INCORPORATION TRENDS OF (1-C^{14}) ACETATE IN PREGNANCY LIPIDS OF VARIOUS ORGANS

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Abstract

Comparative evaluation of (1-C^{14}) acetate incorporation was studied in ovary, adrenal, blood plasma and placenta in guinea pigs in mid pregnancy. The respective level of incorporation within the sample for total lipids did not differ in pregnancy and non-pregnant states. Placental lipids in general, and phospholipids in particular were highly incorporated in contrast to other organs/tissues. Amongst non-pregnancy total lipids, the blood plasma showed an elevated incorporation over ovarian and adrenal lipids.

The ovary in pregnancy revealed depressed incorporation in general, except for esterified cholesterol which contained higher incorporation. Phosphatidyl choline in adrenal, and phosphatidyl ethanolamine in blood plasma appeared to be active fractions involved in respective phospholipid metabolism during pregnancy. Similar incorporation pattern in blood plasma and placenta with correspondingly increased activity in phosphatidyl ethanolamine, and depressed activity in phosphatidyl choline suggested that plasma tend to supplement the placental phosphatidyl ethanolamine source.

It has been reported that there is decreased (1-C^{14}) acetate incorporation in lysophosphatidyl choline (LPC), sphingomyelin (SPH) and phosphatidyl serine (PS), and an increased incorporation into phosphatidyl choline (PC) and phosphatidyl enthanolamine (PE) fractions of rabbit ovary during pregnancy (Morin 1968 a). Morin (1968 b) further observed decreased (1-C^{14}) acetate incorporation in PC and PS fractions of rabbit aorta during pregnancy suggesting diminished susceptibility to atherosclerosis.

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Much information is not available on comparative incorporation in pregnancy lipids in various biologcal organs/tissues involved in reproduction. This study covers relevant incorporation in ovary, adrenal, placenta and blood plasma in guinea pigs in mid-pregnancy. The blood plasma being the medium of transport has also been included in this investigation.

This paper constitutes a preliminary study dealing mainly on magnitude of incorporation in different organs/tissues under study.

Materials and Methods

Female guinea pigs in the range of 5-6 months age, and 600-800 g body weight were randomly selected. The experimental group (E) was allowed to breed to mid pregnancy and control group (C) was safely kept apart as non-pregnant. The animals were weighed and injected intraperitoneally with sterile solution of (1-C^{14}) acetate (specific activity 3.2 mc/mM) with a dose of 10uc/100 g body weight two hours before sacrifice by decapitation. The blood was collected in heparinised tube (200 units heparin in 1.0 ml. normal solution), sufficient for 50 ml blood. The abdomen was opened and ovaries, adrenals and placentae removed quickly and weighed correctly to 0.01 mg on a Meltar balance. Heparinized blood was centrifuged and blood plasma collected with Pasteur pipette and measured correctly to 0.1 ml.

The extraction, separation of lipids by TLC and estimation of specific activity was carried out as reported earlier (Sharma and Venkitasubramanian, 1973 a, 1973 b, 1973 c, 1974).

Results

Results of incorporation have been summarized in the Table.

Total lipids : Incorporation of total lipids in ovary, adrenal and blood plasma did not differ significantly in pregnancy and non-pregnancy states. However, apparently the ovarian incorporation was depressed by 20 per cent and adrenal incorporation enhanced by 85% in mid pregnancy. The blood plasma retained same level of incorporation in experimental and control groups.

The placenta showed a very high significance in incorporatiion as compared to other organs/tissues in pregnancy. Amongst non-pregnancy values, the blood plasma revealed significantly higher incorporation in contrast to other organs.

Lipid fractions: In ovarian lipid fractions, the incorporation was depressed in PE in pregnancy, with PC and sphingomyelin + lysophosphatidyl ethanolamine (SPH + LPE) fractions retaining the same level. The incorporation in ovarian esterified cholesterol was significantly elevated during pregnancy.

The incorporation in adrenal PC was significantly enhanced while other adrenal phospholipid fractions showed no activity. The blood plasma manifested a significantly depressed activity in PC and very high incorporation in PE during pregnancy. The blood plasma PE and few other phospholipids manifested no activity in non-pregnancy state (Table).

The placental lipids in general and placental phospholipids in particular showed a very high level of incorporation. The polyglyecerol phosphatide + phosphatidic acid (PGP + PA) revealed highest incorporation followed by PE, phosphatidyl inositol (PI) + PS, SPH + LPE and PC fractions in the order given (Table).

