Note

Prevention by Polyhydroxysteroids and Saponins of Asterina pectinifera of the Desquamation of Stratum Corneum Cells

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Two polyhydroxysteroids and three steroidal saponins (pectiniosides A, B and C) were isolated as bioactive substances from Asterina pectinifera. These compounds inhibited the release of guinea-pig skin stratum corneum cells by 48–67% (control, 0%) at 2 mg/ml. It is suggested that the bioactivity of these compounds is connected with the remedial and preventive effects of an aqueous extract of A. pectinifera on rough human skin.

Key words: Asterina pectinifera; polyhydroxysteroid; steroidal saponin; desquamation; stratum corneum

Asterina pectinifera is a common seastar found in the coastal areas of Japan. This seastar produces polyhydroxysteroids and steroidal saponins like other seastars to deter mobile predators from feeding.1) In the course of our study on an avoidance reaction of A. pectinifera from the predator, Solaster dawsoni, we found that the aquarium water of A. pectinifera showed remedial and preventive effects on scaly areas of human volunteers’ hands.

The bioactivity was examined by directly applying on the scaly areas of human volunteers’ hands. Frozen-thawed seastars (200 g) were cut into small pieces and extracted with water (300 ml) for 3 h. The extract was filtered and evaporated. A 5% (w/v) solution of the extract in 5% ethanol-water containing 0.17% of methyl 4-hydroxybenzoate and 0.07% of ethyl 4-hydroxybenzoate as antiseptics showed a remedial effect on rough human skin as shown in Fig. 1.

The bioactive fractions that had been obtained from a preliminary separation also showed an inhibiting effect on the release of guinea-pig skin stratum corneum cells. The subsequent bioassay2) was therefore used for isolating the bioactive compounds.

Each test sample was added to a 0.1 M Tris-HCl buffer (pH 9.0) containing 2 mm sodium dodecylsulfate, 8 mm dimethyl dodecylamine oxide, and 60 μg/ml of Kanamycin. A guinea-pig stratum corneum sheet was incubated in a detergent-containing buffer at 50°C for 20 min. After stirring for 3 seconds with a mixer, the released cells were stained with 1% Gentiana violet. The number of released cells was counted (n = 5) with a cell counter.2)

The aqueous extract of A. pectinifera, which had been collected from Mutsu Bay in Aomori Prefecture and from Sanriku in Iwate Prefecture, was passed through an HP-20 column, and the adsorbed materials were eluted with methanol. The methanol eluate showed bioactivity and was separated by a silica gel column with CHCl3–MeOH–H2O (7:3:0.3 and then 6:4:0.4) into four fractions. Polyhydroxysteroids 1 (2.6 × 10^{-4} % from wet animal materials) and 2 (1.8 × 10^{-4} %) were isolated from fraction 2 by repeated HPLC (C-8, 10 mm × 250 mm, 75% methanol-water, 3% acetonitrile).

Fig. 1. Remedial Effect of the Aqueous Extract from Asterina pectinifera on Skin Roughness.

A 5% solution of the extract was applied 5 times a day to the scaly area of a volunteer’s finger. A right thumb is pictured before the application (a) and 11 days after the treatment (b).
Fig. 2. Structures of Polyhydroxysteroids 1 and 2 and Pectiniosides A (3), B (4) and C (5) Isolated from Asterina pectinifera.
Corneum Desquamation Inhibitors from Asterina pectinifera

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References