

Carbohydrate Loading in Preparation for Childbirth

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Abstract — The similarity between endurance sports and childbirth suggests that an elevation of maternal glycogen stores through a moderate increase in dietary carbohydrates during the last few weeks of pregnancy may benefit both mother and child.

Introduction

The woman in labor is easily fatigued. Contributing to this fatigue is the development of ketoacidosis as labor progresses. This condition could be reduced by increasing the consumption of carbohydrates by the near-term pregnant woman.

Causes of ketoacidosis

Excessive reliance upon fat and protein as energy sources rather than glucose is the primary cause of ketoacidosis. This reliance occurs in part because the fetus parasitizes most of the glucose out of the mother's bloodstream (1). The resulting inability of the mother to build up her glycogen stores increases the dependence upon fat and protein. Other factors often present during labor that increase fat and protein metabolism include mild starvation and pain-induced catecholamine release (2, 3).

The harmful effects of ketoacidosis

The depletion of glycogen in a working muscle may result in a severe metabolic acidosis that con-

tributes to fatigue (4). This fatigue is of concern because as the length of labor increases, so does the fall in fetal pH. A fetal pH of above 7.25 is associated with Apgar scores greater than 7 in 90% of all cases, but below this, general fetal distress is much more common (5, 6).

Ketoacidosis also leads to maternal distress and contributes to hypertonic uterine dysfunction. This uterine dysfunction is dangerous for the fetus even when the membranes are intact. The fetus is deprived of oxygen because the utero-placental circulation is diminished by the hypertonicity (7). This hypoxia causes a greater acid load upon the body, contributing to uterine dysfunction, and thereby creating a noxious cycle.

The shortcomings of intravenous glucose

Intravenous (IV) glucose is often used to prevent ketoacidosis during labor. However, carbohydrate loading still could be of benefit because: a) IV glucose is not always available, b) some women refuse IV glucose for personal reasons, and c) IV glucose skips the first-pass effect of the liver and

carries the risk of causing harmful, wide swings in blood glucose levels. It is less metabolically controlled than glucose coming from glycogen stores.

A proposed regimen

For most of the industrialized nations, carbohydrates supply approximately 45% of the total energy intake. Increasing this level to 65% starting the 37th week of gestation would be a significant change for many people, but historically this carbohydrate level is quite common. For example, this was the level of dietary carbohydrates in the American diet less than a century ago (8).

Conclusion

The woman in labor, like the endurance athlete, is subjected to many factors that are associated with, and may cause, ketoacidosis. This condition sets in motion a number of harmful metabolic effects which may be lessened by optimal glycogen stores

achieved by a mild increase in dietary carbohydrates during the last few weeks of gestation.

References

1. Pritchard JA, MacDonald PC, Gant NF. Williams Obstetrics. Appleton-Century-Crofts, Norwalk, 1985.
2. Koeslag JH, Noakes TD, Sloan AW. The effects of alanine, glucose and starch ingestion on the ketosis produced by exercise and by starvation. *J Physiol (Lond)* 325: 363, 1982.
3. Schade DS. The role of catecholamines in metabolic acidosis. *Ciba Found Symp* 87: 235, 1982.
4. Terjung RL, Dudley GA, Meyer RA. Metabolic and circulatory limitations to muscular performance at the organ level. *J Exp Biol* 115: 307, 1985.
5. Read JA. Presentation and delivery. p 250 in *Practical Manual of Obstetrical Care* (FR Zuspan, EJ Quillign, eds) CV Mosby, St Louis, 1982.
6. Oxorn H. Human labor and birth. Appleton-Century-Crofts, New York, 1980.
7. Myles MF. Textbook for Midwives. 7th ed. T & A Constable Ltd, Edinburgh, 1971.
8. Linder MC. Nutrition and metabolism of carbohydrates. p15 in *Nutritional Biochemistry and Metabolism with Clinical Applications* (MC Linder, ed) Elsevier, New York, 1985).