



# **CRNH's Historical context**



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# Aims

- Coordination and development of research in nutrition  
Bench to bedside: molecular and cellular level to clinical research including epidemiological studies
- Collaborations with industrial partners to improve the quality of food for health purpose.
- Bring together all the tools and knowledge required for Nutrition Research in well-defined internationally renowned locations.
- Role in education and as an expert body.

# Organisation

## Administration

- Director and associate director
- Administrative council
- Scientific council

## Partners

- Research Institutes
  - INRA
  - INSERM
- Universities
- Hospitals
- Others, dependent on local facilities



# Common Tools



• **Healthy volunteers or pathological subjects**



**Body composition and energy expenditure  
(DEXA, indirect calorimetry, double labelled  
water, calorimetric chambers)**

**Stable isotope technology for substrate turn-  
over and food bioavailability**

**Insulin sensitivity determination**

**Muscle, adipose tissue or gut biopsies after  
nutritional interventions for genomics and  
proteomics**

With MD, trained nurses, dietician



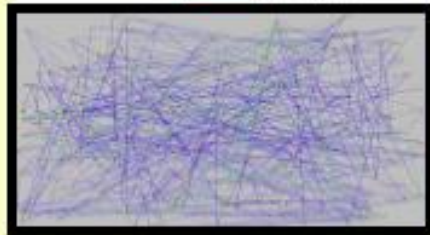
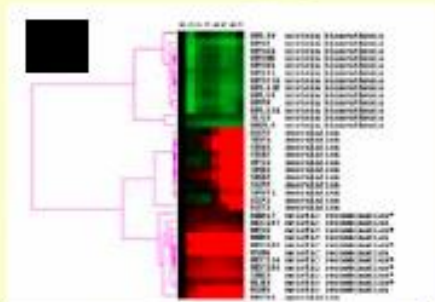


## Isotopic and organic mass spectrometer

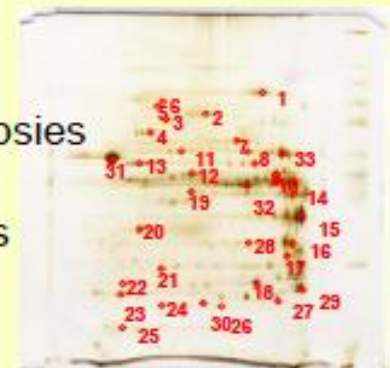
- GC-MS for Isotopic Enrichment in glucose, fatty acids, amino-acids ( $D_2$ ,  $^{13}C$ ,  $^{15}N$ )
- GC-IRMS  
 $^{13}C$  glucose,  $^{13}C$  galactose,  $^{13}C$  ribulose,  $^{13}C$  xylose,  $^{13}C$  fructose,  $^{13}C$  fatty acids
- IRMS
  - $^{18}O$  and  $^2H$  (water, Urines, plasma)
  - Breath test  $^{13}CO_2$







