

PHYTOMILK  
Potential improvement of the salutary  
effect of organic dairy milk by forage  
species and by supplementation

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Short about our project

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### Recent research:

”There is a number of ingredients in milk that may be salutary (healthy)”

Bioactive components are for example:

- Fatty acids (omega-3, omega-6, CLA)
- Vitamins
  - Carotenoids (Vitamin A)
  - Tocopherols (Vitamin E)
- Phytoestrogens
- Endogenous hormones and growth factors
- Low content of Selenium in organic Nordic milk – very little in the soil

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### Organic milk

- Different from conventional milk :
  - Higher proportion of forages in the ration
  - Higher proportion of legumes and other herbs (not so much grass)
- Knowledge of the chemical and sensory characteristics are limited

▼ Organic milk is more and differently affected by forage than conventional milk.

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We are going through the whole chain

- Forage and forage production
- Milk production
- Shelf stability
- Bioactive components

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Motivation for working transnationally and expectations

Common use of research facilities

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## Collaboration between 4 Nordic countries

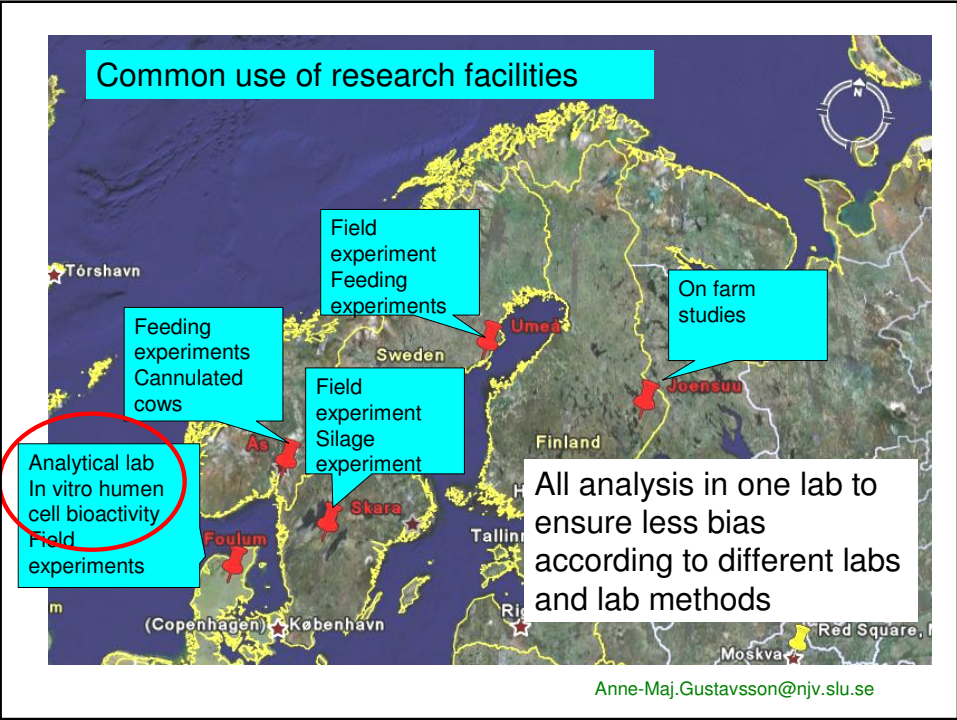
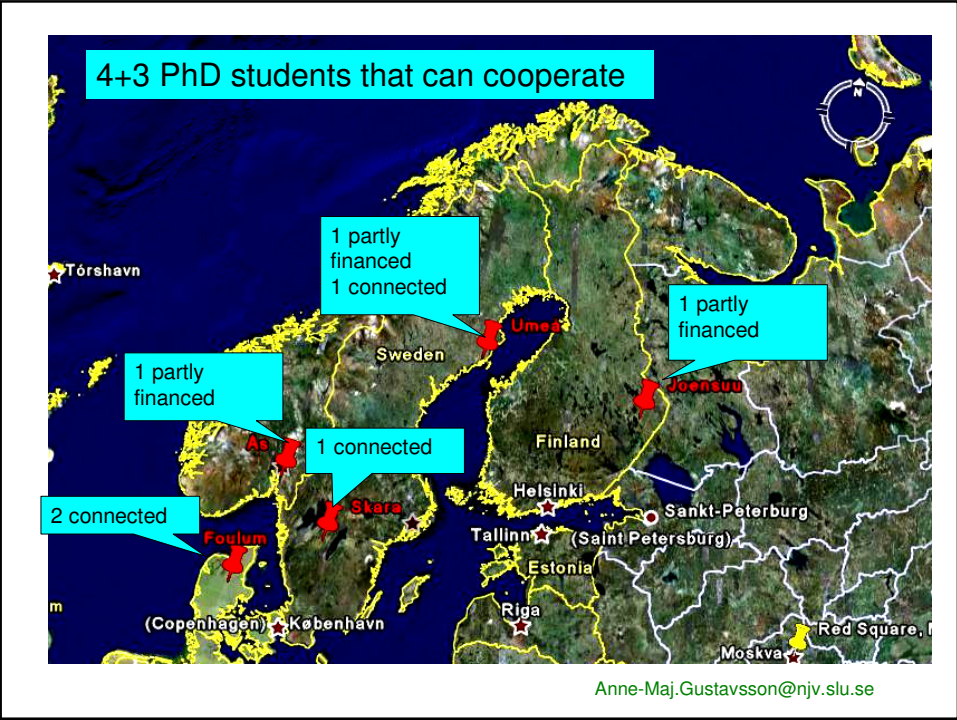
- Dairy production is important in all Nordic countries
- Small countries
- Need to increase “the critical mass” for conducting high quality research
- Take advantage of the variation in sites and disciplines

