

Colloque 1<sup>er</sup> Decembre 2011 - Paris

**Resultats d'une large étude sur le lien  
alimentation - santé chez les poulets,  
incluant des methodes holistiques**

Machteld Huber, MD-senior researcher  
Louis Bolk Institut, Pays-Bas

## The content of my talk:

1. The history behind the article
2. The content of the article
3. The meaning for 'omics' research
4. The challenges ahead

**Health expectations are the main argument  
to buy organic products.  
But there is not much research done!**

**So I performed a big explorative study,  
which was named:**

***“Organic More Healthy?”***

# Organic More Healthy?

In 2006-2008 I conducted an explorative feeding study in chicken, model for humans, in search for possible **health effects** from two different food types:

A blinded intervention study in an **immunological chickenmodel (3 lines)**, 150 chicken in 2 generations, receiving an immunological **challenge** in the 2<sup>nd</sup> generation.

**Only the feed differed: A or B**

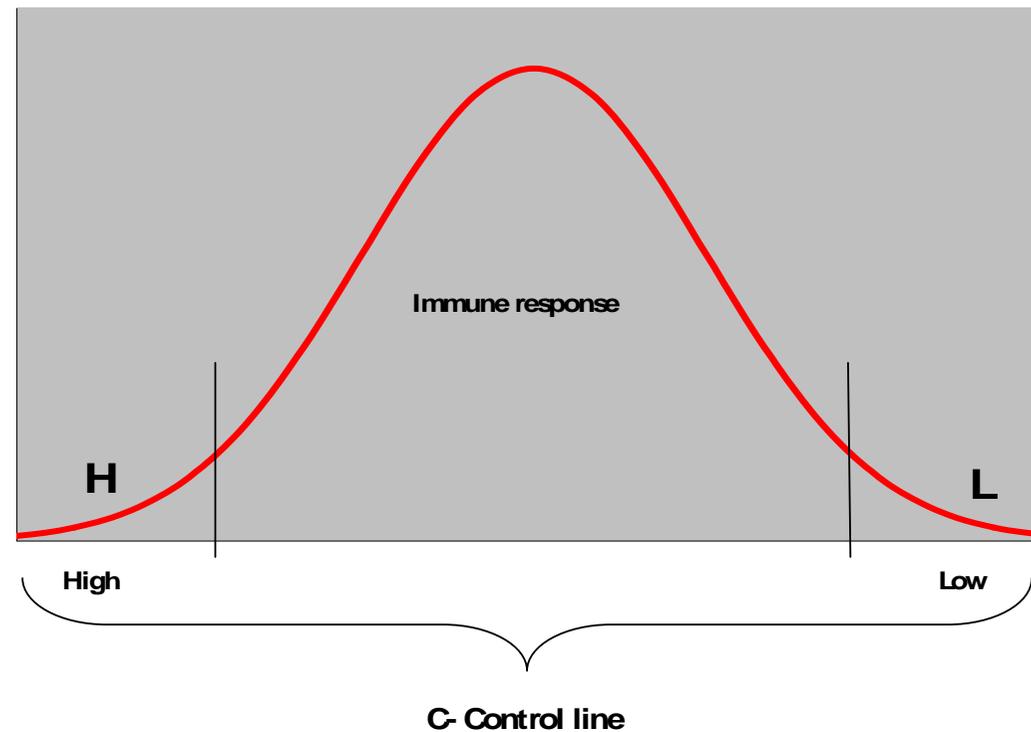
**Partners: WUR, TNO, RIKILT**

# The Animals

**3 special immunological chicken lines: H, C, L**

3 x 2 groups of 25 chicken each

*H = High responders, L = Low responders,  
C represents 'normal'*



# The researched health parameters

## General health features

- Weight, growth, feed conversion
- Fertility

## Immune parameters

- Innate & Specific; humoral & cellular

## Organ Systems

- Metabolic function through metabolomics of blood & liver
- Gut function through genomic
- Post mortem evaluation

**All related to the challenge with the healthy animals.**

# The Feed

**Chickenfeed for 3 phases** in development was manufactured out of **6 ingredients: Starter, Grower, Layer feed.**

All with different percentages of ingredients.

