

# CONNECTED HEALTH

Technologies and smart systems  
for health monitoring and care



# Smart wearable devices: enabling new healthcare strategies

**600M**

people in the world suffer from hypertension

Source: World Health Organization

**1.5B**

adults worldwide are overweight

Source: "Obesity and overweight: Fact sheet N°311," World Health Organization, March 2011

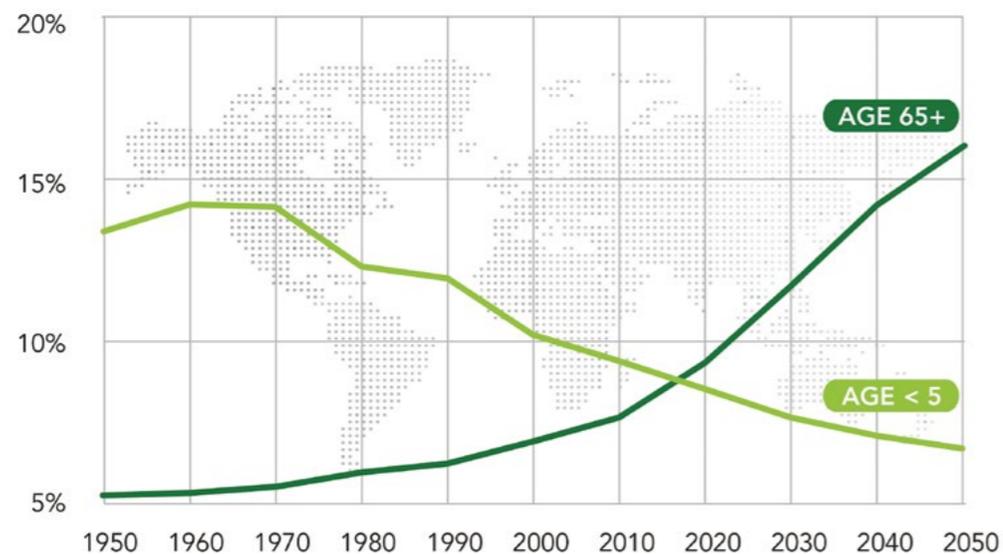
**415M**

people in the world are diabetic

Source: www.afd.asso.fr/diabete/chiffres-monde

Increased life expectancy and improvements in public health are some of the great achievements of the last century. As a result, more and more people are living past the age of 65 and the number of chronically ill patients is rising, exerting considerable demands on health systems worldwide. To address these challenges, new medical approaches are needed. Smart connected wearable devices are playing an important role in establishing new health maintenance and care strategies globally.

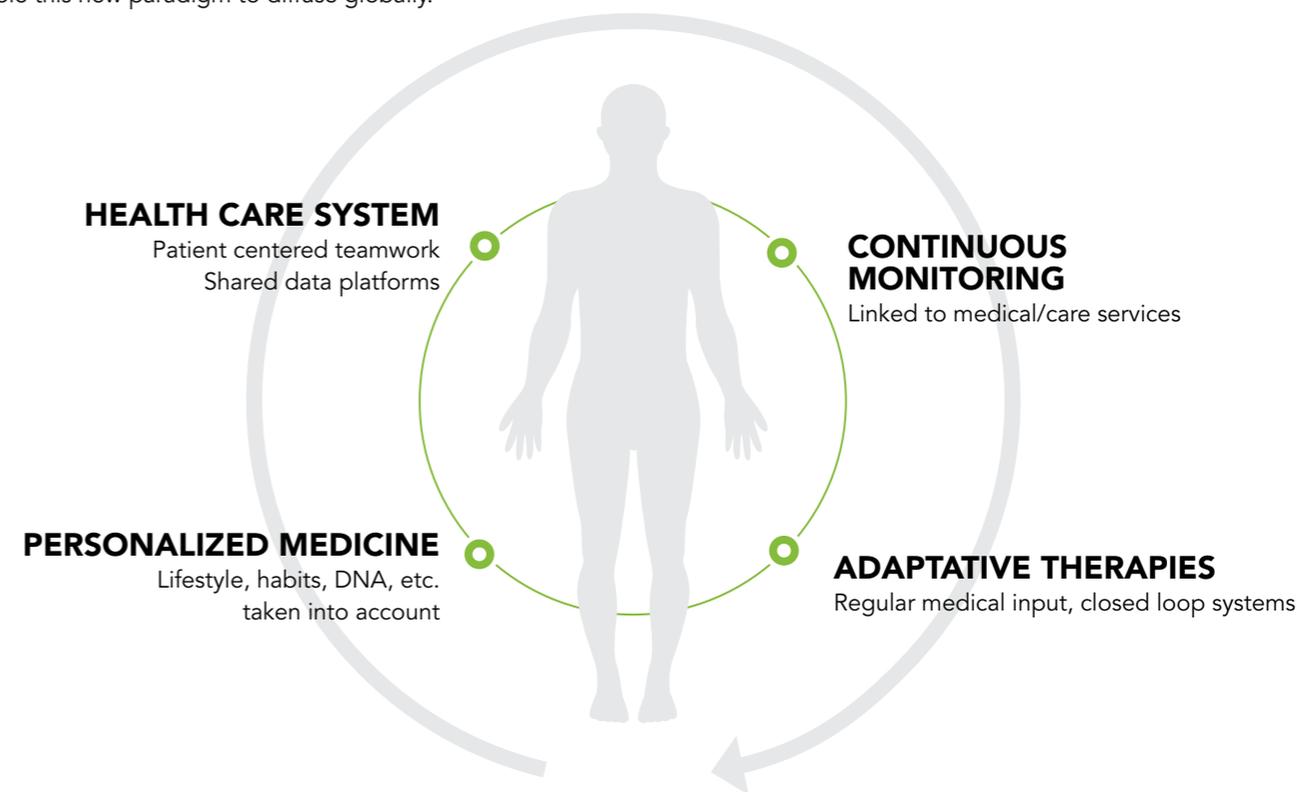
The increasing popularity and adoption of mobile technologies are paving the way for the universal acceptance of self-monitoring portable devices. Wearables in the well-being market are raising public awareness on the effect of daily habits on health maintenance. Patient medical information can now be made accessible in real-time to the patients themselves, their doctors and caregivers. Closed-loop wearables are improving diagnostics, monitoring and treatment of chronic diseases (such as diabetes), maximizing adult autonomy and the participation of individuals in their own health care.



