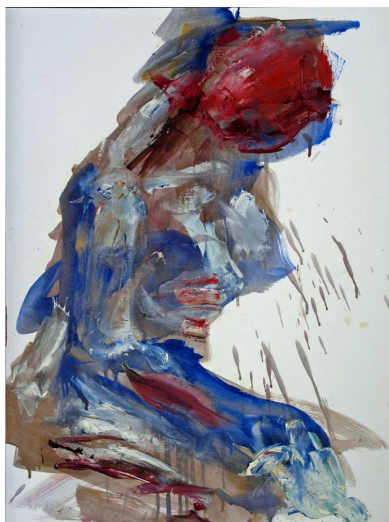


## Smart sweat

Vivienne Baillie Gerritsen

**W**e all sweat. Which is just as well because, generally speaking, the loss of body fluids is essential to our well-being. It rids us of a certain number of physiological impurities. Our skin – the material through which we sweat – is an organ *per se*, the largest one we carry around and a particularly complex one. It is a spaghetti junction of blood vessels, a harbour for nerve endings, a workshop for pigmentation and a field of sweat glands, oil glands and hair follicles. And that is not all. Our skin has also been called our ‘third kidney’. Indeed, waste seeps through it daily: sodium, chloride, potassium, magnesium, calcium, urea, ammonia, uric acid – which is what tastes salty on the skin once all the water has evaporated – but also toxic metals such as copper, lead, zinc and mercury offered to us by way of environmental pollution. Amongst all this body garbage, however, is a protein known as dermcidin, which is not debris but an antibiotic peptide. Here is medicine we actually perspire.



‘Sweat’, Anne Karin Glass

Courtesy of the artist

What is the point of perspiring antibiotic peptides? We already know of antimicrobial proteins which appear following injury. Dermcidins however do not wait for such a prompt and are probably there to fight off bacteria which use our skin as feeding and mating ground. This is reminiscent of the magainin antimicrobial peptides found on frog

skin for example<sup>1</sup>. When we sweat, it is because our body temperature needs to be regulated. Bacteria love conditions that are the result of an overheated body: warmth and moistness. And they will thrive. Hence, it is a cunning move to provide a few antibiotic peptides in our sweat to check bacterial growth because in the event of a wound, infection is weakened.

Dermcidin is made in our sweat glands of which hordes cover our entire body save the lips, nipples and external genital organs. There are two types of modified sweat glands: the milk-producing mammary glands and the ceruminous glands in our outer ear. The latter produce earwax instead of sweat. Moreover, sweat glands on the palms of our hands and our feet are probably the remnants of our ancestors who needed moist palms and soles for better adhesion...to hunt, fight and run away! On an average, a human being boasts 2.6 million sweat glands, which are lodged in the dermis. They are hollow cellular tubes whose far ends are coiled. This is where sweat is produced to make its way through a straight duct which opens onto the skin’s surface. Dermcidin itself is made in the mucous cells of the coiled part of the glands where it is secreted into the sweat. It starts as a 110 amino-acid precursor but is cleaved – probably by proteases that also swim around in our sweat.

<sup>1</sup> Spotlight issue February 2001

Not much is known about the mode of action of dermcidin. Frog magainins punch a hole through the bacterial membrane, which unbalances the ratio of molecules between the outside and the inside of the bacteria, and consequently bringing on death. Dermcidin, however, probably works differently. It is unusual in that it has a slight negative charge, whereas most antibiotics are positively charged and can thus take a good grip of the bacterial membrane. Dermcidin's negative charge suggests that it kills bacteria in a completely different manner.

Sweating is a particularly healthy activity for a number of reasons – renewal of the immune system, discharge of toxins and heat regulation. Though in ancient times the biochemistry of sweat was unknown, its beneficial effects had been recognised. The Ayurveda – a medical

document written in Sanskrit in 568 BC – stresses the importance of sweat and a number of ways of inducing it. Sweat baths as well as sweat-inducing herbs and spices are part of many cultures. Today we know that a body which cannot perspire – because the passage of sweat is impeded one way or another – accumulates poisons and dies within a few hours.

Scientists see in dermcidin a candidate for a generation of new antibiotics. It is remarkably effective against three bacteria: *Escherichia coli*, *Enterococcus faecalis* and *Staphylococcus aureus*. But would it be effective against particularly resistant microorganisms that are resistant to traditional antibiotics? Time will tell. In the meantime, horses will sweat, men will perspire and women will get a little hot.

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