Structural analysis of antiangiogenic algal polysaccharide, and the relationship between the structure and biological function

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Summary

Angiogenesis is forming new blood vessels from existing blood vessel and has an important role in physiological processes. In addition, angiogenesis is involved in several pathological conditions, including tumor growth and metastasis, atherosclerosis and diabetic retinopathy. Inhibitory agents for angiogenesis are very useful to prevent such diseases. Some sulfated polysaccharides are potent antiangiogenic agents. Marine algae have been recognized as valuable resource of sulfated polysaccharides and some of them have strong anticoagulant activity. However, there are few reports on their antiangiogenic effect. We found the activity of anticoagulant polysaccharides from a marine green alga, *Codium cylindricum*. The anticoagulant was sulfated galactan. The fraction was separated into two fractions, F-1 and F-2, on gel filtration. F-1 had both anticoagulant and antiangiogenic activities, however F-2 had only anticoagulant activity. Linkage analysis of the polysaccharides revealed that the polysaccharides were composed of 3, 6 -, 3, 4 -, and 3 - galactosyl residues, and 3, 6 - galactosyl residue was sulfated. They had no 3, 6 - anhydro galactosyl residue. F-2 had higher amount of 3 - galactosyl residue than F-1. Thus, F-1 had more complex structure than F-2, and this difference would affect their antiangiogenic activity. Desulfated F-1 and F-2 lost the anticoagulant activity, and the antiangiogenic activity of desulfated F-1 also disappeared. Therefore, the sulfate modification is critical to exert their biological activities. In this study, we clearly demonstrate the relationship between the structure of antiangiogenic polysaccharide and its activity.