Male Egg Layer Embryo Selection Initiatives

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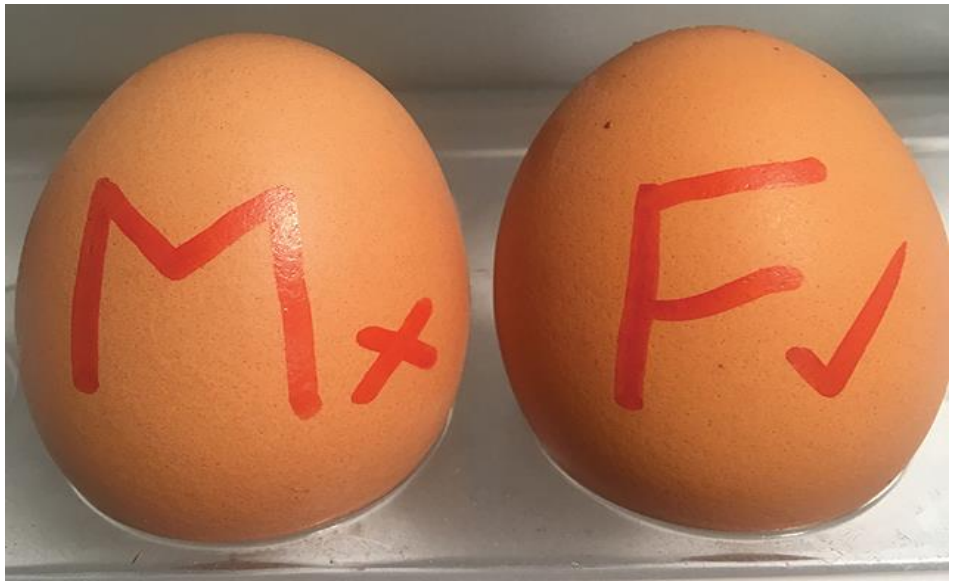
SPECIALISED BREEDERS AUSTRALIA

Male Egg Layer Embryo Selection Initiatives

WHY it is important !!!

Every year and all over the world millions of day old male chicks – “Brothers” of our laying hens, are culled because they can neither lay eggs nor they have much meat on them like broilers or not economical to grow them for meat.



Options to stop culling day-old males

Carcasses of different origin (70 days of age)

