25-02-2018

A natural anti-corrosion agentTurbinaria ornata

What is in news?

Seaweed can now help protect the steel body of ships from corrosive bacteria. These seaweed extracts can kill fouling agents like barnacles and biofilm-forming bacteria.

"Turbinaria ornata extract proved most effective"

Turbinaria ornata is tropical brown algae of the order Fucales native to coral reef ecosystems of the South Pacific.

Research done by:

- ✓ Researchers from Bharathidasan University, Tiruchirapalli, have reported.

About it:

- ✓ With the International Maritime Organization (IMO), London, completely banning the use of chemicals as anti-fouling agents, there is an urgent need to develop environment-friendly paints that serve the purpose.

- ✓ As seaweed is known to be rich in compounds such as lipopeptides and amides, the researchers examined their potential as anti-corrosion agents.
- ✓ Ten different varieties of seaweed were collected from different locations in the southeast coast of India. Their bioactive compounds were extracted using different solvents and tested against barnacles and biofilm-forming bacteria.
- ✓ The extract from the seaweed Turbinaria ornata proved to be an effective anti-corrosion agent on mild steel — the metal used for building ships and other marine structures.

- ✓ The extract showed high anti-microbial activity against eight different biofilm-forming bacteria collected from the base of ships. At a concentration of just 25 g/l, the extract showed nearly 100% inhibition of bacterial growth on mild steel. The 10-Octadecaonic acid present in the seaweed was found to inhibit corrosion.
- ✓ When tested against barnacle larva, 400 microgram/mL of the extract caused about 100% mortality in 12 hours. After a biofilm is formed on the hull of the ship, a solution known as pickling solution is now being used to remove it. But this solution leaches out some of the metal as well. Our new extract was able to remove the biofilm alone without harming the metal.

- ✓ There is a huge economic loss due to bio fouling. It adds to the drag force of the ship, thus increasing fuel consumption. The current anti-fouling agents are rich in chemicals and highly toxic to the environment. This new extract is completely natural and thus eco-friendly.

Prelims Question:

Q) Statements about Turbinaria ornata recently in news.

1. Turbinaria ornata is tropical brown algae of the order Fucales native to coral reef ecosystems of the South Pacific.

2. Turbinaria ornata proved to be an effective anti-corrosion agent on mild steel – the metal used for building ships and other marine structures.

Which of the above statements is/are correct?

a. Only 1
b. Only 2
c. Both
d. None Ans: C

Mains Question:

Q) Completely banning the use of chemicals as anti-fouling agents by International Maritime Organization (IMO), there is an urgent need to develop environment-

friendly paints that serve the purpose. Explain about new research done in this regard.

IIT Delhi researchers develop scar-tissue model for screening drugs

What is in news?

The first time developed a 3D scar-tissue model through tissue engineering. The two-member team led by Prof. Sourabh Ghosh from the Department of Textile Technology at IIT Delhi was successful in replicating the early inflammatory microenvironment that initiates a cascade of events that lead to scar development.

Research done by:

- ✓ Researchers at the Indian Institute of Technology (IIT) Delhi

About research:

Drugs currently available to reduce scarring in the case of deep wounds that affect all the layers of the skin have limitations owing to poor understanding of scar tissue formation and the signalling pathways responsible for its development. This is particularly so as results of scar tissue models created in animals have limitations when extrapolated to humans.

Optimized cocktail

- ✓ The researchers first encapsulated fibroblasts from healthy human skin within the collagen gel. Three days after an optimized cocktail of three cytokines were added to the media, differentiation of dermal fibroblasts into myofibroblasts was triggered.
- ✓ Myofibroblasts are bigger in size than fibroblasts and have greater contractile power, something that is essential to close the wound. Scar-specific proteins are expressed by myofibroblasts.
- ✓ "There was an increase in the scar-specific proteins and gene expression with increasing duration of culture. By day 14, scar-tissue similar to what formed naturally on human skin was formed,"

Typical features:

- ✓ The researchers witnessed other typical features that cause scar formation. For instance, during the wound-healing process, excessive fibrous extracellular matrix is produced.
- ✓ While there is excessive production of extracellular matrix proteins, the secretion of matrix metalloproteinase, whose role is to degrade certain proteins such as ECM, is reduced.
- ✓ As a result, the tightly regulated balance between synthesis and degradation of matrix components get disturbed, and the skin gets thicker and stiffer.

- ✓ There was also increased expression of alpha smooth muscle actin, a cytoskeleton protein, in the in vitro scar model. "The alpha smooth muscle actin is a characteristic marker of myofibroblasts. The cytoskeleton protein is expressed as a thick bundle that stretches the cell thereby causing contraction," says Chawla.
- ✓ "All these features that make the scar tissue thicker and stiffer in humans are already known. Using tissue engineering strategies, we are now able to replicate these features in the *in vitro* 3D model," says Prof. Ghosh.
- ✓ "In addition to these five features, the scar model was also able to replicate two important cellular signalling pathways through which scar tissue are formed," says Prof. Ghosh.

- ✓ "Since the scar tissue formed *in vitro* followed similar signalling pathways as natural scar tissue, new drug molecules and immune modulatory strategies designed to manipulate one or both the pathways might help in modulating scar tissue formation."

Implications

- ✓ Creating scar tissue in the lab has great implications for the pharmaceutical industry. "The cosmetic and pharmaceutical industries, which are developing anti-fibrosis or anti-scar medicines, need not have to test them

on animals. They can use our tissue-engineered model instead," he says.

- ✓ The team is now using selective peptide domains and a 3D bioprinting strategy to develop progressively more complex in vitro scar tissue, which would recapitulate more hallmark features that are critical for tissue fibrosis.

Prelims Question:

Q) Statements about Three dimensional (3D) bioprinting.

1. It is the utilization of 3D printing and 3D printing–like techniques to combine cells, growth factors, and biomaterials to fabricate biomedical parts that maximally imitate natural tissue characteristics.

2. Bioprinting can be used to print tissues and organs to help research drugs and pills.

Which of the above statements is/are correct?

a. Only 1
b. Only 2
c. Both
d. None

Ans: C