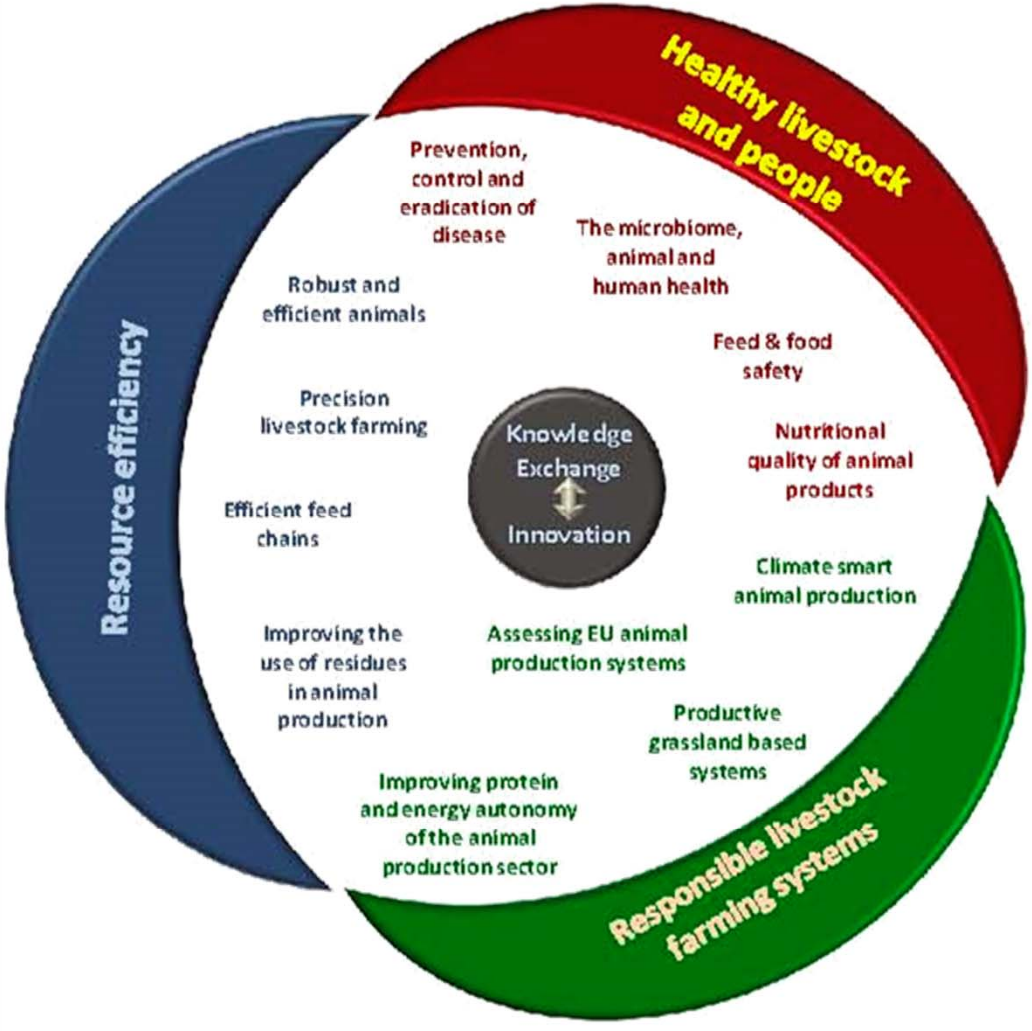
EAAP
64th Annual Meeting

Animal Task Force Special Session

Block 3
Healthy Livestock & People

Thierry Pineau
• head of Animal Health Division - INRA
Thierry.Pineau@toulouse.inra.fr

3 pillars of the atf white paper



- resource efficiency
- responsible livestock farming systems (agro-ecology for livestock)
- **healthy livestock & people :**

1. prevention, control & eradication of diseases
2. the microbiome, animal & human health
3. feed & food safety
4. nutritional quality of animal products

vision of a healthy livestock system in 2030 ?

behind the atf pillar, ...

..... for whom is it healthy ?

the animal

1. diseases prevention & control
   - eradication
2. welfare

the consumer

farmers, stakeholders

3. food security (sufficiency)
4. food safety/ quality
5. fair / cheap prices
   - income
   - competitiveness

mankind & the planet

6. food security / safety
   - political stability
7. public health (One Health)
8. environment
   - sustainability
   - ecosystem services

vision of a healthy livestock system in 2030 ?

behind the atf pillar, ...

..... for whom is it healthy ?

