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## Germany - Scientists Developed Automatic Skin Making Machine

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Germany - Scientists at Germany's Fraunhofer Society research organisation have developed a machine that makes artificial skin fully automatically.

If it receives approval from the relevant control bodies in Europe it could make animal testing in laboratories obsolete.

The machine is seven metres long, three metres wide and three metres high. Inside, small robot arms take care of the work of producing skin samples. The machine can also make connective tissue and pigment cells.

At the moment foreskins from male infants provide the cells that initiate the process.

"The older the samples are, the less efficient cell production is," says Andreas Traube, an engineer at the Fraunhofer Institute for Manufacturing Engineering and Automation in Stuttgart.

Work is being carried out on using stem cells to initiate the skin production process. "It's very important that the initiating cells come from a uniform source in order to avoid variations during production," says Traube.

Between three and 10 million cells are extracted from each of the initiating skin samples. These cells are then incubated to increase their number by a hundred-fold.

The cells are then placed on a layer of collagen inside a one-centimetre-diameter test tube. The new epidermis that grows is less than one millimetre thick.

When the scientists combine the collagen with connective tissue they can create a skin with a thickness of up to five millimetres. The entire process takes six weeks.

"We can't speed that up in the machine. Mother nature has determined it takes that long," says Traube.

The machine is completely sterile inside while in the incubating chambers the temperature is a warm 37 degrees Celsius. It can handle up to 500 trays containing 24 test tubes each at the same time.

Testing is still being carried out to see if the skin samples produced by the machine produce the same results as the animal skin used in laboratory testing.

"I think that in about eight months we'll get official approval and can go into full production," says Traube. Commercial industrial operations are likely to be the machine's main buyers.

Rolf Hoemke from the trade organisation the Association of Research-Based Pharmaceutical Companies believes one area where the new machine will find a home is the area of developing new active ingredients.

"We think cells found in artificial skin are comparable with those in real skin," he says. Until now artificial skin samples have only been produced in small quantities. "It makes sense that we can now make skin on a large scale."

Hoemke thinks artificial skin will be used in research on cancer, pigment disorders, allergic reactions and fungal infections.

However, he also thinks it could be years before artificial skin made by the machine is routinely used in testing new drugs: "The terms of reference for testing new drugs are standardized around the world. You can't interchange the procedures."

Artificial skin is already often used in hospitals to treat patients.

Two companies dominate the market for so-called skin bandages, which are between eight and 10 centimetres long, according to Ulrike Schwemmer from the German Society for Regenerative Medicine.

There is a market, however, for even larger skin sections such as those used to treat burns.

Traube says it will be some time before the machine can make skin sections that big. Right now, the next step is to produce cornea, the transparent tissue at the front of the eye.

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