A c-mitotic action is also detected by the rise in metaphase number. Since this c-mitotic action, earlier described by Ceriotti[3] on animal material, is absent in other protein synthesis inhibitors such as in anisomycin or cycloheximide[10], it may be that this effect is a secondary one not related to the primary inhibition which works on protein synthesis.

Action on nucleologenesis. We analysed the frequency of binucleate cells with an organized nucleolus at different times after the caffeine treatment, both in control meristems, and in meristems treated with 1 µg/ml narciclasine. This study was especially valid since nucleologenesis takes place during or immediately after the caffeine action, and the binucleate cells are made up of a synchronous population. The analysis shows that narciclasine increases the frequency of cells that have finished nucleologenesis, in comparison to control meristems. The accelerated kinetics of nucleologenesis induced by narciclasine, is very similar to the action of other protein synthesis inhibitors upon nucleologenesis, for example cycloheximide[10], and anisomycin[11]. We postulate the importance of the nucleologenesis test for detecting metabolic responses in eucariotic cells, because the nucleologenesis test shows clearly and simultaneously whether there is any inhibition of protein synthesis produced by nucleologenesis acceleration, or whether the drug is inhibiting RNA synthesis and then blocking the nucleologenesis.

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Phospholipid composition of *Dipylidium caninum*

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Summary. The phospholipid composition of *Dipylidium caninum* has been studied. Chloroform-methanol-soluble fraction amounted to 2.4% and phospholipids to 0.5% of the wet weight of the parasite. Phosphatidyl choline and phosphatidyl ethanolamine represented the bulk of the phospholipids, whereas phosphatidyl serine, phosphatidyl inositol, lysolecithin and lysophosphatidyl ethanolamine were present in minor amounts. Sulfatides were also identified in this parasite.

The dog tapeworm *Dipylidium caninum* is a parasite belonging to the class of cestodes. It inhabites the intestine and is responsible mainly for the intestinal problems like abdominal discomfort, indigestion, hunger pain, diarrhoea and constipation. At present, our knowledge of the nature of biochemical components of parasites in general is very limited[2]. As part of a detailed chemical and immunological study of the parasite, the lipids of the adult *Dipylidium caninum* have been investigated. This note pertains to the phospholipid composition of this parasite.

Materials and methods. Dipylidium caninum tapeworms were removed from the intestinal tract of dogs immediately following the sacrifice and were placed in physiological saline. After repeated washing, they were blotted on filter paper and weighed. Extraction, purification and isolation of phospholipids and their separation, identification and characterization were as described previously[3-5]. Cerebrosides and sulfatides were separated on silica gel G plates in chloroform-methanol-ammonia (80:20:0.4, vol/vol). Plates were developed for several h to achieve better resolution of these lipids. Sugar-containing lipids were identified with alpha naphthol sulfuric acid spray.

Results and discussion. The total chloroform-methanol soluble fraction of *D. caninum* amounted to 2.4% and phospholipids to 0.5% of the wet wt of the parasite. When these lipids were subjected to TLC, 8 components were identified with iodine vapors (figure). Of these components, 6 were found to be phosphorus-positive when sprayed with molybdate spray. These phospholipids were identified as lysophosphatidyl choline, phosphatidyl choline, lysophosphatidyl ethanolamine, phosphatidyl inositol, phosphatidyl serine and phosphatidyl ethanolamine. The presence of these phospholipids was further confirmed by cochromatography with authentic standards. The phospholipid composition of *D. caninum* is presented in the table. It makes clear that phosphatidyl ethanolamine and phosphatidyl

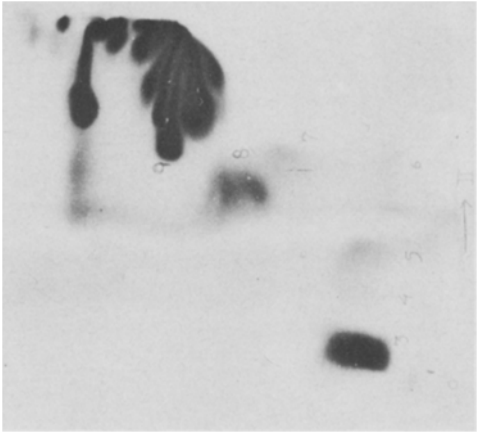
Phospholipids of *Dipylidium caninum*

Phospholipids	% of total phospholipids*
Lysolecithin	3.5±0.5
Phosphatidyl choline	54.5±2.5
Lysophosphatidyl ethanolamine	4.4±0.8
Phosphatidyl inositol	7.1±1.2
Phosphatidyl serine	10.4±1.4
Phosphatidyl ethanolamine	20.1±1.6

* Each value is the mean ± SD of 3 different determinations.

choline represent the major phospholipids of this parasite. On chromatography of these lipids in chloroform-methanol-ammonia (80:20:0.4, vol/vol) 1 sugar positive component was identified with alpha naphthol sulfuric acid. This component was identified as sulfatides with authentic markers. The presence of this lipid was further confirmed by its chromatography with the respective glycolipid.