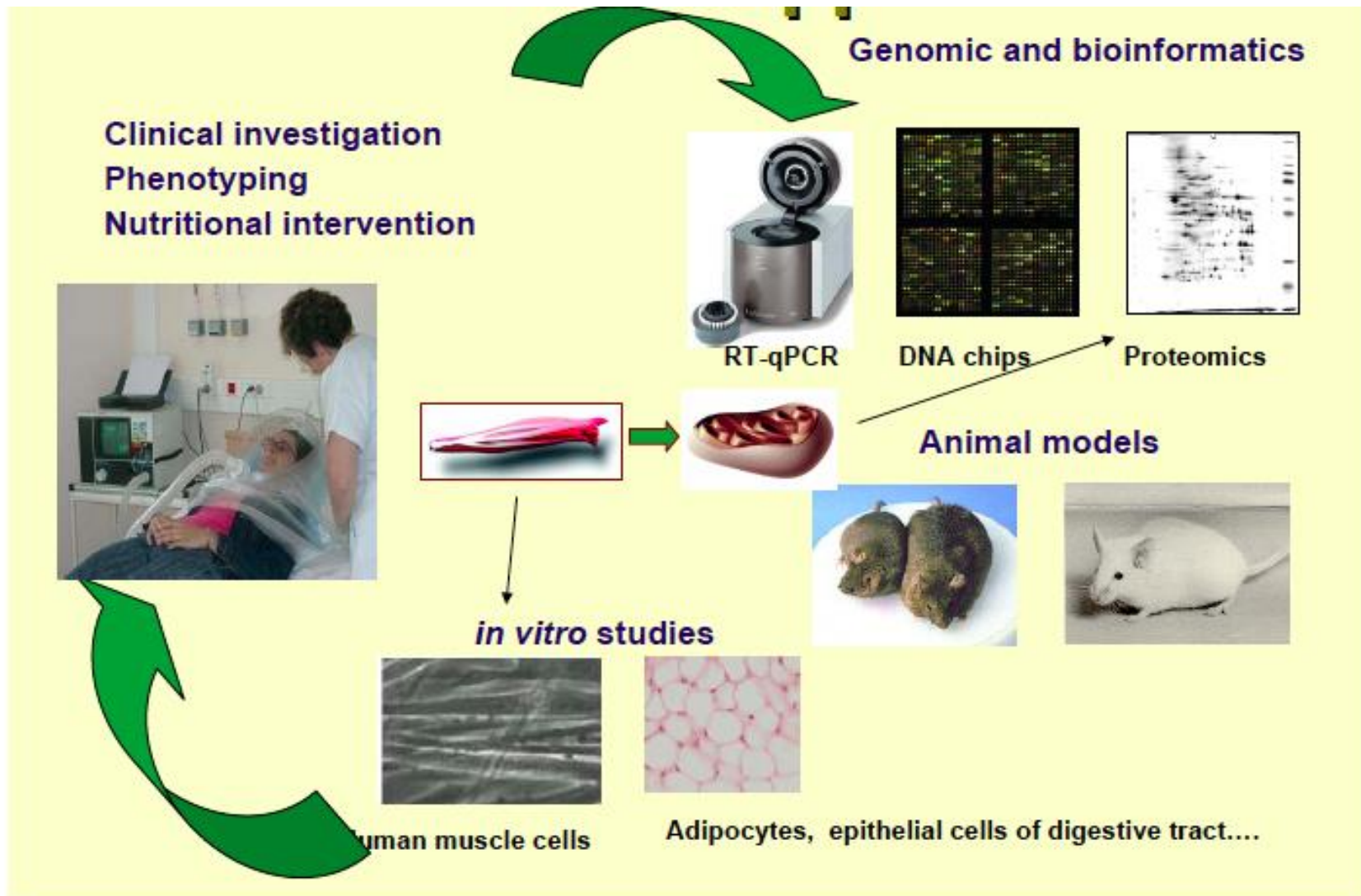
From human samples :  
 Blood, Muscle, adipose tissue, gut biopsies  
 Epithelial cells of the digestive tract,  
 From gastric juice in premature babies  
 On feces



# Nutritional survey and intervention in cohorts

<b>COHORTS</b>	
<b>Cohort SU.VI.MAX</b>	<b>Cohort SU.FOL.OM3</b>
<b>Etude Nationale Nutrition Santé (ENNS)</b>	<b>U5 Panel SECODIP 57</b>
<b>Cohort obesity surgery</b>	<b>Familial obesity data biobank</b>
<b>EPIC (International Agency Cancer Research)</b>	<b>Cohort Children</b>
<b>Grandir ensemble</b>	<b>ELFE</b>

# Global approach



# ***CRNH Auvergne***

## **PREVENTIVE NUTRITION & AGING**



**Sarcopenia**

**Osteoporosis**

**Cancer**

**Cardio-vascular disease**

**Energy and protein metabolism and aging**

**Micronutrients and prevention**

**Intestine, intestinal microflora and preventive nutrition**

# CRNH Ile-de-France

## FOOD CONSUMPTION AND BEHAVIOR



- ✓ Study of food consumption and nutritional determinants of behavior
- ✓ Health consequences
- ✓ Prevention/ recommendations
- ✓ Education

*Specific approach:*

Epidemiology

Sociology

Economy

Psychology

Education sciences

Clinical research

Experimental research

Genetic

Physiology



## NUTRITION AND INTESTINE



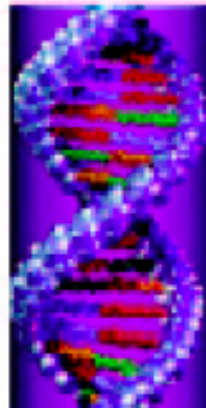
- Nutrition and cancer (colon, breast)
- Intestinal inflammatory disease
- Intestine of the newborn
- Intestinal lipoproteins
- Obesity

