NEUTRAL LIPID COMPONENT IN CESTODES

INTRODUCTION

Members of platyhelminthes are dependent upon the external sources for the sterols and long chained fatty acids, but they are able to synthesize their other complex lipids by chain elongation (Ginger and Fairbairn 1966; Jacobsen and Fairbairn 1967; Bailex and Fairbairn 1968; Oldenborg et al., 1975). Their lipid composition seems to reflect a close distance between the environment in which these organisms live and are dependent on for specific lipids and upon their own metabolic abilities for lipid synthesis.

The major neutral fractions or components of whole adult worm are triglycerols, free sterols and sterols esters. Smith and Brooks (1969) demonstrated thin-layer chromatography. They observed that, free sterol and triglycerides are major neutral lipid fractions in Schistosoma mansoni adult worms. Analysis of neutral lipids by GLC and TLC showed that cholesterol is the only sterol in adult worms (Smith and Brooks 1969, Meyer et al., 1970, Fried et al., 1983) and it was quantitated by Fried et al., (1983). In the present study author has analyse the neutral lipid by available commercial test
kit in some cestode parasites. This study describes neutral lipid fraction in *Cotugnia ambae* and *Moniezia chetanae* from two different hosts. Mills et al. (1981), demonstrated that lipid compositions seem to reflect a close distance between environment in which these live and are dependent upon for specific lipids on host lipid composition which are compared qualitatively however quantitative difference may be extreme. A number of detailed studies indicated that the percentage of lipids in certain organs of parasites had no importance as a storage area. So we examined lipid component in whole worms and not in particular organs.

**MATERIALS AND METHODS**

A bulk of cestode parasites as seen in (fig. 1 & 2) were collected from intestine of *Gallus gallus domestica* and *Capra hircus*. Few of them were preserved in 4% formalin for taxonomic studies which revealed that they were *Cotugnia ambae* n.sp. and *Moniezia chetanae* n.sp.

Other identical adult worms were sorted out and kept separate in previously weighted watch glasses. These materials were taken on a separate blotting paper to remove excess of water and then
it was weighed on a sensitive balance to obtain wet-weight of parasites. After this parasites were kept at 80°C in oven till it dried completely, powered in Mortar and Pastle and preserved for lipid estimation. Lipids were extracted from powered worms in chloroform-methanol mixture, which was in 2:1 Ratio.

Powered parasites were homogenized with mixture of chloroform methanol and debris were removed by centrifugation and supernatents were transferred into the test-tubes.

The estimation of major neutral lipid fraction was carried out by adopting the methods described by "Trasisia Biomedical Kit" Lipid profile ERBA Test and to obtain lipoproteins, extracts were incubated in water bath at 37°C for 10 min. and values are calculated by formula which is given in the leaflet, which is available in the kit.

RESULTS

Percent distribution of neutral lipid fractions from both parasites i.e. Cotugnia ambae n.sp. and Moniezia chetanae n.sp. are presented in Table No. 1. Major neutral lipid fractions in adult worms are sterols, triglycerides and lipoproteins. Quantitative result shows,
Cotugnia comprises 10.1% triglycerides, 6.75% total cholesterol and 1.26% high density lipoproteins and 0.41% low density lipoproteins of its dry weight.

Moniezia chetanae n.sp. contains 6.0% triglycerides 2.08% cholesterol and 4.20 high density lipoproteins and 1.47 low density lipoproteins of its dry weight.

Extract of Cotugnia and Moniezia contains more triglycerides than cholesterol and small amount of lipoprotein.

DISCUSSION

The ability of cestode to achieve some selectivity in the absorption of dietary fatty acids (Jacobsen and Fairbairn 1967) and to perform certain interconversions of acids may be of considerable biological significance. The worms exerts in this way a measure of control over the composition of their fatty acids, and thus, in Jacobsen and Fairbairn’s (1967) words, they maintain species individuality. However this control is far from complete. The percent distribution of various fatty acids in the lipids of H. diminuta, Overturf and Dryer (1968) and Raulieta cesticillus, Botero and Reid (1969) is quite
different in worms recovered from hosts kept on diets with low and high quantity.

Parasites synthesize rather freely, the water soluble components of complex lipids, such as glycerol or chlorine and form complex lipids from various precursors. Rapid glycerol format from glucose and its incorporation into various lipid fractions occurs also in cestodes (Ginger and Fairbairn, 1966 b, Meyer et al, 1966).

The mechanism of triglyceride formation has been studied in *Hymenolepis* by Buteau and Fairbairn (1969). As mentioned above, this worm rapidly hydrolyzes and absorb monoglycerides and their fatty acids are subsequently found in other glycerides. The worm has considerable capacity for synthesizing phospholipids also but cestodes are not able to synthesize the cholesterol, the species studied in this respect can esterify it.

Present study indicates that *Cotugnia ambae* n.sp. develop in small intestine of *Gallus domesticus* where as *Moniezia cheilae* n.sp. worm grow in *Capra hircus*. When the lipid fractions of two genus were compared qualitatively. However there is quantitative difference in lipid fraction.
In *Cotugnia ambæe* n.sp. neutral lipid fraction like triglycerides, cholesterol and lipoproteins are accounted for 18.52% of total lipid extract and *Moniezia chetanae* n.sp. account for about 14.47 % of total lipid extract. Table shows the percentage distribution of neutral lipid fractions of two worms. As can be seen, the lipids detected were common to both but quantity is different may be due to distinct environmental niche that the parasites occupies (Mills et al; 1981).

