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論文名稱:	蘭嶼種母豬哺乳期間與動情週期的血脂蛋白分析
論文名稱(外文):	Plasma Lipoprotein Profiles of Lanyu Sows in the Estrus Cycle and Nursing Stages
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論文出版年:	1999
畢業學年度:	87
語文別:	中文
論文頁數:	80
中文關鍵詞:	蘭嶼母豬、哺乳期、動情週期、乳腺、脂蛋白
外文關鍵詞:	Lanyu Sows、Nursing Stage、Estrus Cycle、Mammary Gland、Lipoprotein
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中文摘要:	<p>本研究是探討蘭嶼種母豬在動情週期與哺乳期間血中脂蛋白的變化，以及乳腺對脂蛋白的利用和血中脂蛋白顆粒直徑的分析。</p> <p>乳腺的循環系統解剖圖顯示，流經乳腺的動脈血管和靜脈血管平行，如樹枝狀；每側均有一主要血管流經每個乳腺區，且在經過每個乳腺區時多會有分支的血管伸入腺體內部。泌乳期間乳靜脈血漿中 LDL、VLDL 和 HDL 和頸靜脈血漿中 HDL、VLDL 和 LDL 是呈顯著正相關 ($r=0.89$，$P<0.05$；$r=0.88$，$P<0.05$ 和 $r=0.91$，$P<0.05$)。應用頸乳靜脈差值來分析乳腺對脂蛋白的攝取率，以 VLDL 為最高。在產後第 7、21 和 42 天乳腺對三酸甘油酯攝取較高；而產後第 21 天的對葡萄糖的攝取率 57.6% 最高。泌乳期間乳汁組成份中，乳脂肪 ($7.88\pm 0.61\%$)、乳蛋白質 ($6.44\pm 0.29\%$) 和無脂固形物 ($12.62\pm 0.25\%$) 均是在分娩後第二天的乳汁含量最高和，但乳糖量則最低 ($4.60\pm 0.27\%$)。泌乳母豬乳靜脈血流速率於母豬分娩後第 14、21 和 35 天經由耳靜脈注射 30IU 的催產素後併以手按摩乳房並擠出乳汁，乳靜脈血流速率增加的幅度分別為 45%、65% 和 18%；若不注射催產素而僅以手按摩刺激乳房，則乳靜脈血流速率增加的幅度亦有為 20%、35% 和 7%。</p>

母豬動情週期血中的 VLDL 從第 1 天 ($8.2\pm 1.8\%$) 緩緩上升到第 15 天 ($14.5\pm 1.8\%$) 並達最高值 ($P<0.05$)，而後開始下降。LDL 變化並不顯著 ($P>0.05$)。HDL 則從第一天 ($48.9\pm 2.2\%$) 逐漸下降到第 11 天的最低量 ($40.1\pm 2.2\%$) ($P<0.05$)。動情週期血漿中膽固醇於第 1 天 ($83.3\pm 5.7\text{mg/dL}$) 為最高，然後逐漸下降到第 11 天 ($63.3\pm 5.7\text{mg/dL}$) 為最低 ($P<0.05$)。三酸甘油酯則是以第 3 天 ($40.5\pm 4.6\text{mg/dL}$) 為最高。蛋白質的量則在整個動情週期並無顯著的變化。動情週期血漿中膽固醇和助孕素量呈顯著的負相關 ($r=-0.75$, $P=0.008$)。

血中 HDL 顆粒的直徑因個體差異，介於 $4.83\pm 0.34\text{nm}$ 至 $11.6\pm 0.26\text{nm}$ 不等；而 LDL 的平均介於 $18.23\pm 0.18\text{nm}$ 至 $18.92\pm 0.20\text{nm}$ 不等。HDL 顆粒的直徑變異較大，而 LDL 顆粒的直徑變異較小。