**Prevention and treatments :**  
**role of fibers, prebiotics, fatty acids, proteins...**



# ***CRNH Rhone-Alpes***

## **OBESITY AND RELATED DISEASES**



- **Nutrigenomics**
- **Mechanisms of insulin resistance  
and type 2 diabetes**
- **Cardio-vascular risk and oxidative stress**
- **Food bioavailability**
- **Nutrition and cancer**

# Regional role of CRNH

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- Development of local research in human Nutrition by bringing tools, methodology and knowledge in human nutrition and building bridges between different communities'
  - Basic researchers
  - Physicians
  - Engineers
  - Sociologist, economist
  - food industry
- Important role in the organisation of research in nutrition with a critical mass of scientist in large INRA or INSERM units.



# CRNH's

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- A big potential of more than 450 p (PhD, MD, University professors, 80 researchers with h factors more than 20 )
- Annual global budget around 4 Millions €
- High out put of highly-cited international publications
- Complementary and synergy of tools and research fields
  - Possibility of multicentres studies
  - Exchange of knowledge and competency
- Application to national and international calls...

# CRNH's



How to promote CRNH's?



CRNH  
CENTRE DE RECHERCHE  
EN NUTRITION HUMAINE  
RHÔNE-ALPES



## Institutional Partners

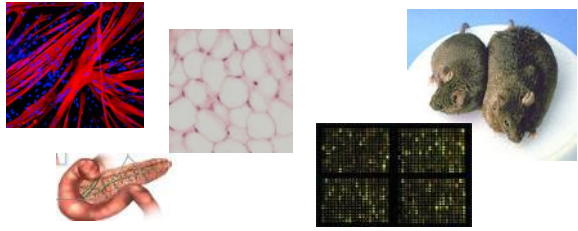
- **Research Institute:**
  - INSERM.
  - INRA.
- **University :**
  - Lyon 1.
  - J. Fourier Grenoble.
  - J. Monnet Saint Etienne.
- **Hospital :**
  - Hospices Civils de Lyon.
  - CHU Grenoble.
  - CHU ST Etienne.

A Critical Mass

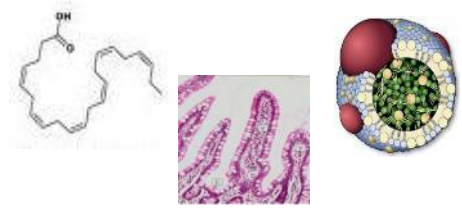
200 people  
5 research Units  
25 Hospital Departments



## ***Nutrition & Diabetes***



## ***Lipid Metabolism***



## ***Hospital departments***

- Diabetology
- Nutrition,
- Nephrology
- Paediatrics
- Geriatrics
- Intensive care,
- Bariatric surgery
- Transplantation surgery
- Biochemistry
- Pharmacy

**Team 1 : H. Vidal/ M. Laville**  
*Nutritional adaptations,  
Environment and Diabetes*

**Team 4 : M. Lagarde/ Ph. Moulin/  
MC Michalski**  
*Engineering and Functions of  
Lipids and Lipoproteins*

**Team 2 : E. Lefai/ C. Simon**  
*Regulation of Muscle Mass and  
Metabolic Diseases*

**Team 3 : J. Rieusset/ C. Thivolet**  
*Glucolipotoxicity, Metabolic  
Stress and Diabetes*



# CRNH –RA teams

## University of Lyon

- Centre de Recherche en Neurosciences de Lyon U1028 /  
UMR 5292

Team: Waking - Integrative Physiology of Brain Arousal  
Systems , Leader : K. Spiegel

## University of Grenoble

- Physiopathology Cardiovascular and Respiratory (HP2)  
Inserm U 1042,

Leaders: P. Levy, JL Pepin, AL Borel

- Laboratory of Applied and Fundamental Bioenergetics  
(INSERM 1055)