The chemical constitution of the phospholipids has received detailed attention only in recent years. In general, it appears that the major phospholipid group known from vertebrates occur also in parasites. The phospholipids detected in *D. caninum*, namely lysolecithin, phosphatidyl choline, lysophosphatidyl ethanolamine, phosphatidyl inositol, phosphatidyl serine and phosphatidyl ethanolamine were the same as those reported in *Hymenlepis diminuta*[6] and *Taenia hydatigena*[7]. They differed, however, from those of *T. saginata*[8] and *T. taneniaeformis*[9] in that the former contained no lecithin, and the latter no phosphatidyl inositol. Ethanolamine and choline containing lipids comprise about 74% of total phospholipids similar to *Ascaris lumricoides*[10] and *Ancylostoma caninum*[11]. The identification of sulfatides in *D. caninum* is similar to its presence in nematodes and trematodes[3]. The function of these lipids in the metabolism of *D. caninum* is unknown and warrants further work.



Two-dimensional thin layer chromatogram of lipids of *Dipylidium caninum*. Chloroform-methanol-water (65:25:4, vol/vol) was used in the first direction and chloroform-methanol-acetic acid-water (50:35:8:1, vol/vol) in the 2nd direction. Components are visualized with iodine vapors: 1, lysolecithin; 3, phosphatidyl choline; 4, lysophosphatidyl ethanolamine; 5, phosphatidyl inositol; 6, phosphatidyl serine; 7, sulfatide; 8, phosphatidyl ethanolamine; 9, neutral lipids.

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Chaetogaster limnaei K von Baer 1872 on *Lymnaea tomentosa:* Ingestion of *Fasciola hepatica* cercariae

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Summary. The fresh water mollusc, *Lymnaea tomentosa,* the intermediate host of the liver fluke is heavily infested under natural conditions with ectocommensal annelid, *Chaetogaster limnaei.* These annelids which destroy the larval stages of *Fasciola hepatica* have been observed in the laboratory. The association of *C. limnaei* with the snail intermediate host is of value in exploiting a control measure against economically important liver fluke disease.

Lymnaea tomentosa is the intermediate host of the liver fluke, *Fasciola hepatica,* in Australia. Its ecology has been studied in detail[2] and many biological and chemical measures aimed at controlling populations of this snail have been suggested[3]. The former include artificially creating competition with other snails, encouraging the predatory habits of sciomycid flies and rearing ducks and other water fowl in snail localities. A competition between the larvae of echinostomes and *F. hepatica* in snails also seems to lessen the prevalence of *F. hepatica* cercariae (Boray; personal communication). Although such methods have been found to be quite successful in controlling lymnaeid snails in other parts of the world, none were found successful for the control of *L. tomentosa* in Australia.

An alternative biological control measure for fascioliasis might derive from *Chaetogaster limnaei,* an oligochaete annelid, which is found attached to the bodies of snails. This species feeds on protozoa, rotifers, nematodes, crustaceans, water mites and chironomid larvae[4]. There are also reports that they feed on miracidia[2,5,6] and cercariae[7,8]. Becklund[8] and Khalil[6] considered that these annelids play a part in limiting the distribution of trematodes. This view seems to be supported by the fact that a) Boray[2] found few or no sporocysts of *F. hepatica* in snails infested with this annelid, and b) Khalil[6] noted an inverse relationship between the prevalence of *F. hepatica* infections in snails and the number of *C. limnaei* present. *C. limnaei* may also kill snails since Bendezu[9] found many snails dying due to excessive protozoan accumulation in the intrashell space following the death of the annelid. This report provides additional observations of the feeding behaviour of *C. limnaei* on cercariae of *F. hepatica.*

Experimental observations. Adult *L. tomentosa* collected from Brooks' Creek, which flows through sheep grazing areas near Canberra, Australia, were examined for the presence of larval stages of *F. hepatica.* It was observed that all snails carried heavy infestations of *C. limnaei* (ranging from 70 to 90 per snail) on their external surfaces and shells, but they were apparently not infected with trematodes. 88 snails were each exposed in the laboratory to 20 miracidia of *F. hepatica.* During the next 2 months many snails died and most of them were devoid of any larval