin micro/nano structure – A low adhesion, superhydrophobic, anti-wetting, self-cleaning, biocompatible, antibacterial surface, *Acta Biomaterialia*, In Press: www.sciencedirect.com/science/ … ii/S1742706115001075

Abstract
The gecko, and specifically its feet, has attracted significant attention in recent times with the focus centred around their remarkable adhesional properties. Little attention however has been dedicated to the other remaining regions of the lizard body. In this paper we present preliminary investigations into a number of notable interfacial properties of the gecko skin focusing on solid and aqueous interactions. We show that the skin of the box-patterned gecko (Lucasium sp.) consists of dome shaped scales arranged in a hexagonal patterning. The scales comprise of spinules (hairs), from several hundred nanometres to several microns in length, with a sub-micron spacing and a small radius of curvature typically from 10 to 20 nm. This micro and nano structure of the skin exhibited ultralow adhesion with contaminating particles. The topography also provides a superhydrophobic, anti-wetting barrier which can self clean by the action of low velocity rolling or impacting droplets of various size ranges from microns to several millimetres. Water droplets which are sufficiently small (10–100 μm) can easily access valleys between the scales for efficient self-cleaning and due to their dimensions can self-propel off the surface enhancing their mobility and cleaning effect. In addition, we demonstrate that the gecko skin has an antibacterial action where Gram-negative bacteria (Porphyromonas gingivalis) are killed when exposed to the surface however eukaryotic cell compatibility (with human stem cells) is demonstrated. The multifunctional features of the gecko skin provide a potential natural template for man-made applications where specific control of liquid, solid and biological contacts is required.