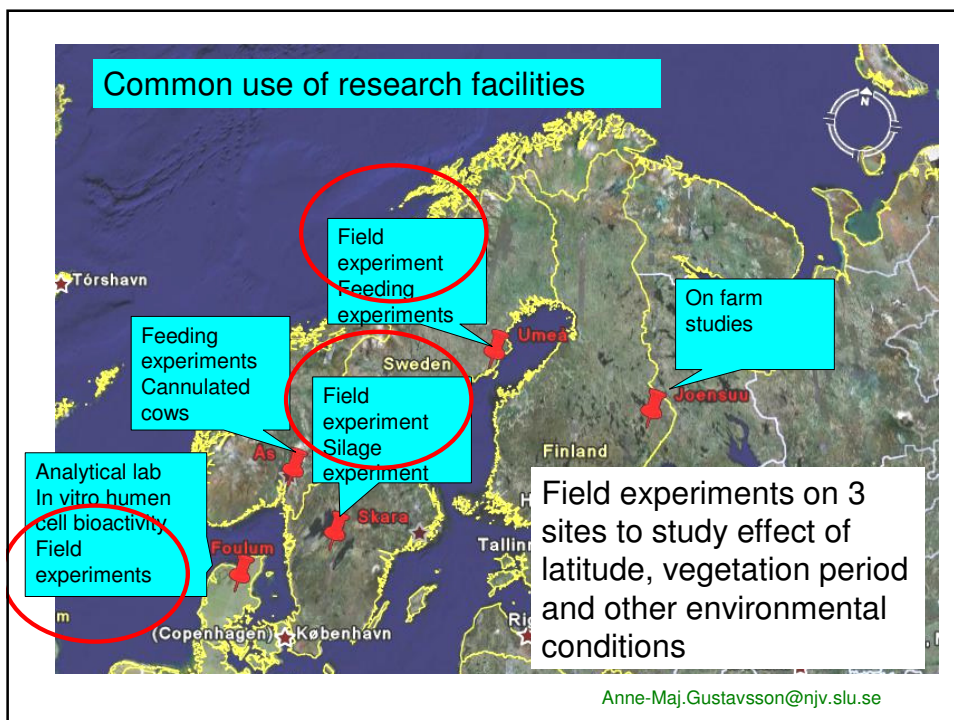
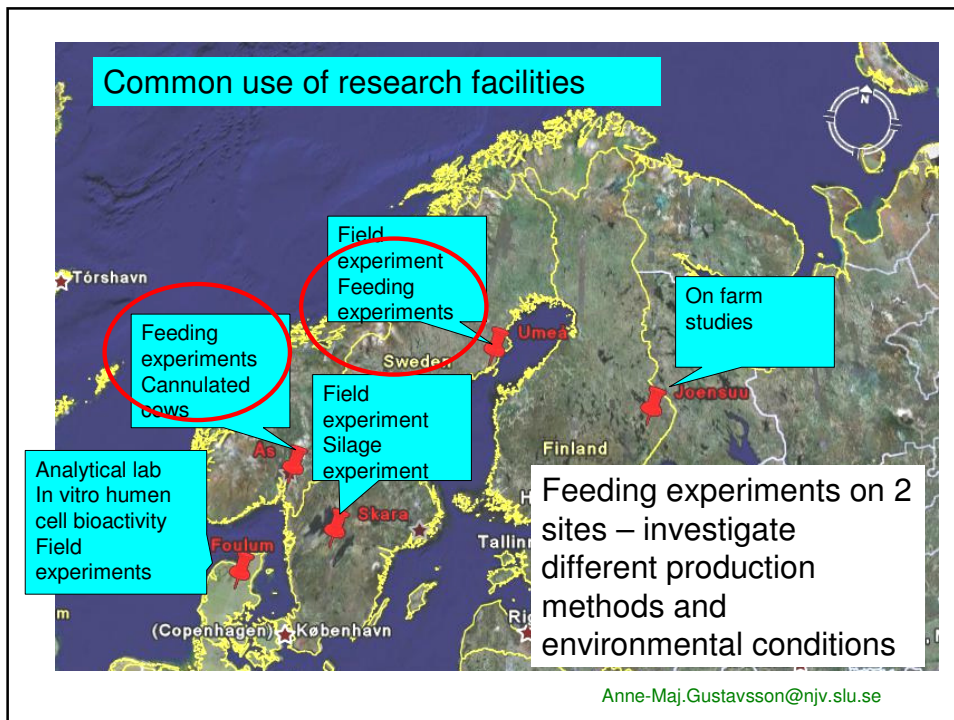
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## Scientists from many disciplines