Source: National Institute on Aging, NIH, USA

## FUTURE MEDICAL TRENDS: PATIENT CENTERED HEALTHCARE

As more and more individuals become key actors of their own health, behavioral awareness, acceptance of continuous monitoring and compliance to treatment will increase, reducing illness and the need for acute medical care for many. Smaller, smarter and safer data collection, analysis and transmission technologies will enable this new paradigm to diffuse globally.



### NEW USER FRIENDLY MEDICAL DEVICES, CAPABLE OF:

- 

**DATA COLLECTION**
- 

**DATA ANALYSIS**
- 

**DATA TRANSMISSION**
- 

**IN A SECURE WAY**

# LETI'S ONE-STOP-SHOP

FROM TECHNOLOGICAL INNOVATION...

...TO CLINICAL VALIDATION



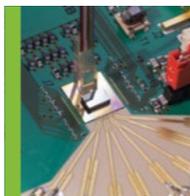
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**INTERFACE CHEMISTRY**
- 

**SILICON & PLASTIC PLATFORMS**
- 

**MICROFLUIDICS & BIOLOGY**
- 

**HETEROGENEOUS PACKAGING**
- 

**NANOCHARACTERIZATION PLATFORM**
- 

**PHOTONICS PLATFORM**
- 

**DATA PROCESSING**



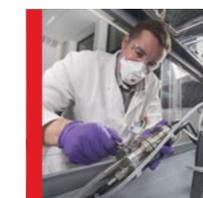
**USE CASES PLATFORM**



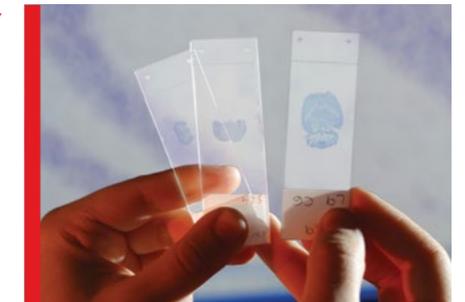
**CLINICAL PLATFORM**



**PRECLINICAL PLATFORM**



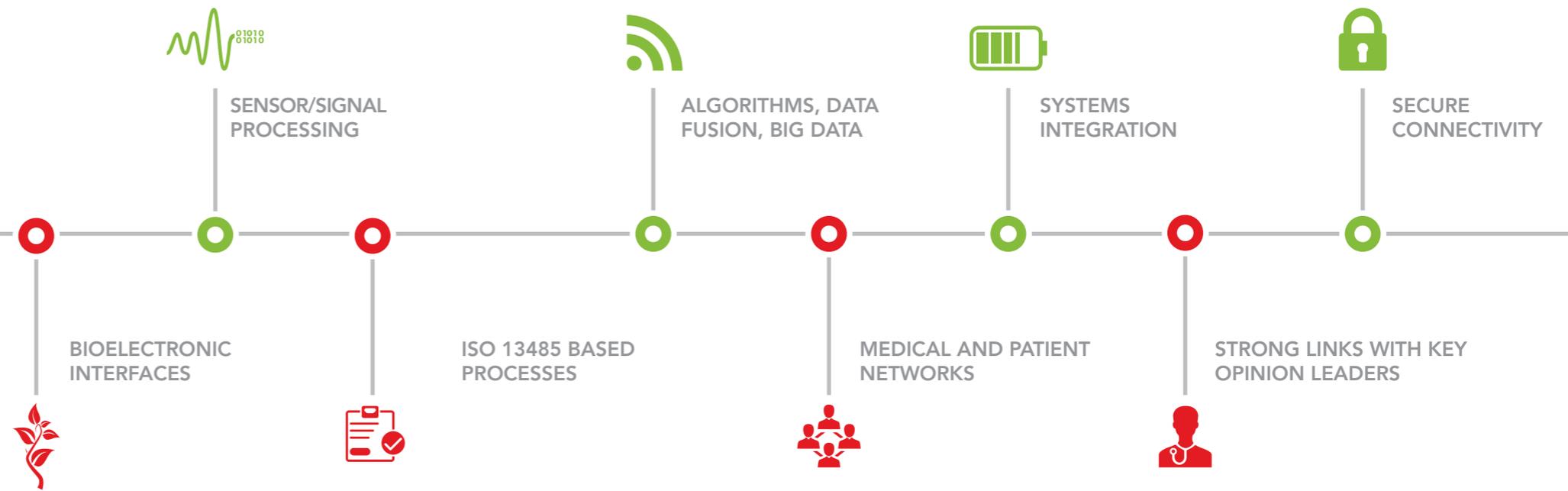
**NANOSAFETY PLATFORM**



**BIOINTERFACE CHARACTERIZATION**

## TECHNOLOGICAL OFFER

## CLINICAL OFFER



# LETI'S OFFER

## YOUR CONNECTED HEALTH PARTNER FOR SUCCESSFUL PRODUCT INNOVATION

Leti intends to be a major player in the connected health world, providing differentiating technologies and smart systems for health monitoring, diagnosis and treatment. Leti is present along the whole value chain and delivers components, system elements and clinically validated complete systems to its industrial partners, according to their needs.

### TECHNOLOGICAL COMPONENTS



With the Debioject micro-needle, injections are no longer something to fear. Measuring less than a millimeter, the silicon needle penetrates the top layers of the epidermis where it does not significantly affect nerve endings. Leti launched larger-scale production of the needle for the first clinical trials, improving production yields by stabilizing processes on 200 mm wafers.



