electrophysiologically active mammalian NIE 115 neuroblastoma cells.

While a separate toxicological classification was claimed[6] for the α-cyano-pyrethroids and those not containing this group, the pyrethroids in the table which induce the sodium ion influx belong to both classes of structures. In contrast, the combined DDT-pyrethroid – GH414 : which does not induce the influx contains the α-cyano group.

This selectivity of effects in the mammalian neuroblastoma also contrasts with the finding of Lund and Narahashi[7] who reported, that both the α-cyano pyrethroids and those not containing this group, including the compounds EDO and the combined DDT-pyrethroid insecticide GH401 (table), exert the same qualitative effect in the induction of the influx of Na$^+$ ion in the voltage clamped arthropod (crayfish) axon. All these active insecticides differed only at the quantitative level in their response, on the prolongation of the sodium tail current on step depolarization of this arthropod axon.

We conclude from the above evidence that there is a qualitative difference between the receptors in arthropods and mammals for the DDT-isostere EDO and the DDT-pyrethroid compounds, when they act in the Na$^+$ channel gating system. Such selectivity has been previously observed for a family of sea anemone toxins which are polypeptides and comprise toxins particularly specific against Na$^+$ channels in crustaceans, while other members of the family are more specific against Na$^+$ channels in mammalian tissue[8].

We have to assume that the combined DDT-pyrethroid insecticides, are either selective for the Na$^+$ channels of arthropod nerve membranes, or that their action is completely different from that of the pyrethroid class of insecticides. Considering their structural similarities to the pyrethroid class of compounds, we assume for the DDT-pyrethroid esters a lack of attachment to the gating system structure of the Na$^+$ channel in the mammalian nerve cell.

This finding also indicates that the observed[2] graded Na$^+$ influx induced by differing concentrations of the pyrethroid insecticides in the mammalian preparation does not reflect their insecticidal activity, but possibly indicates neurophysiological events which alone, or in combination with other more recently reported CNS effects[9], lead to the observed acute mammalian toxicity for some of the pyrethroids[10].

This contrasts with a lack of mammalian toxicity for EDO and the combined DDT-pyrethroid compounds listed in the table. EDO was tested without toxic effects to a dose of 2000 mg/kg. Compound GH380 and GH601 gave not toxic effects to a dose level of 16,000 mg/kg (i.p. in olive oil, albino mouse, 5 animals/dose, 7-day observation period)[11]. Moreover, the α-cyano-group containing insecticide GH414 to the tested limit dose of 5000 mg/kg, i.p. in the mouse (or same dose orally, rat), also gave no symptoms of acute toxicity.

These findings diminish the requirement to invoke a differential biochemical degradation to explain the decreased mammalian toxicity of the combined DDT-pyrethroid insecticides. The study also demonstrates that great care has to be exercised in the extrapolation of neurophysiological data from one species to another, in the search for detailed explanations of the mode of action of insecticides.

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The siderophore mediated release of iron and magnesium from Mt St. Helens' ash and silicate rock standards[1]

H. A. Akers and K. P. Magee[2]

Department of Chemistry, Lamar University, Beaumont (Texas 77710, USA), 29 May 1984

Summary. Substantial amounts of iron and magnesium were observed to be released from ash from Mt St. Helens' and US Geological Survey Silicate Rock Standards by the siderophore rhodotorulic acid.

Key words. Rhodotorula pilimanae; Mt St. Helens' ash; siderophore-mediated release; silicate rock standards, rhodotorulic acid.

The involvement of microbes in rock weathering has been of interest for some time. The classical concept of lichens as the pioneering organism has generated some literature support[3]. The most convincing evidence was the demonstration that compounds isolated from lichens could extract metal ions from rock samples[4]. Unfortunately, the biological function of these latter compounds is unknown. With the 1980 eruption of Mt St. Helens' there has been new interests in the events in the biological colonization of 'new' geological areas[5].

Because of the limited solubility of ferric salts in aerobic environments, one of the problems that a colonizer would encounter is an iron source. To circumvent this situation microbes excrete ferric specific chelators (siderophores) into their environment and then reabsorb the ferric-siderophore complex to obtain iron[6]. Siderophores have been observed in soils[7], are thought to be involved in plant nutrition and in the suppression of plant diseases[8–10], but no data exist on their involvement in the weathering of rocks.

In order to determine the role of siderophores in the release of ions from rocks, an aqueous solution of the siderophore rhodotorulic acid (RA) was shaken with various rock samples and the resulting supernatant was examined for metal ions.