- the animal
- the consumer
- the farmer, stakeholders
- mankind & the planet

foreseeable benefits

costs for a healthier livestock system ?

conceivable trade-offs ?

livestock & animal health care sectors facts & trends

review of drivers

❶ increasing demand

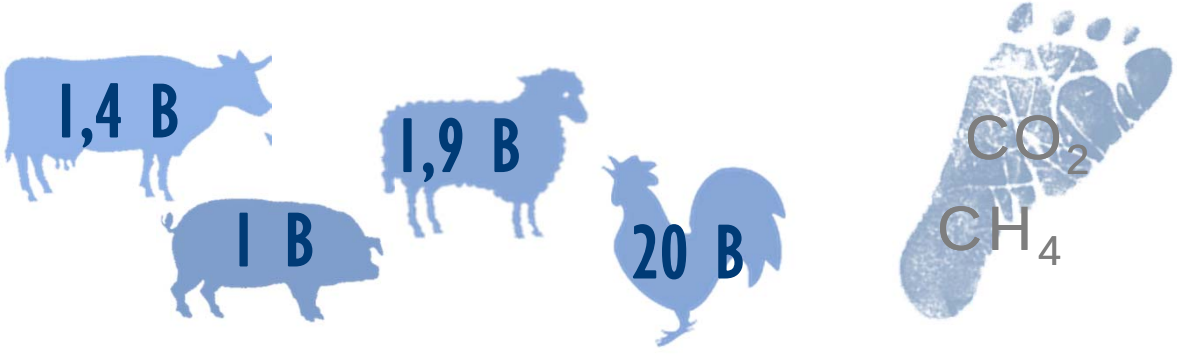
- EU: ~130 b€ / y 48 % GDP of agriculture in EU (> 50%, global scale, ~2016)
- on a global perspective: health conditions responsible for ~20% livestock production losses (pre-market)
- ± 20-25 % losses during processing & post-purchase (household)
- needs for livestock products X 2 by 2030
- speculation on livestock products availability ?

2013 main challenge: equity of access to a sufficient volume of foodstuffs

2050 9 billion people / food sufficiency ? speculation → affordability ?

❷ environmental challenge

- rising animal population a burden on the environment



livestock & animal health care sectors
facts & trends

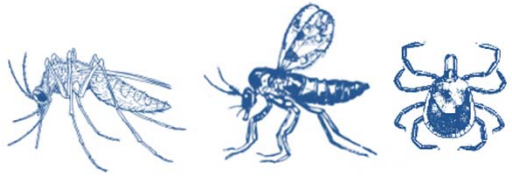
❸ infectious threats emerging diseases

- ❖ transitions in land use, urbanization, human encroachment on wild life increased promiscuity animals/humans
- ❖ increased movements of animals, products and people
- ❖ 60% of human infectious diseases : animal origin
- ❖ 75% of emerging diseases are zoonoses
- ❖ one emerging disease every 8 months – BSE, BTV, H5N1 H1N1 H7N9, SBV

ONE HEALTH

❹ ongoing global change (climate)

- ❖ water & land scarcity ± political instability
- ❖ concerns regarding vector borne diseases



❺ sub-optimal breeds (robustness / resistance to diseases)

livestock & animal health care sectors facts & trends

❻ weak links

- ❖ less efficient public policies in vulnerable countries, veterinary services and public health services neglected
- ❖ efficient veterinary services = public good

❼ decrease of societal acceptance of health management practices

- ❖ flocks eradication, herd culling …….
- ❖ animal well being, welfare ∈ EU legislation, a component of health status

❽ "food for feed": competition for crops use (market imbalance)

❾ animal / humans: a single pharmacopeia

- ❖ sharing drugs / challenge of prudent and sustainable use of anti-infectious (AI) molecules
- ❖ global management of AI-resistance : a One Health issue

livestock production: 2013 farmer's duties

animal health: more than a status of absence of pathology

(« physical, mental and social status of well being » WHO, 1946)

❖ assignments to achieve :

- economy (competitiveness)
- public health
- environment protection
- social issues
- ethical issues

animal welfare / acceptance of livestock farming

an ecosystem of competences

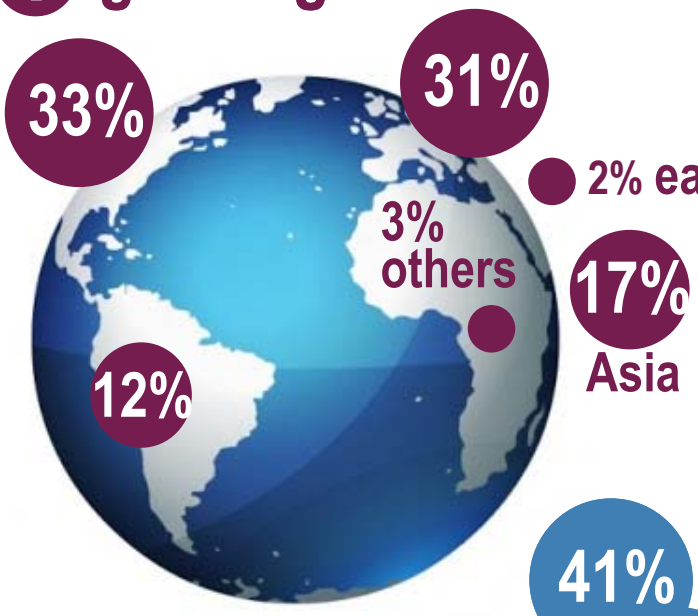
❖ new ways of producing :

a *"renaissance"* period for livestock farming?

