4.2. Final publishable summary report

4.2.1. Executive summary

In Green Nano-Mesh, we proposed a novel approach that employs recent advances in green nanotechnology and sustainable raw materials for scaffold fabrication to not only eliminate toxic chemicals from the processes, but also enhance functional repair due to superior biological properties.

Specifically, we aim to fabricate a nano-fibrous mesh with well-defined nano-topography using cellulose; human recombinant collagen, derived from transgenic tobacco plants; and biodegradable poly-ε-caprolactone or polylactic/polyglycolic acid as raw materials. The green credentials of this innovative approach are based on the use of sustainable eco-friendly raw materials that will produce biodegradable waste products and therefore replacing hazardous chemicals currently in use.

To-date, at the end of the project, the Green Nano Mesh consortium:

(a) has developed environmental friendly raw materials (e.g. cellulose nano-crystals, pepsin soluble animal extracted collagen; human recombinant collagen, poly-ε-caprolactone) that would be part of the ultimate green hernia mesh;
(b) has developed numerous nano-textured scaffolds using electro-spinning, evaporation at room temperature, freeze-drying, and supercritical CO_2 technologies;
(c) has extruded PLA and PCL fibres without using organic solvents and coated them with pepsin extracted bovine collagen and human recombinant collagen using dip coating;
(d) has stabilised materials with cellulose nano-crystals and green cross-linking methods based on CNC and plant extracts respectively. The produced lab-based prototypes have mechanical properties similar to commercially available synthetic meshes;
(e) has functionalised the produced scaffolds with biophysical (e.g. porosity) and biological (e.g. collagen coatings) signals;
(f) has demonstrated the *in vitro* cytocompatibility of the produced prototypes;
(g) has demonstrated in vivo compatibility
(h) has demonstrated environmental friendliness of the materials used;
(i) has scientifically contributed with numerous conference and peer-reviewed publications;
(j) has developed new technologies (IDFs are under preparation);
(k) has engaged with key stakeholders (e.g. companies, patients, clinicians, funding agencies; policy makers) for appropriate dissemination of the developed technologies;
(l) has trained numerous researchers to PhD level, whilst elements of the cutting edge work developed were used in lectures of under- and post- graduate students at the institutes of academic partners;
(m) has created employment, as partner organisation will take developed technologies further;
(n) has enhanced European competiveness in the field, as numerous products are expected to be launched within the years to come as direct result of this project.

The Green Nano Mesh Consortium has brought several platforms technologies (e.g. nano-scaffold fabrication; functionalization) to Technology Readiness Level 4 and we expect to reach level 5-9 within 4 years post project, which will enable clinical trials and commercialisation of the developed technologies. Further, the novel green products and processing methods will be game-changers in the field of medical device, enabling European-based industries to excel in the competitive field of medical devices.