IN OVO SEX DETERMINATION

Leon Schouren
Sales Europe & Global Technical Service H&N International

Ban on CULLING DAY-OLD MALES

Date: 20.01.2021

How it all started….

- German Legislation from 01.01.2022 onwards…
- Before day 7 of incubation
- Transition period of 2 years because of absence of suitable solutions
- Pain study University Munich during 2023
- From January 2024 onwards before day 13 of incubation

Ending culling of day-old chicks

1) Rearing of brother males

2) Dual purpose breeds

- Males for meat production
- Females for egg production

 questionable compromise

Foto: AAT

Foto: AAT

3) Gender determination of hatching eggs

Rearing of male brothers

Minimum 70 day rearing
Minimum 1,200g Live weight
Feed concersion 1:3 – 1:4 (> 5 kg feed)

Speed	According to hatchery
Weekly capacity	According to hatchery
Accuracy	-
Female hatch	41 % (-0 %)
Female loss	0 %
Hatching eggs / ♀ chicks	2.4
Plannability	
Sustainability	

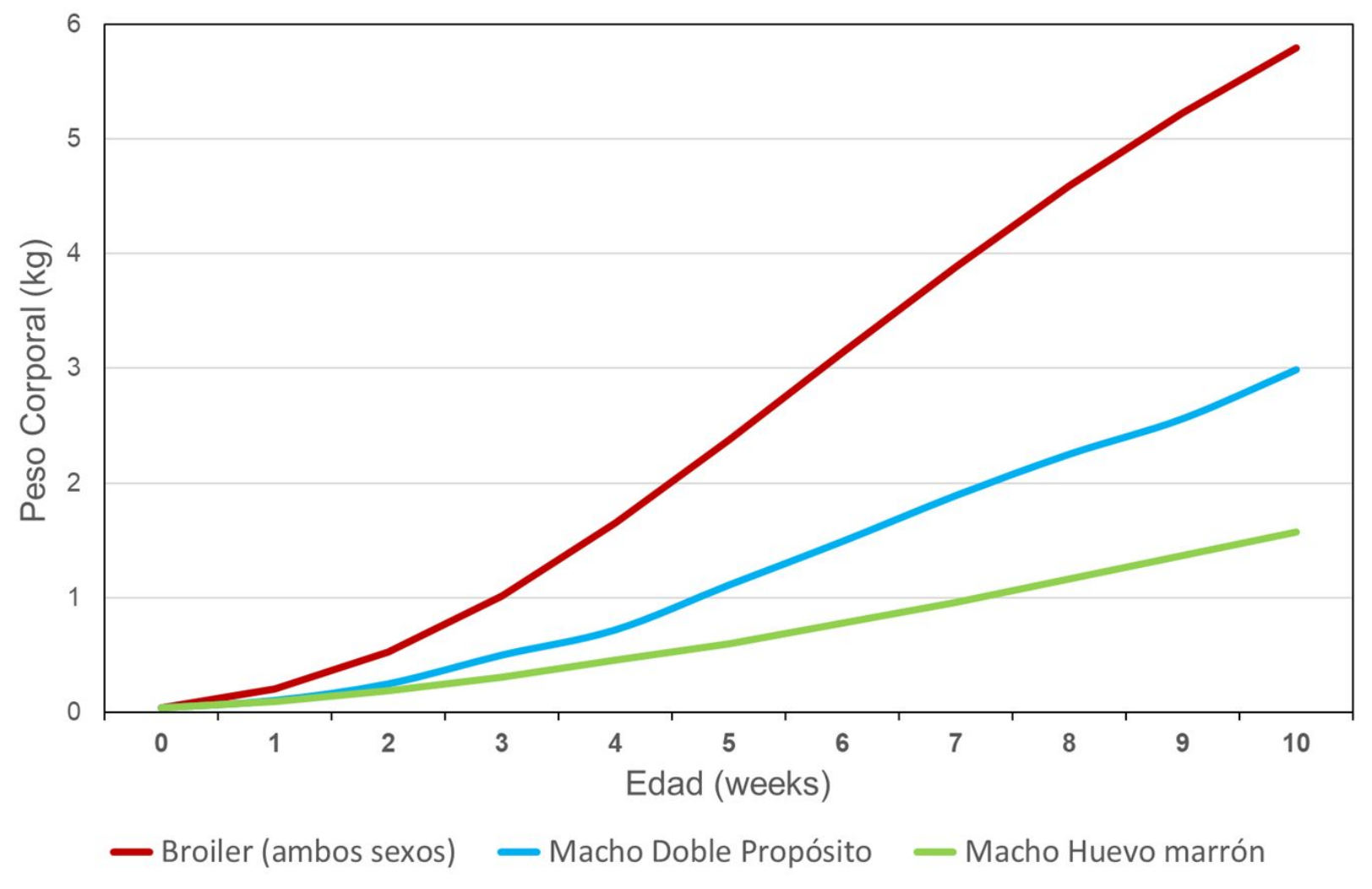
<u>Laying hen:</u>

50 kg feed during life
+ 5 kg from males

Increase of feed usage by ***10%!***

Source: Lohmann Deutschland

REARING OF MALE – THE BROTHERS



Source: H&N International

REARING OF MALE – THE BROTHERS

Macho puesta
~ 1 kg peso canal (66%)
13% pechuga
I.C.: 4

Doble Proposito
~ 2 kg peso canal (68%)
17% pechuga
I.C.: 2,5

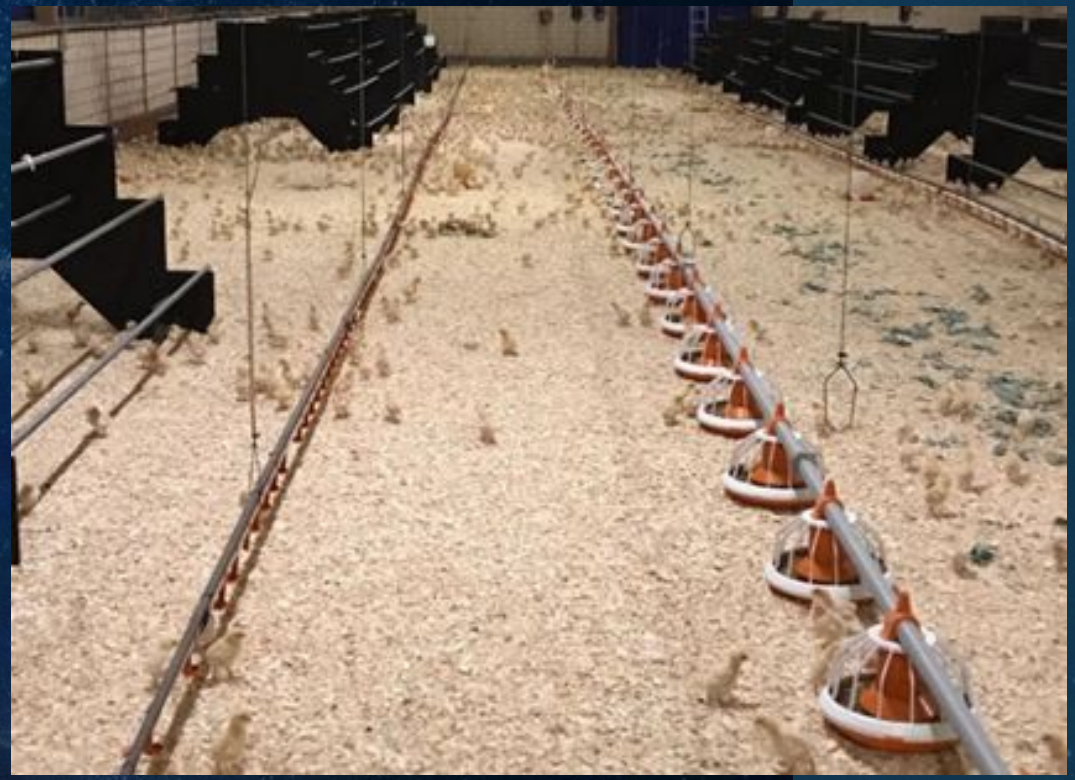
Broiler (crec. lento)
~ 2,8 kg peso canal (74%)
23% pechuga
I.C.: 2

Source: H&N International

REARING OF MALE – THE BROTHERS

- Adapted vaccination program for males (Hatchery/Rearing)
- Only use rearinghouses that bin approved by **KAT**
- Perches, slats on different levels
- Material to keep the males busy (Pick stones, Alfalfa…..)
- Daily control and registration by farmmanager.

Guarantee of the highest animal welfare criteria!