- Crop Science
- Animal Science
- Chemistry

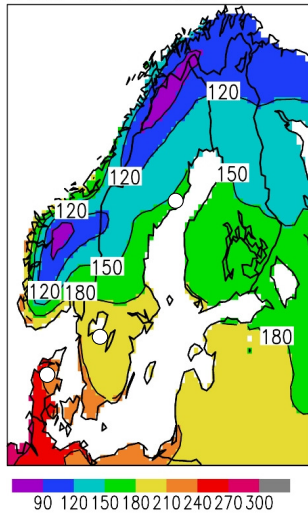
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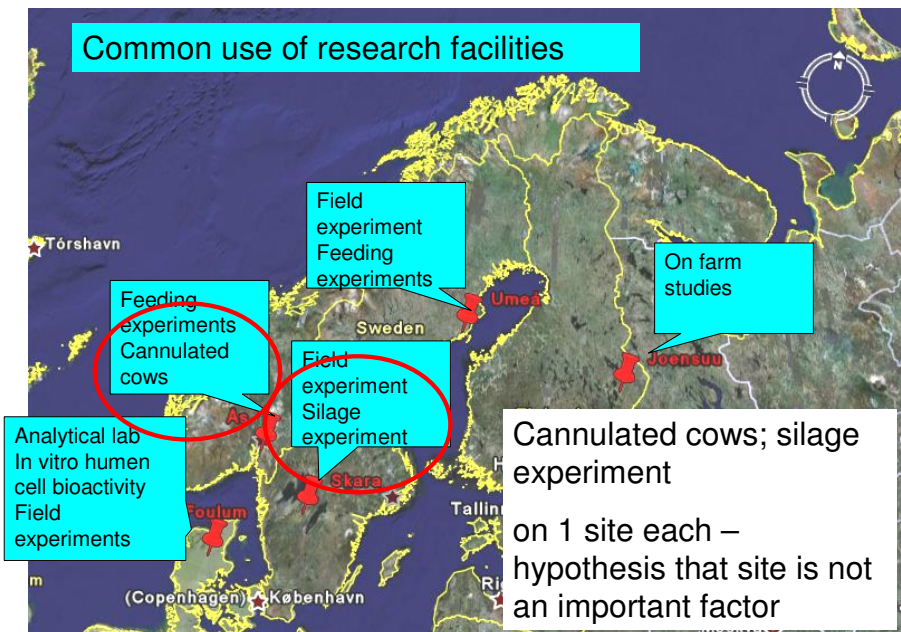
## Effects of latitude and harvest time