Team: “bioenergetics and metabolism

Leader: E. Fontaine

## University of Saint Etienne

- EA 4607- SNA (autonomous nervous system),

Team: Anorexia nervosa and constitutional thinness,

Leader: B. Galusca

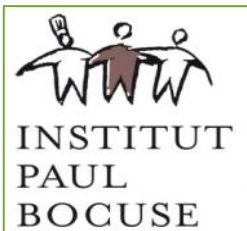


Departments of **Pneumology,**  
**Endocrinology and Nutrition**



Departments of  
**Endocrinology-Nutrition**

# Characterization of environment



Pollutants, Gut microbiota

Socio-economic context



Dietary intake

Sedentarity

Session A



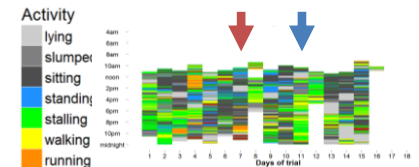
Session B



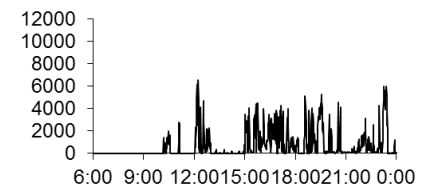
Allirot, Appetite, 2012, 58:889-897



GPS, accéléromètre, magnétomètres, inclinomètre, fréquence cardiaque



Day 11 (saturday)  
949.3 kcal, 39.6 kcal/d



Bastian et al. EASD 2012

Casey, IJO, 2012,36, 914-919

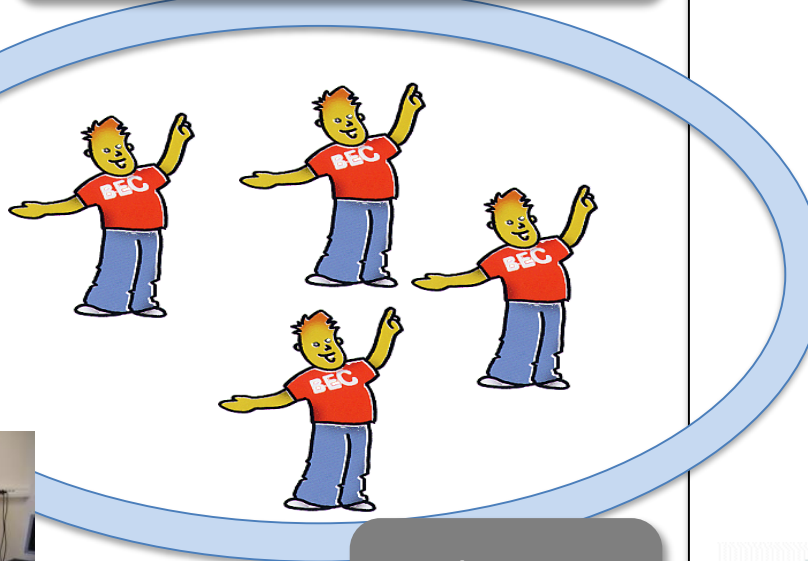
# Accurate phenotyping

Platforms : clinical investigation, omics, imaging, mass spectrometry

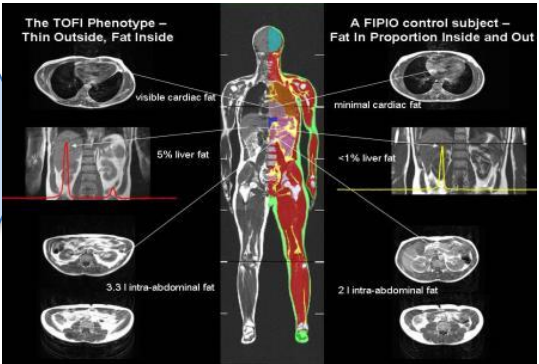


clinical biological imaging

Metabolic investigations

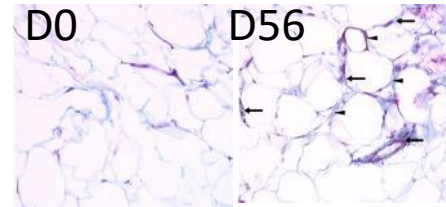


Substrate fluxes





# Translational research



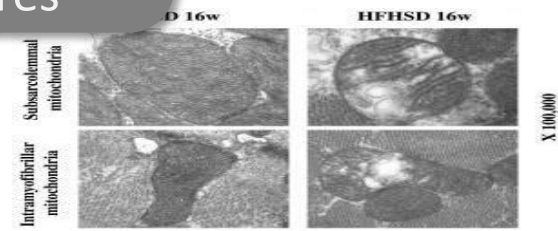
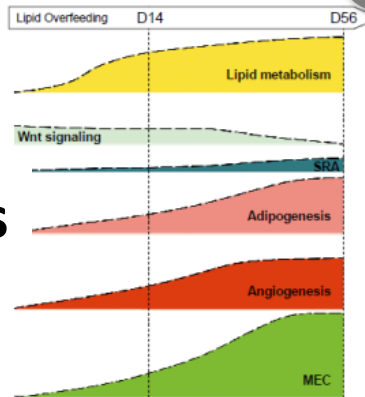
*Alligier, JCEM, 2012*



