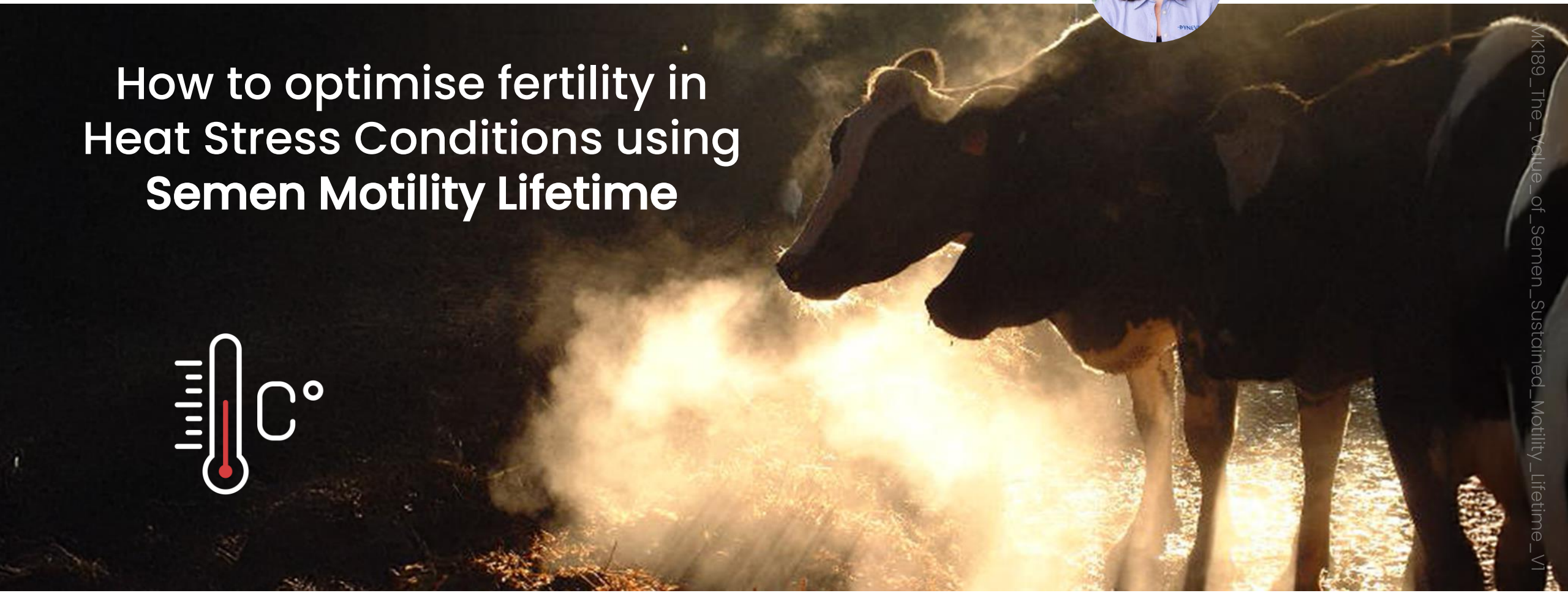
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Hannah Nicholson
Validation Scientist

How to optimise fertility in Heat Stress Conditions using **Semen Motility Lifetime**