**Ingredients** were Wheat, Barley, Triticale, Peas, Maize and Soy, in different compositions in the feeds.

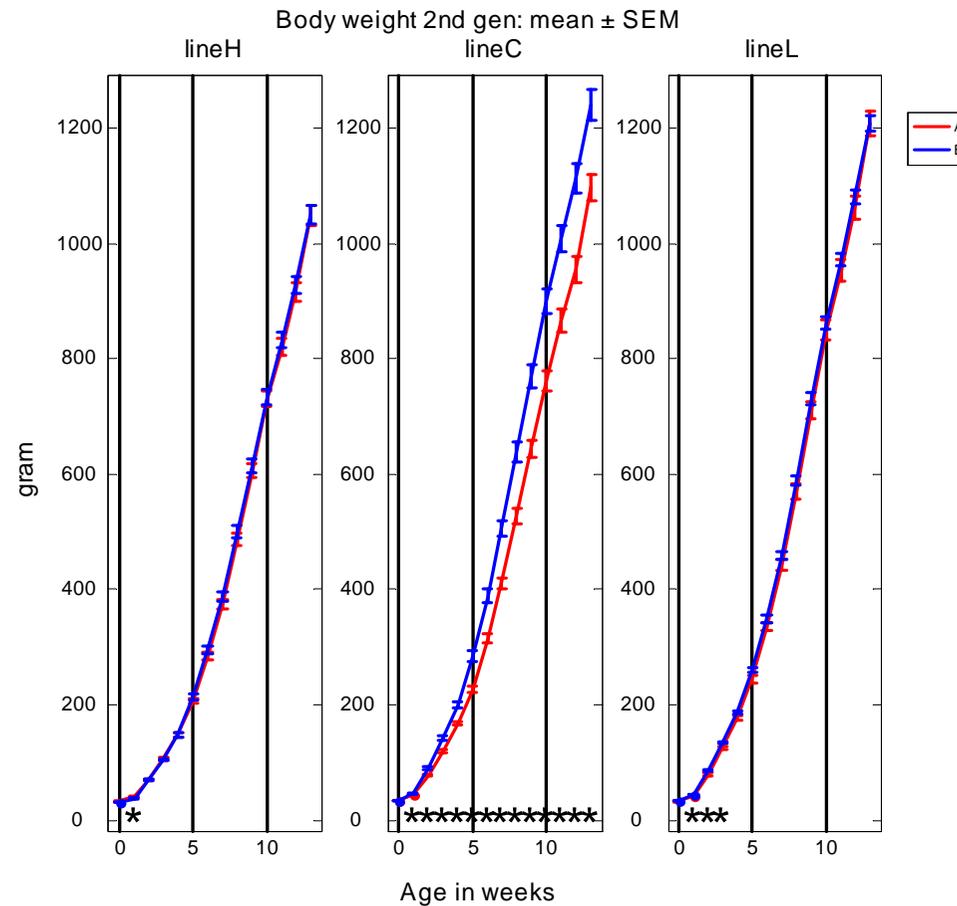
# The Animals - Results

**First outcome: all animals were healthy!**

This could be expected as both feeds were adequate. Yet there were many physiological differences, especially after we gave at 9 weeks an immunological challenge with **KLH** (from the keyhole limphet haemocyanin molusc).

# The Animals - Results

- **Weight:** Animals on **Feed B** gained more weight than on **Feed A**  
**Feed A is Red    Feed B is Blue**



