Discussion

Following the presentation on ‘Human Milk Fortification’
by G. Putet

Dr. Haschke: Could you elaborate a little bit on protein quality? Nowadays we should consider not only the protein quantity in human milk, but also protein quality, because we know that the quality changes rapidly. The whey fraction decreases after a couple of weeks and the nutritive quality of the milk might not be the same immediately after birth and later on because the composition of the protein differs. Are there any studies on this, or could you speculate on how this could affect the real intake values of nutritive and nonnutritive protein?

Dr. Putet: The only thing I really know is that the whey to casein ratio of the human milk is changing. The more mature the milk is the more this ratio will change to around 50 to 50 and will not stay at 60 to 40.

Dr. Puplampu: I would like to know what type of protein was used to fortify human milk. You mentioned dextrose maltose being one of the ingredients, but what about the others, particularly protein, and what type of protein?

Dr. Putet: In the various studies I showed there were different human milk fortifiers. So from one study to another the human milk fortifier was not at all the same. Most of the time they were either Enfamil or Eoprotein.

Dr. Netrebenko: You showed the higher osmolarity of human milk fortifiers. Have you seen any adverse effect of this kind of feeding?

Dr. Putet: There have been several studies showing that when the osmolarity of the fluid given per os is above 550 mosm it may be dangerous for the baby and provoke necrotizing enterocolitis. This is why we have to be careful that the osmolarity is not too high.

Dr. Netrebenko: So it means that these fortifiers are not very safe for preterm babies?

Dr. Putet: They are safe. What I showed is that human milk fortifiers may increase the osmolarity of human milk to a certain level. This level has not been shown to increase necrotizing enterocolitis. When this kind of human milk is used and some drugs are added at the same time, the osmolarity may increase a bit more. So caution must be taken to dilute the drugs with enough human milk.

Dr. Beaumier: You talked mainly about protein but in earlier talks we heard that protein is missing. Perhaps we should think about having a higher protein concentration. What would the effect of the combinations human milk and human milk fortifier be on protein? What is the source of calories added. Currently, and I am talking only for North America, we are using carbohydrate- and lipid-predominant fortifiers. Is there any preference? We just heard from Dr. Thureen that increased carbohydrate above 18 g/day might have a detrimental effect due to lipogenesis. Looking at the carbohydrate content of human milk and the carbohydrate-predominant fortification, a couple of calculations will give a value in the 20–22 range.

Dr. Putet: Most of the human milk fortifiers contain energy with dextrin maltose or lactose, lipids and minerals, vitamins and some oligoelements. It is important to know that they contain minerals to be able to know what the result on calciuria is when this fortifier is added. With human milk fortifier the carbohydrate load is not that much; at the most it may be 8 cal/dl. I don’t think there is any consequence of that because if
they are given at 180 ml/kg/day the total amount of carbohydrate will not be that high. If they are given at a much higher volume intake, the protein intake and total energy intake will perhaps be a little too high. I don’t know of any study comparing the effect of 50/50 energy supplementation with lipids or dextrin maltose with human milk fortifier or of any comparison of lipids and carbohydrate in very low birth weight infants.

**Dr. Dhanireddy:** When we add the fortifiers to human milk, what is the impact on the bioavailability of the various nutrients? Frequently these babies are on continuous feeds through plastic tubing. Does that alter the absorption of nutrients?

**Dr. Putet:** Human milk fortifier may change the capacity for retention but not the bioavailability. For instance if a human milk fortifier which has the correct amount of phosphorus is added, then the calcium retention of human milk will increase because at the same time there will be a little more phosphorus. Therefore the impact of the fortifier on calcium phosphorus balance must be measured or known. It is more the retention which has to be looked at rather than the bioavailability, because most of the time the bioavailability, which means metabolizable nutrients, will not change; it may increase but it will not change in infants.

Adding human milk fortifier by syringe will not change the amount of nutrients. We know that there may be protein losses or energy losses within a syringe, but by adding human milk fortifier the percentage of nutrients remaining within the syringe will not change.

**Dr. Kamenwa:** We have been talking about food allergy in babies and I was just wondering whether the protein macromolecules used to fortify human milk may be a potential risk for sensitizing these preterm babies?

**Dr. Putet:** When human milk is fortified and used within a few hours, the osmolarity will not increase. Attention must be paid to the osmolarity of the drugs added to the fortifier. If the fortified human milk is left for 24 h, the osmolarity will increase a little.

**Dr. Fusch:** Does the introduction of cow’s milk products in the fortifier increase the risk of sensitization?

**Dr. Putet:** With the introduction of cow’s milk protein the risk may increase. There are now some partially hydrolyzed human milk fortifiers and very soon there will be human milk fortifiers with totally hydrolyzed protein.

**Dr. Haschke:** There is one fortifier presently on the market which is based on extensively hydrolyzed protein, so there is no risk of sensitizing an infant to cow’s milk protein. For other formulas which include intact proteins, the question might be valid but nobody has really studied this.

**Dr. Putet:** You are right, there is a human milk fortifier with cow’s milk, total protein, and partial protein like the one we use, but it is not yet available in every country.

**Dr. Costalos:** When a premature baby is breastfed by its mother it is getting enough milk when breastfeeding is continuous. If breastfeeding continues after 1 month the protein or sodium content decreases even if the baby is getting his mother’s milk. This must be taken into consideration. For 1 month it is all right but after that something must be done.

**Dr. Fusch:** We know what we are putting into the milk when we use the fortifier. But we do not know what the basis of the individual mother’s milk is. Sometimes we see babies who do not grow with a 5% fortifier and even when the fortifier is increased up to 7.5%, which has not been studied or recommended, the baby does not grow either. Then we switch to normal preterm infant formula and the baby grows. How often do you think the mother’s milk does not have a high enough energy or protein content?

**Dr. Putet:** It will always be difficult to measure the protein content of human milk. We can only rely on what is generally accepted. Even in the first or second week of life some mother’s milk has a very low protein content, 1.2 or 1.3 g/dl, some others will
stay at 1.8 g/dl. So most of the time it is very difficult to add human milk fortifier from one meal to another. This is why it is better to give the fortifier for the whole day; the error will be much less.

Dr. von der Weid: Microbiological growth after reconstitution of human milk fortifier appears after 48–72 h. Like any powdered infant formula, the product must be consumed as soon as possible after reconstitution, especially in the case of sensitive premature infants. I am surprised to see that bacterial growth in human milk was maintained in the fridge at 4°C, a temperature at which bacteria normally do not grow. What kind of bacteria was detected in these samples?

Dr. Putet: You are not totally right because in France I am know that mothers who live a certain distance from the hospital keep their expressed breast milk in the fridge and bring it to the hospital. So I would say the time of 48 h is right if we are sure that the fridge temperature is not too high, and this may explain why it was not growing. When expressed breast milk is put in the fridge at 4°C, even though there are some colonies at the beginning, most of the time a decrease in the number of colonies will be seen over the first 24 h. Even if it is kept for a longer time it will be stable. Studies have shown that if it is kept up to 48 h there will be no growth. If the fridge is at 8°C or more there may be growth.