Materials and methods. United States Geological Survey 200 mesh Silicate Rock standards (granite, G-2; granodiorite, GSP-1; andesite, AGV-1; peridotite, PCC-1 and basalt, BCR-1) were from Dr F.J. Flanagan[11]. Ash from Mt St. Helens was from Moscow, Idaho (18 May 1980, eruption) and Hillsboro, Oregon (12 June 1980, eruption). A sand sample from Camp

The release of metal ions from ash and rock samples by rhodotorulic acid after 21 days of equilibration

Sample[a]	Element (mg/g)	
	Fe	Mg
Ash 18–5	0.07 [0.01] (31.0)	0.44 [0.21] (11.5)
Ash 12–6	0.06 [0.01] (33.6)	0.35 [0.20] (12.6)
ACV–1	15.28 [0.34] (46.5)	1.93 [1.79] (9.1)
BCR–1	19.90 [0.07] (93.2)	0.39 [0.16] (20.9)
G–2	7.66 [2.31] (18.6)	0.04 [0.03] (6.1)
GSP–1	14.56 [5.49] (29.6)	0.10 [0.07] (5.97)
PCC–1	19.04 [0.29] (57.4)	0.00 [0.26] (261.0)
Sand	0.07 [0.01] (ND)	0.08 [0.07] (ND)

[a] The figures shown are the amounts of Fe and Mg released by RA corrected for the RA free controls (bracketed numbers), while the parenthetical numbers are the amount of that element present in the sample[10,13]. ND, not determined.

Niwana, Woodville, Texas, was freed of plant debris, washed with distilled water, and dried at 37°C. The median grain diameter of this sand was within the fine sand range of the Wentworth size grade scale (0.25–0.125 mm). The dihydroxamic acid RA was crystallized from the medium of low iron cultures[12] of *Rhodotorula pilimanae* ATCC 26423. In a laboratory experiment 5 g of rock sample and 50 ml of 0.05 M pH 7.0 sodium phosphate+0.01 M RA were placed in 125-ml bottles on a shaker (150 3.7-cm reciprocating strokes per min) at 23°C for 21 days. Following centrifugation (12,000 × g, 10 min) the supernatants were discarded if they deviated more than 0.1 pH units from that of the original solution, if the residue showed evidence (microscopic) of microbial contamination, or if there was any weight loss during shaking. Solutions were examined for metal ions by atomic absorption (Perkin-Elmer 360). Corrections were made for metal ions present in the extracting solution prior to exposure to the rock samples and for the control run without RA.

Results and discussion. The amounts of Fe and Mg released from the rock samples by 3 weeks exposure to buffer+RA is recorded in the table. Also recorded in the table is the original Fe and Mg content of the rock samples. Other elements were considered but less than the following amounts were removed from the samples by RA (units are mg metal/g rock sample): 0.01 Ca, 0.005 Co, 0.01 Cr, 0.015 Cu, 0.005 Mn, 0.005 Ni, 0.008 Sr, and 0.003 Zn. With longer shaking times or higher ash to chelator ratios increasing amounts of Mg and Fe were removed from the ash (data not shown).

The release of Mg from rock samples by RA was unexpected because siderophores are not involved in magnesium metabolism and hydroxamic acids are not particularly selective for Mg[13]. The amounts of Fe removed from the silicate standards were related to, but not a linear function, of the quantities of Fe present. This is not surprising because the rock samples differ in particle size distributions, chemical compositions, and grain size of individual rock forming minerals. Due to the 'glass-like' nature[14] of ash, less iron would be expected to be leached from the ash than from the crystalline rock standards[11].

In this study RA was used as the model chelator because it is the most readily available siderophore[12]. The RA concentration of 0.01 M used was substantially higher than the concentrations of siderophores present in soils[7]; however, this RA concentration has been observed in the medium of low iron cultures of *Rhodotorula pilimanae*[10].

When considering the grain size and weathered nature of the sand sample, the fact RA was effective at Mg and Fe removal suggests siderophores may have a role in rock decomposition.

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2 Present address: University of Texas Medical School, San Antonio, Texas 78284, USA.

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A biologically active diphenyl ether from the green alga *Cladophora fascicularis*[1]

M. Kuniyoshi, K. Yamada and T. Higa

Department of Chemistry, College of General Education and Department of Marine Sciences, College of Science, University of the Ryukyus, Nishihara, Okinawa 903-01 (Japan), 13 March 1984

Summary. A new polybrominated diphenyl ether (**1**) has been isolated from the green alga *Cladaphora fascicularis*, and the structure was determined by spectral analysis and conversion to known compounds. It showed antibacterial and antiinflammatory activities.

Key words. Green alga; alga, green; *Cladophora fascicularis;* diphenyl ether, polybrominated; 2-(2′,4′-dibromophenoxy)-4,6-dibromoanisole.

In the course of our chemical study of marine algae from Okinawan waters, we found a new diphenyl ether, 2-(2′,4′-dibromophenoxy)-4,6-dibromoanisole (**1**), in the green alga *Cladophora fascicularis*. The alga, collected from Miyako Island in April, 1983, was washed with fresh water, air-dried at room temperature for a week, and extracted by steeping in 95% ethanol for a month. The extract was concentrated and partitioned between water and chloroform. The chloroform-soluble material was chromatographed on a Sephadex LH-20 column by eluting with 1:1 chloroform-methanol. Fractions displaying NMR signals in the aromatic region were combined and purified by repeated chromatography on silica gel columns and