**Tissu biopsies**  
Tissu adipeux, muscle, feces...

**Nutritional interventions**

**Link with animal models and human cell cultures**

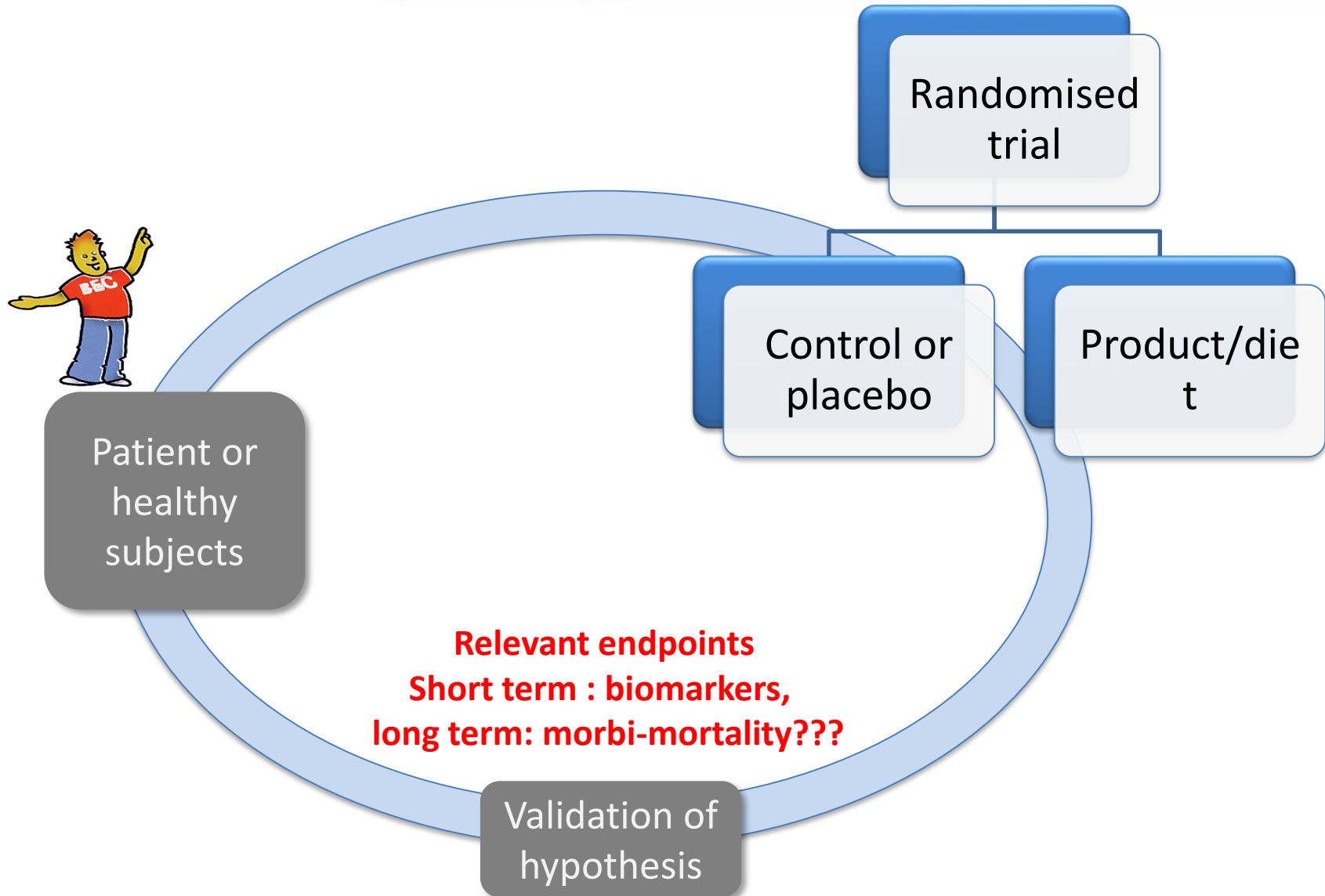


*Bonnard, JCI, 2008*

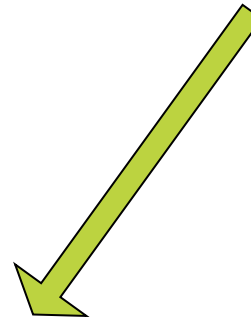
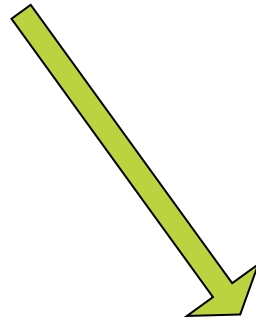
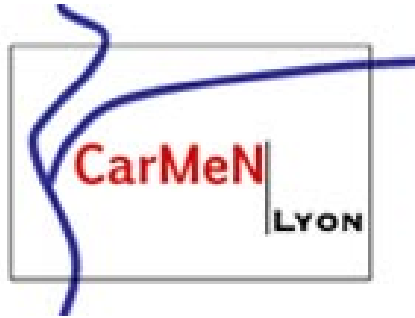
**Therapeutic applications**



# Randomised control trials



# CRNH RA a powerful actor of development



# Opening to society and international networking

**CENS is a consortium of scientists and clinicians specialised in nutrition, together with industrial partners to address health and societal challenges at an international level**



**and sharing the same vision to provide an available and affordable healthy lifestyle to the general population.**



# Missions



RECHERCHE

Help for collaborative projects



FORMATION

Transmission of knowledge



RESEAU

Networking and promotion of scientist, clinician and industrial skills

In 2016, A new 6000-m<sup>2</sup> building dedicated to clinical and clinical research and collaborative projects

# CRNH-RA an important role in obesity research organisation

## **DO-IT :**

*Dialogs in Obesity and Innovative  
Therapeutics*

University-Hospital Federation

(Lyon1 university- Hospices Civils de Lyon)