Slow growing broiler
~ 2,8 kg carcass weight

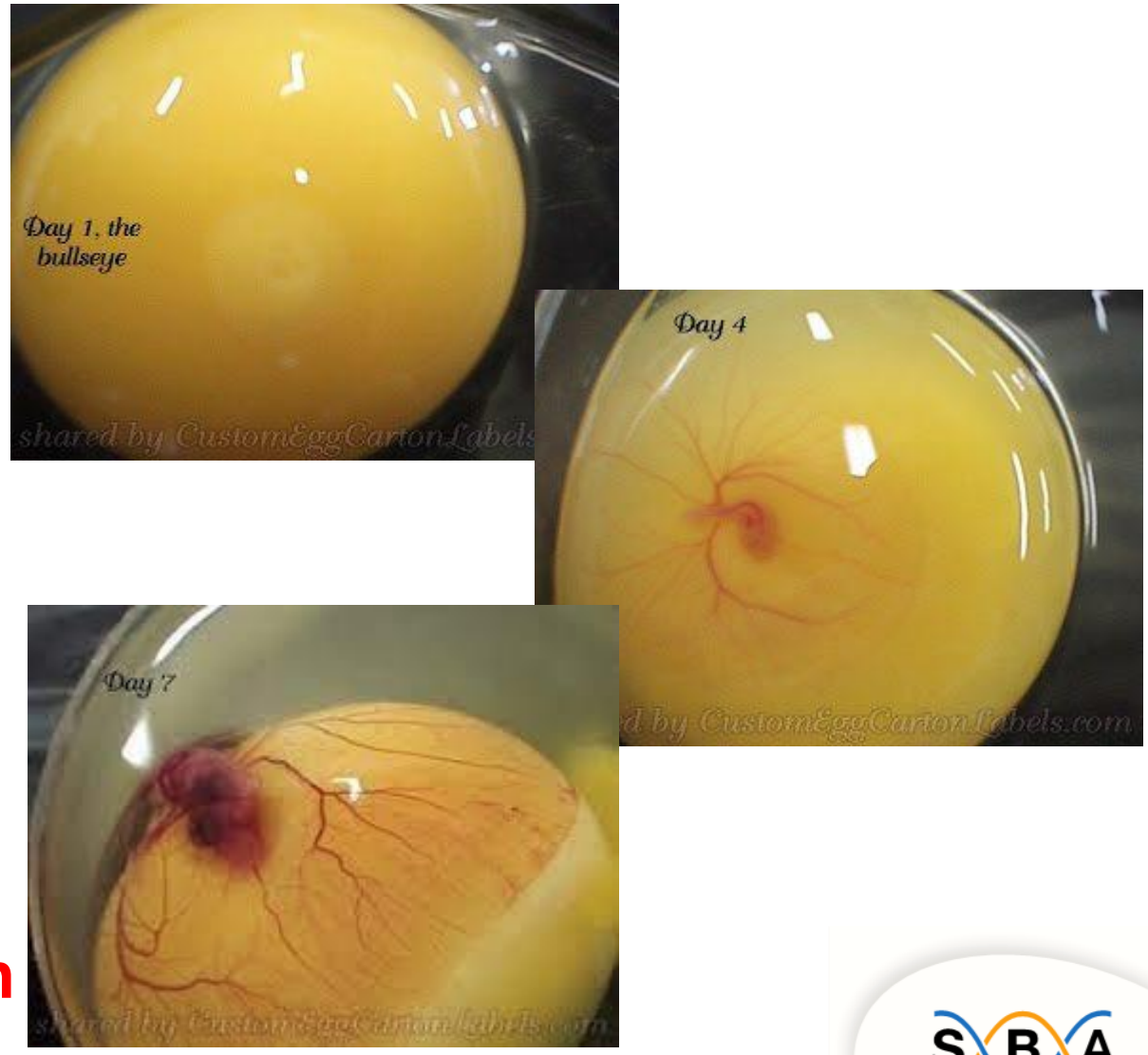
Male layer hybrid
~ 1 kg carcass weight

Male dual purpose breed
~ 2 kg carcass weight

Sex determination: Requirements ?

- Early Detection
- Accurate
- Fast
- No negative impacts on
  - Embryo
  - Layer performance
- Use of male embryos/eggs – options ?
- Inexpensive
- Sustainable
- **Consumer acceptance:**

