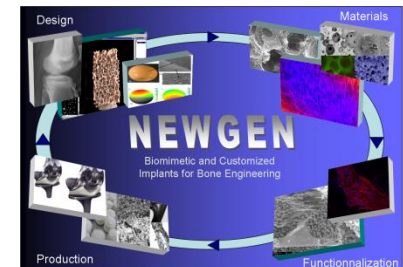


- **Complete denomination:** Life Sciences Department -Università degli Studi di Trieste
- **Location (city, country):** Trieste, Italy
- **Director:** prof. Giannino Del Sal
- **Contact person in NEWGEN:** dr. Antonella Bandiera
- **Working Group involvment:** WG1. Design and Synthesis of New Materials  
WG3. Functionalization of implants for improved functional and therapeutic effects
- **Research topics:** Biomimetic materials, elastin, recombinant proteins, hydrogel matrices
- **Researchers expertises:** molecular biology, biochemistry, biotechnology, recombinant protein expression technology, cell culture

The features of materials inspired to elastin are particularly suitable for the design and realization of materials that can be successfully employed for bone tissue engineering and for the realization of innovative coatings for implants. The biomaterials that can be derived from biomimetic elastin polypeptides combine several favourable aspects that can be found in natural and synthetic such as biocompatibility as well as reproducibility and standardization. There are many other valuable opportunities to exploit this material in the context of bone regeneration, especially to realize new bioactive interfaces between the tissue and implant that can definitely improve the response of the biological system. This will lead to the realization of a new generation of medical devices that will possess a better integration capacity respect that shown by the implants currently used. Moreover, being elastin prone to mineralization under some specific circumstances, elastin-based materials can be exploited for their capacity to promote hydroxyapatite formation, offering the appealing chance to obtain mineralized matrices that mimic the bone physiologic environment.

The biomimetic elastin materials offer also a new and still unexplored perspective of improving basic knowledge of physio-pathological mechanisms at molecular level due to their simplified primary structure that allow to adopt a reductionist approach.

The knowledge and expertise developed at University of Trieste in biomimetic elastin compounds can well contribute added value to the NEWGEN. Joining the other members will allow to spread the knowledge and the potential of this research in the context of bone engineering as well as to create new synergies through complementary expertise and unmet medical needs.



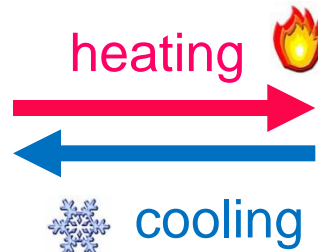
# HELPS Human Elastin-like polypeptides

Protein-based polymers based on the pentapeptidic motifs that are repeated in the hydrophobic domains of **human tropoelastin**

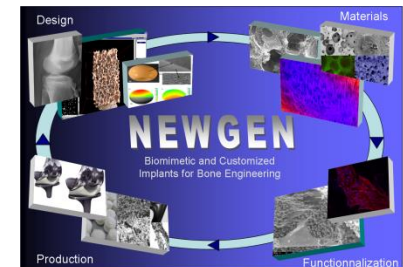
thermoreponsive behavior  
**COACERVATION**

**reversible** aggregation process regulated by physico-chemical conditions

biopolymer in  
solution below  
threshold  
temperature



biopolymer  
aggregation  
above threshold  
temperature



**HELP**s are prototypes of a family of Human Elastin biomimetic polypeptides, new genes with different functionality can be designed

**HELP**s allow preparation of smart, engineered surfaces that support and control cell growth for specific applications

**HELP**s offer the opportunity to build a controlled environment for cell growth to supply new insights in molecular and cell biology

# HELP

Biopolymers Family

## PRIMARY STRUCTURE

### HELP



MRGSHHHHHHGS<sup>AA</sup> (AAAAAAKAAAKAAQFG<sup>L</sup>VPGVGVAPGVGVAPGVGVAPGVGLAPGVGVAPGVGVAPGVGVAPGVAPGIAP)<sub>8</sub>GV

