

Sensors for Dairy Health and Welfare



See our COST Action website
www.dairycareaction.org
Eg in library pages "Pastell"

UNIVERSITY OF COPENHAGEN



Food Animal Biotechnology



The Dairy ICT Project



Prof Chris Knight
University of Copenhagen

UNIVERSITY OF COPENHAGEN



Dairy ICT Project aims to improve dairy cow welfare

- In the Dairy ICT project we are developing new uses for accelerometer collars, expanding the utility of milk metabolomics and building novel biomarker technologies. Outputs from these novel technologies will be integrated into ICT-based "smart" husbandry support systems for use by dairy farmers.

Dairy ICT Project will expand existing proven technologies



Herd Navigator:
Progesterone
LDH
BHB

Add
SARA

Add
lameness



Silent Herdsman™
estrus detection

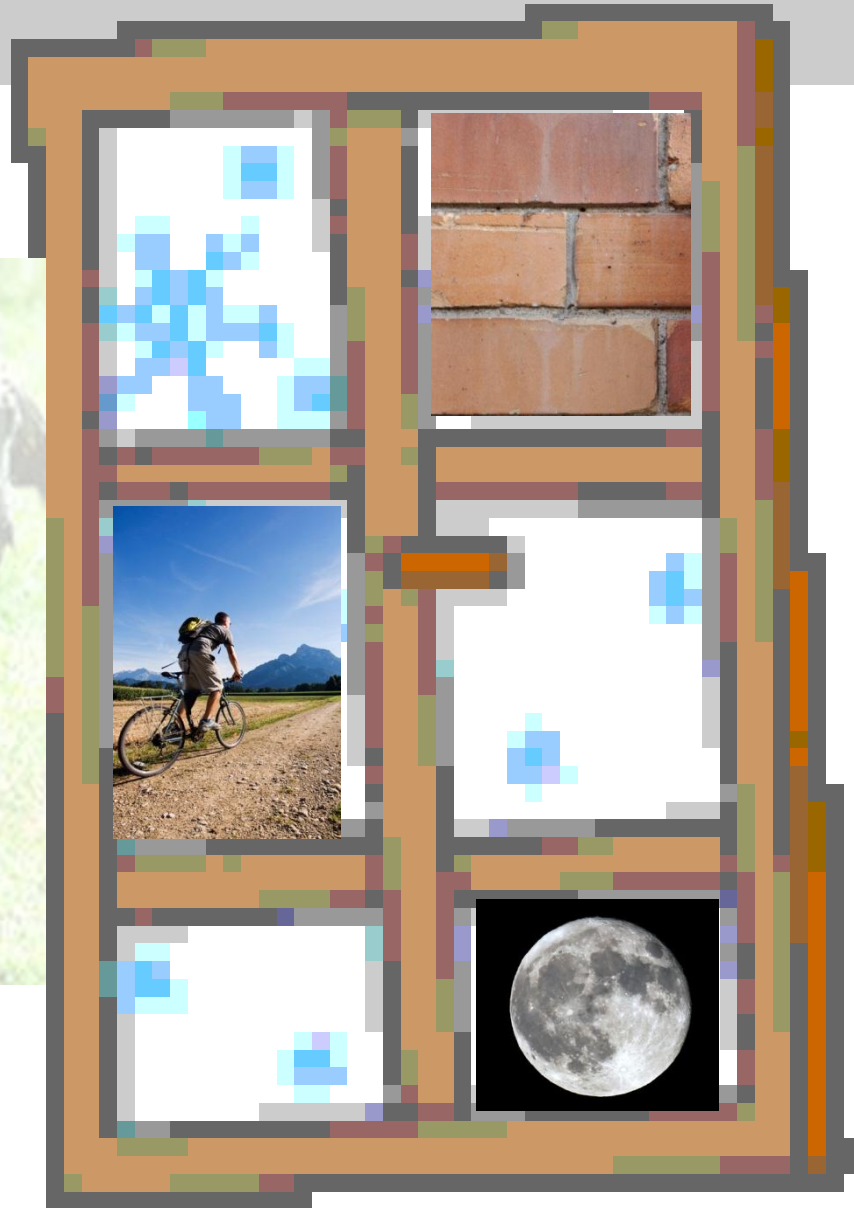
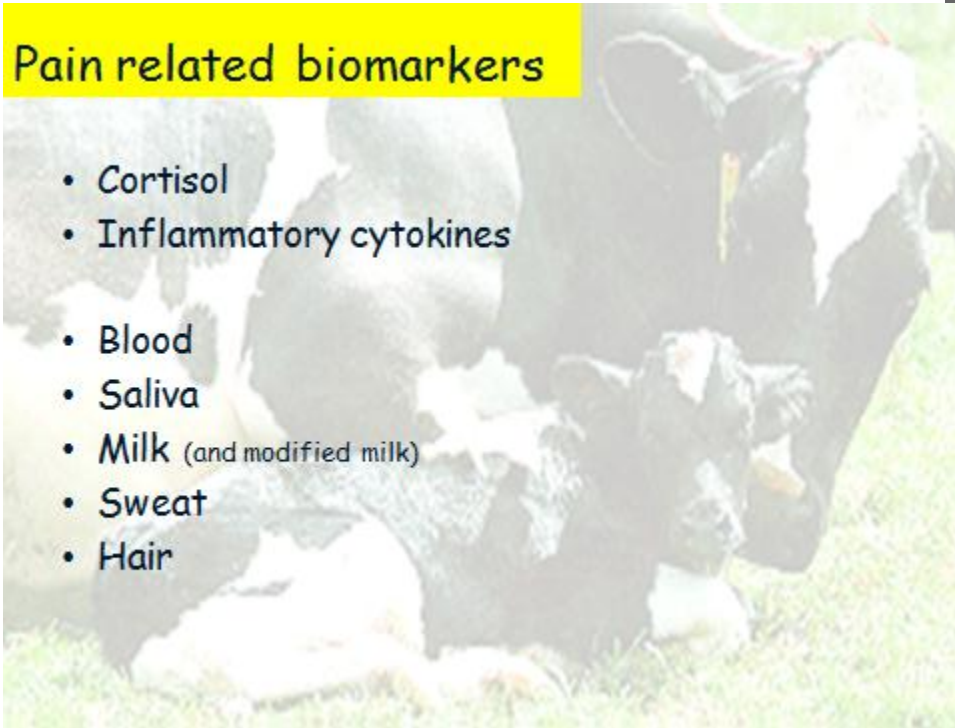
Add
feeding
activity