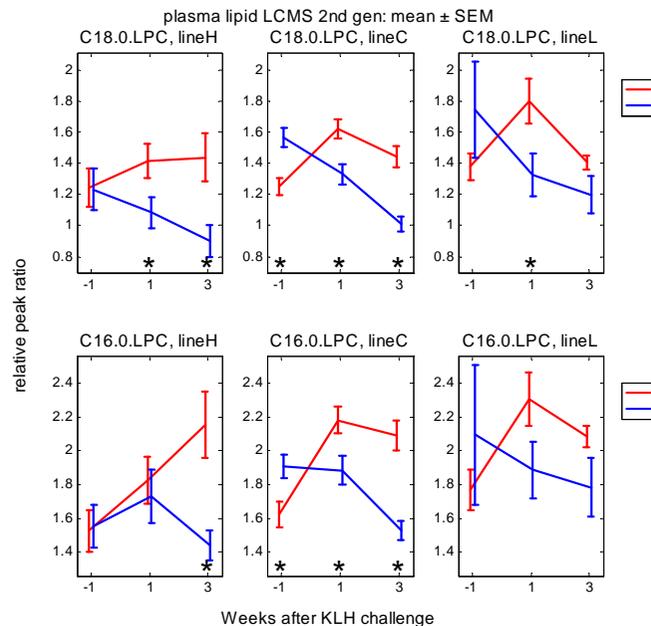
# The Animals - Results

- **Immune system:**

Animals on the **Feed A** showed a **stronger 'immune responsivity'**, in the innate as well as the adaptive immune system, called a **more 'alert' immune system.**

# The Animals - Results

- Metabolomics:** A broad spectrum of differences in all platforms. Animals on the **Feed A** showed a **stronger 'Acute phase response'** after the challenge with **KLH** and a **stronger liver metabolism** afterwards.



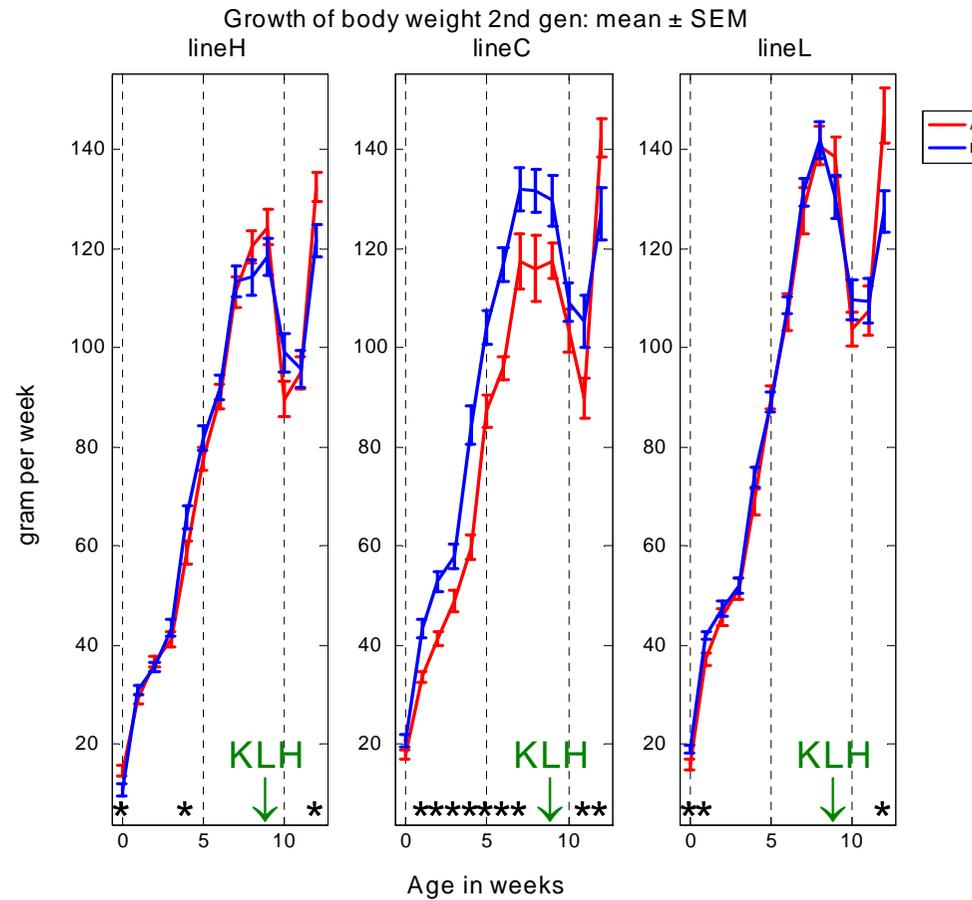
Two most discriminating metabolites in the lipid platform

# The Animals - Results

- **Gut genomics:** Animals on **Feed B** showed **less active genes** in the natural **cholesterol synthesis**.  
However in the blood no differences in cholesterol levels.
- **Post mortem:** No abnormalities, but some differences in organ weights.
- **Overall:** A long list of significant physiological differences was found between the Feed groups **A** and **B**.