- agro-ecology
- ecologically intensive farming
- responsive, responsible, sustainable livestock production
- integrated management of animal health
- prudent & reduced use of anti-infectious drugs .....

animal health care sector
facts & trends

1 growing market

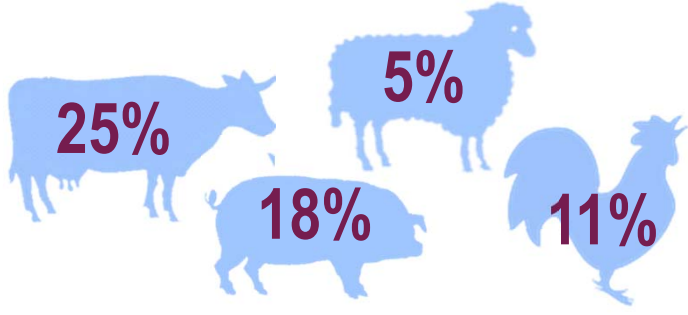


- 17,5 B€
- 1/40 of the « human » market
- +9,5 % / Yr, not in 2013

2 segmentation:

41% companion animals

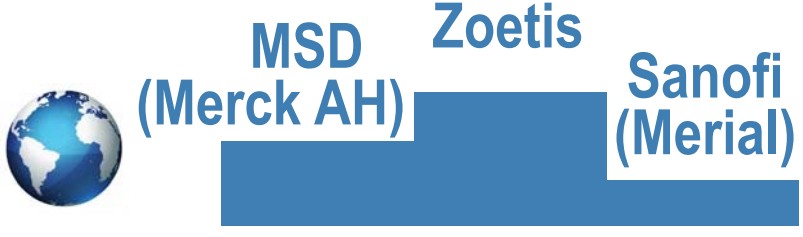
59% farm animals



within EU: FR 24%, DE 16%, UK 15%, IT 12%, ES 9%, NL 5%, BE 4%, DK 3%, PL 3%

3 condensed sector

- ≠ strategies (stand alone / subsidiaries)



4 investments

↗ vaccines ↗ anti-parasitic drugs anti-inflammatory ↗ dogs-cats ↘ AB (GP)

dietary public health

❖ atf healthy people:

food safety

≠

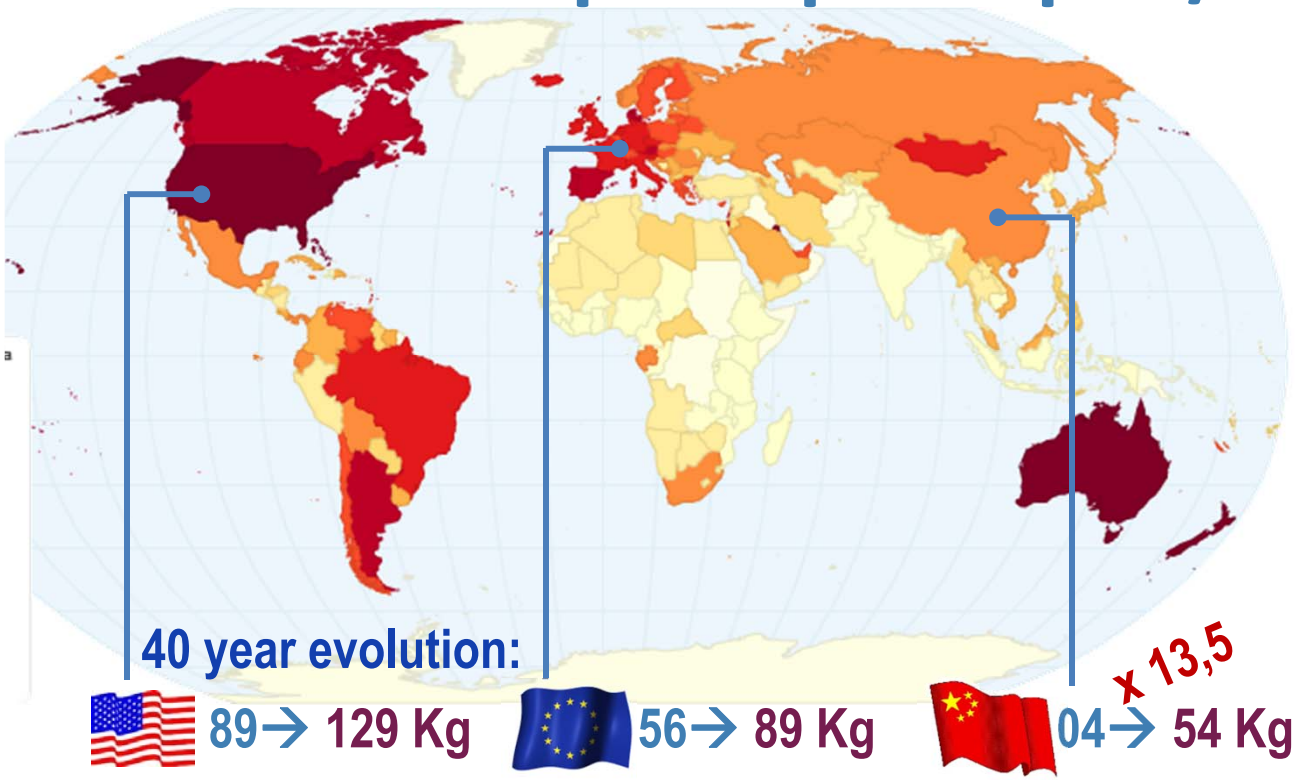
impacts of high caloric intake, public health issue