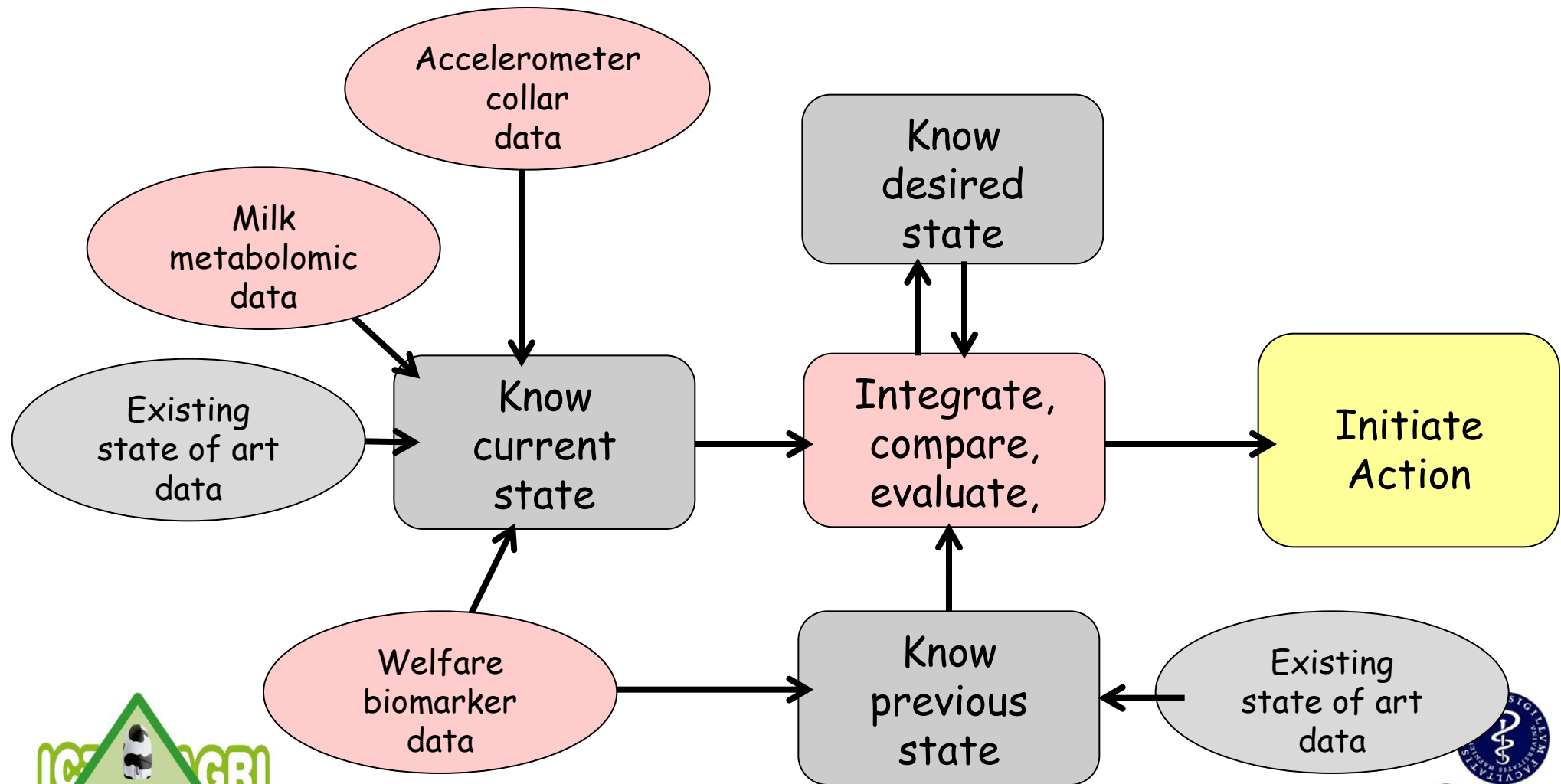
Dairy ICT Project will view biomarkers differently

