

The condom has remained unchanged for decades, but not because it cannot be improved. Hannah Krakauer goes in search of new designs

See ya, latex!



PATRICK LEWELYN-DAVIES/SCIENCE PHOTO LIBRARY

If I didn't already know what they were, I would have difficulty identifying the objects in front of me. There are about 20, mounted on a rack of vertical wooden pegs and illuminated into ghostly shadows by a light box beneath. They resemble elaborate sculptures in translucent resin. One looks like a thin, hollow lemon juicer; others are like accordions or abstract spaceships.

Designers Danny Resnic and Ray Chavez joke that they used to keep these racks in the window since passers-by had no chance of guessing what they were. And it's true; they share only the most rudimentary qualities with what most people think of when they think of a condom.

Despite being available in various colours, flavours and textures, modern condoms all follow a basic design that has been with us for more than 150 years: a rubber tube with one end sealed up. But perhaps not for much longer.

The first reference to condoms in the medical literature was by Gabriele Falloppio, a 16th-century Italian anatomist who is best known for describing the fallopian tube. In a posthumously published article in 1564 he claimed to have invented a linen sheath that could prevent syphilis, which he got 1100 men to try out. Linen was eventually supplanted by various animal skins, intestines and bladders. Casanova reportedly used, but did not like, them.

The invention of vulcanisation by Charles Goodyear in 1844 made rubber a viable condom material, though the earliest rubbers were as thick as a bicycle inner tube with a seam up the side. The advent of liquid latex in the 1930s allowed condoms to become thinner, stretchier and last longer on the shelf. Since then, condoms have remained fundamentally unchanged.

Simple and effective, what's not to love?

But not because there is no room for improvement. Condoms may be functional, but they have never really been sexy. In the ➤

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beginning, that was part of the point, since the health authorities naively thought condoms would discourage people from having sex, thus halting the spread of disease.

A few radical alternatives have been attempted but none have risen to the challenge. Female condoms made their debut in 1993 to overwhelmingly negative reviews. Made of polyurethane and sporting a baggy and intrusive design, they frequently slipped out of place and made an unfortunate crinkling sound during sex. In 2006, German entrepreneur Jan Vinzenz Krause invented the spray-on latex condom, only to cast it aside when none of his volunteers were willing to insert anything other than a finger into the latex-spraying machine. The potentially troublesome 3 minute drying time was thus never properly road-tested.

The latex condom's cheapness and simplicity are evidently hard to beat. But condoms may not remain so homogenous for long. Researchers and designers are re-examining them from bottom to top, looking at their intended functions of contraception and disease prevention and digging deep to see if those goals can't be accomplished in a rather more elegant fashion.

Latex condoms operate under the basic principle of transferred sensation: the latex is sufficiently thin for the penis to feel contact. This is why the few genuine condom innovations that have been made are in the realm of thinness. But the obvious problem with making a material thinner is that it is more liable to break.

Resnic's experience in this area gave him a compelling motivation to improve on the design. In 1994 he learned that he was HIV positive, the likely result of a split condom. He

10bn

condoms used
in 2005

was flabbergasted that it was possible for a product on which people rely so heavily to simply fail.

But when Resnic, founder of a Los Angeles design company called Strata, began to investigate he quickly ran into a barrier. Condoms are made by dipping a mould into a vat of liquid latex which is allowed to dry before being rolled off. That means the design options are limited. The production method also explains why they have to be scrolled on.

So he decided to start from scratch, first turning to a new material: silicone. Stretchier and more flexible than latex, silicone also turns out to be better at blocking viruses and bacteria. It can also be folded accordion-style, which means it can be slipped on rather than rolled.

Where silicone really shines is in the pleasure department. Resnic's "Origami" condoms are thicker and looser than latex ones, but this actually becomes a design feature. By adding textures and ridges, Resnic says he can make sex with condoms feel better for both partners than sex without. The result is what he describes as a hybrid sex toy and contraceptive.

The prototypes on display represent a series of brainstorming and experimentations with silicone's mouldable potential. The latest version even includes a backflow-prevention reservoir at the tip. Instead of just including a teat at the end to catch semen – from which it can easily escape – Resnic has created a separate chamber blocked by a one-way valve that he compares to a lobster trap: liquid can get in, but it cannot get out again.

The condoms are now ready to be put to the test. Resnic and his business partner Chavez have received funding from the US National Institutes of Health to carry out clinical trials of three types of condom: a male condom, a female condom and a specialised anal sex condom which, if it passes, will be the first condom approved for anal sex by the US Food and Drug Administration.

The three separate trials, conducted by researchers at the California Family Health Council, RTI International and the Fenway Institute in Boston, are in the very earliest stage. Participants are given a couple of different prototypes and are asked to try them. For safety reasons, there is no partner involved in this stage, so participants are instead asked to simulate sex with their hand or a dildo.

The feedback thus far has been positive, at least according to testimony the company allowed me to see. "Terrific," commented one



A sculpture in silicone, half contraceptive, half sex toy (right)

tester. “Would make anyone use a condom,” said another. Still others said they were “really enjoying the feeling”.

The condoms still need to be tested by couples before larger-scale studies can start, and then there’s the commercialisation process. But Resnic and Chavez are convinced that their emphasis on pleasure is going to make condoms more popular. “The reason our focus is on pleasure is that’s what’s going to keep people using condoms,” Resnic says. “We’re developing ones that people are going to like.”

Invisible condoms

Elsewhere in the world there are other very good reasons for rethinking the condom. In many parts of the developing world where HIV is prevalent, resistance to condoms among men is fierce. For these people, silicone condoms may not gain much traction.

Instead, microbicide gels and creams have been seen as a discreet solution to the problem many women have getting their partners to use condoms. The polymer gel sticks to mucous membranes in the vagina and acts as a temporary internal condom that eventually dissolves, with the male partner none the wiser. Because it is a physical barrier, the gel stops viruses from infecting host cells, and has even been shown to interfere with the maturation process of HIV.

But in recent years enthusiasm for microbicides has waned, since chemicals that block HIV in the test tube often fail when tested in the real world. The Alliance for Microbicide Development, an alliance of pharma companies and not-for-profit labs, closed in 2009.

Not everyone has given up on them, though. Rabeea Omar, an infectious disease researcher at Laval University in Quebec, Canada, has held fast to the belief that the problem was not with the gel, but how it was applied. So he asked women to apply the gel using a standard applicator with a single hole at the top – the same kind used to apply yeast infection medications. Then he gave them an MRI scan to see where the gel was actually going and found that it stuck only to the surface of the cervix without covering the rest of the vagina.

So Omar and his colleagues set out to design a better applicator. Rather than having just one hole at the tip, theirs has many small holes all over the surface, spreading the gel more evenly. Results coming back from clinical trials conducted in Cameroon are extremely promising, he says. When applied with his

Despite safety testing, condoms can fail



COH SENG CHONG/BLOOMBERG VIA GETTY IMAGES

team’s “Invisible Condom” applicator, MRI images show the gel is going and staying right where it needs to be, forming a thin layer that lasts for six hours.

Getting the applicator onto the market will cost up to \$40 million. Aside from the money, the biggest challenge is the intimate nature of what is being tested. The controlled environment of the lab and its MRI machines must be abandoned in favour of real-world situations. Excusing himself for the indelicacy,

Omar explains that “you cannot get into the bedroom to make sure couples use the product before sex.”

Omar’s voice is sincere when he describes his research, reminding me over and over of the injustice he and his colleagues want to address. “Men have always had control over the condom. Women have no say,” he says. “Our goal is just to help women.”

The sex-toy condom and the invisible one couldn’t represent two more opposing visions of the future of safe sex. But they have one important thing in common: their starting point was thinking outside the box.

Resnic is sure that the future will be even more diverse. “The era of there only being one rolled male condom is over,” he says. Instead, we will have a variety of devices that address the needs of everybody – male, female, straight, gay, wealthy, impoverished. It has only been in the past 50 years that people have gotten comfortable enough talking about sex to openly discuss condoms, he says. Hopefully it will not be as long before the rubber receives its long-awaited makeover. ■

27bn

**condoms predicted
to be used in 2015**

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