Personalized nutrition: science and societal aspects
**Personalized nutrition: science and societal aspects**

- The concept
- The environment
- The science
- The trade-offs
Personalized Nutrition: the concept

- Population
  - Food pyramid like

- Sub-group
  - Dietary recommendations and special needs

- Individual
  - Individualized advice
  - Personalized products
"What consumers really appear to hunger for are products that fit their unique needs, wants and desires"

“They want products that talk just to them, work just for them and appeal just to them on an emotional level…”

Deeply linked with the emerging "me" trend is the consumer desire to stand apart from the crowd and express one's individuality.

Twenty or thirty years ago, it was all about fitting in. Today it's about standing out from the crowd.
Consumer subtypes (with diffusion)

The moralist
The pragmatist
The therapist
The gourmet
The technocrat
The metaphysician
The MEGATREND HEALTH
### Kondratieff: long waves, basic innovations and main application areas

<table>
<thead>
<tr>
<th>Kondratieff</th>
<th>steam engine</th>
<th>textile industry</th>
<th>railway</th>
<th>electricity</th>
<th>automobiles</th>
<th>information</th>
<th>biotechnology</th>
<th>psychosocial health</th>
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</table>

**FOOD + NUTRITION**
Current DRIVING FORCES in the markets

Cost

Convenience

Enjoyment

Safety

Health

Consumer’s values by ranking:
1. Safe family life
2. Health and fitness
3. Honesty
4. Responsibility
5. Real friendship
How much health can nutrition/food deliver?
„Let your food be medicine and your medicine be food“

*Hippocrates, 460 to 370 BC, Kos*
How much health can nutrition/food deliver?

**Malnutrition**
- Diet/food: nutrient-deficient
- Various diseases and severities

**Overnutrition**
- Behaviour: nutrient-dense
- Energy balance
- Increasing disease risk
- Quality of food

?
The environment
Personalized Nutrition in its setting

- Changes in food systems
- Changes in society
- Economic system
- Scientific developments
Total world population in billions: projections until 2050

<table>
<thead>
<tr>
<th>YEAR</th>
<th>Mean Growth Rate in Percent</th>
<th>Low Development Prognosis</th>
<th>Mean Development Prognosis</th>
<th>High Development Prognosis</th>
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<tr>
<td>1950</td>
<td>2.53</td>
<td>2.86</td>
<td>3.12</td>
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<td>3.02</td>
<td>3.36</td>
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<td>3.53</td>
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<td>5.44</td>
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<td>2010</td>
<td>5.57</td>
<td>5.95</td>
<td>6.37</td>
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<td>2020</td>
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<td>6.47</td>
<td>6.89</td>
<td>7.31</td>
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<td>2030</td>
<td>6.59</td>
<td>6.98</td>
<td>7.40</td>
<td>7.83</td>
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<tr>
<td>2040</td>
<td>7.10</td>
<td>7.49</td>
<td>7.92</td>
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<tr>
<td>2050</td>
<td>7.61</td>
<td>8.00</td>
<td>8.43</td>
<td>8.87</td>
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Quelle: UN/DESA: World Population Prospects: The 2008 Revision (Stand: Mai 2010)
Lizenz: Creative Commons by-nc-nd/3.0/de
World population increase: challenges for food production

Institut für Technikfolgenabschätzung und Systemanalyse (ITAS), 2008
World population increase: challenges for food production

Consequences for farm animal production

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2030</th>
<th>2050</th>
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<tr>
<td><strong>World population</strong></td>
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<td></td>
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<tr>
<td>Billion</td>
<td>7</td>
<td>8.5</td>
<td>9.2</td>
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<td><strong>Farm animals</strong></td>
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<tr>
<td>Relative</td>
<td>-</td>
<td>+ 50%</td>
<td>+ 100%</td>
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<tr>
<td><strong>Feedstuffs</strong></td>
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<tr>
<td>Relative</td>
<td>-</td>
<td>+ 50%</td>
<td>+ 100%</td>
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<tr>
<td><strong>Climate change</strong></td>
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<tr>
<td>Temperature increase</td>
<td>-</td>
<td>+ 2°C</td>
<td>+ 4°C</td>
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</table>