Pain related biomarkers

- Cortisol
- Inflammatory cytokines
- Blood
- Saliva
- Milk (and modified milk)
- Sweat
- Hair



Dairy ICT Project will develop minimalist approaches to smart systems



Dairy ICT Project participants

- University of Copenhagen
 - Chris Knight, co-ordination, biomarkers
- Aarhus University
 - Klaus Lønne Ingvarstsen, milk metabolomics
- INRA AgroParisTech
 - Nic Friggens, teleonomic smart system modelling
- University of Strathclyde
 - Ivan Andonovic, accelerometer collars (under subcontract to INRA)
- University of Bern
 - Rupert Bruckmaier, biomarkers
- Teagasc Moorepark
 - Riona Sayers, dairy cow experiments

- University of Padua, Newcastle University and SRUC provide advisory input



Dairy ICT Project, biological sensing tasks

- **TS.1 Cow feeding activity sensing using accelerometer collars**
 - Task Leader: STRATH - Partners involved: TEAGASC, INRA, UNIPD
- **TS.2 Detection of lameness in cows using accelerometer collars**
 - Task Leader: STRATH - Partners involved: TEAGASC, SRUC
- **TS.3 Development of novel biomarker sampling methodologies**
 - Task Leader: UCPH - Partners involved: UNIBE
- **TS.4 Detection of sub-acute ruminal acidosis using milk metabolomics**
 - Task Leader: AU - Participants involved: UNIBE

Dairy ICT Project, teleonomic modelling tasks

- **TT.1 Generic tools: Data filtration and extraction tools**
 - Task Leader: INRA - Partners involved: AU, STRATH, UNEW
- **TT.2 Generic tools: Feature integration tools**
 - Task Leader: INRA - Partners involved: AU, UNEW, STRATH
- **TT.3 Testing of generic tools**
 - Task Leader: INRA - Partners involved: STRATH
- **TT.4 Tailored integrated solutions and development of Dairy Management Support System**
 - Task Leader: INRA - Partners involved: STRATH