income —

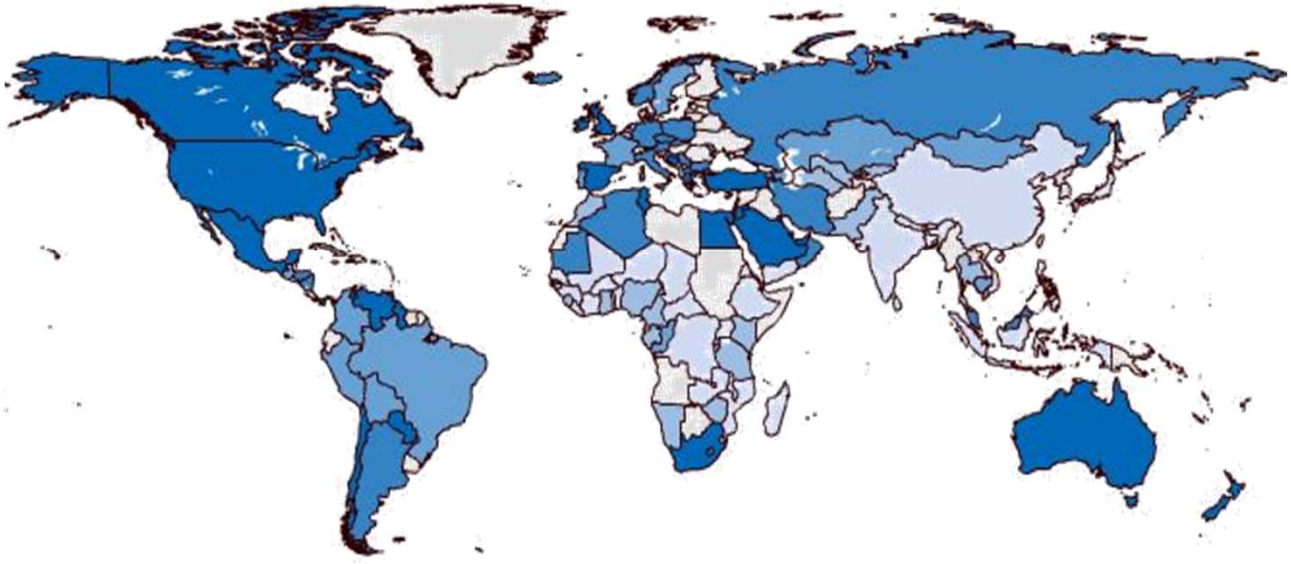
income +

both issues at the same time in some countries

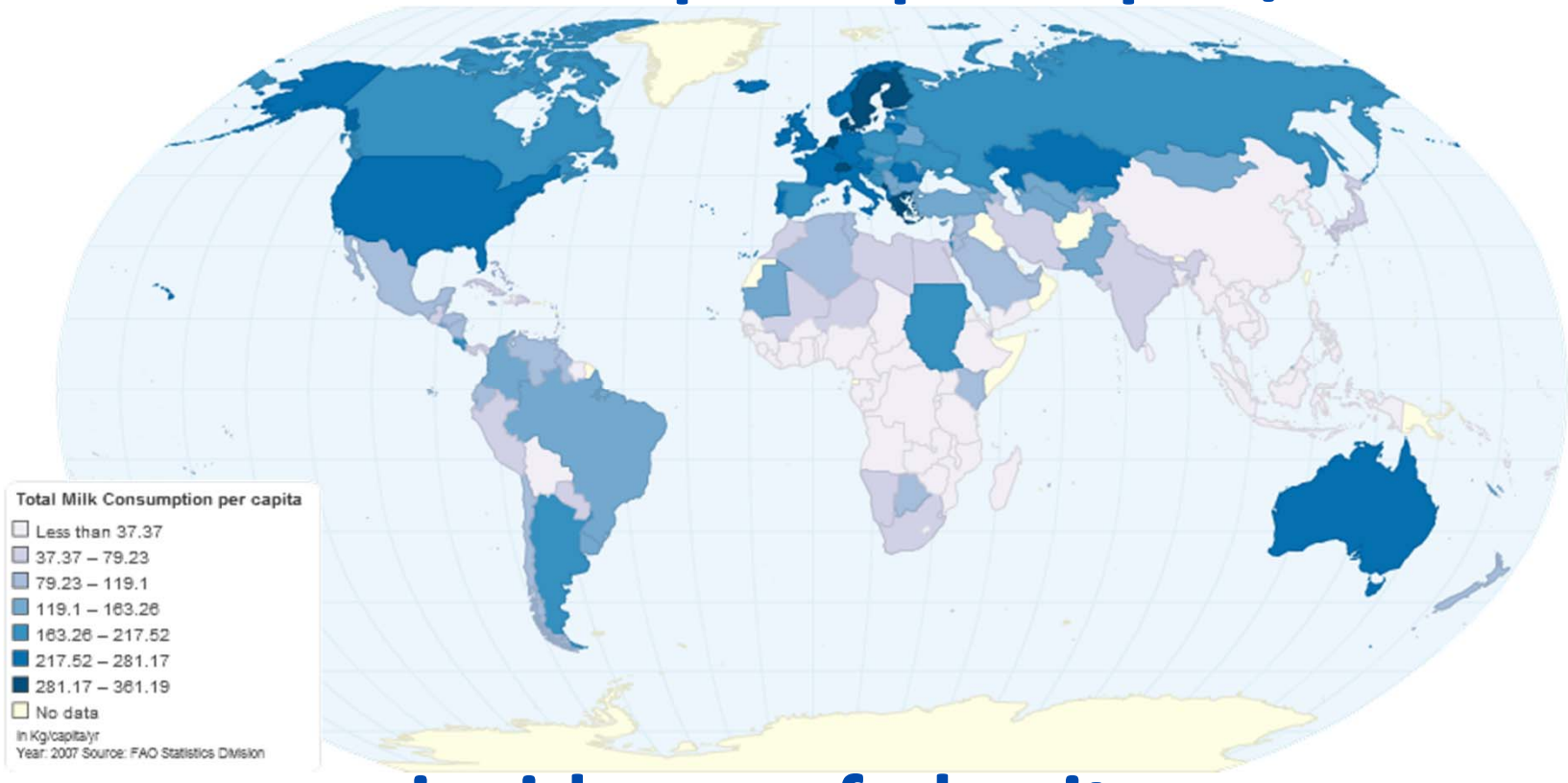
