Technology developed for detecting gravitational waves has been spun-out to grow new bone by vibrating stem cells. This unique technique is cheaper and easier to implement than current technologies and could lead to new therapies for orthopaedic conditions such as spinal traumas, osteoporosis and stress fractures.

Our bodies’ stem cells have a remarkable quality in that they can develop into any other kind of tissue, for example muscle, cartilage or bone. To do this the stem cells have to be ‘persuaded’, normally using complex engineering or expensive (and potentially harmful) drugs.

The new technology, called nanokicking, vibrates the cells 1,000 times a second with motions of 30 nanometres. The system, developed by the Universities of West of Scotland and Glasgow, mechanically converts stem cells into bone-building cells, a process essential for the maintenance of healthy bones.

Musculoskeletal disorders cost the UK close to £10 billion every year and are the leading cause of disability and time off work for sickness worldwide.¹ The hope is that the new technology will be able to reduce these costs whilst improving care for patients.

Nanokicking offers biologists a new platform which will significantly reduce the cost of bone research whilst offering the pharmaceutical industry a new test bed for production of next generation osteoporosis drugs. In addition the team has recently secured funding from the charity, Find a Better Way, to use nanokicking to grow new bone for landmine victims. Since the process uses stem cells from the patient’s own bone marrow chances of rejection are removed. The first in-person study of nanokicked stem cells is planned within the next 3-4 years.

The team from Glasgow and the West of Scotland is truly multidisciplinary including cell engineering, medicine and astrophysics and has received funding from Engineering and Physical Sciences Research Council (EPSRC), Biotechnology and Biological Sciences Research Council (BBSRC) and STFC.

Professor Stuart Reid was involved in the detection of gravitational waves – and nanokicking makes use of some of the same precision measurement techniques as used to measure gravitational waves. Gravitational waves are ripples in space-time that propagate as waves, first predicted 100 years ago by Albert Einstein’s famous theory of general relativity. The detection of these waves has required extremely sensitive equipment and novel techniques.

Professor Reid transferred his knowledge between domains, seeing the potential for diversification of technology through to applying it in a new sector. This is a great example of knowledge creation from frontier research leading to real-life improvements.

Professor Reid leads the research at the University of West Scotland along with Professor Matt Dalby from the University of Glasgow. Support for the project has been provided by staff at the Scottish Universities Physics Alliance (SUPA) and Glasgow’s Queen Elizabeth University Hospital, with commercialisation being supported through the award of an RSE Enterprise Fellowship.

The team have now grown bone in the laboratory and are looking for other applications. For example, they are working with rehabilitation engineers to help patients with spinal injuries.