Discussion

The incorporation in pregnancy total lipids of various biological samples under study was higher in placenta. Blood plasma revealed 4.4 fold (not significant), and placenta 30 fold (significant) incorporation as compared to ovarian lipids in pregnancy.

Total lipids in ovarian tissue showed an apparent decrease in incorporation in pregnancy which was not significant. The concentration of total lipids in ovaries has, however, been reported to be elevated during pregnancy (Bloor **et al.**, 1930; Boyd and Eldon, 1935; Sharma and Venkitasubramanian, 1973 c), though the incorporation has apparently been diminished or at best remained constant at non-pregnancy level. This suggested lowered level of utilisation of lipids by ovarian tissue during pregnancy.

The striking change in ovarian phospholipids was a significant decrease in PE incorporation pointing to reduced metabolism of this fraction during pregnancy. There was little or no change in incorporation of PC in experimental group. The increased concentration of these fractions during pregnancy (Blood **et al.**, 1930; Boyd and Eldon, 1935; Sharma and Venkitasubramanian, 1973 c) despite their respective declined or constant level of incorporation suggested to their reduced utilisation by the ovarian tissue pregnancy. Similar evidence has been furnished by Morin (1968 a) for increased ovarian PC in pregnancy in rabbits.

Adrenal PC showed an increased incorporation in pregnancy state. The stepped up incorporation in PC suggested that this fraction was actively involved in adrenal phospholipid metabolism in pregnancy.

Blood plasma showed significant diminution in PC incorporation during pregnancy. The incorporation study revealed the presence of additional phospholipids which were found to be active in plasma during pregnancy (Table). Plasma PE showed the highest radioactivity of all phospholipids,

TABLE

Incorporation of (1-C^{14}) acetate in lipids of various organs/tissues in pregnacy (E), and non-pregnancy (C) states. The values given are mean + S.E. of six observations.

Lipids	Ovarian		Adrenal		Blood plasma		Placenta
	C	E	C	E	C	E	
Percentage incorporation of injected dose:							
I. Total lipids	.0049±.0006^{e}	.0039±.0006^{b}	.0027±.0006^{e}	.0050±.0014^{b}	.017±.0011^{d}	.017±.0022^{b}	.122±.03^{a}
Specific activity (cpm/mg):							
II. Phospholipids fractions :							
PI + PS	—	—	—	—	—	124.2±15.0^{b}	37275±565^{a}
LPC	—	—	—	—	—	—	28703±652^{a}
SPH + LPE	350.0±27.6^{e}	308.4±31.4^{b}	—	—	—	392.1±42.1^{b}	32313±352^{a}
PC	246.0±24.7^{e}	242.1±19.3^{b}	20.7±1.5^{f}	39.1±3.7^{b} *t	427.8±29.7^{d}	200.1±19.0^{b} *t	29259±550^{a}
PE	352.0±20.3	147.1±14.9^{b} *t	—	—	—	1138.8±15.2^{b}	56550±581^{a}
PGP+PA	—	460.2±27.1^{b}	—	—	338.0±42.1	381.0±15.2^{b}	72780±436^{a}
III. Neutral lipids:							
PC	506.2±40.0^{e}	507.5±19.7^{b}	—	—	807.0±83.0^{d}	—	9150±347^{a}
EC	1279.9±132.1^{d}	1728.2±68.7^{b} *t	139.8±7.2^{e}	307.2±75.7^{c}	387.1±37.5^{e}	203.0±11.5^{c}	8650±505^{a}

— stands for no radioactivity; *t stands for significance by t test between pregnancy and non-pregnancy values within the same organ/tissue; Corresponding lipid fractions between various organs/tissues are compared by Duncan's multiple range test in pregnancy (a,b,c) and in non-pregnancy (d,e,f). Means denoted by same letter are not significant, and those denoted by different letters are significant between themselves.

indicating its increased role in plasma lipid metabolism in experimental group. The role of different phospholipids as active fractions in adrenal and blood plasma during pregnancy was therefore quite obvious.

It is evident from high degree of incorporation in total lipids, phospholipids and cholesterol fractions of placenta that lipid metabolism in this organ is rather extremely active. Amongst phospholipid fractions, PE showed far greater activity than PC suggesting that PE was more actively involved in placental phospholipid metabolism in guinea pigs. The investigations revealed that the incorporation pattern of plasma phospholipids was similar to that of placenta specifying correspondingly higher activity in PE, and lowered activity in PC. This pointed to the possibility that blood plasma tend to supplement the availability of PE source to placenta.

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