Funded under the EU's Framework 7 research theme "Nanosciences, nanotechnologies, materials and new production technologies" (FP7-NMP), the project unites 15 research institutes and industry partners in Denmark, Germany, Sweden, Switzerland and the UK and is coordinated by the University of Leeds.

- University of Leeds, United Kingdom
- Eidgenössische Technische Hochschule Zürich, Switzerland
- Uppsala universitet, Sweden
- Ionbond AG, Switzerland
- Simulation Solutions Limited, United Kingdom
- Universität Zürich, Switzerland
- Wilhelm Schulthess-Stiftung, Switzerland
- Leeds Teaching Hospitals NHS Trust, United Kingdom
- Aesculap AG, Germany
- AnyBody Technology A/S, Denmark
- Linköping universitet, Sweden
- TuTech Innovation GmbH, Germany
- Technische Universität Hamburg-Harburg, Germany
- Peter Brehm GmbH, Germany
- Imperial College, London

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LIFE LONG JOINTS

SILICON NITRIDE COATINGS FOR IMPROVED IMPLANT FUNCTION

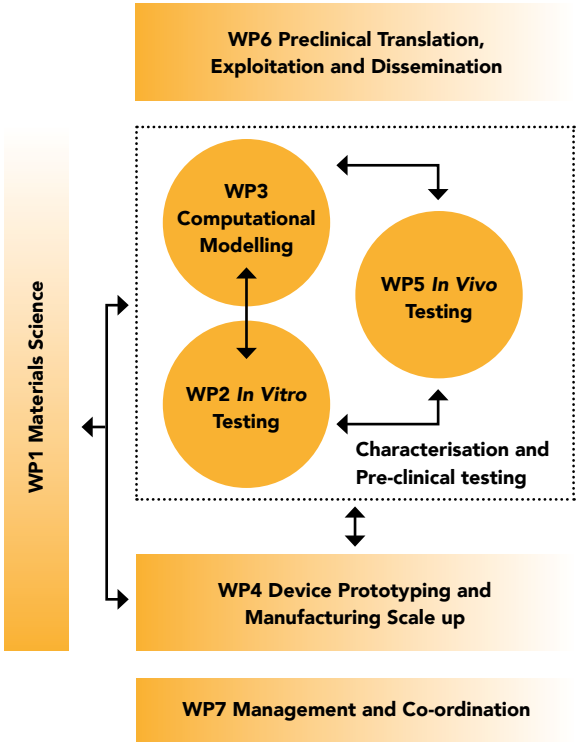
lifelongjoints.eu

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no NMP-310477

MATERIALS FOR A NEW GENERATION OF JOINT REPLACEMENTS

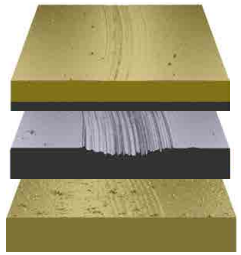
The worldwide cost of artificial joints currently exceeds €14 billion a year. Total Joint Replacement, particularly of the hip and also the knee, represent one of the most successful and common surgical interventions, giving a new lease of life to those in pain and whose mobility has declined. This success has led to an unprecedented rise in the number of procedures being undertaken, increasingly on younger patients. Also increasing are the number of revision procedures. These factors are driving a demand for longer lasting implants and a reduction in failure rates. LifeLongJoints aims to make a break-through in the development of functional biomaterials to improve implant wear and corrosion by using novel silicon nitride-based coatings. These offer the possibility to combine high wear resistance and the solubility of wear particles released to reduce the overall potential for adverse tissue reactions. A variety of coatings will be considered in a range of clinical scenarios related to total hip arthroplasty.

Implant corrosion observed on the stem of an explanted component.



LifeLongJoints project structure.

LifeLongJoints began on 1 April 2013 and runs until 31 March 2018. Of the total project costs of €18,286,366, project funding of €13,317,000 is contributed by the EU's Framework 7 Cooperation programme Nanosciences, nanotechnologies, materials and new production technologies (NMP), Grant Agreement No. NMP-310477.



The wear of silicon nitride coating is substantially less than that observed for CoCr.

The programme of research will produce a bio-compatible, low-wearing silicon nitride coating, functionally tested utilising cutting edge techniques with a view to preparing the necessary regulatory information, as appropriate.

- Development and characterisation of novel wear-resistant silicon nitride-based coatings for both articulating and non-articulating surfaces;
- Development of advanced simulation methodologies, *in vitro*, together with the dissemination of new guidance documents and standards for the functional assessment of novel silicon nitride coatings;
- Production of *in silico* tools for the prediction of wear, which reflects the variability of patient and surgical inputs with which to evaluate coating performance;
- Production and pre-clinical testing of a series of prototype devices in each of the scenarios for functional assessment and production evaluation;
- Finalise manufacturing scale-up through translation of the coating technology from a research to the industrial environment;
- Delivery of the necessary *in vivo* data through the use of applications-specific experiments to support the use of the coating in terms of cytotoxicity and joint functionality, and
- Deliver the necessary regulatory evidence to an advanced stage.