meat consumption per capita/Y



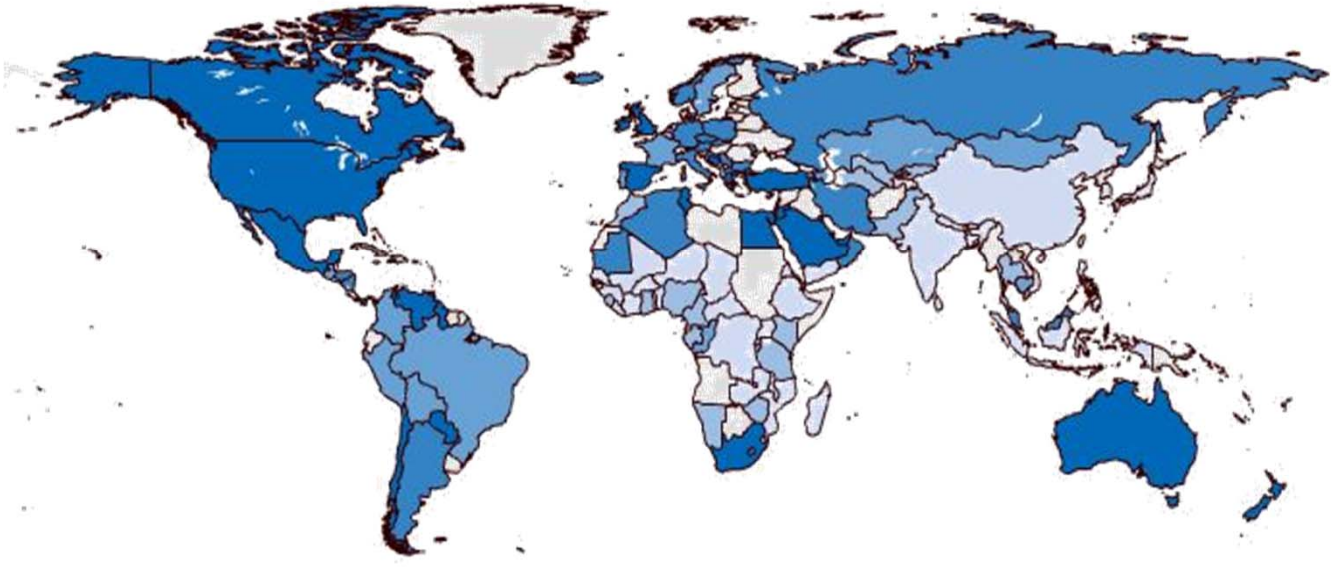
incidence of obesity



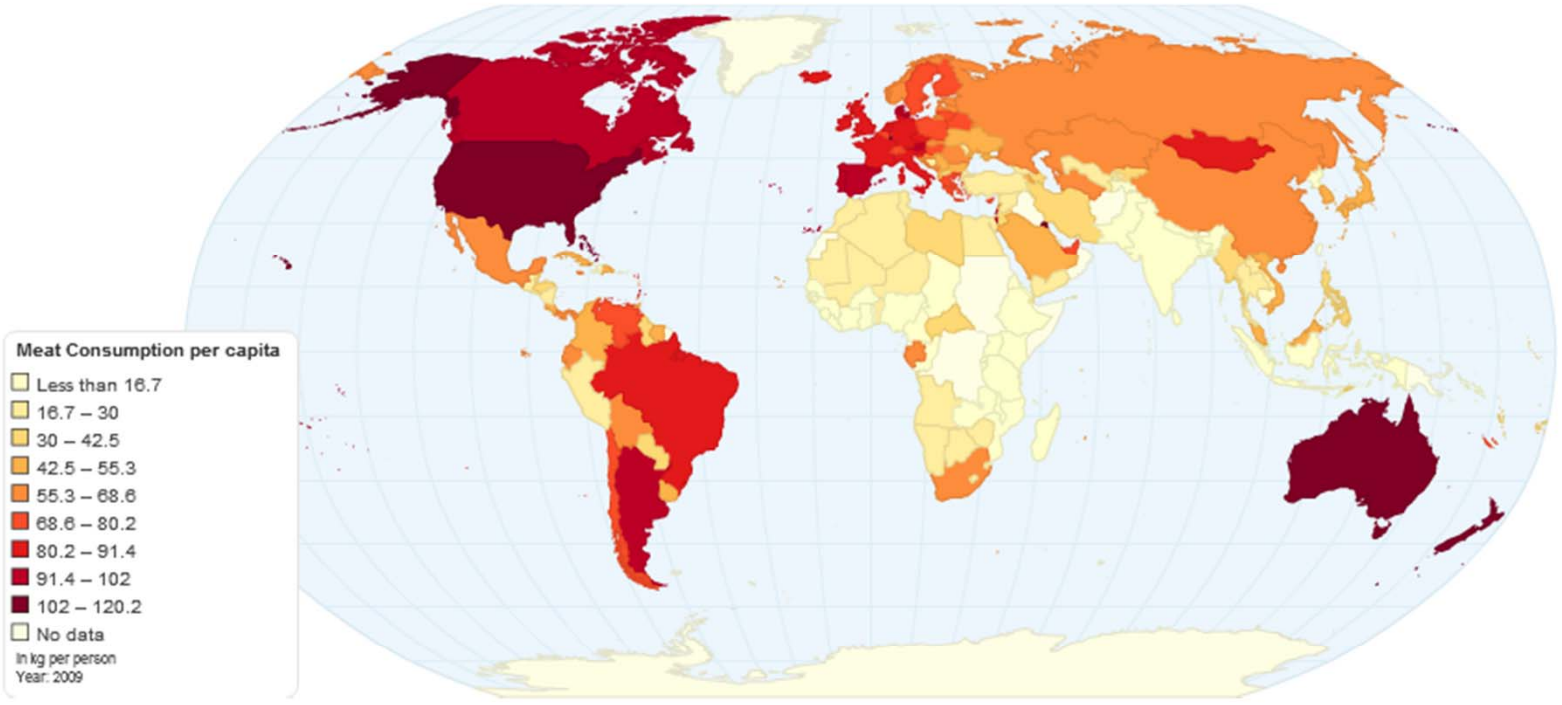