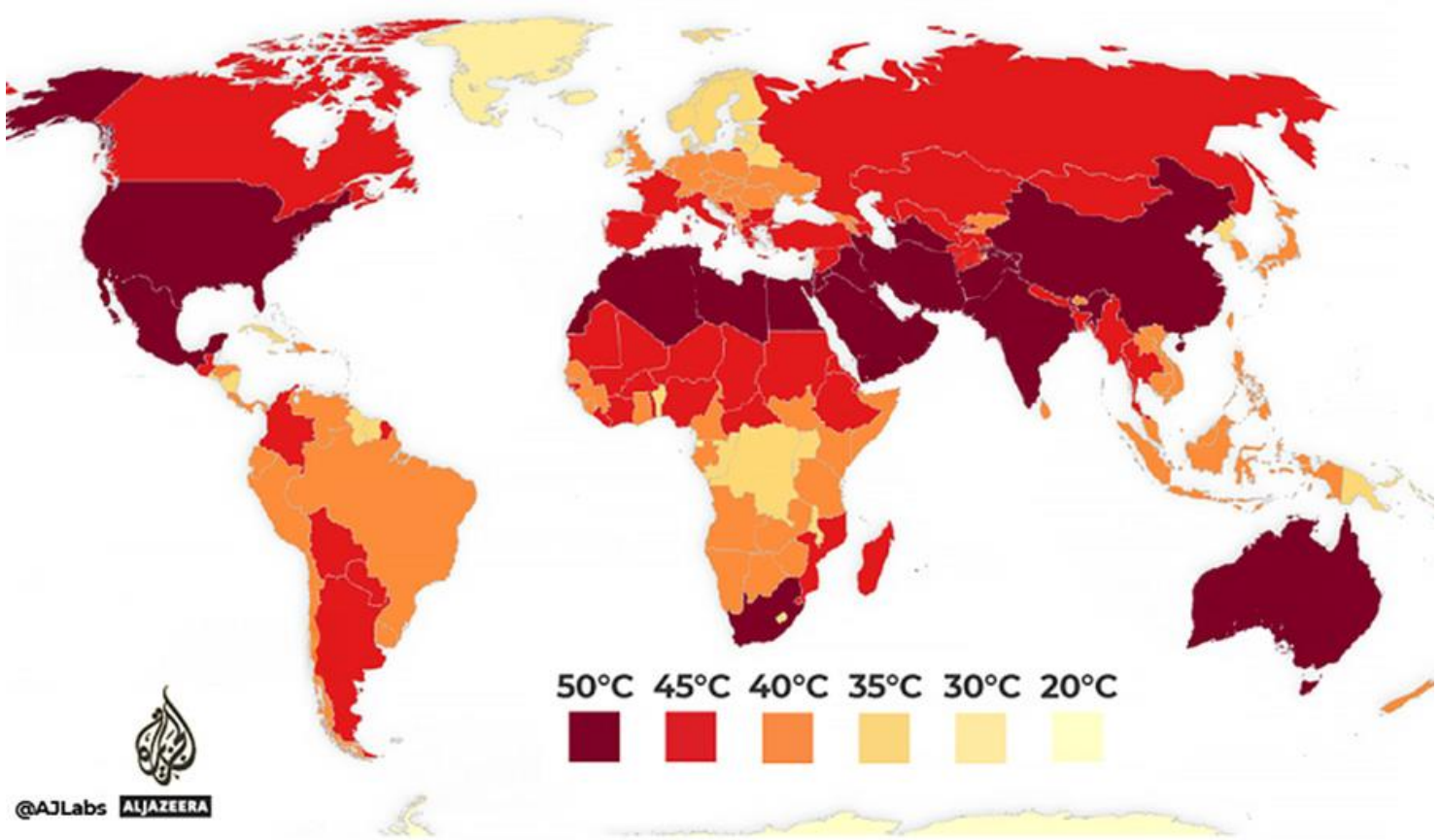


MK189_The_value_of_Semen_Sustained_Motility_Lifetime_V1

AFRICAN JERSEY FORUM
JERSEY GENE BANK
JERSEY ISLAND Genetics
Royal Jersey AGRICULTURAL & HORTICULTURAL Society
JOA JERSEY OVERSEAS AID
UKSIRES
Rwanda Jersey Farmers and Breeders Association RWAJEFBA
RIPPLE EFFECT It starts on a Rwandan farm
RAB RWANDA

Why is Heat Stress a Problem?

Red and dark red regions > 45°C



AJLabs, "Mapping the hottest temperatures around the world", Al Jazeera, 5 July 2023.

- Body temperature inside a cow can reach 41.5°C.
- Semen must be able to maintain motility long enough to fertilise an egg.
- Can the temperature inside a cow affect semen quality?

Yan, et al., *Journal of Thermal Biology,* 2021; Baruselli WBC, 2022

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Novel Research into Heat Stress

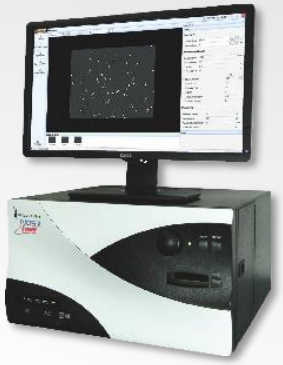


- Can we test how different genetics cope with high temperatures?
- And then select these genetics based on their robust performance
- We tested 19 different conventional frozen straw batches

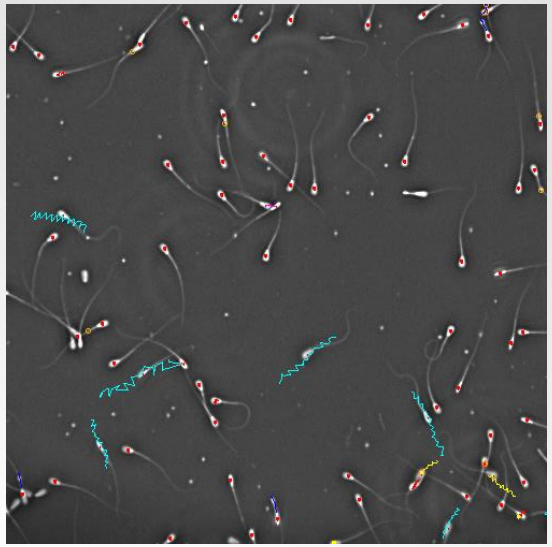


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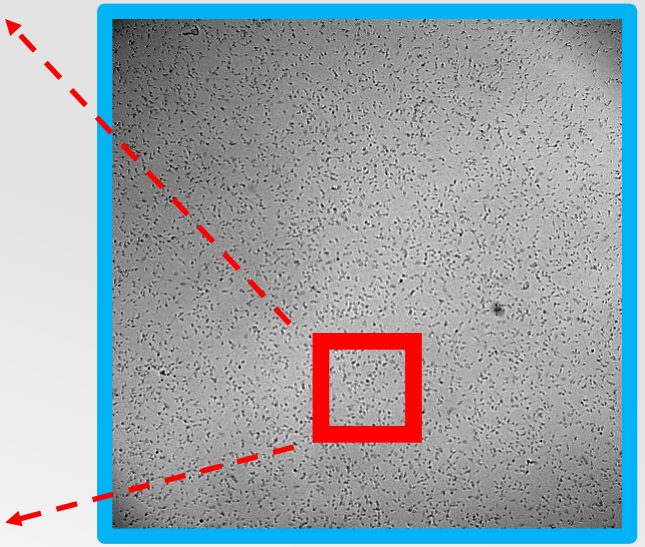
Types of Semen Analyser



IVOS® II Sperm Analysis System from Hamilton Thorne



20 times more cells analysed
30s long video (60x longer)





Dynescan by Dyneval®

Technology	CASA: Hamilton Thorne, iSperm, Androvision	Dynescan
Method	Cell tracking	Light intensity fluctuations
Volume analysed	1.5 pL	33.8 pL
Concentration Range	10-35 million cells/ml	1-550 million cells/ml
Dilution for conventional straws	REQUIRED	NOT REQUIRED

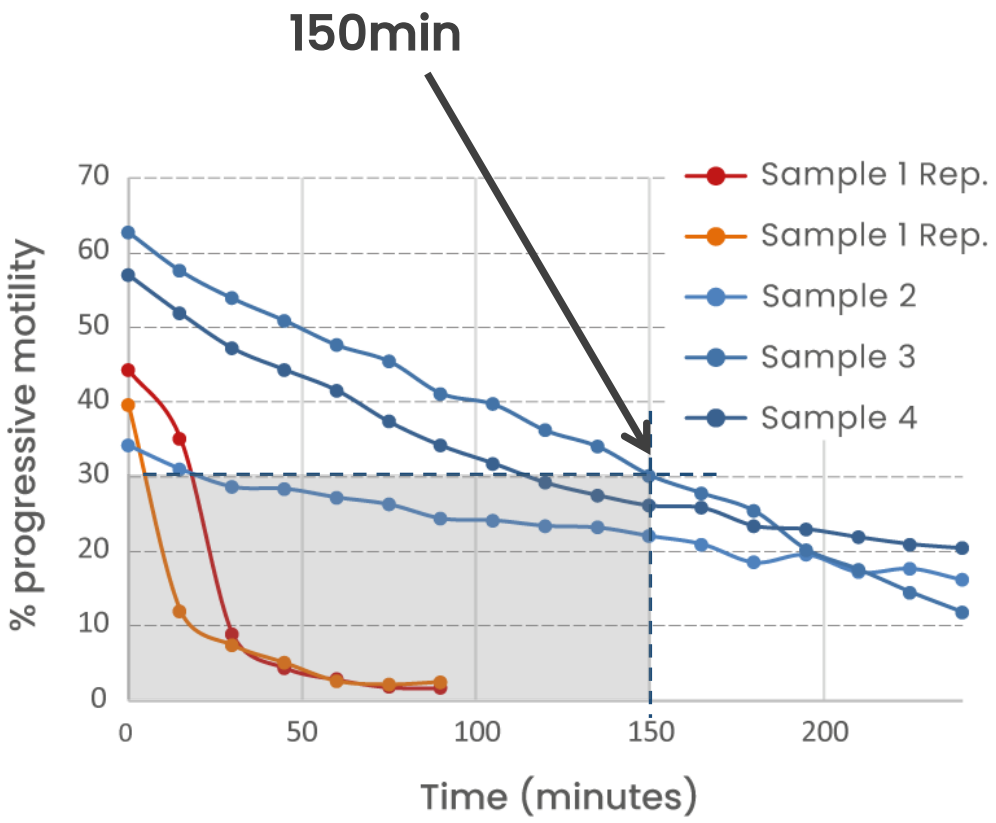
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DYNESCAN
The only technology capable of measuring sustained motility over time
Samples at 37.5°C
DYNEVAL®

Semen Motility Lifetime



5 samples from the same Bull



Poor fertilisation rates and poor embryo growth are correlated with short SMLs. Fertility&Sterility 65(2), 1996

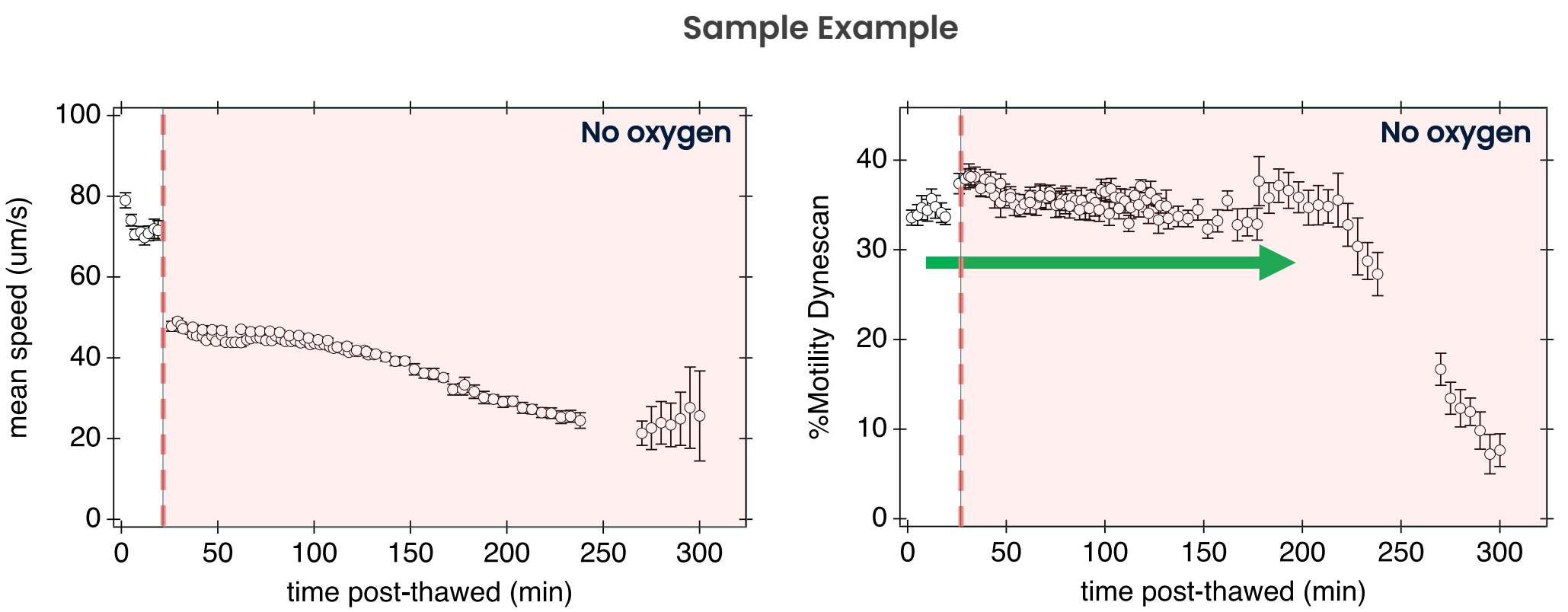
SML may depend on:

- DIET
- INFECTION
- OBESITY
- MEDICATION

Goal: Improving male fertility

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Can the Semen Maintain Motility in Low Oxygen?



- Oxygen content
- Metabolic health
- Good flagellum structure and function
- Damage from toxins
- The importance of extender or seminal plasma

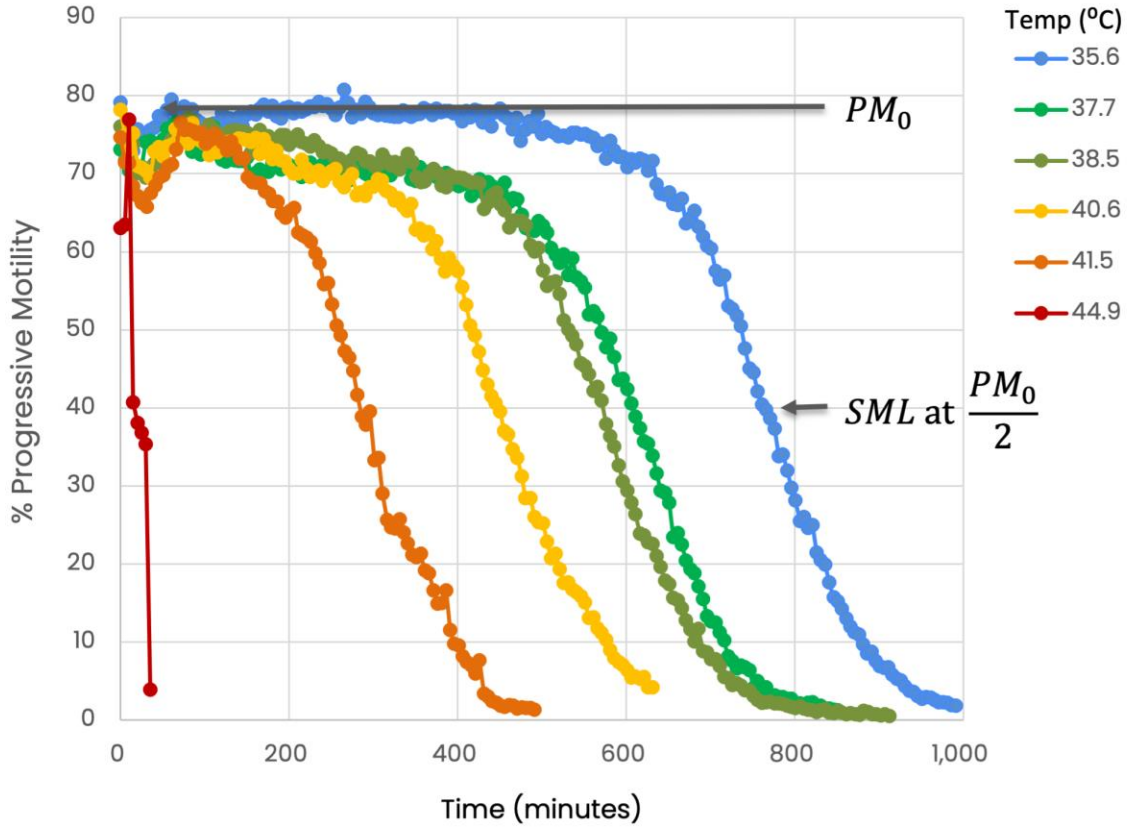
Alvarez et al., Fertility & Sterility, 1996
DeJarnette et al., J. Dairy Sci., 2004
Bacinoglu et al., Animal Repro, 2008
Sellem et al., Therionology, 2015
Schulze et al., Therionology, 2021
Bremer et al., Animal Repro Sci, 2023

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SML and Heat Stress

Cow body temperature can reach up to 41.5 °C
(Yan, et al., *Journal of Thermal Biology,* 2021; Baruselli WBC, 2022)