In the present study extract of *Cotugnia ambæe* and *Moniezia chetanae* contain more triglycerides than other fractions. Triglycerides comprises the major lipid components from both genus. This is particularly true when it is compared to other cestodes (Ginger and Fairbairn 1966; Mayer et al, 1969; Vessal et al, 1972; Beecchi et al, 1973). Trematodes (Smith et al, 1969, 1977; Smith and Brooks 1969; Meyer et al, 1970; Hopkin et al, 1974, Oldenborg et al, 1975, Fried and Bodroff 1978; Fried and Shapiro 1979) and a Turbellaria (Meyer et al, 1970).

In all these organisms, cholesterol is another major neutral lipid (Mii et al, 1981). In the present investigation also cholesterol detected from *Cotugnia* and *Moniezia* 6.75% and 2.08%
respectively. In general cestodes cannot synthesize the cholesterol but they can esterify Von Brand, T (1966). According to Smyth (1966) cholesterol is chief sterol in cestodes but as with fatty acids, cestodes are unable to synthesize this or other sterol.

Although the role of cholesterol in metabolism of parasites is not clearly understood but it is supposed that cholesterol may help in synthesis of bile acid, hormones and vitamin D etc., similar to that in vertebrate. Jadhav et. al, (1995).

The lipophilic factors are important in growth and development (Shaw et., al, 1927) extract of Cotugnia ambae n.sp. contains 1.26% HDL and 0.41% LDL and amount of lipoproteins in Moniezia chetanae n.sp. is 4.20% ND 1.47% respectively. It is concluded that Moniezia contain large amount of lipoproteins than the Cotugnia because growth and development of Moniezia, observed to be more than Cotugnia but it is not clearly understood.

Thus the distribution of lipid between class and quantity of individual lipid component, when compairing either two species of same genus or other members of platyhelminthes is quite different.
These quantitative changes are probably due to difference in environment and in the functional roles of the lipids for each organism. It is also possible that they may reflect the developmental stages at which the lipids are studied.

Some of the quantitative difference in the lipid component may be due to fat deposited in the intestinal region (Zelezky et al, 1965). This is related to the fact that host intestinal fatty acids and sterols are directly absorbed by cestodes and the quantitative composition of cestode lipids generally follows that of the host Smyth (1996).

Lastly some account is available on the disturbance in the host lipid metabolism during parasitic infection.

**COMPARATIVE HOST- PARASITES LIPIDS**

Host lipids play a critical role for long term survival and life cycle completion of endogenous parasites. Investigation of host lipid utilization in parasites is thus important in understanding the disease processes and interactions between the host-parasite.
Numerous studies have been conducted and advancement have been made in understanding the process of lipids uptake and metabolism in several mammalian parasites (Ellis et al., 1996). Present communication deals with comparative and quantitative, total lipids in some vertebrates and their cestode parasite.

Same procedure was applied for collection of cestode parasites as in "Neutral lipids". Lipid content was estimated by Barner’s Black Stock Method (1973) from host and parasites, both. 100mg. of tissue was homogenized in chloroform-methanol mixture. In 5ml. homogenate 10ml. 10% T.C.A. was added, centrifuge at 3000 R.P.M. for 15 min.

In 1ml supernatent 0.25ml. Hydrazin reagent was add, boiled in water bath for 20 minute and after cooling, 3ml. of ice-cold 85% H₂SO₄ was added by constant stirring, kept for 30min. at room temperature, O.D. was read at 540nm.

RESULT AND DISCUSSION

Result is obtained from the estimation of lipids by Barner’s Black Stock Method in some hosts and adult cestode parasites, because lipid content of cestode changes with age as per
Mcttrick and Cannon (1970). They observed that 5 days old worm contain 23.63% lipid in their dry weight and 16 days old one contain only 0.4%. In the present investigation author doesn’t know parasites age, but we obtained the values from adult worm which are given in Table No. 2.

Results revealed that content of lipids in parasites are in large amount than their host, it may be solvent mixture of unsaturated fatty acids are used to remove lipids from their association with the cell membranes. An important conclusion has emerged that composition of lipid seems to reflect according to environment of different type of host, whose physico-chemical properties and nutritional level may vary, Mill et al, (1981). This type of distribution is a major characteristic of host-parasite relationship.
Table No. 1  Percent Composition of Neutral lipid from *Cotugnia ambae* and *Moniezia chetanae* n.sp.

<table>
<thead>
<tr>
<th>Lipid Components</th>
<th>Cotugnia ambae</th>
<th>Moniezia chetanae</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triglycerides</td>
<td>10.1</td>
<td>6.0</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>6.75</td>
<td>2.8</td>
</tr>
<tr>
<td>HDL Lipoprotein</td>
<td>1.26</td>
<td>4.20</td>
</tr>
<tr>
<td>LDL Lipoprotein</td>
<td>0.41</td>
<td>1.47</td>
</tr>
<tr>
<td>Percentage of Total neutral lipid</td>
<td>18.52 %</td>
<td>14.47 %</td>
</tr>
</tbody>
</table>

_HDL_: High density lipoprotein

_LDL_: Low density lipoprotein
Table No. 2  Comparative host - parasites lipids

<table>
<thead>
<tr>
<th>Parasites</th>
<th>Total lipids in %</th>
<th>Host</th>
<th>Total lipids in %</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Raillietina corvina</em></td>
<td>18.16</td>
<td>Dove</td>
<td>16.21</td>
</tr>
<tr>
<td><em>Moniezia (B.) chetanae</em> n.sp.</td>
<td>14.57</td>
<td>Goat</td>
<td>10.90</td>
</tr>
<tr>
<td><em>Cotugnia omboe</em> n.sp.</td>
<td>18.52</td>
<td>Hen</td>
<td>16.02</td>
</tr>
<tr>
<td><em>Vampirolepis ratti</em> n.sp.</td>
<td>18.55</td>
<td>Rat</td>
<td>14.05</td>
</tr>
</tbody>
</table>