# The Animals - Results

- Growth:** Animals on the **Feed B** grew stronger till the **KLH challenge**. After that the **Feed A-group** took over (*catch-up growth*).



# The Feed - Results

## Results of analyses:

Consistent differences in amount of protein:

**conventionally** on average 10% more protein in the ingredients, mainly in wheat, barley and soy.

# The Feed - Results

## Results of analyses:

In **some organic** ingredients more vitamin K, isoflavons, vitamin E and folic acid.

In **some conventional** ingredients more phyto-sterols, vitamin C and vitamin B5.

In the **organic** feed somewhat more moulds and bacteria. In **conventional** feed more LPS.

**Identification** was possible with complementary methods (Biofotons, partly with biocrystallizations), which gives an indication for the representivity of the feeds.

# The Animals - Results

Question: Which group is healthier?

Conclusion: *Scientifically we did not know!*

In science the concept of 'Health' is not operationalized!

Yet the great majority of researchers had a preference to be themselves either **animal A** or **animal B**.

**Do you? And why?**

## My next step was work on the definition of health:

BMJ

BMJ 2011;343:d4163 doi: 10.1136/bmj.d4163

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# ANALYSIS

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## How should we define health?

The WHO definition of health as complete wellbeing is no longer fit for purpose given the rise of chronic disease. **Machteld Huber and colleagues** propose changing the emphasis towards the ability to adapt and self manage in the face of social, physical, and emotional challenges

Machteld Huber *senior researcher*<sup>1</sup>, J André Knottnerus *president, Scientific Council for Government Policy*<sup>2</sup>, Lawrence Green *editor in chief, Oxford Bibliographies Online—public health*<sup>3</sup>, Henriëtte van der Horst *head*<sup>4</sup>, Alejandro R Jadad *professor*<sup>5</sup>, Daan Kromhout *vice president, Health Council of the Netherlands*<sup>6</sup>, Brian Leonard *professor*<sup>7</sup>, Kate Lorig *professor*<sup>8</sup>, Maria Isabel Loureiro *coordinator for health promotion and protection*<sup>9</sup>, Jos W M van der Meer *professor*<sup>10</sup>, Paul Schnabel *director*<sup>11</sup>, Richard Smith *director*<sup>12</sup>, Chris van Weel *head*<sup>13</sup>, Henk Smid *director*<sup>14</sup>

The history behind it .....

## Which even received a cover of the British Medical Journal:



**BMJ's cover saying: ...Health is in the air!**

# “Organic More Healthy?”

*was published in the BJN:*

Huber M et al. *Effects of organically and conventionally produced feed on biomarkers of health in a chicken model.*

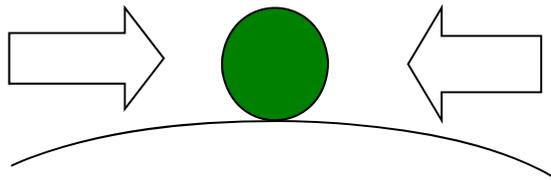
BJN (2010), 103:663-676

***Thank you for your attention!***

# Different production approaches

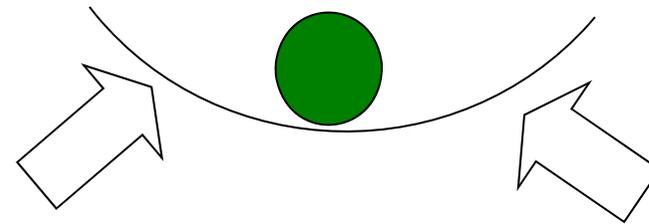
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## Control model Conventional approach