milk consumption per capita/ Y



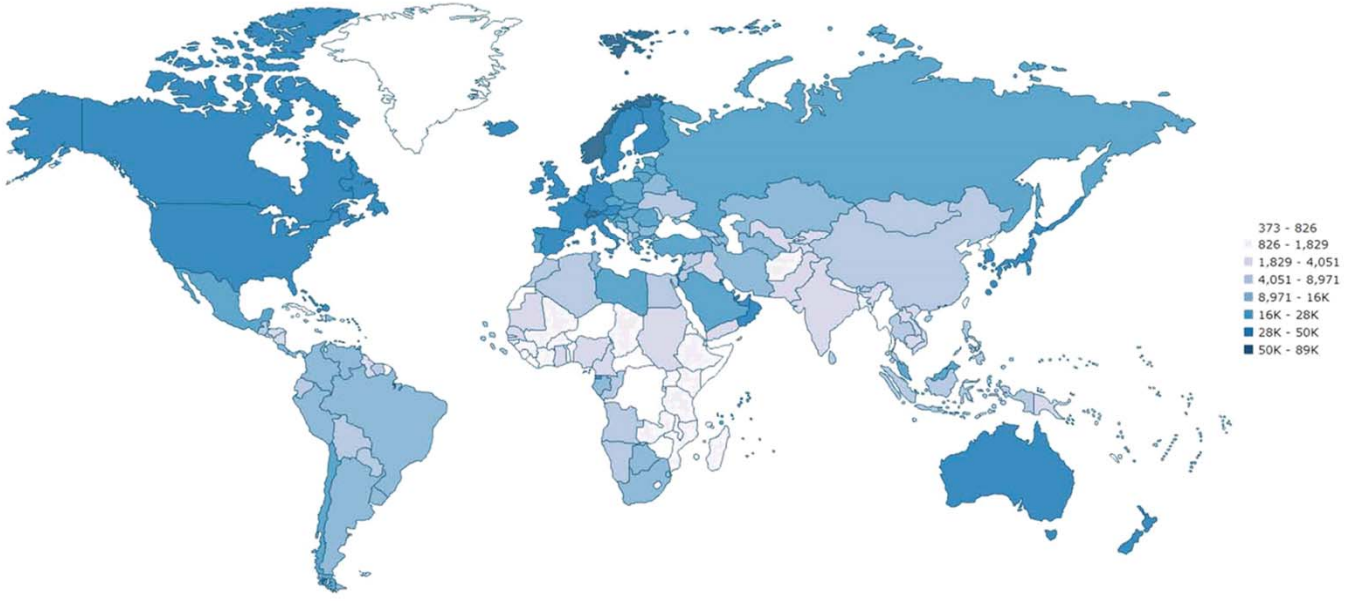
incidence of obesity



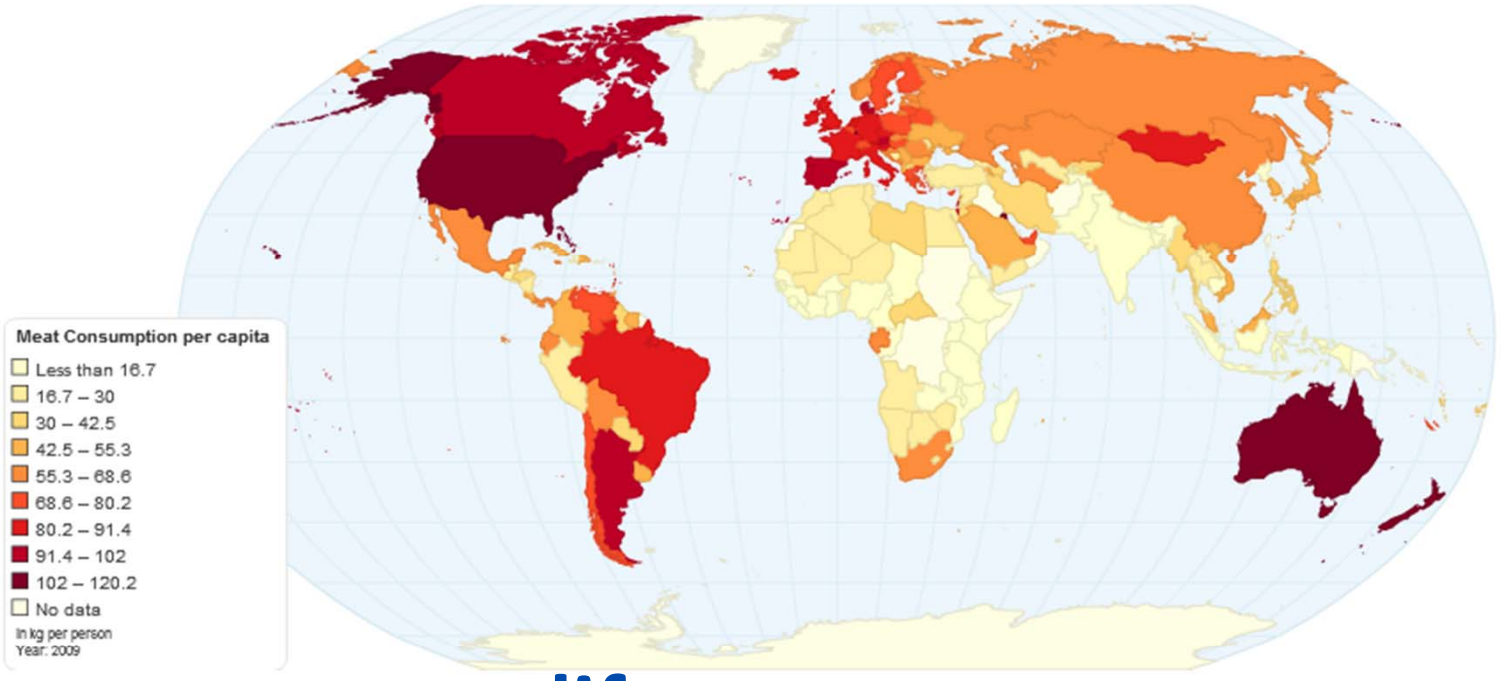
meat consumption per capita/ Y