Prof. Caspar Wenk

Index 2004 = 100

changes in food systems

World population increase: challenges for food production

![Graph showing changes in food systems](image)
Competition for biomass: challenges for food production

Biomass cycle:
- Fuels
- Raw materials
- Feed/Food

Changes in food systems
Increasing volatility of prices: challenges for food production

FAO Food Commodity Price Indices (nominal)

Link between Food and Oil Prices

Source: FAOSTAT, 2011.
Societal change „loss of time“

GfK ConsumerScan: Fastmoving Consumer Goods
Convenience-Orientierung der Haushalte
(Kochen muss einfach und schnell gehen)

Quelle: GEO, 3, 2002
Societal change „increasing obesity and health problems“
Societal change „population ageing“

What determines normal human condition
What determines normal human condition?

Model building
Advanced imaging
Metabolome analysis
Proteome analysis
Transcriptome analysis
HT-sequencing (SNP-analysis)
Methylation analysis
Advanced imaging
Metabolome analysis
Proteome analysis
Transcriptome analysis
Model building

scientific developments
With profiling techniques to biomarkers of health/disease

scientific developments

transcript/epigenome-profiling
proteome-profiling
metabolite-profiling
in vivo imaging

life stages

early markers
markers of initiation of disease

healthy

diseased

late markers

variations in
homeostatic control

BIOMARKER

change in markers/variation

time

with profiling techniques to biomarkers of health/disease
With profiling techniques to biomarkers of health/disease

early markers
markers of initiation of disease

healthy

diseased

late markers

Change in variations

life stages

time

GLOBAL HUMAN NUTRITYPE PROJECT

scientific developments

Transcript/epigenome-Profiling
Proteom-Profiling
Metabolite-Profiling

BIOMARKER
The CERN Large Hadron Collider

5,100,000,000 Euro

Does the Higgs particle exist?

What are the implications if it does not? Is there only one of them?
Genotype Phenotype

susceptibility annotation – phenotype association

easy/expensive
difficult/expensive

whole genome sequencing
Genotyping in the commercial environment

When you purchase our complete service, this is what you'll get:

Your risk analyzed for 119 diseases and traits, including:
- Breast Cancer
- Rheumatoid Arthritis
- Parkinson's
- Type 2 Diabetes

Your ancestral path, based on your DNA, in amazing detail:
- Ancestry Painting
- Global Similarity
- Maternal and Paternal Ancestry

Find a disease or trait that we cover:
Select a Disease or Trait

Popular Topics:
- Type 2 Diabetes
- Rheumatoid Arthritis
- Parkinson's
- Type 1 Diabetes
- Cystic Fibrosis
- Heart Disease
- Hemochromatosis
- Breast Cancer
- Colon Cancer

23and Me

NaviGenics Health Compass

deCodeGenetics
Translations and visions
The comprehensive nutrition and health care service system

- Blood pressure
- Body weight
- Blood glucose
- Blood Cholesterol

Monitoring devices

- Biomarker profiling
- Genetic testing
- Assessment of food intake and exercise intensity
The comprehensive nutrition and health care service system

Monitoring devices
- Blood pressure
- Body weight
- Blood glucose
- Blood Cholesterol

Data Center

Health management program

Personalized dietary advice

Biomarker profiling
- Blood sample taken by consumer

Assessment of food intake and exercise intensity

Consumer
Devices for monitoring and transmitting body functions

On the Go & In the Know
You know that the right tools can help you lose weight. But if you’re away from your computer – how do you keep data or log food? BodyMedia’s Rio helps you to the answer:

- Use our FREE app, log food on your smartphone or Android mobile device and see your most recent Activity Manager info. Plus, with Armband BW – using Bluetooth wireless technology – get real-time info on calories burned & workout data.

Learn More

Only Looks Simple
Don’t get误导ed into thinking that “old school” is a hard core machine that’s all business when it comes to gathering, tracking and delivering information about your body. Dr. René’s wearable unit is both simple and functional. It opens up an amazing world of possibilities that will help you take your health to a whole new level.