Dairy ICT Project, Implementation and Timeframe

- **TI.1 Cost benefit, systems efficiency and environmental impact analysis**
 - Task Leader: UoC - Partners involved All
- **TI.2 On-farm testing and implementation**
 - Task Leader: TEAGASC - Partners involved: INRA, STRATH, UoC, AU

Task	Year 1				Year 2				Year 3			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
T.S.1												
T.S.2												
T.S.3												
T.S.4												
T.T.1												
T.T.2												
T.T.3												
T.T.4												
T.I.1												
T.I.2												

Dairy ICT Project, Midterm Progress

Milestone	Partner responsible	Date	Progress	Comments
M1	Copenhagen	April 1st 2013	Achieved	MOU and cooperation Agreements in place
M2	Strathclyde, Bern	July 1st 2013	Achieved	Collars in place
M3	INRA	July 1st 2013	Achieved	Postdoc appointed
M4	INRA, Strathclyde, Teagasc	October 1st 2013	Achieved	Data needs identified
M5	INRA, Strathclyde, Teagasc	February 1st 2014	Achieved	Collar data for feeding and rumination delivered to INRA
M6	All	May 1st 2014	Achieved	Consortium Meetigns at Teagasc (November 2013) and Strathclyde (March 2014)
M7	Aarhus	July 1st 2014	Ready	Metabolomics data available for delivery

Dairy ICT Project, Example biomarker data



Evaluation of salivary cortisol as a biomarker for plasma cortisol during ACTH challenge and at variable salivary consistency

J.J. Gross¹, R.S. Zbinden¹, C. Philipona¹, C.H. Knight², R.M. Bruckmaier¹

¹Veterinary Physiology, Vetsuisse Faculty University of Bern, Bremgartenstrasse 109a, CH-3012 Bern, Switzerland

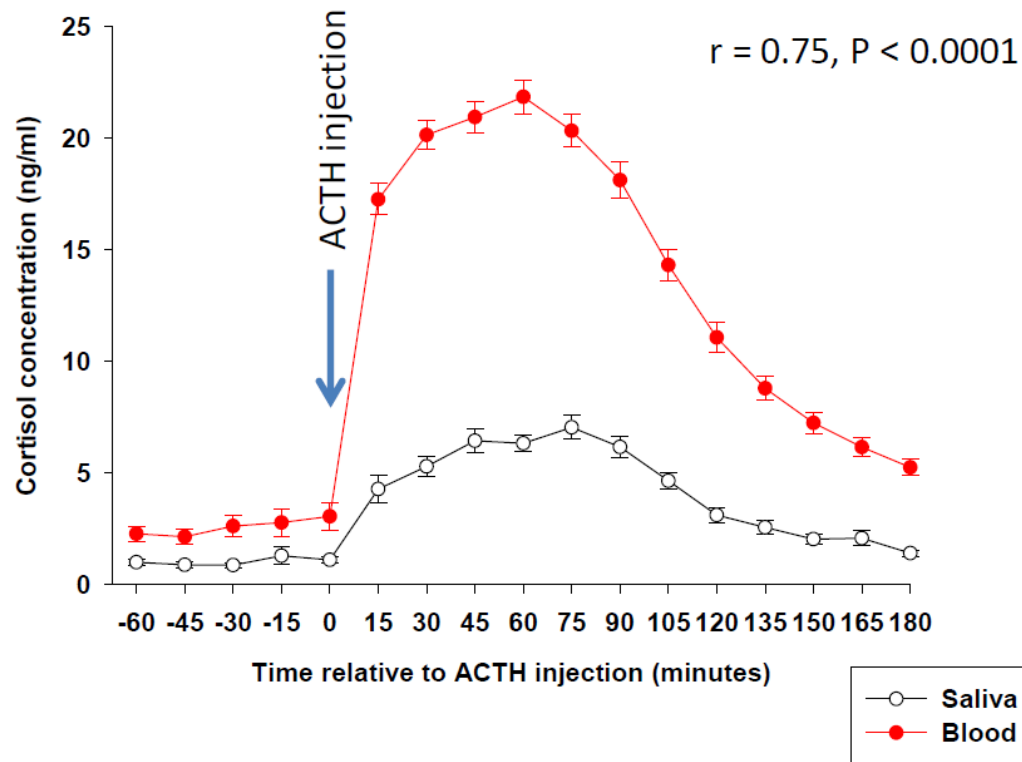
²Institute of Veterinary Clinical and Animal Sciences, University of Copenhagen, Dyrhøjevej 100, DK-1870 Frederiksberg C