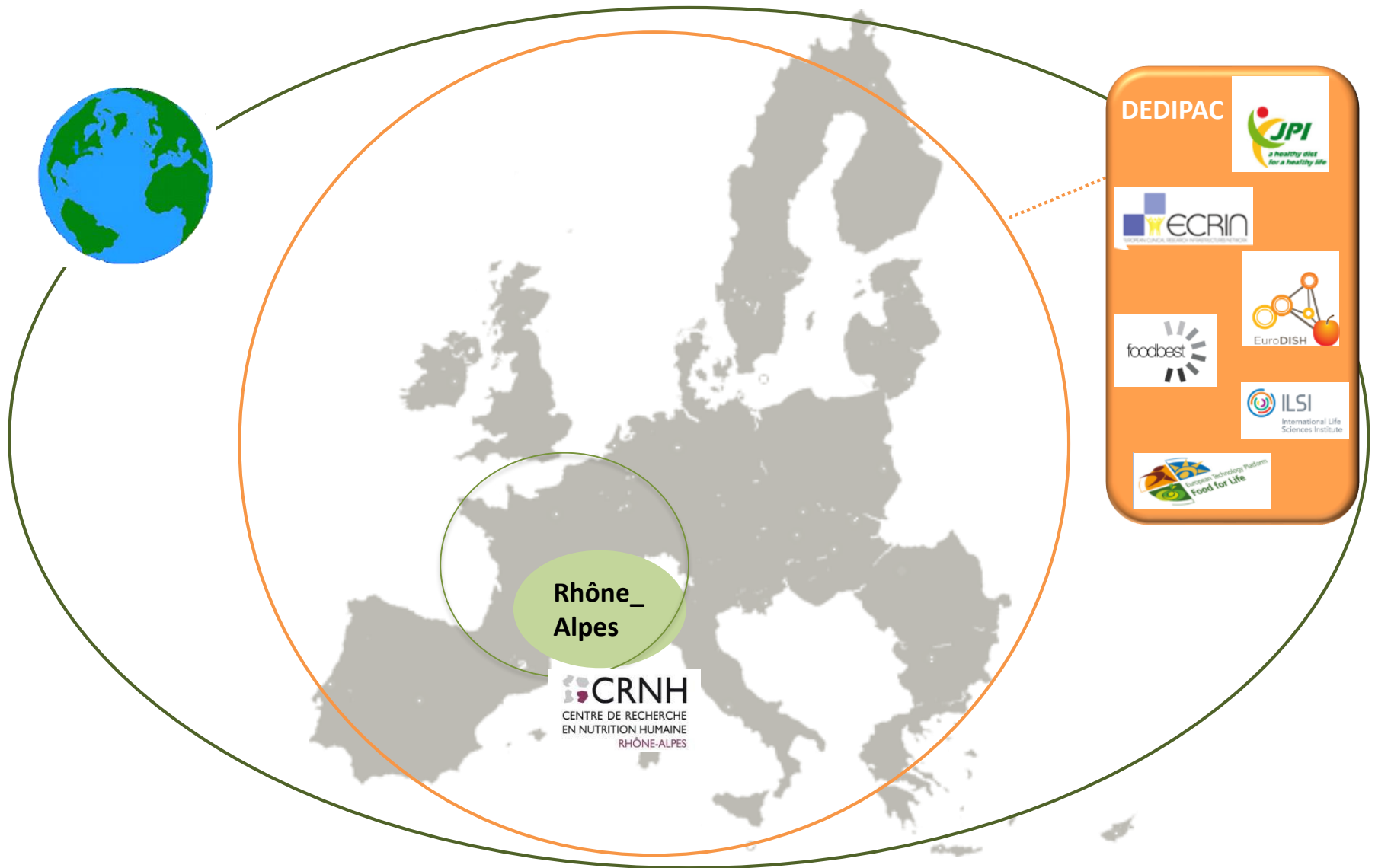
## **FORCE :**

*French Obesity Research Centres of  
Excellence*

labeled by FCRIN : Paris, Lyon, Toulouse



# CRNH-RA a role in EU Infrastructure initiatives



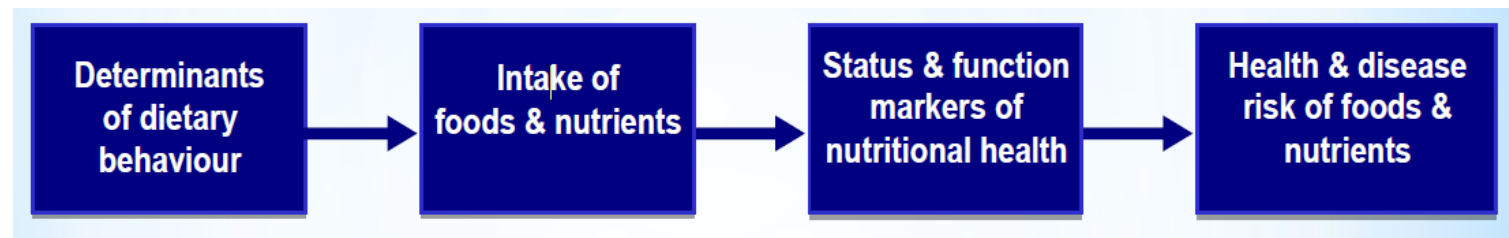
# Study on the need for food and health research infrastructures in Europe

## EuroDISH

DETERMINANTS, INTAKE, STATUS, HEALTH



*Conceptual model of the causal chain of food & health research, helpful for organizing the research area*





## *ECRIN-IA (2012-15): structuring pan-European investigation networks*

### European Clinical Research Infrastructure Network

ECRIN is listed on the ESFRI (European Strategy Forum on Research Infrastructures) roadmap and is the pan-European distributed infrastructure designed to support **multinational clinical research**, making Europe a single area for clinical studies, taking advantage of its population size to access patients, and unlocking latent scientific potential.

# Nutrition hub based in Lyon

## 73 centres in 18 countries



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