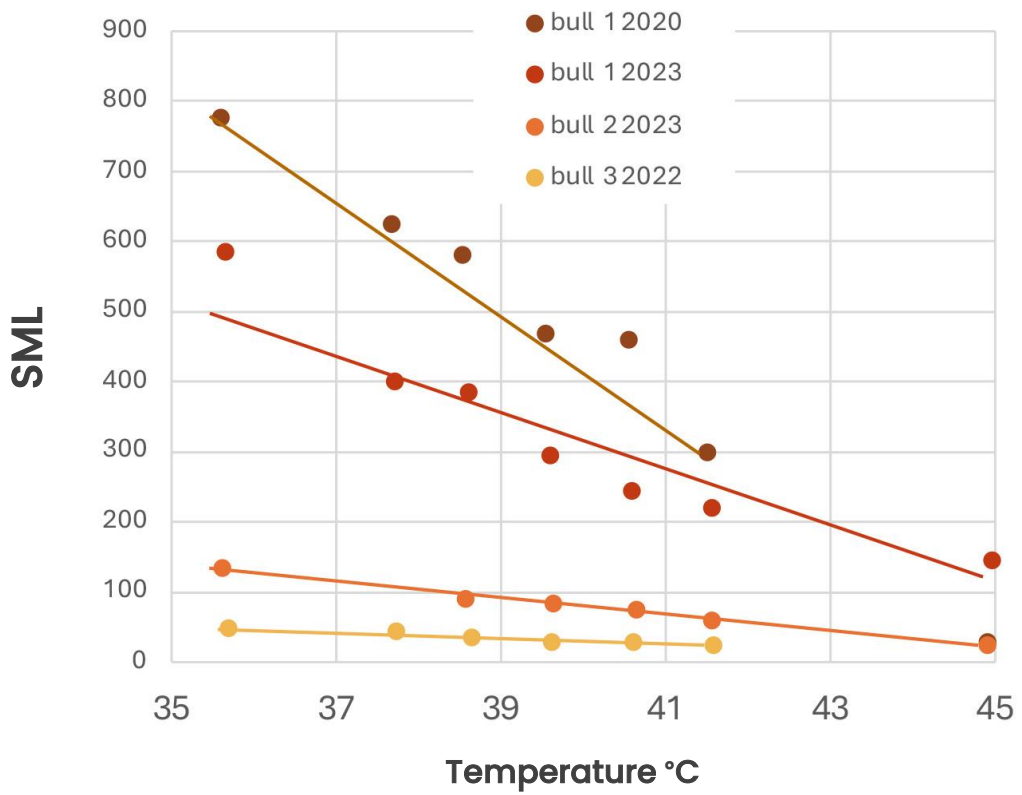
- Temperatures from 35.6 °C to 45°C
- Measured in sealed conditions similar to post-insemination
- The higher the temperature, the shorter the SML
- Do some batches decline more rapidly with temperature than others?



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SML and Heat Stress

Can we identify semen ideal for using in hot regions?



Some batches handle higher temperatures better

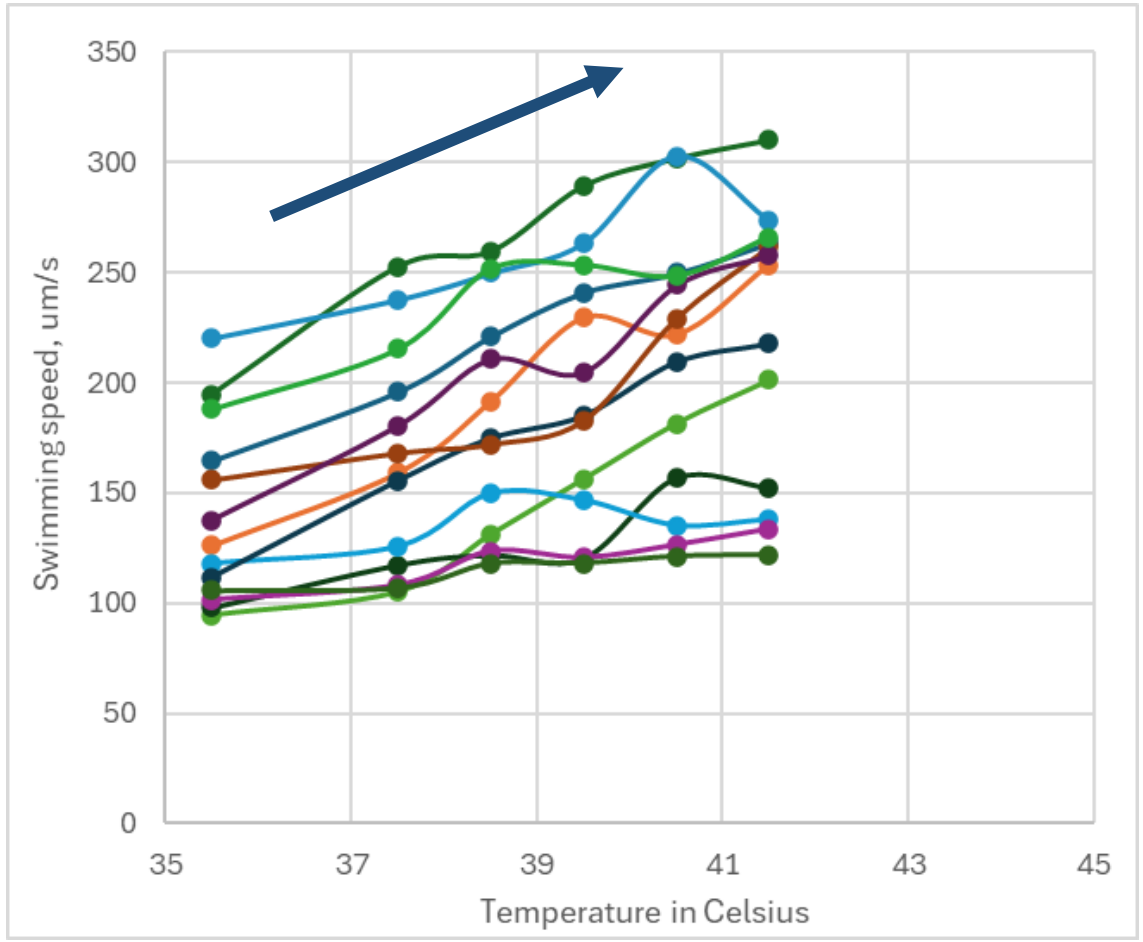
Accelerated stress tests: the SML at 41.5 °C is ~ **half** that measured at 37.5°C