not too late/best before incubation



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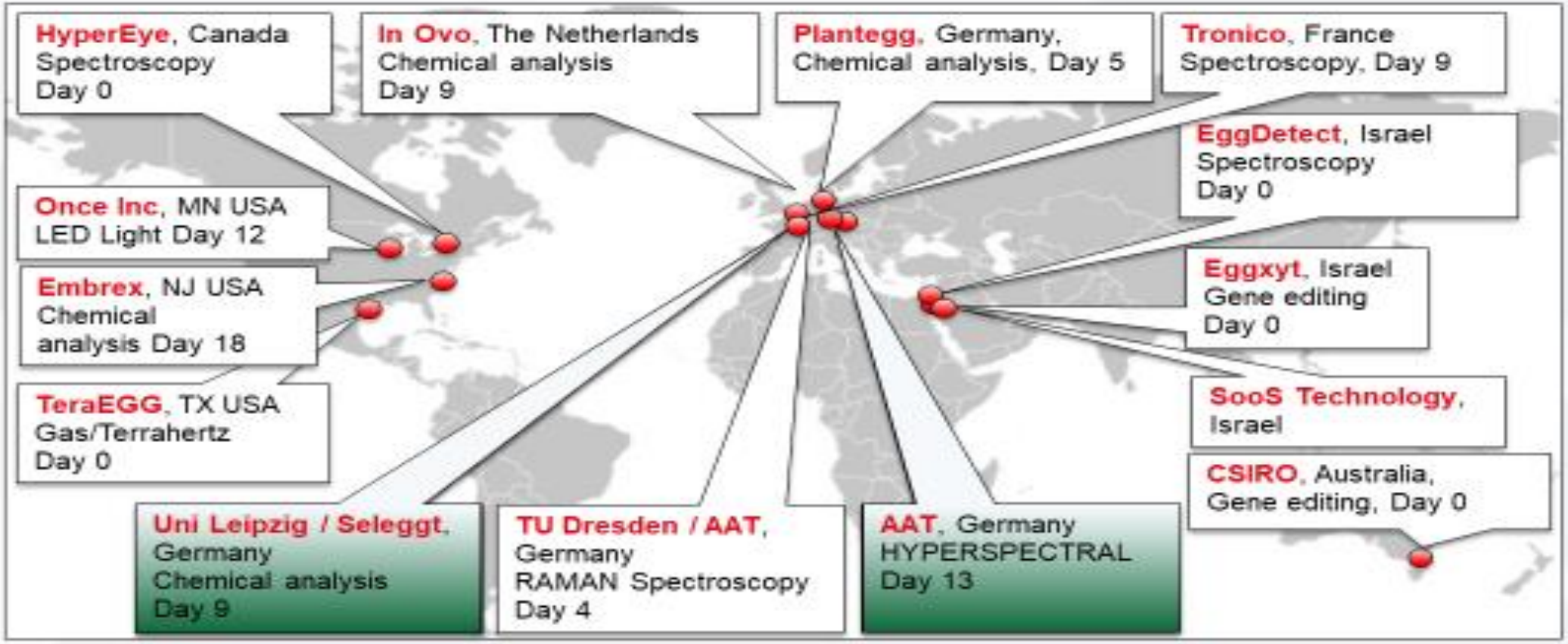
- Today, there is a bunch of research teams worldwide that are working on this issue to find potential solutions. We have to investigate all of them to see if the method is reliable and can be used for industrial application.
- There are approaches based on **Gene Editing** methods like in Australia or Israel, where a sexing before the incubation can be done –Gene modification?
- There are several approaches based on **Chemical Analysis** – mostly invasive – taking out samples of the egg.
- And there are approaches based on **Spectroscopy** like Tronico in France or HyperEye in Canada.
- Germany who is in the forefront of the development has promoted two approaches: the **Endocrinological** based and the **Spectrocopical** one.

**The only approaches which are market-ready at the moment is the Seleggt method and AAT´s Hyperspectral analysis.

LOCATIONS OF SEX DETERMINATION TRIALS WORLDWIDE



Source: AAT

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RAMAN SPECTROSCOPY

(optical on hatching day 4)

BASED on

In most animals including birds, the sex information is genetically encoded. For instance, cells of male domestic chickens possess larger chromosomes, enabling sexing by optical spectroscopy based on different DNA amount.

Infrared Raman Spectroscopy

(optical)

- Possible from day 4 after brooding starts
- Non-contact measurement
- A hole has to be made in the shell (diameter 12 mm)

Photo: R. Preisinger

Infrared Raman Spectroscopy

(optical)