CTRL 1961–1990

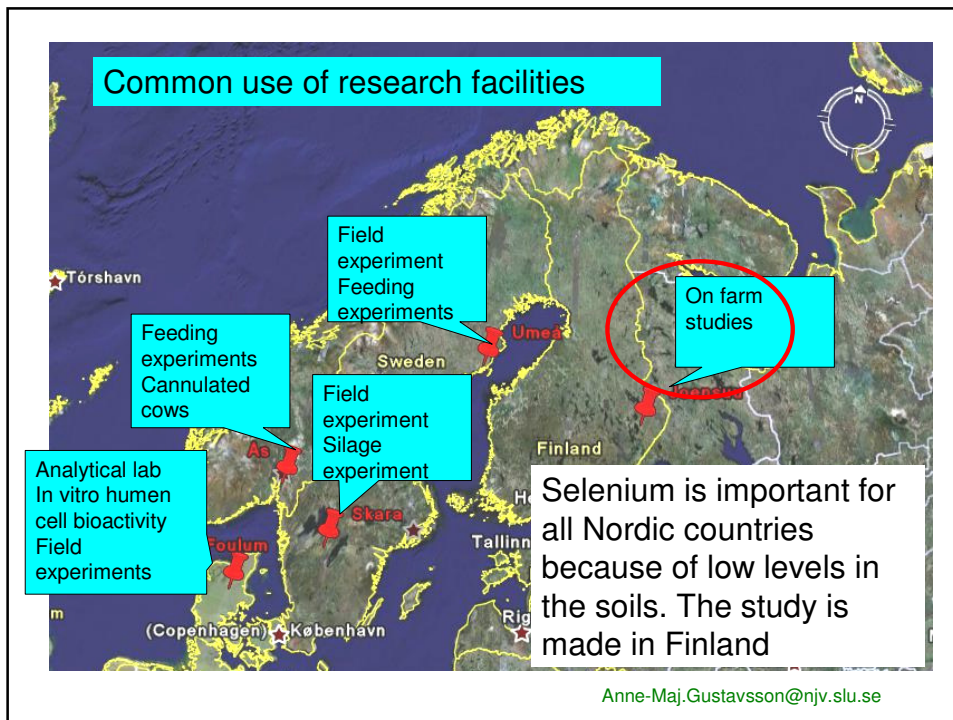


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## Common use of research facilities



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We can explore the differences between the countries

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## Different production systems – feeding experiment

### Sweden:

- More intensive production system
- About 10000 kg milk/cow and year
- Short term rotational leys