綜而言之，母豬哺乳期間乳腺對血漿中脂蛋白的利用是以 VLDL 為主要，三酸甘油脂的攝取亦較高；在產後的第 21 天的葡萄糖攝取率高達 57.6%。泌乳時乳腺血流速率在第 21 天增加最多。母豬動情週期的血中 HDL 有顯著的變化，血中膽固醇的變化亦較明顯。血中 HDL 顆粒直徑變異大，而 LDL 顆粒直徑變異小。

外文摘要:

This study was conducted to reveal plasma lipoprotein profiles of Lanyu sows in the estrous cycle and nursing stages, to determine the uptake of lipoproteins by the mammary glands, to measure the diameter of plasma lipoprotein particles. Sow's blood circulation system for the mammary glands was studied to show that the artery lied in parallel to the vein by forming a pattern akin to the branches of a tree. A main blood vessel went through every section of the mammary gland with vessel branches to the interior one of the gland. In the nursing sows, the percentages of LDL, VLDL and HDL in the plasma of the mammary vein were highly correlated with that of in the jugular vein ($r = 0.89$, $P<0.05$; $r = 0.88$, $P<0.05$; $r = 0.91$, $P<0.05$). According to the difference between plasma lipoprotein contents of the jugular and mammary veins, the highest uptake rate of three kinds of lipoproteins was VLDL. The mammary gland took triglycerides actively in Day 7, 21 and 42 after parturition. The assimilation of glucose was most apparent on Day 21 with the uptake rate of 57.6%. The concentration of milk fat ($7.88 + 0.61\%$), protein ($6.44 + 0.29\%$) and the non-fat solids ($12.62 + 0.25\%$) on Day 2 were the highest ones as compared to that of other days during the nursing stage, but milk lactose was the lowest one ($4.60 + 0.27\%$). The blood flow rate in the mammary vein on Day 14, 21 and 35 increased 45, 65 and 18%, respectively, when the nursing sow was injected with 30 IU oxytocin via ear vein along with messaging on the teat udder for collection of milk. Without oxytocin injection and message, the blood flow rate also increased 20, 35 and 7%, respectively on Day 14, 21 and 35.

Plasma VLDL increased gradually from Day 1 of the estrous cycle ($8.2 + 1.8\%$) to Day 15 ($14.5 + 1.8\%$) and reached the highest value ($P < 0.05$), and then decreased gradually. LDL was varied insignificantly ($P > 0.05$). HDL decreased gradually from Day 1 ($48.9 + 2.2\%$) to Day 11 ($40.1 + 2.2\%$) and reached the lowest value ($P < 0.05$). (2) Plasma cholesterol had the highest value on Day 1 ($83.3 + 5.7 \text{ mg/dL}$) and decreased gradually to the lowest level on Day 11 ($63.3 + 5.7 \text{ mg/dL}$) ($P < 0.05$). Concentration of plasma triglyceride on Day 3 was the highest level ($40.5 + 4.6 \text{ mg/dL}$). The levels of plasma protein in the estrous cycle changed with no significant difference. Plasma cholesterol concentration was negatively correlated with progesterone level ($r = -0.75$, $P = 0.008$).

Plasma HDL particles varied among individual animals and the mean diameter varied from $4.83 + 0.34$ to $11.6 + 0.26 \text{ nm}$. Mean diameter of LDL particles varied from $18.23 + 0.18$ to $18.92 + 0.2 \text{ nm}$. HDL particles had a great variation in diameter but not in the case for LDL particles.

In summary, the major one of lipoproteins used by the mammary gland of nursing sows was VLDL. Triglyceride was also used highly by the mammary gland. The uptake rate of plasma glucose in the mammary gland on Day 21 was 57.6% and it was the highest one. The blood flow rate in the mammary vein on Day 21 had a highest increment during milking. Plasma concentration of HDL and cholesterol varied significantly in the estrous cycle. HDL particles had a great variation in diameter but not in the case for LDL particles.