# Metabolic-Language Encoded Digital Twin with Realistic Food Composition and Physical Activity

THE 19TH INTERNATIONAL CONFERENCE ON
ADVANCED TECHNOLOGIES & TREATMENTS FOR DIABETES

## Input

- Heartrate, food diary (CHO, protein, fat)…
  - ✓ Extensible range of inputs, drugs including

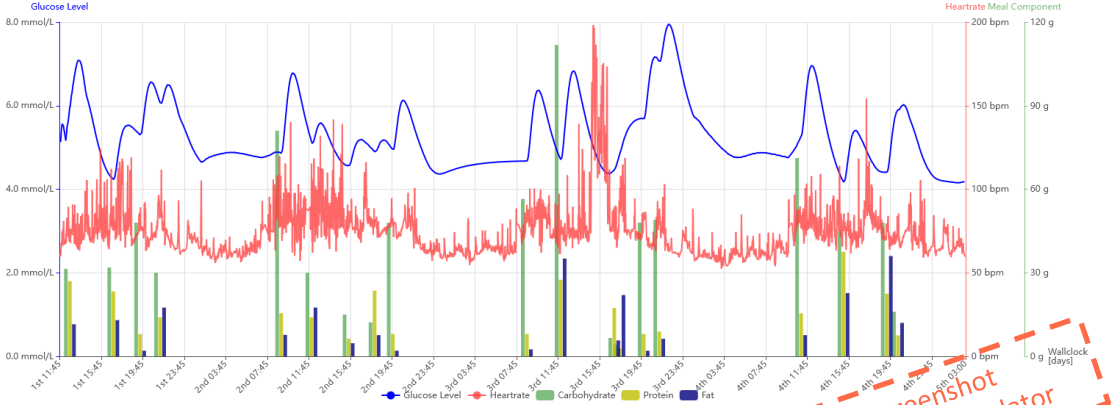
## Means

- Physician- & engineer-friendly metabolic language
  - ✓ Describe and experiment with the metabolism
  - ✓ Easy to edit the metabolic code
  - ✓ Virtual metabolic machine executes it

## Output

- Simulated glucose level
  - ✓ Multiple days, multiple meals (multi-ingredient)
  - ✓ 1:1 fitting of digital twin to a real patient

## Simulated glucose level in response to CHO, protein, fat and heartrate




Screenshot of on-line simulator

Scheduled and delivered meals

| Simulation Time | Carbohydrates | Protein | Fat | Action |
|---|---|---|---|---|
| 4th day 20:29 | 16 | 7.5 | 12 | Consumed |
| 4th day 19:24 | 48 | 22.5 | 36 | Consumed |
| 4th day 15:14 | 45 | 37.5 | 22.7 | Consumed |
| 4th day 11:09 | 71.2 | 15.4 | 7.6 | Consumed |
| 3rd day 21:30 | 49 | 8.9 | 6.3 | Consumed |
| 3rd day 20:00 | 48 | 8 | 2 | Consumed |
| 3rd day 17:39 | 4.2 | 2.8 | 22 | Consumed |
| 3rd day 17:09 | 6.6 | 17.4 | 5.7 | Consumed |
| 3rd day 12:00 | 111.8 | 27.5 | 35.1 | Consumed |
| 3rd day 08:45 | 56.5 | 8 | 2.5 | Consumed |

## Cori cycle transcribed to the Sirael metabolic language


react: glucose & metabolic_need → lactate in muscle
equalize: lactate in blood ↔ muscle
equalize: lactate in blood ↔ liver
react: lactate → glucose in liver

Example of encoding the metabolism

## Work in Progress

AI → react: substance_1 & new_drug in pancreas → c-peptide
equalize: new_drug in pancreas ↔ blood

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