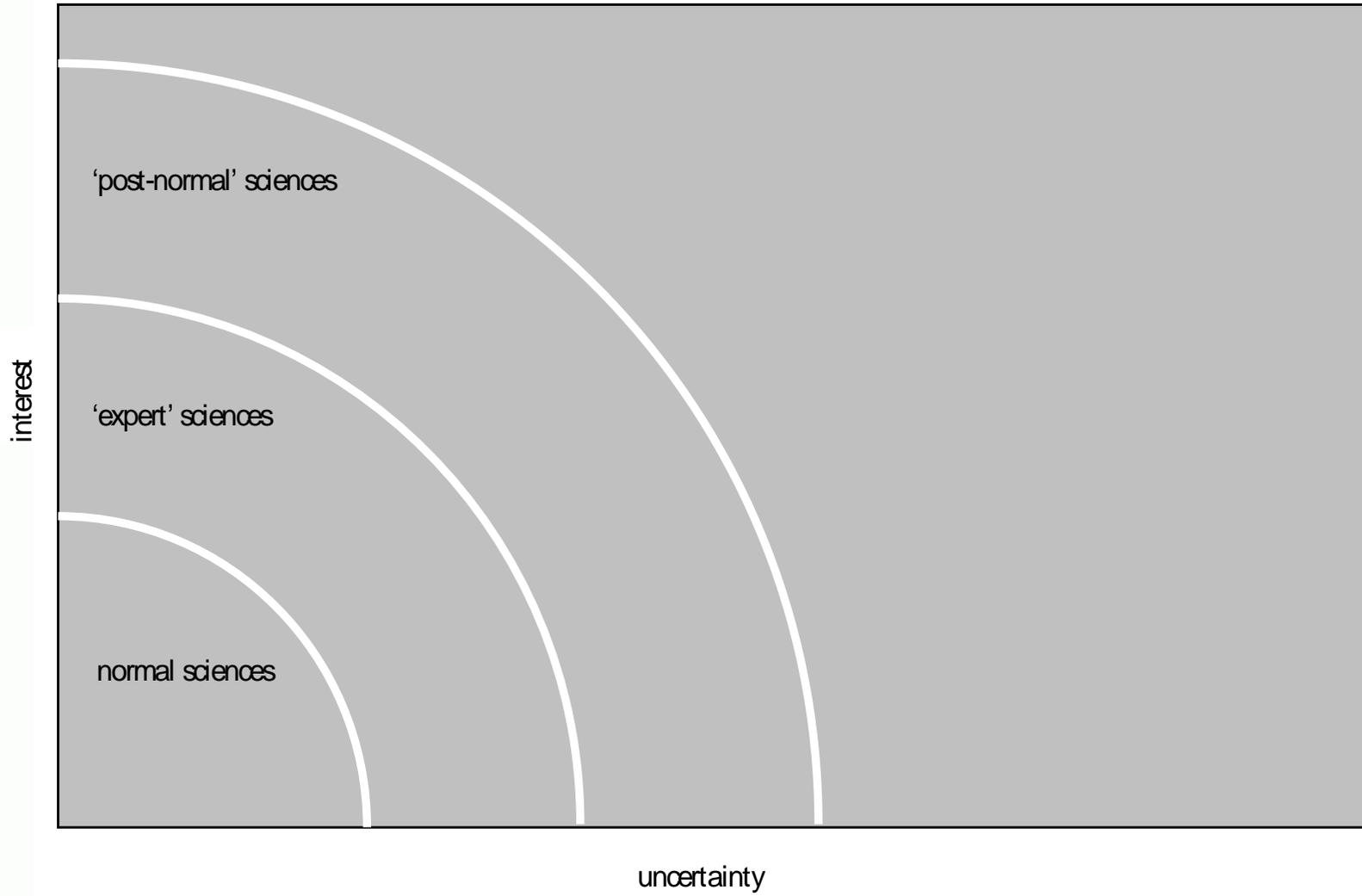
- focus on a problem
- control variation
- continuous monitoring
- direct intervention
- static equilibrium

## Adaptation model Organic approach: robustness



- focus on the system
- use of variation
- stimulation of selfregulation
- indirect intervention
- dynamic equilibrium