Sustained Motility Lifetime (SML)) measured for conventional semen taken from three different bulls as a function of temperature. The inset shows the SML, normalised by the SML at body temperature (37.5°C), decreases linearly with a gradient of -0.12±0.02 for all samples.

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Aerobic Swimming Speed and Heat Stress

Insights into the metabolic health

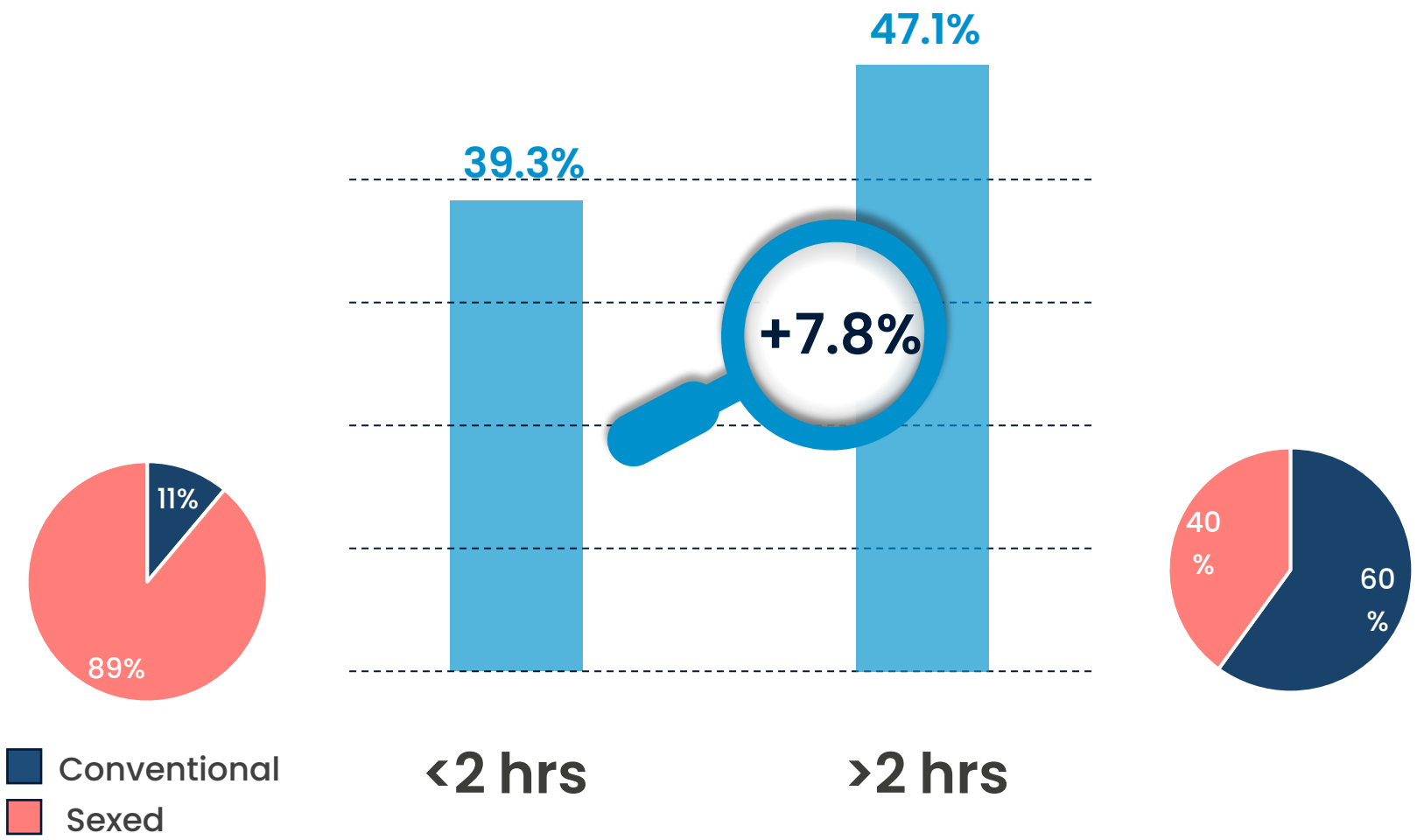


- Semen swims faster at higher temperatures

  -> Viscosity?
  -> Increased metabolic rate?

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Conception Rates and Breeding Decisions with SML



Based on:

- 2000 inseminations
- 7 farms
- 22 batches
- No info on cows/heifers, heat, or technicians.

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Benefit to Rwanda



SUSTAINABLE DEVELOPMENT GOALS