A Window into the Wonder of You
Your heart rate is only part of the story of your health. There’s a wealth of potentially valuable information behind this small window, giving you an intimate view into your sleep, exercise and more including:

- Body temperature
- Kcal

Sleep better. Both of you.
You wake silently. They sleep in Track and improve your sleep.
Devices for monitoring and transmitting body functions

- VitaScan
- Body Fat
- Hydration

- icare
- How do you feel today?
- Good, Ok, Poor

- Actual Age
  - 40

- Comparative Vascular Age (CVA)
  - 48

- Young at Heart
  - 23
Devices for monitoring food (caloric intake)

- Calories
  - Fat
  - Carbohydrates
  - Protein

- Calories by Meal Type
  - Dinner
  - Lunch
  - Snack
  - Breakfast

- My Diet Diary
  - Download Weight Loss App
  - My Diet Diary - Free Calorie Counter & Weight Loss APP

- Bite Technologies
  - Calorie Counting Made Easy
  - What is a Bite Counter?
    - automatically counts calories

- What are its advantages?
  - works anywhere, for any food or beverage
  - time-stamped log of meal data can be downloaded for long-term analysis
  - augments food diary or professional counseling for tracking outside of meal
    - additional support in part, helping you count how much you eat at work
    - custom alarm to remind you when you have reached limits for meal or daily intake
The personal nutrition and health coach

Google health

About Google Health

What's New

User Stories

Google Health Advisory Council

Frequently Asked Questions

For Partners

Google Health Privacy

Help Center

Terms of Service

Features

Manage your Health Information Online
Is your health information in disarray? Google Health can help by offering a single place to organize and store your health information online. Track your wellness metrics, gather and organize your medical records, or import your health data directly into your account from connected doctors, hospitals and retail pharmacies. You can even create multiple profiles for family members or others you care for.

Set Personal Health Goals
Do you want a better way to track your goals for weight, blood pressure, or other wellness metrics? Have you ever wanted to track your sleep patterns, record how much you walk during the day, or track your progress at the gym? Or are you trying to overcome a health problem or caring for someone who is? With Google Health you can set personalized goals online and monitor them regularly.

Track your Progress
Create custom trackers for things you want to monitor like daily sleep, how much coffee you drink a day, or how many times you exercise a week. You can also take notes or keep a diary on your how you are doing with a particular medical condition or a personal goal you set.

Share your Health Information
Help better coordinate your care by sharing your health records with individuals in your care network - family members, friends and doctors. Share your wellness goals and progress notes with family and friends. You can stop sharing at any time and you will always be able to see who has access to your information. You can also print a wallet-sized version of your health profile to share with your doctor or family members in person.

Personalize your Health Needs with Content and Apps/Devices
Access content about health topics from trusted sources and Google search results. You can also connect to apps that are integrated with Google Health that will help you better manage your health needs using our partner directory.
Current approach to food processing, designed to assemble food products according to the consumer’s anticipated view of particular products or product categories.

Consequences for food production systems

Proposed approach to foods for the future, designed around the consumer and delivering foods that address the specific needs, desires, and aspirations of each consumer for their individual health and well-being.

Consequences for food distribution systems

The „new“ supermarket experience.
Pharma 3.0: pharma on the move

Ernst and Young, Global Pharmaceutical Reports, 2011
Food and Pharma: new alliances?

Ernst and Young, Global Pharmaceutical Reports, 2011
The trade-off's
The two faces of Personalized Nutrition and Health Monitoring

Janus, the two-faced Roman god of gates, doors, doorways, beginnings, and endings.
The comprehensive nutrition and health care service system

- Data Center
- Health management program
- Biomarker profiling
  - Blood pressure
  - Body weight
  - Blood glucose
  - Blood Cholesterol
  - Blood sample taken by consumer
- Food intake
- Exercise intensity
- Personalized dietary advice
- Consumer
The comprehensive nutrition and health care service system

