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Title: Studies On Angiogenic And Anti-Angiogenic Potential Of Algal Isolates

Abstract:

Angiogenesis and tumor progression are very closely linked with each other. Tumor cells are dependent on angiogenesis because their growth and expansion require oxygen and nutrients, which are made available through the angiogenic vasculature. Investigational studies on tumor development have shown that an alteration in the blood supply can noticeably affect the tumor growth and its metastasis (Severin et al., 2002). Therefore, tumor angiogenesis has become an area in cancer research that is currently undergoing an intensive experimental revolution. Anti-angiogenic therapies have become one of the most promising approaches in the anti-cancer drug development.

Cyanobacteria have been identified as one of the most promising group of organisms from which novel and biochemically active natural products are isolated. Cyanobacteria such as *Microcystis*, *Anabaena*, *Nostoc* and *Oscillatoria* produce a great variety of secondary metabolites. Because cyanobacteria are largely unexplored, they represent a rich opportunity for discovery; the expected rate of rediscovery is far lower than for other better-studied groups of organisms (Olaizola., 2003).

Findings:

1. The CAM assay provides the following results

- ❖ On 12th day of incubation, on the developed CAM which was treated with VEGF showed profuse growth of blood vessels around the coverslip.
- ❖ At microscopic level, a higher vascular density was recognizable below the VEGF containing ovalbumin coated coverslip as compared to normal. In contrast, treatment with *Chlorella pyrenoidosa* extracts decreased the blood vessel density in a dose dependent manner.
- ❖ The thalidomide and *Chlorella pyrenoidosa* at dose levels 50 µg and 100 µg showed reduction in blood vessel density and were found to be statistically

- significant as compared to untreated VEGF control which indicated anti-angiogenic activity of *Chlorella pyrenoidosa*.
- ❖ The treatment with *Cylindrospermum* was shown prominent angiogenic activity as compared to positive control thalidomide.
 - ❖ With all other extract, the results found are insignificant as compared to untreated VEGF control.
- 2. Caution induced neovascularization study reveals**
- ❖ *Chlorella pyrenoidosa* extract significantly reduced the corneal neovascularization as compared to sham treated.
 - ❖ However as compared to standard bevacizumab (4.95 ± 0.33) treatment, the observed effect in *Chlorella pyrenoidosa* was inferior and this could be due to the presence of the active compound in very small quantities.
- 3. The MTT assay provides the following results**
- ❖ MTT provides a preliminary screen to separate potential bioactive extracts.
 - ❖ *Cylindrospermum*, *Plectonema spp.*, *Anabeana spp.*, *Aulosira fertilissima*, *Westiellopsis prolifica*, *Microchaeta spp.*, *Phormidium tenuae*, *Gloeocapsa gelatinosa* and *Chroococcus* failed to show anti-proliferative activity in this assay (Fig.R35-Fig.R43).
 - ❖ Only *Chlorella pyrenoidosa*, *Oscillitorea spp.* and *Lyngbya officinalis* extracts possess anti-proliferative activity.
- 4. ESI-LC-MS/MS finger printing of algal strains provides a preliminary screening and showed the presence of potential bioactive compounds**
- ❖ Finger printing of *Chlorella pyrenoidosa* has revealed the presence of compounds such as ypaoamide, hydroxy ypaoamide, malyngamide-F and palauamide.
 - ❖ *Cylindrospermum* showed the presence of Pukeleimide A & B, Kalkitoxin, Taveuniamide G and Malyngamide-B.
 - ❖ *Plectonema spp.* showed the presence of Ulongamide-E, Hectachlorin and Kuloide.
 - ❖ *Anabeana spp.* showed the presence of Ulongamide-C.
 - ❖ *Aulosira fertilissima* showed the presence of Taveuniamide-H, Antillatoxin-B, Jamaicamide-C and Antanapeptin-C.
 - ❖ *Westiellopsis prolifica* showed the presence of Aplysiatoxin.
 - ❖ *Microchaeta spp.* showed the presence of Malyngamide-D, Belamide and Antillatoxin.
 - ❖ *Oscillitorea spp.* showed the presence of Malyngamide-J.
 - ❖ *Phormidium tenuae* showed the presence of Yanucamide-B and Ulongamide-C.
 - ❖ *Lyngbya officinalis* showed the presence of Deacetylhectochlorin, Lyngbyatoxin-A and Ulongamide-C.
 - ❖ *Gloeocapsa gelatinosa* showed the presence of Guineamide-F and Grenadadiene.
 - ❖ *Chroococcus* showed the presence of Taveuniamide-A and Yanucamide-A.