### HELP1



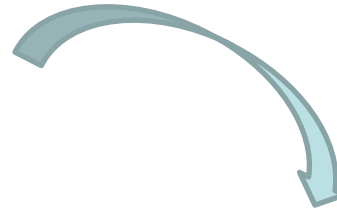
MRGSHHHHHHGS<sup>AA</sup> (AA<sup>L</sup>GLVPGVGVAPGVGVAPGVGVAPGVGLAPGVGVAPGVGVAPGVGVAPGIAP)<sub>8</sub>GV

WG1. Design and Synthesis of New Materials

Functionalization of **HELP**



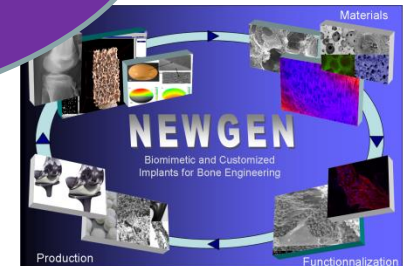
**HELP**



modified **HELP**



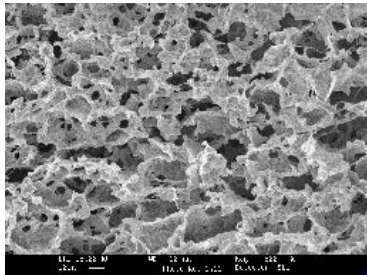
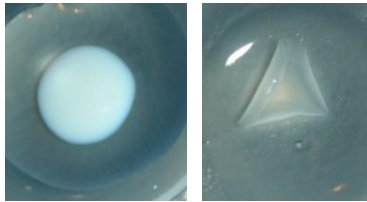
third generation  
biomaterials





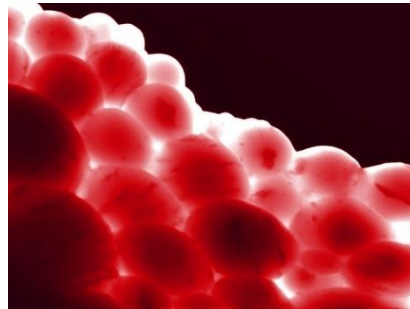
WG3. Functionalization of implants for improved functional and therapeutic effects

Different **HELP** formulations



3D Matrices

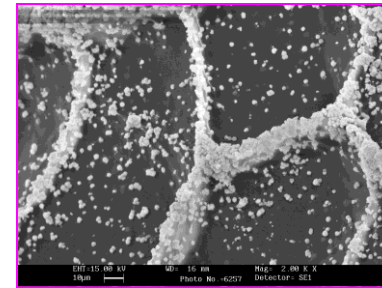
Nano/microspheres



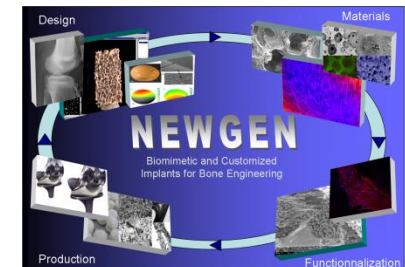
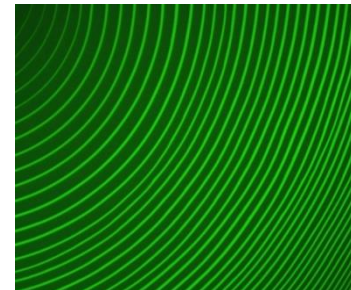
Thin layers



Biomimetic environment  
for osteogenic cell growth



Micropatterns



COST Action MP1301

- **Molecular cloning of synthetic genes**
- **Recombinant protein expression technology**
- **Protein functionalization by addition of bioactive domains**
- **Production of recombinant protein -based biomaterials**
- **Protein analysis and manipulation set up**
- **Cell cultures equipment**
- **Microscopy techniques**