Source: Lohmann Deutschland

Locations of sex determination trials

TH OWL, Germany
Spectroscopy
D6

Seleggt, Germany
Chemical Analysis
D9-12

Plantegg, Germany
Gene Analysis
D9-12

AAT, Germany
Hyperspectral
D12-13

HyperEye, Canada
Spectroscopy
D0

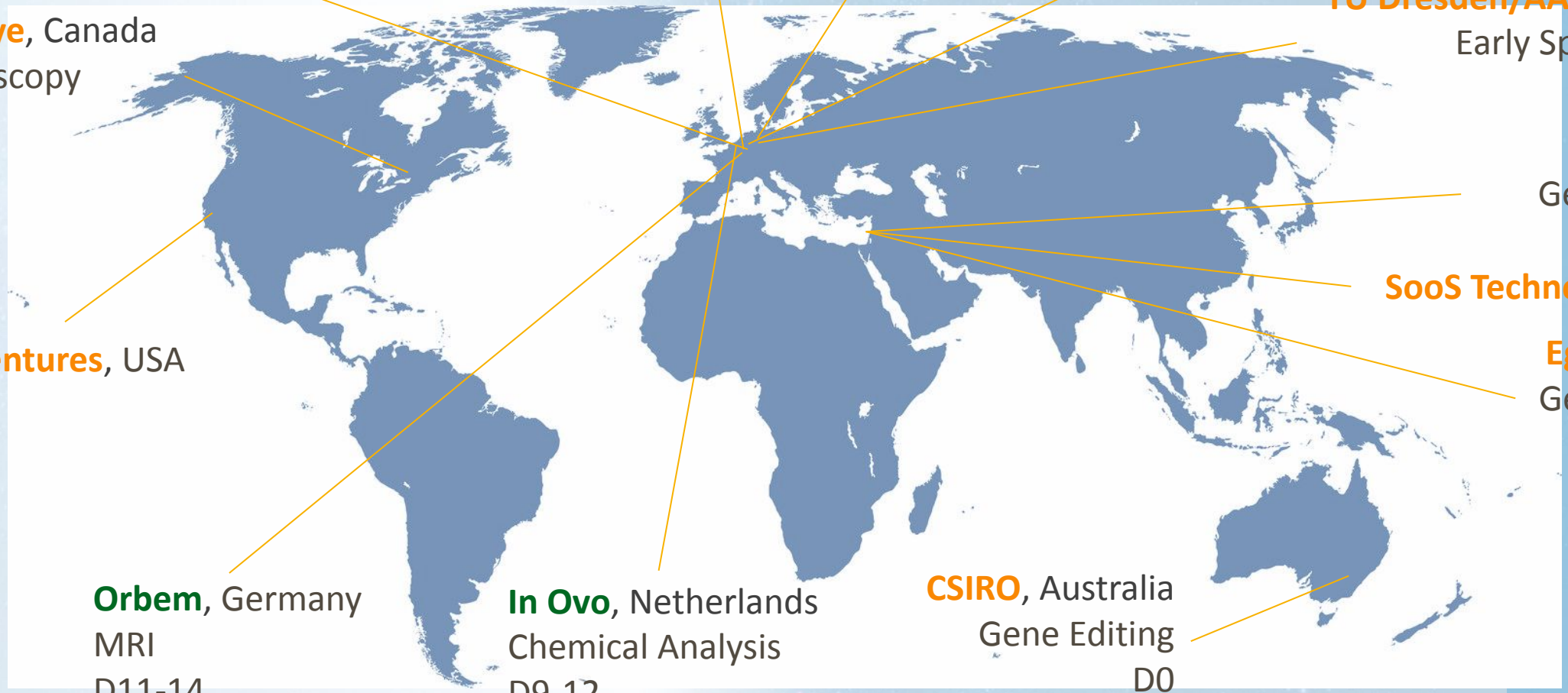
TU Dresden/AAT, Germany
Early Spectroscopy
D5

NRS, Israel
Gene transfer
D0

SooS Technology, Israel

Eggxyt, Israel
Gene transfer
D0

Sensit Ventures, USA
Gas
D?



