Effect of supplemental formula milk on physiological weight changes in neonates

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Objectives: Feeding problems can occur in breastfed newborns, leading to dehydration and excessive weight loss, associated with increased morbidity. Goal was to describe effects of supplemental formula milk on weight changes during the first week of life, expanding an existing semi-mechanistic model characterizing physiological weight changes in neonates [1].

Methods: Longitudinal weight data from 887 healthy term neonates exclusively breastfed and 809 breastfed neonates receiving additional formula were available up to 7 days of life. A Kinetic-Pharmacodynamic (K-PD) component was added to the existing semi-mechanistic model to characterize effects of supplemental formula milk on weight changes in neonates. Exclusively breastfed neonates were compared to those receiving supplemental formula. A population analysis was performed with NONMEM7.3. Model selection was based on predefined statistical criteria, goodness-of-fit plots and simulations. Advanced evaluation was performed on data from 829 additional neonates.

Results: Weight changes during the first week of life were described as a balance between time-dependent rates of weight gain (Kin) and weight loss (Kout); Fig.1. A saturable effect of supplemental formula feeding was included on an additional weight gain rate (KIn,add). A population effect (neonates exclusively breastfed vs. neonates receiving supplemental formula) was found on Kin with faster basal rate of weight gain in neonates exclusively breastfed. Visual predictive check (VPC) demonstrated good predictive performance of the expanded model; Fig.1.

Figure 1: Developed model and VPC

Conclusions: We report here the first pharmacometric model that describes effects of supplemental formula milk on weight changes in breastfed neonates during first days of life. An online tool permits caregivers to forecast individual weight changes, and with that to personalize and optimize monitoring and feeding of neonates.

References: