Digital Technologies for Primary Industrial Research

19/02/2019

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18-20 February 2019 | Heritage Auckland
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DEVELOPMENT ENGINEERING TEAM

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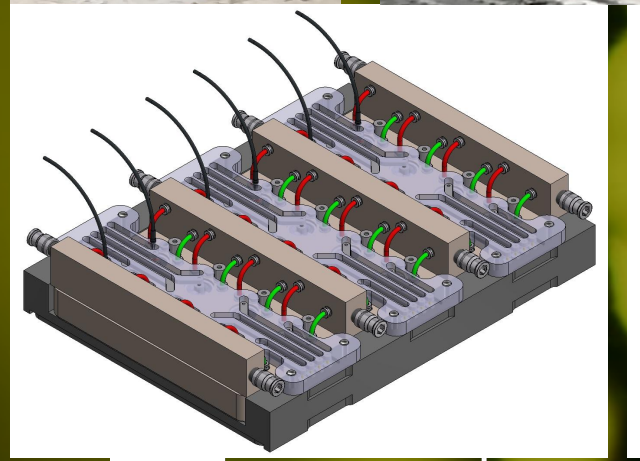
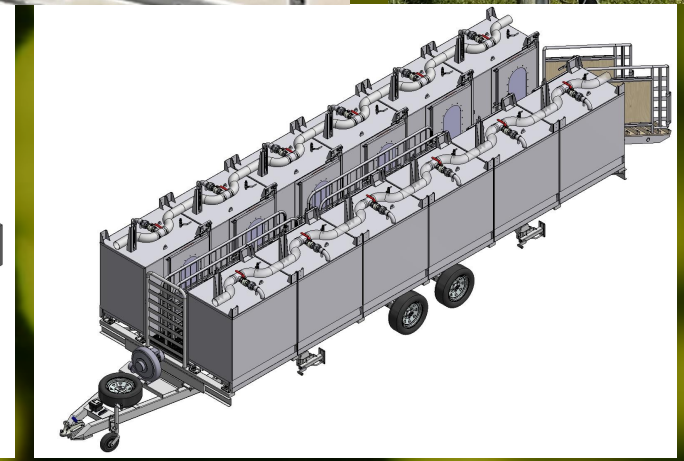
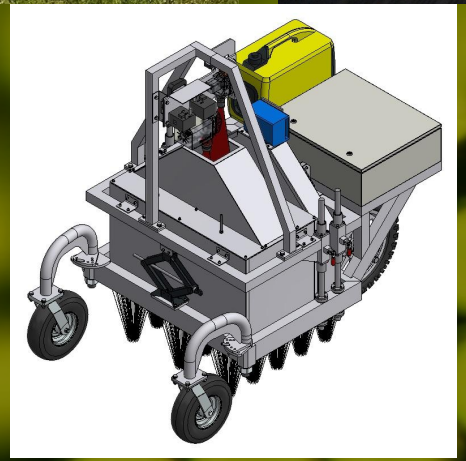
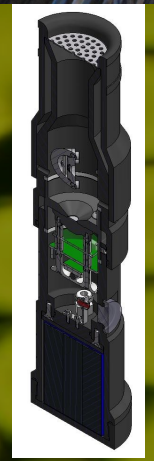
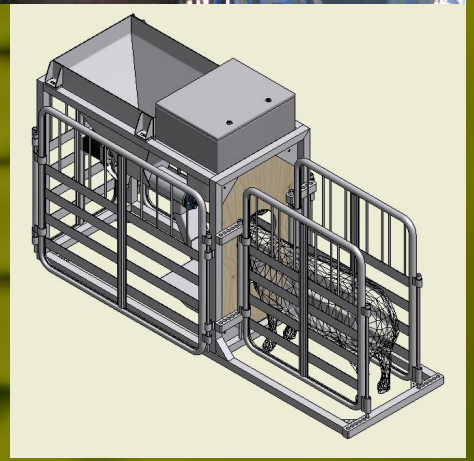
Digital Technologies Solutions Provide











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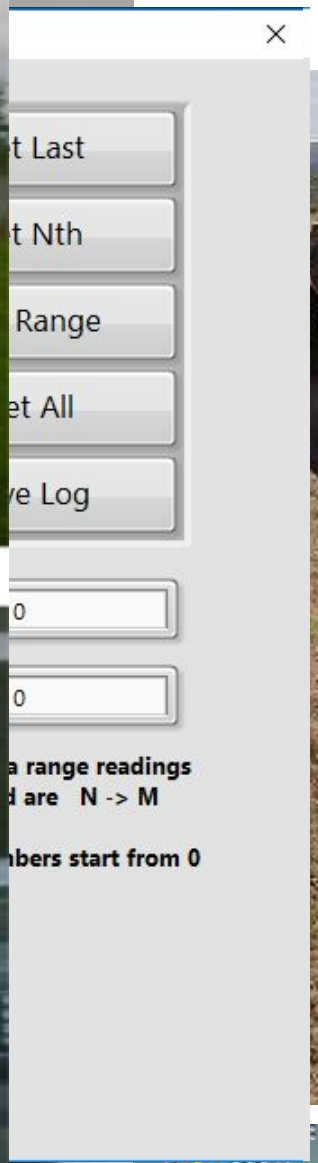

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URINE SENSOR

Publications

- Betteridge, K., D. Costall, S. Balladur, M. Upsdell and K. Umemura (2010). "**Urine distribution and grazing behaviour of female sheep and cattle grazing a steep New Zealand hill pasture**." *Animal Production Science 50(6): 624-629*.
- Betteridge, K., C. Hoogendoorn, D. Costall, M. Carter and W. Griffiths (2010). "**Sensors for detecting and logging spatial distribution of urine patches of grazing female sheep and cattle**." *Computers and Electronics in Agriculture 73(1): 66-73*.
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- Clark, C. E. F., K. L. M. McLeod, C. B. Glassey, P. Gregorini, D. A. Costall, K. Betteridge and J. G. Jago (2010). "**Capturing urine while maintaining pasture intake, milk production, and animal welfare of dairy cows in early and late lactation**." *Journal of Dairy Science 93(5): 2280-2286*.
- Draganova, I., I. Yule, M. Stevenson and K. Betteridge (2016). "**The effects of temporal and environmental factors on the urination behaviour of dairy cows using tracking and sensor technologies**." *Precision Agriculture 17(4): 407-420*.
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- Hoogendoorn, C. J., K. Betteridge, S. F. Ledgard, D. A. Costall, Z. A. Park and P. W. Theobald (2011). "**Nitrogen leaching from sheep-, cattle- and deer-grazed pastures in the Lake Taupo catchment in New Zealand**." *Animal Production Science 51(5): 416-425*.

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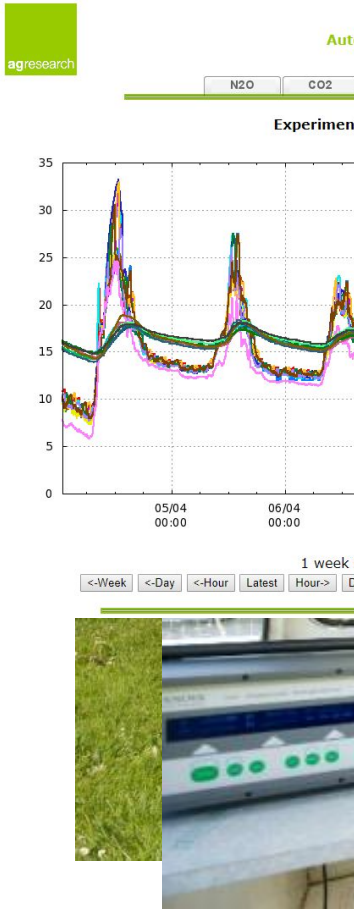