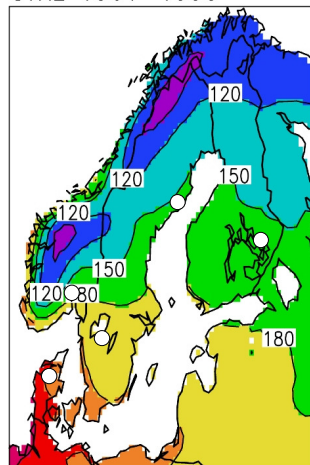
### Norway

- Less intensive system
- About 7000 kg milk/cow and year
- Long-term leys with higher proportion of non red clover herbs are common

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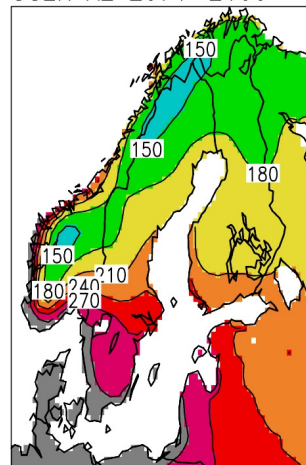
## Vegetation period

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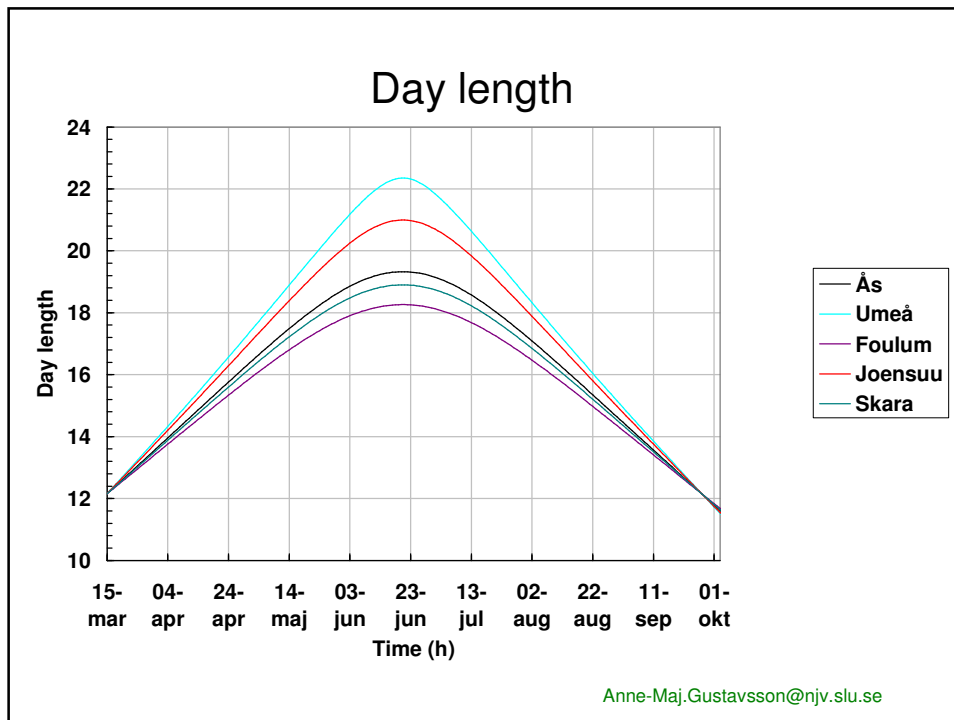
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- ### We are studying the whole chain
- Forage crop and environmental conditions
  - Different milk production systems
  - Milk properties
    - Shelf stability
    - Biologic activity
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## Basis for both farming management and dietary recommendations

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## Common articles

- Compare long term and short term leys
- Compare short term red clover with birdsfoot trefoil
- Compare short term red clover, different production systems
- Biodehydrogenation
- Effect of storage time and preservation
- Effect of latitude and harvest time
- Biological activity in milk
- Effects of vitamins and Se on oxidation stability of organic milk
- Effects of Se supplementation on tank milk quality

