Journal of Natural Products
Vol. 51, No. 1, pp. 184-192, Jan-Feb 1988

ISOLATION AND STRUCTURE DETERMINATION OF TWO NEW BIOACTIVE LIPIDS FROM THE GONADS OF A SEA URCHIN, *STRONGLYOCENTROTUS DROEBACHIENSIS*[1]

M.S.R. NAIR,* ARVIND MATHUR, KEIKO TABEI, AJAY K. BOSE,

Department of Chemistry & Chemical Engineering, Stevens Institute of Technology, Hoboken, New Jersey 07030

A.S. GOLDBERG, V. KOCH, B. HUNT,

Department of Chemistry, Southampton College, Southampton, New York 11968

V.K. DAYAL, Y.S. ARKEL, G. OBIEDZINSKI, and M.A. VAN ALLEN

Department of Special Hematology, St. Michael's Medical Center, Newark, New Jersey 07102

Gonadal extracts of the sea urchin, *Stronglyocentrotus droebachiensis* O.F. Müller, showed prostanoid-like smooth-muscle-stimulating action on guinea pig ileum assays and inhibitory action on platelet aggregation and serotonin release induced by ADP, epinephrine, and arachidonic acid (1,2). Two active metabolites were isolated from the extract and their structures were determined by spectroscopic studies and hydrolysis to known products, as the triglyceride and cholesterol ester of 8,11,14-eicosatrienoic acid.

Primary metabolism is basically the same in all living organisms and primary metabolites are ubiquitous. Lipids are generally considered to be primary metabolites, even though some rather unusual lipids have been isolated from marine sources. These two lipids of sea urchin gonads have never before been isolated from a natural source. That combined with their biological activity would strongly suggest that they have more than primary metabolic function in the organism.

EXPERIMENTAL

The sea urchins, *S. droebachiensis*, were collected from the Atlantic Ocean off Buck Harbor, Maine, at a water temperature of 45°F. The gonads were removed by excising the ventral theca using a procedure that is a trade secret of Ichimura Co. Ltd. of Eastport, Maine, who kindly gave us the frozen gonads as a gift. Freshly thawed gonads were homogenized in MeOH-$CHCl_3$ (2:1), filtered, and the solvents were removed. The residue was separated initially by dry column filtration. Two active fractions obtained were treated with activated carbon, and the filtrates were passed through SEP-PAK (Si gel). The two lipids were obtained by fcc followed by final purification by tlc, from the less and more polar fractions, respectively. Biological activity was monitored during these operations using platelet aggregation studies.

Spectroscopic data, especially one and two dimensional ^1H- and ^{13}C-nmr spectra, showed that the lipid from the less polar fraction was a triglyceride of a methylene-separated eicosatrienoic acid. This was confirmed by its alkaline hydrolysis to the free fatty acid and $LiAlH_4$ reduction to the corresponding fatty alcohol. The ir spectrum of the fatty acid obtained by hydrolysis was identical with that of 8,11,14-eicosatrienoic acid (Sigma). The second lipid was hydrolyzed to the same fatty acid and cholesterol, thus, establishing its structure.

Full details of isolation, spectroscopic data, and bioassays are available on request from the senior author.

ACKNOWLEDGMENTS

The authors are grateful to the Office of Naval Research (N0014-83-C-0233) for partial support of this research.

LITERATURE CITED

1. M.S.R. Nair, A.S. Goldberg, V.K. Dayal, Y.S. Arkel, G. Obiedzinski, and M.A. Allen, Presented at the 25th Annual meeting of the American Society of Pharmacognosy, Austin, Texas, 1984, Abstr. 75.
2. M.S.R. Nair, A.S. Goldberg, V.K. Dayal, Y.S. Arkel, G. Obiedzinski, and M.A. Allen, *Blood*, **64**, 258A (1984).

Received 9 October 1986

[1]Presented at the 191st National Meeting of American Chemical Society, New York, April 1986.