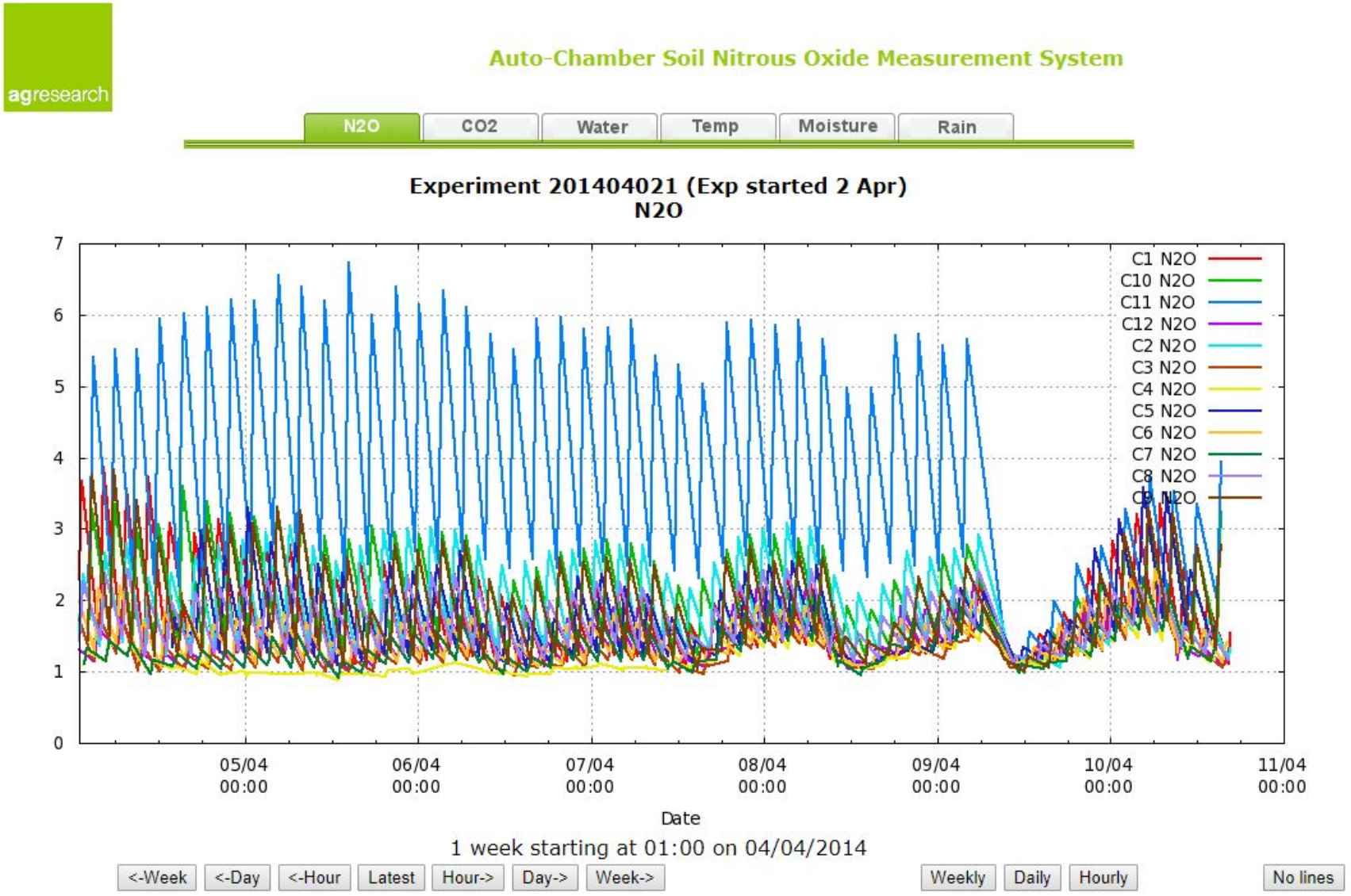

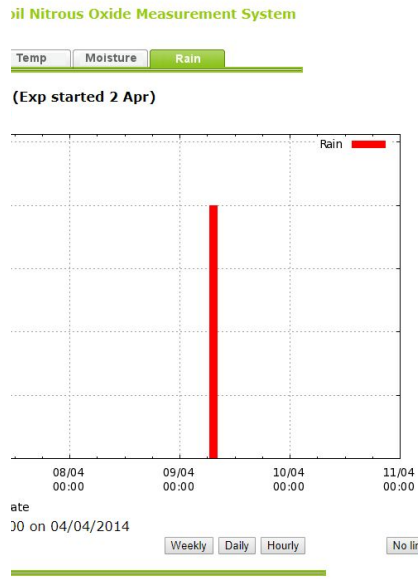

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SOIL N2O MEASUREMENT SYSTEM **Publications**

- de Klein, C., R. Eckard and T. van der Weerden (2010). **Nitrous oxide emissions from the nitrogen cycle in livestock agriculture: Estimation and mitigation**. Nitrous Oxide and Climate Change*, Earthscan: 107-142*.
- de Klein, C. A. M., M. A. Shepherd and T. J. van der Weerden (2014). "**Nitrous oxide emissions from grazed grasslands: Interactions between the N cycle and climate change - a New Zealand case study**." *Current Opinion in Environmental Sustainability 9-10: 131-139*.
- Giltrap, D. L., I. Vogeler, R. Cichota, J. Luo, T. J. Van Der Weerden and C. A. M. De Klein (2015). "**Comparison between APSIM and NZ-DNDC models when describing N-dynamics under urine patches**." *New Zealand Journal of Agricultural Research 58(2): 131-155*.
- Harrison-Kirk, T., S. M. Thomas, T. J. Clough, M. H. Beare, T. J. van der Weerden and E. D. Meenken (2015). "**Compaction influences N2O and N2 emissions from 15N-labeled synthetic urine in wet soils during successive saturation/drainage cycles**." *Soil Biology and Biochemistry 88: 178-188*.
- Kelliher, F. M., N. Cox, T. J. Van Der Weerden, C. A. M. De Klein, J. Luo, K. C. Cameron, H. J. Di, D. Giltrap and G. Rys (2014). "**Statistical analysis of nitrous oxide emission factors from pastoral agriculture field trials conducted in New Zealand**." *Environmental Pollution 186: 63-66*.
- Luo, J., C. Hoogendoorn, T. van der Weerden, S. Saggar, C. de Klein, D. Giltrap, M. Rollo and G. Rys (2013). "**Nitrous oxide emissions from grazed hill land in new zealand**." *Agriculture, Ecosystems and Environment 181: 58-68*.
- Luo, J., J. Wyatt, T. J. van der Weerden, S. M. Thomas, C. A. M. de Klein, Y. Li, M. Rollo, S. Lindsey, S. F. Ledgard, J. Li, W. Ding, S. Qin, N. Zhang, N. Bolan, M. B. Kirkham, Z. Bai, L. Ma, X. Zhang, H. Wang, H. Liu and G. Rys (2017). **Potential Hotspot Areas of Nitrous Oxide Emissions From Grazed Pastoral Dairy Farm Systems**. Advances in Agronomy, Academic Press Inc. 145**:** 205-268.
- Saggar, S., J. Singh, D. L. Giltrap, M. Zaman, J. Luo, M. Rollo, D. G. Kim, G. Rys and T. J. V. Der Weerden (2013). "**Quantification of reductions in ammonia emissions from fertiliser urea and animal urine in grazed pastures with urease inhibitors for agriculture inventory: New Zealand as a case study**." *Science of the Total Environment 465: 136-146*.
- Van Der Weerden, T. J., T. J. Clough and T. M. Styles (2013). "**Using near-continuous measurements of N2O emission from urine-affected soil to guide manual gas sampling regimes**." *New Zealand Journal of Agricultural Research 56(1): 60-76*.
- Van der Weerden, T. J., J. Luo, C. A. M. de Klein, C. J. Hoogendoorn, R. P. Littlejohn and G. J. Rys (2011). "**Disaggregating nitrous oxide emission factors for ruminant urine and dung deposited onto pastoral soils**." *Agriculture, Ecosystems and Environment 141(3-4): 426-436*.
- van der Weerden, T. J., J. Luo and M. Dexter (2014). "**Addition of straw or sawdust to mitigate greenhouse gas emissions from slurry produced by housed cattle: A field incubation study**." *Journal of Environmental Quality 43(4): 1345-1355*.
- Van Der Weerden, T. J., J. Luo, M. Dexter and A. J. Rutherford (2014). "**Erratum: Nitrous oxide, ammonia and methane emissions from dairy cow manure during storage and after application to pasture (New Zealand Journal of Agricultural Research DOI: 10.1080/00288233.2014.935447)**." *New Zealand Journal of Agricultural Research 57(4): 377*.
- van der Weerden, T. J., J. Luo, H. J. Di, A. Podolyan, R. L. Phillips, S. Saggar, C. A. M. de Klein, N. Cox, P. Ettema and G. Rys (2016). "**Nitrous oxide emissions from urea fertiliser and effluent with and without inhibitors applied to pasture**." *Agriculture, Ecosystems and Environment 219: 58-70*.
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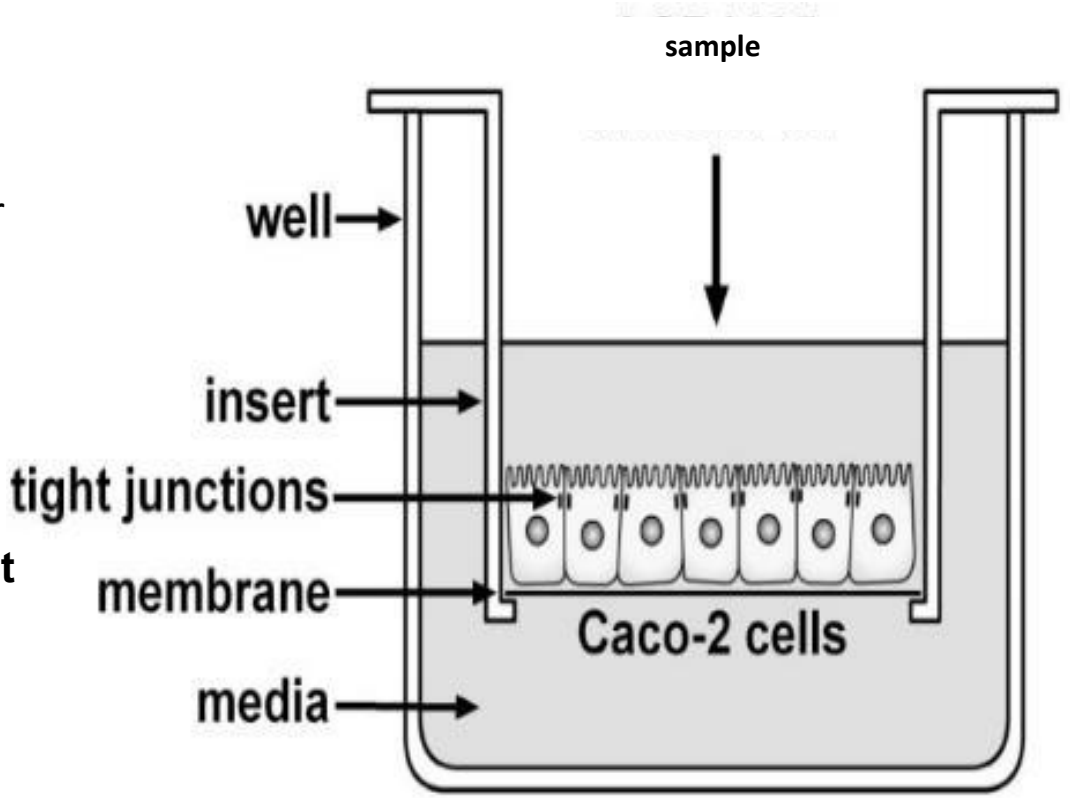
ANAEROBIC CHAMBER

Common cell-based methods

Caco-2 cell model

- Human intestinal epithelial cell line
- Isolated from human colon carcinoma but properties more similar to small intestinal cells
- Spontaneously form apical brush boarders and tight junctions between adjacent cells



Trans-epithelial electrical resistance (TEER) measurement

- Measures resistance across cell layer
- Function of integrity of tight junctions between Caco-2 cells

Gene and protein expression analysis

Confocal/fluorescence microscopy

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ANAEROBIC CHAMBER VERSION 1 (2009)

Dual-environment co-culture system version 1 (DECC v1)

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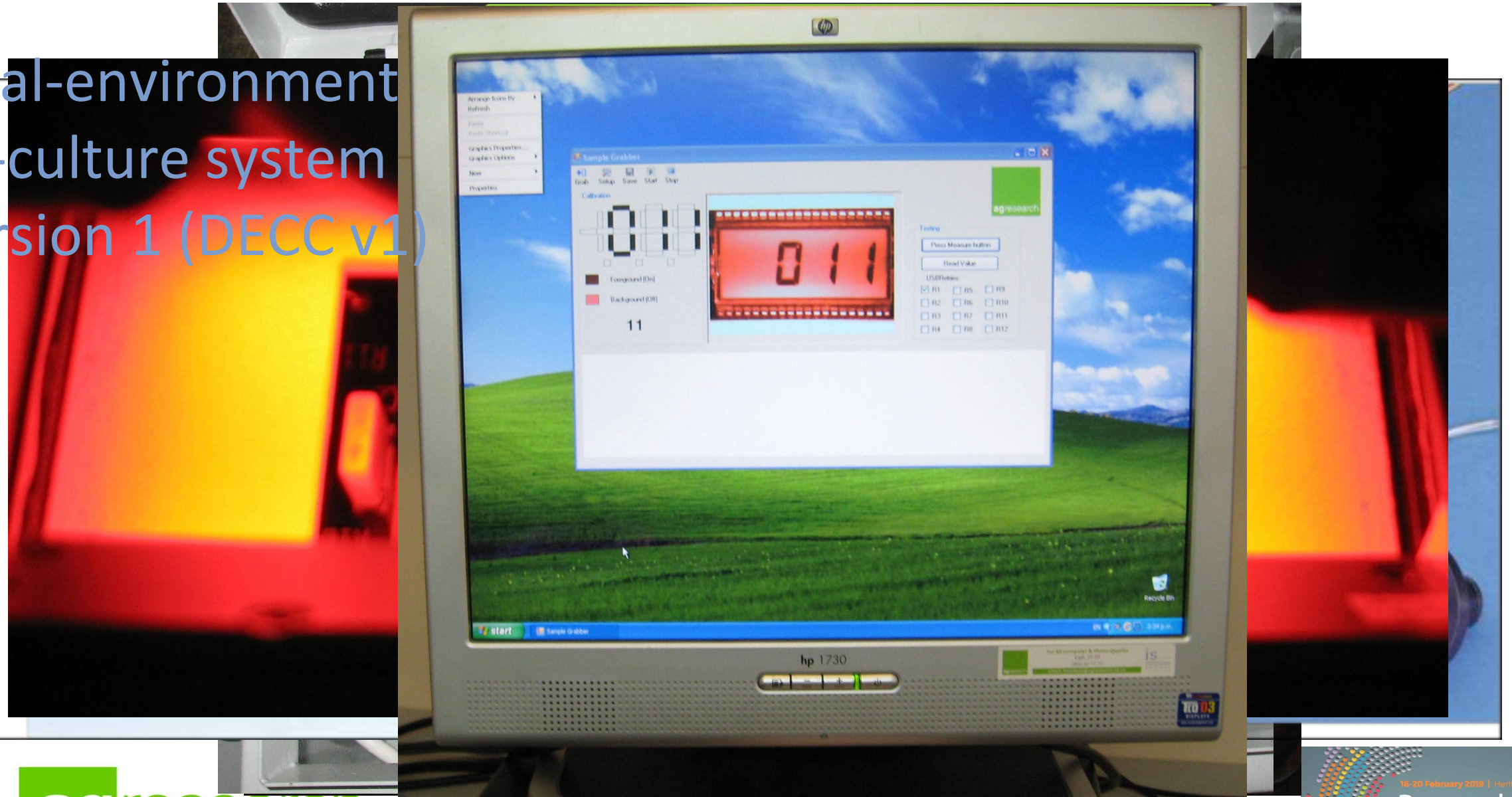

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ANAEROBIC CHAMBER VERSION 2 (2012)

Dual-environment co-culture system version 2 (DECC v2)

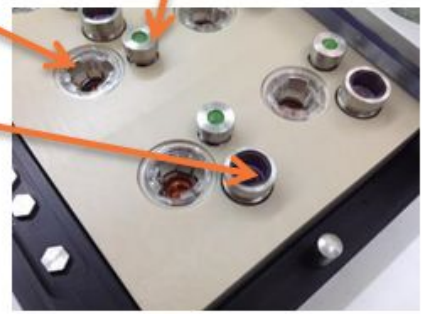
Version 2 (2012)

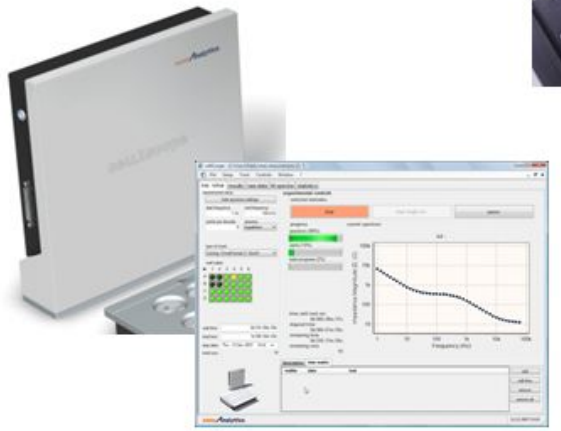
Top electrodes

Septa for basal media sampling

Transwells containing Caco-2 cell layer

One-way pressure relief valve





Connects to nanoAnalytics controller for automated TEER monitoring

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ANAEROBIC CHAMBER VERSION 3 (2018)