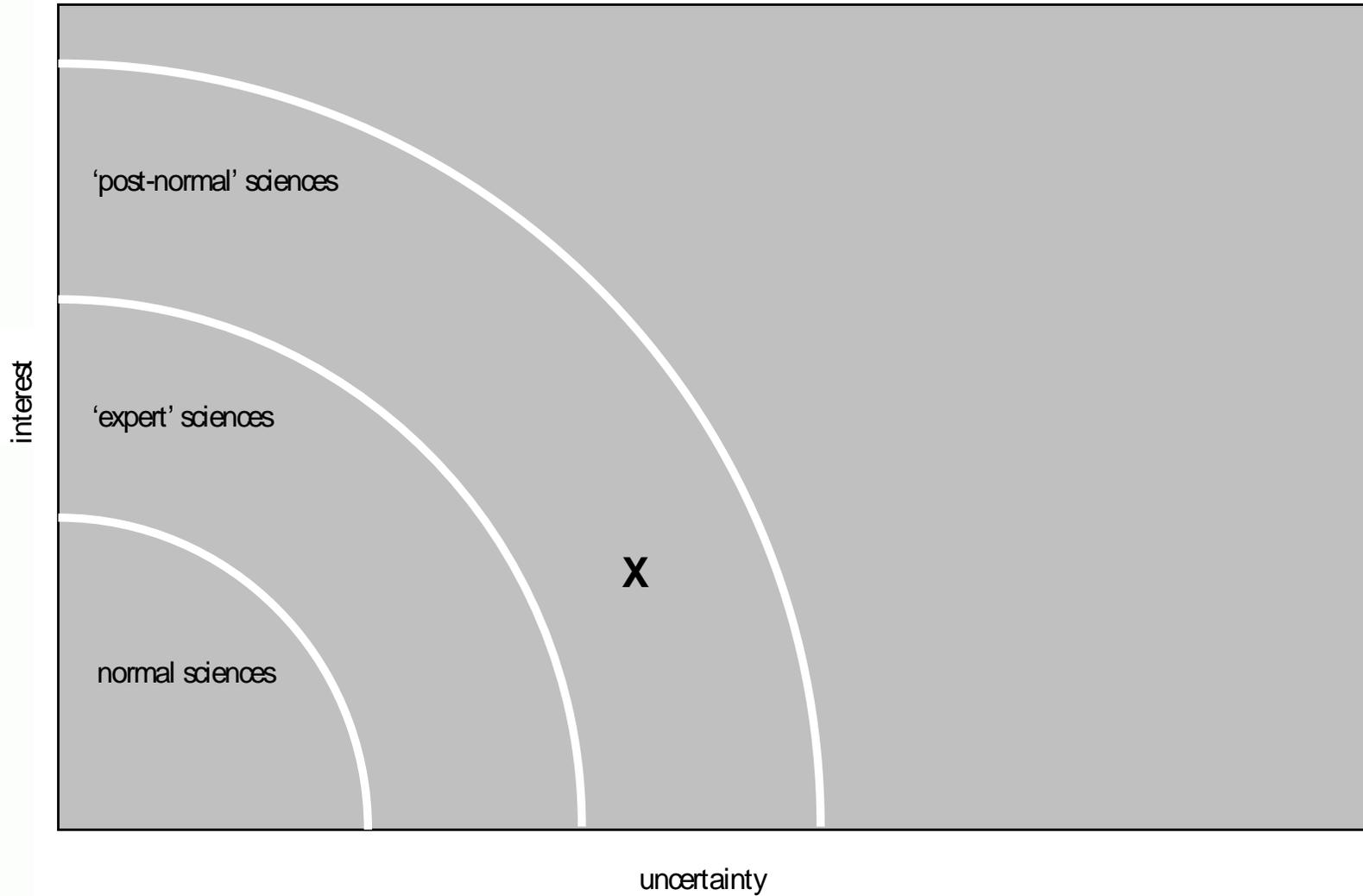
# Classification of scientific research



Funtowicz and Ravetz (1991)