INFRARED-RAMAN-SPECTROSCOPY

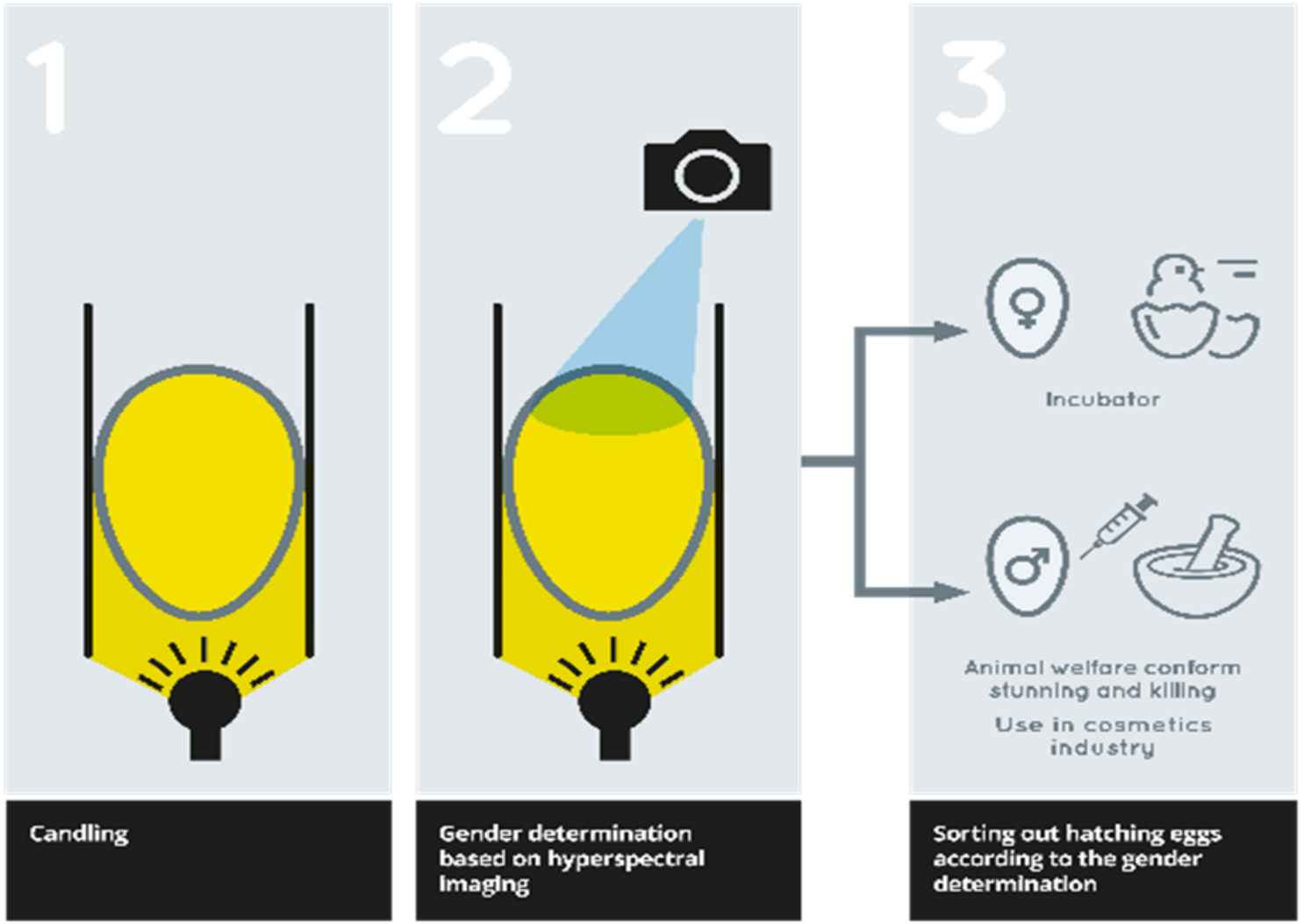
→ **It is currently not foreseeable when this technology will be market ready ?**

Mainly due to major Variance in determination accuracy

HYPERSPECTRAL IMAGING

(optical on hatching day 13)