Dual-enviro
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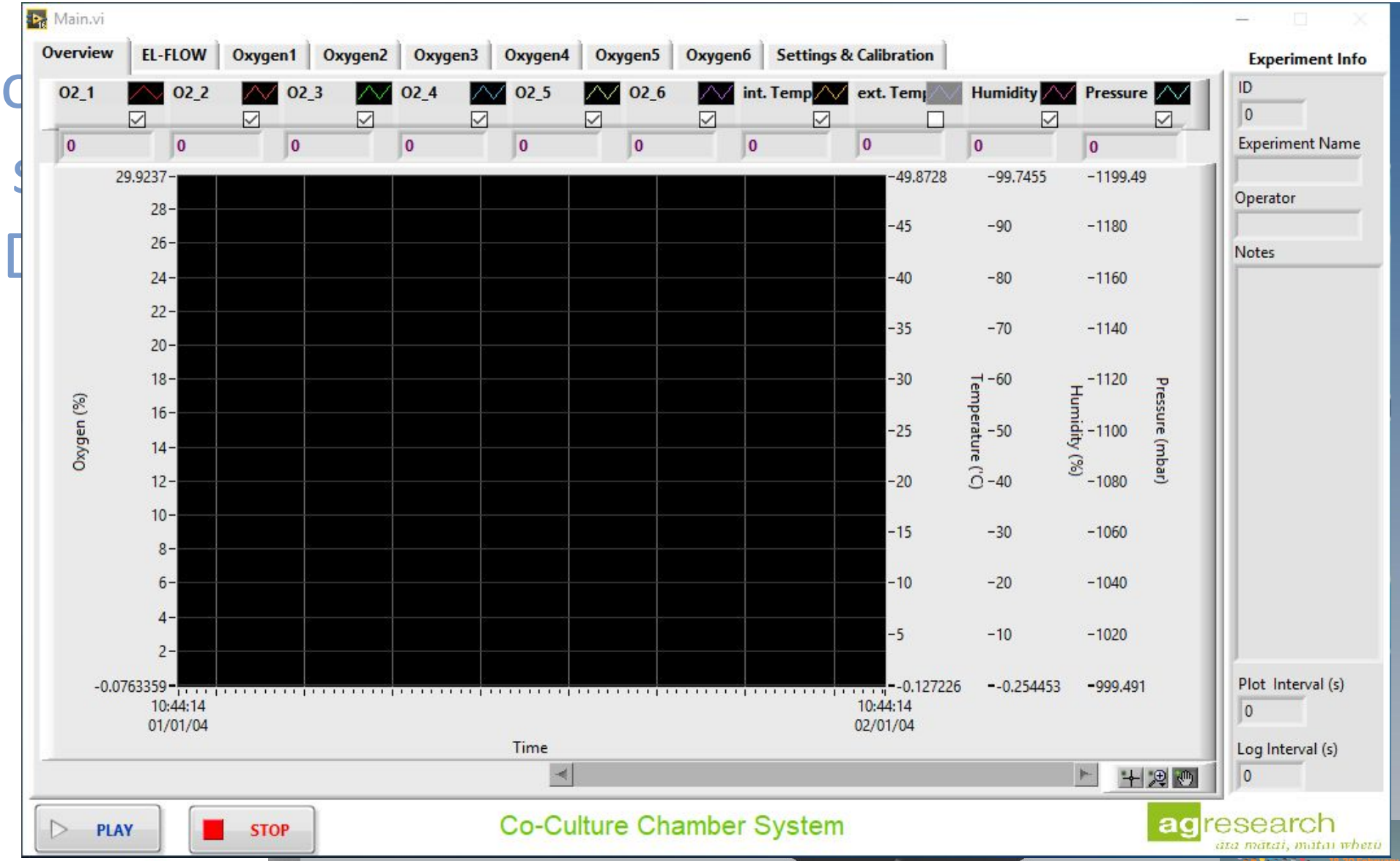