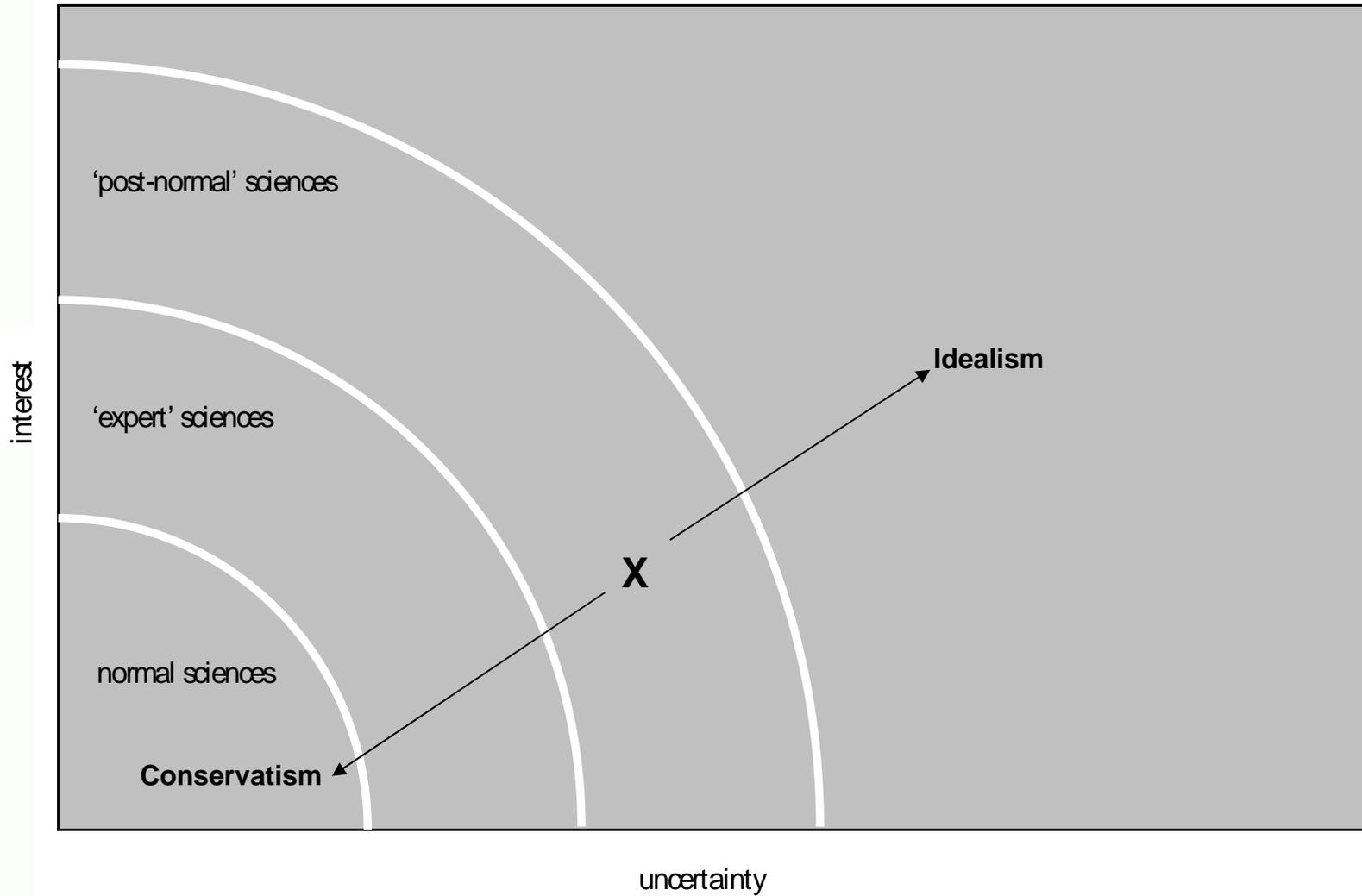
# Classification of scientific research

X = 'Organic healthier?'



Funtowicz and Ravetz (1991)

## Risk for extreme interpretations



Funtowicz and Ravetz (1991)

# Research design

- Chicken, serving as a model for humans, were fed during 2 generations, either organic or conventional feed, blinded.
- Chicken were of the Wageningen Selection Lines, including a Control line, bred for immunological research. 6 groups of 25.
- Just the feed differed, all other circumstances were identical.
- The feed was identically composed out of six ingredients, from the two production systems as best practice 'farm pairs' in NL, AU, DK. No controlled trials. Reflecting 'reality'.
- The feed should be free of 'negative' contents, like pesticide residues or mycotoxins.
- Animals, as well as ingredients and feed, were extensively analysed.
- The 150 animals of the 2nd generation lived for 13 weeks and received an **immunological 'challenge' with KLH** at age of 9 weeks, to test their health.