Medical Textiles and Nano Technology

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Abstract

Innovative medical textiles will be one of the main concerns/priorities for the coming years. Nanotechnology brings to these textile products the opportunity to fulfil their performance requirements, while retaining key characteristics such as aesthetic properties, comfort level and high efficacy. These textiles, in fact, have to fulfil specific characteristics related to non-toxicity, non-carcinogenicity, non-allergenicity and non sensitisation property, also possessing a sterilisation capability without suffering chemical or physical damage.

The global market in 2010 for medical textiles was about €12 billion from about 238 tons of production. Thus, on the one hand Europe is one of the world's leading exporters of technical textiles with an annual turnover of €203 billions in 2008, produced by 2.3 million workers in more than 145,000 companies. On the other hand, medical textiles represent only about 2% of the global technical textile production with few companies involved and an increase of only about 10% per year. Moreover, while globalisation has worsened the EU textile turnover, the niche market of medical textiles, remaining the most dynamic, increased much more than the other textile sectors and will increase even more in the future, due to population ageing.

The increase of population over 60 years of age in Europe and consequently the increase of doctor visits and the higher consumption of medical textiles is the main problem that new technologies will have to cope with in order to assure a good medical service. Innovative medical textiles can, in fact, offer reduced visit requirements because of the better efficacy of these dressings, requiring less frequent replacement. Moreover, the evolution of these textiles allows for recovery at home combined with periodical check-ups for ambulatory care requirements; and the increased drive for advanced disposable bandaging or bed linen systems have reduced the need for cleaning or sterilisation of repeated-use items.

Our company has a patented technology for producing pure crystals of Chitin at a dimension of 240x7x5 nanometers, named Chitin Nanofibrils (CNs) because of their needle-like form. The company possesses a patented technology to insert different kinds of molecules (antibacterials, anti-inflammatory, etc) into CN to be successively transformed into fibres and non-woven tissues by means of electrospinning technology. It must be remembered that CNs and the medical textiles obtained have interesting and proven cicatrising and anti-inflammatory activities with non-toxicity, being a sugar-like, skin friendly molecule.

Furthermore CNs are environmentally friendly and the raw material used to produce these molecules comes from fishery waste by the use of an industrial green technology. A review of these problems will be reported in this article

Nanotechnology and Wellbeing

Health and well-being have now became a must for people worldwide, being not only the most influential current trend for drugs, cosmetics and food but also opening up a wellspring of innovation opportunities for industrial and universities' R&D research centres and many companies in different fields. In particular, convergence and the gradual overlap of the food, cosmetic and pharmaceutical industries, are leading to the creation of new borderline inter-industry segments such as cosmeceuticals, nutraceuticals, nutricosmetics and neurocosmetics, all designed to improve the quality of life.

Given the necessity of recovering strategies to obtain new functional healthy ingredients and carriers, innovative solutions are required. Nanotechnology seems to play the right critical role in solving these problems, constructing ingredients at the molecular level, just as the human body does.

But what does nanotechnology mean? Nanotechnology involves the investigation and construction of extremely small structures. A nanometre (nm) is, in fact, one billionth of meter, so that a bacterium is about 1000 nm long, whilst human hair has a diameter of about 50,000 nm[1] (Figure 1 see next page).