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## Feeding experiment

### Common articles

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## Cannulated cows

### Common articles

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## Silage experiment

### Common articles

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- Compare short term red clover with birdsfoot trefoil
- Compare short term red clover, different production systems
- Biodehydrogenation
- [Effect of storage time and preservation](#)
- Effect of latitude and harvest time
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## Field experiment

### Common articles

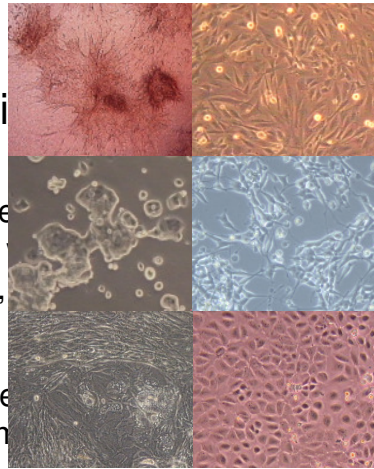
- Compare long term and short term leys
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In vitro cellbased  
human models

Normal and  
cancer cell lines

## Common articles



- Compare long term and short term
- Compare short term red clover
- Compare short term red clover, different production systems
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- Effect of storage time and preservation
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- Biological activity in milk
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Selenium farm  
study

## Common articles

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## Conclusions – why work transnationally

- Increase the "critical mass" of organic forage and dairy science
- Take the advantage to compare different production systems and environmental conditions
- Different disciplines
- Exchange system for PhD-students

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## Silage feeding experiment

Norway

Sweden

Long term leys  
High proportion of  
non-red clover  
herbs + grass

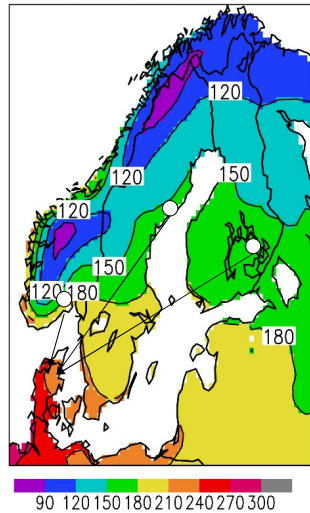
Short term leys  
Birdsfoot trefoil +  
timothy

Short term rotational ley  
High in timothy and red clover

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## Naturally occurring bioactive components

CTRL 1961–1990

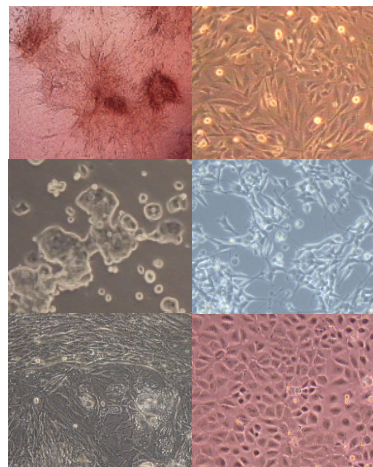


- Milk samples from all studies:
- Different breeds
  - Different lactation and pregnancy stages
  - Different proportion of concentrate
  - High clover, birdsfoot trefoil or non red clover herbs
  - Different production level

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## Cell based models at the Faculty of Agricultural Sciences, Denmark

- Mammary epithelium
- Gastro-intestinal tract
  - Stomach, small intestine, colon
- Bone
- Neuronal tissue
- Connective tissue
  - Fibroblasts
- **Macrophages**
  - Human, bovine and porcine origin
  - Embryonic, adult origin
  - Primary cells and cell lines
  - Normal and cancer



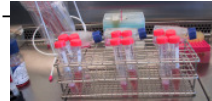
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## Endpoints

- Proliferation and viability
- Cell death (necrosis/apoptosis)
- Protein synthesis, turn-over and secretion
- Intracellular signalling
- Regulation of gene expression
- Migration (wound healing)
- ~~Anti-inflammatory response~~

- In vivo – in vitro combination



from humans or animals

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