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ANAEROBIC CHAMBER

Publications

- Maier, E., Anderson, R., Roy, N., & Moughan, P. (2016, October). **Toll-like receptor activation by live Faecalibacterium prausnitzii using a novel apical anaerobic co-culture model.** Poster presented at the 5th Beneficial Microbes Conference, Amsterdam, the Netherlands.
- Maier, E., Anderson, R., Roy, N. (2015, November). **Investigating the effects of intestinal obligate anaerobes on immune homoeostasis using a novel apical anaerobic co-culture model.** Paper presented at 60th New Zealand Microbiological Society (NZMS) Conference, Rotorua, New Zealand.
- Maier, E., Anderson, R. C., Altermann, E., & Roy, N. C. (2018). **Live Faecalibacterium prausnitzii induces greater TLR2 and TLR2/6 activation than the dead bacterium in an apical anaerobic co-culture system.** Cellular Microbiology, 20, e12805. doi:10.1111/cmi.12805
- Maier, E., Anderson, R., & Roy, N. (2015, June). **Adaptation of the Toll-like receptor assay to a novel apical anaerobic co-culture model to test the immunostimulatory effect of Faecalibacterium prausnitzii.** Poster presented at the New Zealand Institute of Food Science & Technology (NZIFST) Conference 2015, Palmerston North, New Zealand.
- Ulluwishewa, D., Anderson, R.C., Young, W., McNabb, W.C., van Baarlen, P., Moughan, P.J., Wells, J.M., & Roy, N.C. (2014). **Live faecalibacterium prausnitzii in an apical anaerobic model of the intestinal epithelial barrier.** Cellular Microbiology, 17 (2), 226-240
- Anderson, R. (2015, July). **Interactions between Faecalibacterium prausnitzii and intestinal cells in a dual-environment co-culture system.** Paper presented at the 8th Asian Conference on Lactic Acid Bacteria (ACLAB8) Bangkok, Thailand.
- Maier, E., Anderson, R., & Roy, N. (2014, July). **Effect of Faecalibacterium prausnitzii on Toll-like receptor activation in an apical anaerobic co-culture model.** Paper presented at NZ Australasian Society for Immunology Annual Scientific Meeting, Palmerston North, New Zealand.
- Maier, E., Anderson, R., & Roy, N. (2018, June**). Dead or alive: does it matter for host-microbe interactions in the intestine?** Poster presented at the Rowett-INRA 2018 Conference 'Gut Microbiology: No Longer the Forgotten Organ', Aberdeen, Scotland.
- Anderson, R. C., Maier, E., Ulluwishewa, D., & Roy, N. C. (2015, July). **The effect of live Faecalibacterium prausnitzii on Toll-like receptor activation in a dual-environment co-culture system.** Abstract for paper presented at 8th Asian Conference on Lactic Acid Bacteria, Bangkok, Thailand.
- Anderson, R. (2015, November). **Application of a dual-environment co-culture system for studying food-host-microbe interactions.** Paper presented at NZMS 2015, 60th New Zealand Microbiological Society Conference, Rotorua, New Zealand.
- Maier, E., Anderson, R., & Roy, N. (2018, June). **Understanding how Faecalibacterium prausnitzii maintains intestinal barrier function and immune homeostasis.** Poster presented at the 7th International Human Microbiome Consortium (IHMC 2018) Congress, Killarney, Ireland.
- Maier, E., Anderson, R., & Roy, N. (2017, October). **Deciphering the mechanisms used by Faecalibacterium prausnitzii to maintain intestinal homeostasis.** Poster presented at the Food Structures, Digestion & Health International Conference (FSDH 2017), Sydney, Australia.
- Maier, E., Anderson, R., & Roy, N. (2017, July). **Effect of Faecalibacterium prausnitzii on intestinal homeostasis.** Paper presented at the New Zealand Institute of Food Science & Technology (NZIFST) annual conference, Nelson, New Zealand.
- Maier, E., Anderson, R. C., & Roy, N. C. (2017). **Live Faecalibacterium prausnitzii does not enhance epithelial barrier integrity in an apical anaerobic co-culture model of the large intestine.** Nutrients, 9(12), 1349. doi:10.3390/nu9121349
- Anderson, R. (2015, September). **A dual-environment co-culture system to better evaluate effects of food ingredients on intestinal barrier integrity in physiologically relevant conditions.** Paper presented at 8th Probiotics, Prebiotics & New Foods, Rome, Italy.
- Anderson, R. (2016, June). **Novel in vitro model to study the effects of host-microbe-food interactions on intestinal barrier function.** Keynote presentation at Korean Society of Microbiology & Biotechnology 2016 International Symposium & Annual Meeting, Daejeon, South Korea.
- Anderson, R., Maier, E., Ulluwishewa, D., & Roy, N. (2016, October). **A dual-environment co-culture system to better evaluate effects of host-microbe-food interactions on intestinal barrier function in physiologically relevant conditions.** Poster presented at the 5th Beneficial Microbes Conference, Amsterdam, the Netherlands.
- Anderson, R. (2016, June). **Novel in vitro model to study the effects of host-microbe-food interactions on intestinal barrier function.** Presented to Seoul National University, Seoul, Korea
- Anderson, R. (2016, September). **Novel in vitro model to study the effects of host-microbe-food interactions on intestinal barrier function**. Presented to University of Missouri staff and students at Columbia, MO
- Maier, E., Anderson, R.C., & Roy, N.C. (2015). **Understanding how commensal obligate anaerobic bacteria regulate immune functions in the large intestine.** Nutrients, 7(1), 45-73
- Anderson, R. (2018, October). **Cell-based models to study the effect of food ingredients on intestinal barrier function.** Paper presented at the Korean Society of Food Science and Nutrition International Symposium and 50th Anniversary Annual Meeting (KoSFoST 2018), Busan, South Korea.
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THANKS

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