HEALTH INSURANCE

Data Center

health management program

Blood pressure
Body weight
Blood glucose
Blood Cholesterol

biomarker profiling
Blood sample taken by consumer

consumer

food intake
exercise intensity

personalized dietary advice
Who pays for Personalized Nutrition?
Is Personalized Nutrition just increasing private health expenditures?
Personalized Nutrition = individual responsibility

HEALTH INSURANCE

payments

supervision on healthy lifestyle

incentives

HEALTH INSURANCE
Personalized Nutrition = individual responsibility

HEALTH INSURANCE

payments

supervision on healthy lifestyle

incentives
Personalized Nutrition = individual responsibility

BACK-INSURANCE

LIABILITY

HEALTH INSURANCE

payments

supervision on healthy lifestyle

incentives

it’s all about me
Personalized Nutrition = individual responsibility

social inequalities

![Graph showing inequality since 1961](image1)

![Graph showing inequality in Europe, 2007](image2)

Ratio of total income received by the 20% of the population with the highest income to that received by the 20% of the population with the lowest income
Personalized Nutrition = individual responsibility
In ancient China, doctors were paid for keeping their patients well. 

"They did not treat those who were already sick, but those who were not sick... When a disease has already broken out and is only then treated, would that not be just as late as to wait for thirst before digging a well, or to wait to go into battle before casting weapons?"

Huáng Dì Nèi Jīng Sù Wèn (黄帝内经素问): ca. 2698-2598 v. Chr.
The future is uncertain – so is the future of Personalized Nutrition.

Science progresses fast and new players are coming into play (e-Health).

For the food area there are no real business concepts yet but new alliances may help.

To be functional as a health promoting tool, a change in paradigm in health care systems (from therapy to prevention) is necessary.

It can be expected that Personalized Nutrition does not reach „critical“ groups in society and inequalities will remain or even increase.
A new FP 7 project on PERSONALIZED NUTRITION
individual genotype
individual phenotype
Individual food intake

socio-demographic & anthropological data

population
sub-group
individual
food pyramid

assessment
delivery
customized foods
individual advice
target group advice
target group food

segment
consumer oriented studies & compliance

web-based

recommendations/advice

categorize consumers by behavioral types

Alert (sending video messages)

videos by type

Assessment of sociodemographic and lifestyle parameters
Assessment of body weight, blood pressure, taste preferences
Assessing mean food intake and food choices
(via drop-down menu as shown in Schipohl)

data bases

individual trajectory

Various study centers
Common web platforms
Common technologies

consumer

Phase 1
consumer oriented studies & compliance

web-based
- recommendations/advice
  - refined recommendations

Alert (sending video messages)

videos by type

categorize consumers by behavioral types

categorize consumers by metabolic types

data bases

Assessment of sociodemographic and lifestyle parameters
Assessment of body weight, blood pressure, taste preferences
Assessing mean food intake and food choices
(via drop-down menu as shown in Schipohl)

individual trajectory

refined trajectory

Assessment of clinical parameters
(from last doctors visit)
Blood drop based profiling (Oslo model)

Blood sample taken by consumer

consumer

Phases:
- Phase 1
  - categorize consumers by behavioral types
  - videos by type
- Phase 2
  - refined trajectory
Assessment of sociodemographic and lifestyle parameters
- Assessment of body weight, blood pressure, taste preferences
- Assessing mean food intake and food choices (via drop-down menu as shown in Schipohl)

Assessment of clinical parameters (from last doctor's visit)
- Blood drop based profiling (Oslo model)
- Preselected (genotypes) by DNA profiling
- Preselected phenotypes by metabolites

Subset of consumers
- May be intervention by defined products such as rich in PUFA or phytosterols or anything functional

Categorize consumers by behavioral types

Web-based
- Recommendations/advice
- Refined recommendations
- Further refined recommendations

Consumer oriented studies & compliance
- Recommendations/advice
- Refined recommendations
- Further refined recommendations

Data bases
- Individual trajectory
- Refined trajectory
- Further refined trajectory

Alert (sending video messages)

Blood sample taken by consumer

Phases:
- Phase 1
- Phase 2
- Phase 3

Consumer oriented studies & compliance
- Categorize consumers by metabolic types