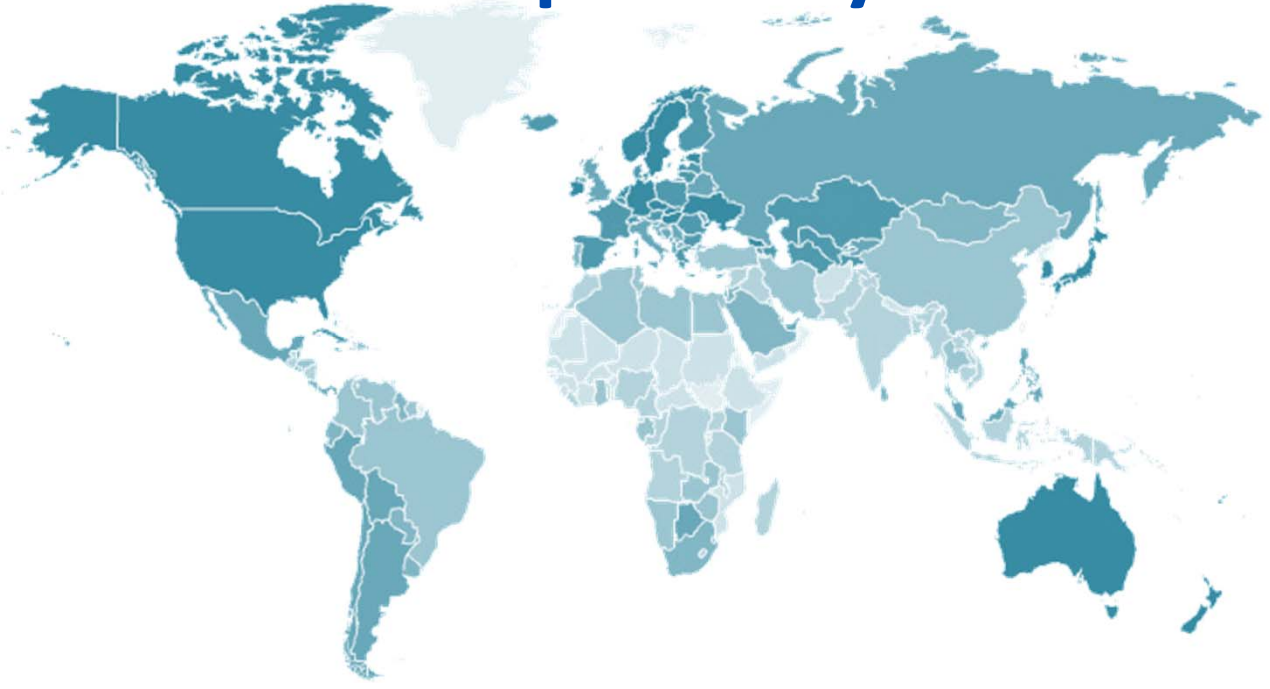
GDP per capita



meat consumption per capita/ Y



life expectancy



the fairy tale scenario !