First DairyCare Conference
Copenhagen, August 2014



Dairy ICT Project, example biomarker data

Results – Experiment 1 ACTH-Challenge



Dairy ICT Project, example activity data



Silent Herdsman; Automatic Classification of Eating and Ruminating in Cattle using a Collar Mounted Accelerometer

Jakub Konka¹, Craig Michie^{1,2}, Ivan Andonovic^{1,2}

¹ Department of Electronic and Electrical Engineering
University of Strathclyde,
Glasgow, Scotland

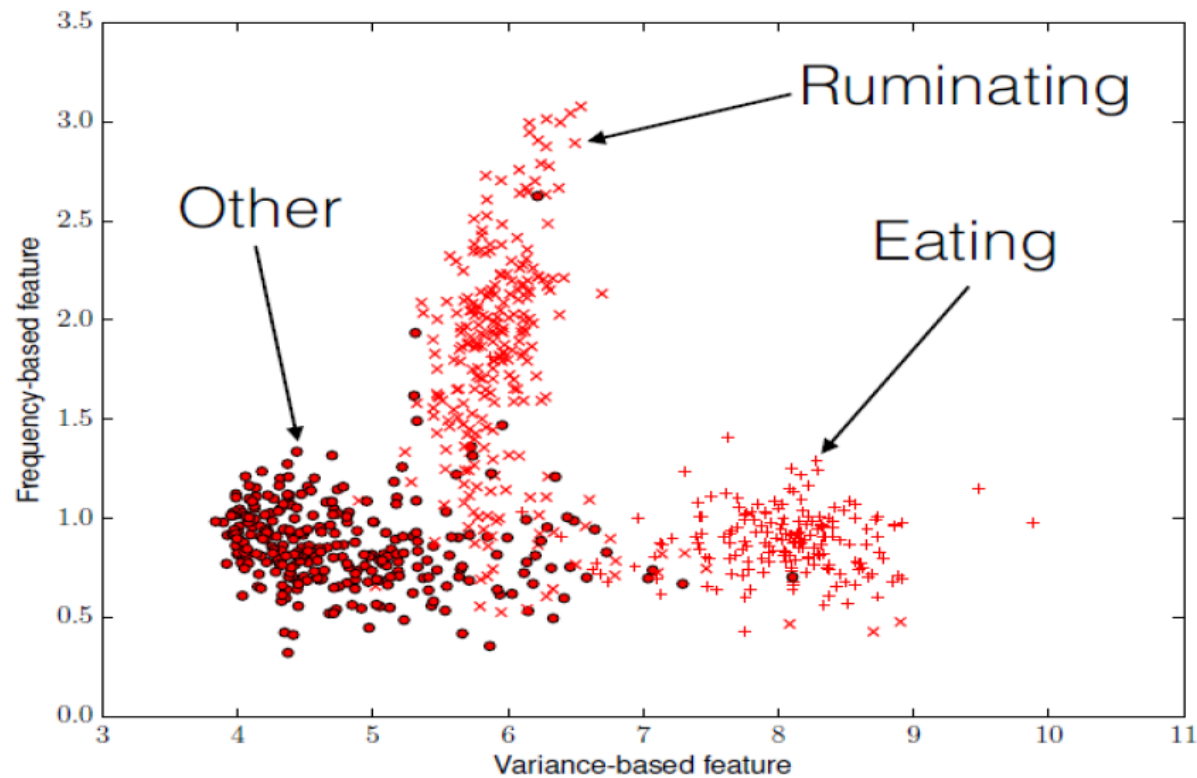
² Silent Herdsman Ltd
Glasgow, Scotland



Dairy ICT Project, example activity data



Clustering Procedure





You may also be interested in the new COST Action FA1308,
DairyCare
www.dairycareaction.org

