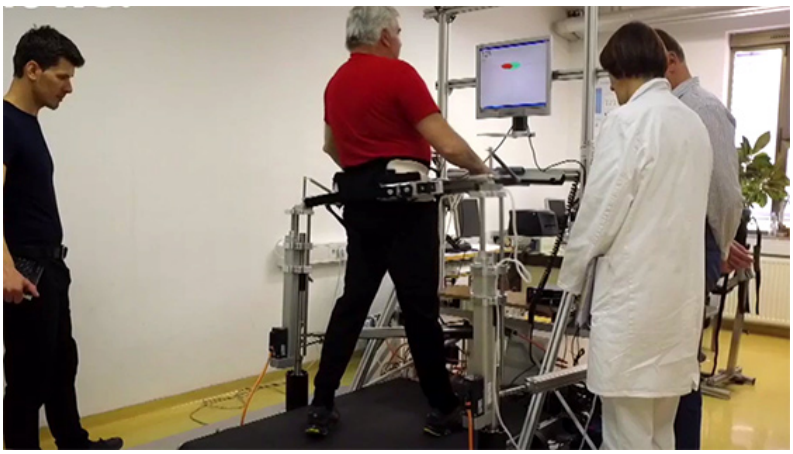
The robotics helping stroke patients regain balance

Re-learning how to walk normally is an essential part of rehabilitation, especially for patients who have suffered a stroke. In Slovenia, the University Rehabilitation Institute in Ljubljana is testing a unique robot that not only helps people to walk again but also to regain a sense of balance.



Video in MP4 format: ar de el en es fr hu it pt ru tr uk (44.9 MB)

Anton is a man who suffered a stroke a year and a half ago. He has only been able to walk again for a few months after traditional motor rehabilitation treatment at the institute in Ljubljana. But then he took part in the testing of a prototype developed by the centre's research unit.

Attached to the pelvis, the device is equipped with sensors and six motors capable of accompanying the different movements of the patient. Several programmes are possible according to what's needed.

Zlatko Matjacic, the head of Research & Development, told Futuris: "The machine is controlled in a way to follow the movement and not influence it, when we want that the movement is natural. On the other hand, for example in stroke rehabilitation, when we want to work on the symmetry of walking then we would apply corrective forces."

With Anton suffering paralysis on the right side, the device encourages him to correct his gait. A screen allows him to follow in real time his performance, which is crucial for motivation.

This programme is part of a European research project aimed at understanding and solving problems of balance thanks to robotics.

Nika Goljar, the Head of the Stroke Rehabilitation Unit, told Euronews: "The aim is to improve his gait pattern which is still abnormal and to improve his gait velocity and dynamic balance which is very important for moving in our every day surroundings."

Anton said: "This equipment helps me to extend my leg and my walk procedure, every day, and it's better!"

An interactive robotics laboratory in the Paris region is also a partner in the project: the

CEA-List laboratory at Gif-sur-Yvette.

Engineers have developed another prototype that goes even further, with an exoskeleton for the legs, from the pelvis to the ankles. The goal is to reproduce the complex mechanism of balance, which doesn't exist in the current exoskeleton. Again, the robot must support or accompany and not force the human to do things.

Catherine Bidard, a robotics engineer at CEA-List, said: "This machine is developed with actuator technology that controls the effort and not just the position.

"What's also particular about this is having four motorised axis points per leg. There is a side movement of the hip that will make it possible to regain balance or to turn."

Keeping balance with only two points of support, like human legs, is a big challenge for scientists. Computer researchers and engineers from several countries are working on final adjustments before human testing.

Jan Veneman, the Balance Project coordinator at Tecnalia Research & Innovation, told Euronews: "The main challenge maybe is in the control of how to collaborate with a human.

"We don't want the exoskeleton to take over control and walk like a robot with a human inside, but we want the exoskeleton to help the human when this is needed."

Within a few months Anton could be among the first to experiment with these robotic legs. But it will take a few more years for these innovations to become more widespread.

- **Project acronym:** BALANCE
- **Participants:** Spain (Coordinator), Germany, Switzerland, France, Netherlands, Slovenia, UK
- **Project Reference** N° 601003
- **Total cost:** €5 912 100
- **EU contribution:** €4 494 323
- **Duration:** January 2013 - July 2017

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See also

Futuris: http://www.euronews.net/sci-tech/futuris
podcast: https://audioboom.com/channel/futuris
Project web site: http://balance-fp7.eu/
Project details:
http://cordis.europa.eu/projects/rcn/106854_en.html

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Legumes see new life in flowerpots

Each year in Europe, the food industry discards millions of tonnes of vegetable residue and legumes. In Italy, scientists are using these leftovers to make bioplastics, an innovative and ecological material.

Video in MP4 format: ar de el en es fa fr hu it pt ru tr (43.7 MB)

Non-marketable by-products of legumes such as peas, beans or other lentils, are experiencing a new life.

Manufacturers tend to get rid of them despite the fact that they're rich in proteins and fibers and still have nutritional value.

Within the framework of a European research project, a method has been developed to transform them into bioplastics. After washing, the vegetal waste is ground and then mixed with a special solution.

Eleonora Umiltà, chemist, SSICA:
"The proteins are made soluble in a buffer solution. Then there is a separation phase between the liquid part and the solid, fibrous fraction."

The fibers can be used to make composite materials, while the proteins will serve as the basic ingredient of a future bioplastic.

Eleonora Umiltà:
"The final protein extract may contain some residual salts, but the percentage of proteins is very high, around 80%."

Simona Bronco, technical manager LEGUVAL project / Institute for the Chemical and Physical Processes, IPCF: "Purity, especially for the protein component, is important as it helps improve the performance and characteristics of the final material, the bioplastic."

The result is a renewable resource – unlike oil, which is primarily used. The fields of application envisaged are varied: from food packaging to agriculture.

Simona Bronco:
"This is one of the polymers that we use in the mixture, as well as proteins and fibers. Through the hot mixing process we get granules like this."

These granules were produced by another research centre, a project partner in Slovenia. It's here too, in a small family business, that bioplastics were first used to make recycled flowerpots.

The granules are melted before being injected into a mold. These pots are fully biodegradable and compostable, giving nutrients to both soil and plants.

Eva Štraser, Bokri D.O.O., co-owner:
"The material is biodegradable in a home compost. So if you don't need it anymore you throw it in the home compost; or even better, you put it in the soil, and, in the soil, after three to four months, it decomposes.

"We first made samples of 1,000 pieces, we saw the production is OK. And now we are intensively looking for the right customers, for ecofarmers, for people who don't want to waste all the plastic parts."

The future looks promising for bioplastics and these ecological pots. Much innovation is expected, particularly in the sectors of agriculture and food packaging.

- **Project acronym:** LEGUVAL
- **Participants:** Spain (Coordinator), Slovenia, Italy, Romania
- **Project Reference** N° 315241
- **Total cost:** €2 459 737
- **EU contribution:** €1 777 873
- **Duration:** December 2013 - November 2016

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