Per herd of 1000 cows per year
7.8% higher conception rates

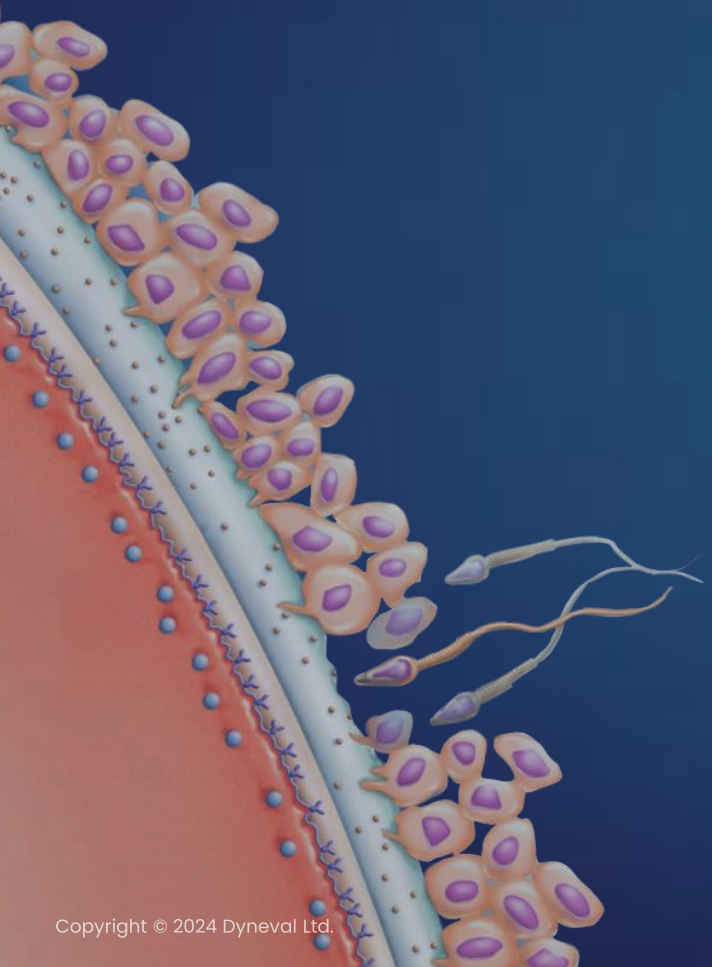
16,000 KG extra protein	**5% uplift** in annual profit	Equiv. to planting **8,000 trees** every year per farm
2 ZERO HUNGER	8 DECENT WORK AND ECONOMIC GROWTH	13 CLIMATE ACTION

Sustainability calculations ratified by

Impact Forecast

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There is Lots More Potential for SML …



- Tool for improving Batch consistency
- Precise monitoring of Straw handling and transportation
- Reliable QC for any stage from production to insemination
- Fresh semen testing on farm or in the lab

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DYNEVAL®

A Platform Technology for Motility Measurement

SCAN ME



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Validation Scientist

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