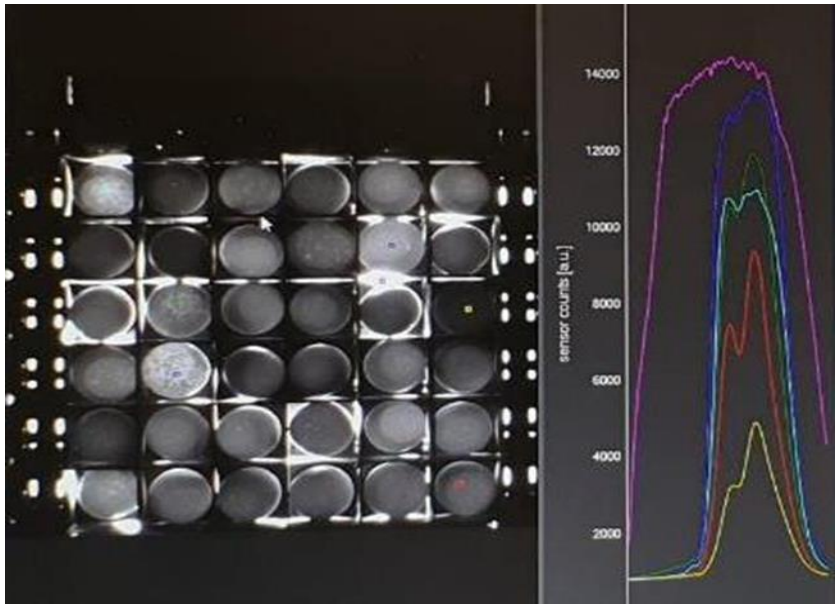
SEX DETERMINATION – HYPERSPECTRAL



Source: AAT

SEX DETERMINATION – HYPERSPECTRAL- CHEGGY

Candling of individual Eggs



Measurement

Sex Determination

Area	White Egg (%)	Brown Egg (%)
Asia	44	56
China	30	70
CIS	44	56
Middle East	81	19
Africa	7	93
Europe	16	83
North America	92	8
South America	59	41
World	47	53

Based on :
Gender specific plumage colors in Brown Layer Lines, sex can be already be determined in the embryo based on its first feathers

CHEGGY from AAT– is not only the first technical solution suitable for the high volumes of a modern hatchery, but also currently the most cost effective alternative to culling male day old chicks.

Accuracy of 98% with Hy-Line Brown layer chicks is possible.

IN OVO SEXING HYPERSPECTRAL IN FRANCE

Photos: AAT

- First commercial flock produced in Dec 2019 with Hy-Line France
- Regular chick delivery since the beginning of 2020

Hyperspectral- CHEGGY

- https://drive.google.com/file/d/1azf_ZPIues6_te5_wqOostR4cfxBpdUE/view?usp=drive_link

Characteristics of the method

- **Non-invasive process** of gender determination
  - → No influence of embryonic development through measuring
  - → No cross contamination risk, positive hygiene and animal-welfare aspects
  - → No risk of higher antibiotics usage
- Hatching eggs are robust to be handled at 13 days incubation
  - → **No hatch losses**
- Fully automated **high-speed measuring** possible (>20,000 eggs per hour)
- **No expensive consumables / chemicals**
  - → environmentally friendly process
- **Accurate and highly cost efficient**
- Easy to operate
- Brown layers (brown eggs make up for 75% of the EU market)- Can be use only in Brown Layers

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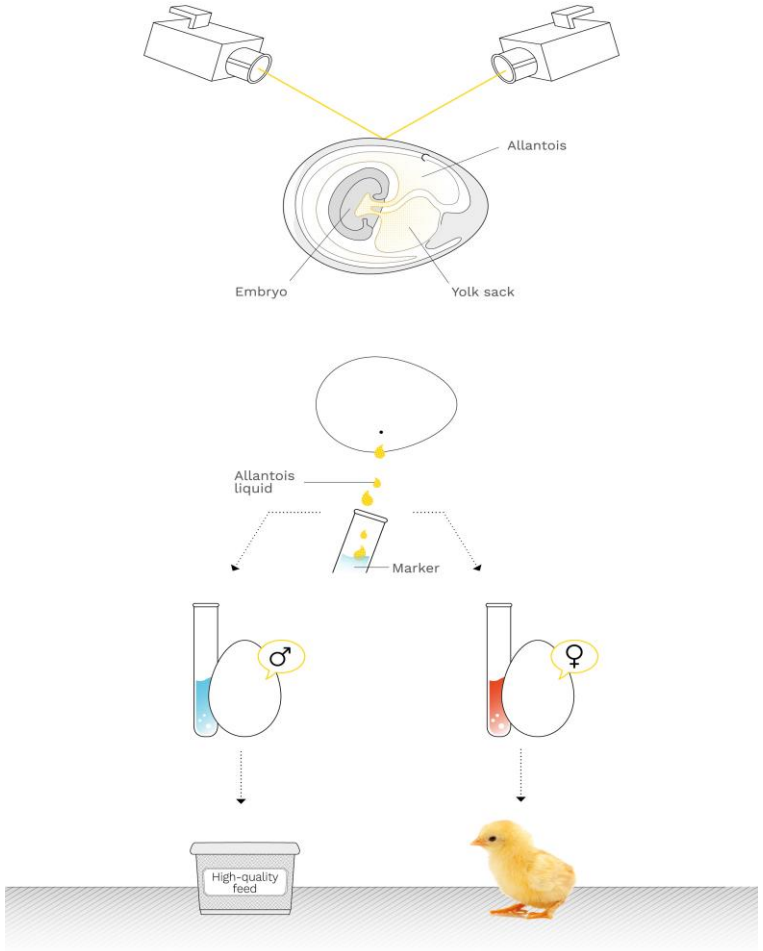
SELEGGT METHOD

- In all fertilized hatching eggs, lasers create a fine hole in the eggshell
- Sampling of allantoic fluid
- The allantois fluid of a female hatching egg contains estrone sulphate, a female hormone.
- Endocrinological analysis through ELISA test.



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COMPARISON OF THE PROCEDURES SELEGGT/AAT

	Endocrinological SELEGGT	Hyperspectral AAT
Brooding day	day 9	day 13
Accuracy	hormone concentration depending on age (97%)	feather colour variation (97%)
Analysis time	> 20 minutes	high throughput, sec.
Egg treatment	invasive with hole	non invasive
Intervention	contamination risk	no
Capacity	3 000 eggs/h	20 000 eggs/h
Embryo losses	low	no
Consumables	high demand for chemicals	no
Expected additional consume egg costs	approx. 2 - 3 cent	approx. 0,5 - 1 cent

Source: AAT

Fully Automatic Hyperspectral System

- Capacity of 20,000 hatching eggs per hour

Sexing Line -Ready for use

Stunning Unit

Photos: AAT

Future!

- Valuation of inovo sexing methods:
  Before Day 7 : Best approach for a long-term Solution
  Between 7-15 : Available technologies with hormone and hyperspectral analysis / **clear improvement** to the current day-old males culling process
  After day 15: Definitely perception of pain / no game-changing progress to the current practiceses.

- The **hyperspectral technology is ready for use** in the form of CHEGGY and has proven itself in commercial practice in Germany, France, Belgium, Italy and Austria.

- More automation by **backfilling system.**
- Parallel continue development of **earlier sexing procedures**

Special thanks to AAT (Agri Advanced Technologies) an EW Group Company, one of our sister companies for providing the technical information

MARKET MODEL INOVO
THEORETICAL FIGURES AUSTRALIA

- **DOC AU$ 3.00** → **AU$ 4.49- 4.79 / in ovo sexed DOC**
- **DOC LKR 675** → **LKR 1075** **160% increse in price**

Thank you