environmental issues under control

- global change stopped or reversed
- efficient surveillance → reliable modeling (pathogen – vector spreading)
- land use issues addressed
- ↘ livestock impact

feed issues

- healthy novel feed supplements
- less crops as feed
- ↗ feed quality (toxins)

food issues

- food sufficiency maintained + better sharing
- food safety (carriers/ excretors)
- ↗ proteins from plant origin

❖ GM animals? GMO?

improved animal health

- access to robust & resilient breeds
- know how to phenotype traits
- efficient & environmentally-safe control strategies (pathogens & vectors)
- efficient & resilient health services
- health problems: not a burden
- ONE HEALTH strategy implemented (AB-resistance ↘)
- reduced rate of emerging diseases
- innovation crisis for AI drugs solved (+ affordable)
- network of biocontained animal facilities (+ affordable)

social issues addressed

- livestock products accepted
- welfare monitored (+ mesurable)
- vaccination socially accepted

Livestock, Veterinary Public Health research: GAPS & GOALS

❶ a paradigm shift for research investigations ?

- ❖ current "disciplinary" pattern not optimal for new expected outputs
- ❖ hypothesis-driven science → +++ data-driven science

- holistic approaches , multi- / trans-disciplinary strategies
- broad scope + integrated scales (herds, flocks, territories)

added value from collaborating disciplines: genetics - genomics, populations genetics, physiology, nutrition, livestock systems, pathology, infectiology, pharmacology, toxicology, ……..

\+ maths + statistics + economy + sociology

❷ big challenge; big data !

- ❖ full benefits from omics / "signatures" biology
- ❖ data mining (multivariate analyses + merging data sets) big challenge / opportunity

Livestock, Veterinary Public Health research: GAPS & GOALS

❸ a conceptual move !

big data → description + modeling → prediction ← + risk assessment → risk management → communication → crisis management + anticipate suitable level of preparedness

- ❖ a socially useful science

❹ ONE HEALTH shared threats; shared benefits !

emerging zoonoses, AB-Resistance, …..

❺ "ecosystem" thinking !

- ❖ animal as a system or pathogen
- ❖ animal in a system or pathogen

animal suitable for given conditions: "customized systems"

Livestock, Veterinary Public Health research: GAPS & GOALS

❻ targeting new impacts & new dialogs between hosts and pathogens

- immunity
  - RNA interference
  - inflammation (control)
  - epigenetic impacts (pathogens, contaminants)

→ relevance for intracellular early dialogs / early responses/ novel targets ?
viruses, intracellular bacteria & parasites

❼ providing flexible links with all stakeholders,

- transfer of knowledge, technologies & know how,
  + involvement in **teaching & training**
- sustain "**precision farming**" /fine animal monitoring/
  ad hoc technologies/ ICT

❽ think global / act global

- networking at a global scale (STAR-IDAZ Global Network for Animal Disease Research) / global "EraNet"/ Ahniwa+
- being H2020-friendly Better Society, Competitive Industries, Excellent Science
- network of biocontained research facilities, pan european sharing

Healthy livestock and people

❖ 4 atf sub-topics ❶

- **prevention control & eradication**

→ genomic selection, +++ unequivocal phenotypic markers for health, disease resistance or tolerance.

→ high throughput phenotyping, libraries of reliable markers to select traits.

→ endemic production diseases not disregarded.

→ epidemiology: new endeavor surveillance +++, big data genomic sequencing, high throughput approaches.

→ pathobiome as an ecosystem, + role of symbionts

→ AB-Resistance

❷

- **the microbiome animal & human health**

→ mucosal flora (gut, lung, …) & skin

→ early gut colonization, weaning

→ distant impacts ? hepatic priming for chemical protection ?

→ silent pathogen hosting, dialogs

→ microbiote signature as marker

→ stably manipulating the microbiote : long term goal

❸ • feed & food safety

→ cautious use of by-products of the food production chain.

→ use omics to develop fast, cheap and reliable new ways to detect chemical and biological hazards.

→ work on satisfactory methods suitable for harmlessness assessment . (more challenging than proof of toxicity)

→ link disciplines to work on risks. (≠ working on threats)

→ challenge of evaluating low and mixed exposures.

→ AB-Resistance

❹ • nutritional improvements

→ nutrigenetics –genomics: animal in a system; integrated solutions for intended purposes. (interactions genetics-environment + livestock management)

→ **healthy by design products** : (≠ healthy by nature)

- socially acceptable ?
- extra value created ?
- consumer willingness to pay?
- translation into innovation?

→ assessment of the impact of welfare on product quality.

EAAP
64th Annual Meeting

Animal Task Force Special Session

Block 3
Healthy Livestock & People

Thierry Pineau
• head of Animal Health Division - INRA
Thierry.Pineau@toulouse.inra.fr