### NEW MEDICAL FUNCTIONS



Diabeloop is the world's first portable artificial pancreas which combines a continuous blood glucose sensor and an insulin pump. The system was developed by French diabetes research center CERTID in conjunction with Leti. It combines a continuous blood glucose sensor (Dexcom) and a miniature patch-type insulin pump (Cellnovo). The sensor and pump communicate via Bluetooth with a smartphone equipped with a closed loop personalized algorithm developed by researchers at Leti for the application.



### CLINICALLY VALIDATED SYSTEMS



**System demonstrator:**  
The device developed for Avalun is based on an advanced lensfree microscopy technology that leverages a CMOS sensor to pick up light diffraction patterns. Leti developed algorithms to reconstitute an "image" from the patterns. The image can be used to perform measurements like cell dynamics, colorimetry, and microscopy, all on the same reader. Leti also developed the microfluidics technology used to carry the very tiny volumes of blood required for each test, (less than 5 microliters) to the microscope's sensor.



**On-going R&D:**  
Researchers at CEA Tech are working on a «health patch» for sufferers of sleep apnea that could improve diagnosis and treatment. Leti developed the signal processing and analysis technology that monitors patient physical parameters in real time and calculates a diagnostic score. The patch will ultimately be equipped with a CO<sub>2</sub> sensor and be used by sleep apnea patients for in-home health monitoring.



## ABOUT LETI

**Leti is a technology research institute at CEA Tech and a recognized global leader in miniaturization technologies enabling smart, energy-efficient and secure solutions. Committed to innovation, its teams create differentiating solutions for Leti's industrial partners.**

By pioneering new technologies, Leti enables innovative applicative solutions that ensure competitiveness in a wide range of markets. Leti tackles critical, current global issues such as the future of industry, clean and safe energies, health and wellness, safety & security...

Leti's multidisciplinary teams deliver solid micro and nano technologies expertise, leveraging world-class pre-industrialization facilities.

For 50 years, the institute has been building long-term relationships with its industrial partners providing tailor-made solutions and a clear intellectual property policy.

**Leti, technology research institute**

Commissariat à l'énergie atomique et aux énergies alternatives

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