Orbem, Germany
MRI
D11-14

In Ovo, Netherlands
Chemical Analysis
D9-12

CSIRO, Australia
Gene Editing
D0

sources: ELD

IN OVO SEX DETERMINATION

Current alternatives

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Day 21

Invasive: Sampling allantoic fluid Measurement out of the egg

Foto: seleggt.com

SELEGGT responsible solutions

Foto: inovo.nl

IN OVO

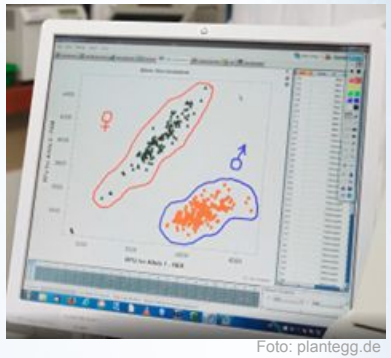


Foto: plantegg.de

PLANTegg

Non-invasive Measurement inside the egg

Foto: AAT

AAT EW GROUP COMPANY

Foto: Orbem

ORBEM

Growing of the males

Foto: Bruderhahn Initiative Deutschland e.V.

sources: ELD

COMPARISON OF FLUID BASED MARKET READY PROCEDURES

	Seleggt	In-Ovo
Timing (days)	(9) 10-13	(9) 10-13
Sample	Allantoic fluid	Allantoic fluid
Sample Collection	Laser + Pipette	Needle
Kind of testing	PCR	Mass Spectrometry
Analysis time	45/60 min.	20 min.
Egg treatment	invasive	invasive
Impact on hatchability	2-3%	5-8%
Female embryo losses	5-8%	10-20%
Sexing errors	0,5-1,5%	3-4 %
Hatching eggs/female chick	2,60-2,65	2,90-3,10
Consumables	high	medium
Capacity/hour/unit	3.000 eggs	3.800-4.500 eggs
Direct transfer	no	no

sources: ELD

COMPARISON OF NON-INVASIVE TECHNOLOGIES

	AAT (Cheggy)*	AAT (Cheggy Zoom)	Nectra *	Orbem *
Timing (days)	13	12	14-15	11-12
Sample	Image	Image	Image	Images
Sample Collection	n.a.	n.a.	n.a.	n.a.
Kind of testing	Hyperspectral	Hyperspectral	Spectral vision	Magnetic resonance
Analysis time	< 1 second	< 1 second	< 1 second ???	1-2 seconds
Egg treatment	non invasive	non invasive	non invasive	non invasive
Impact on hatchability	< 1%	< 1%	???	< 1%
Female embryo losses	2-3 %	1-2 %	???	7-9 %
Sexing errors	2,9 %	4-5 %	5-10 % ???	1-2 %
Hatching eggs/female chick	2,48	2,60-2,65	???	2,60-2,65
Consumables	non	non	non	non
Capacity/hour/unit	15-20.000 eggs	18-25.000 eggs	12.000/hour	2.300 - 2.750/module
Direct transfer	yes, day 13	no	yes	no

sources: ELD

ADDITIONAL BASIC RESEARCH PROJECTS

	OWL	Dresden *	Omegga*
Technology	time-resolved laser-induced fluorescence spectroscopy	fluorescence spectroscopy (two wavelength)	time-resolved absorption spectroscopy
Timing (days)	3-5	4-6	3-6
Sample	none	none	none
Location/Institute	Lemgo	Dresden	Omegga
Kind of testing	Laser	Laser	Spectrometer
Analysis time	< 5 seconds	< 3 seconds	3-6 days, every 5 hours
Egg treatment	semi invasive	invasive	non-invasive
Egg opening	1-2 mm	12 mm	no
Embryo losses	???	???	???
Sexing errors	???	< 5 %	10% ?
Consumables	non	non	non

sources: ELD

IN-OVO METHODS IN USE

•Hyperspektral imaging (Cheggy/AAT)

- France (Hy-Line France)
- France (Lohmann France)
- Germany (Lohmann Deutschland, Cheggy Zoom)
- Netherlands, (Pluriton, Cheggy Zoom)
- Italy (Hy-Line Italy)
- Spain (Ibertec)
- United States (Hy-Line North America)

•DNA analyse (Respeggt)

- Germany (Lohmann Deutschland)

•Magnetic Resonance Imaging (Orbem)

- Germany (Lohmann Deutschland)
- Netherlands (Pluriton)
- Netherlands (Ter Heerdt-Verbeek)

•DNA analyse (Respeggt)

- Netherlands (Barneveld, Respeggt)
- Netherlands (Warder, Broederij ´t Anker)
- Norway (Steinsland & Co AS)
- Germany (AC Weiss GmbH & Co. KG)
- United States (Hendrix-ISA, coming 2025)

•Mass Spectrometrie (In Ovo, Leiden)

- Netherlands (Broederij ´t Anker)
- Belgium (Vepymo)

•Magnetic Resonance Imaging(Orbem)

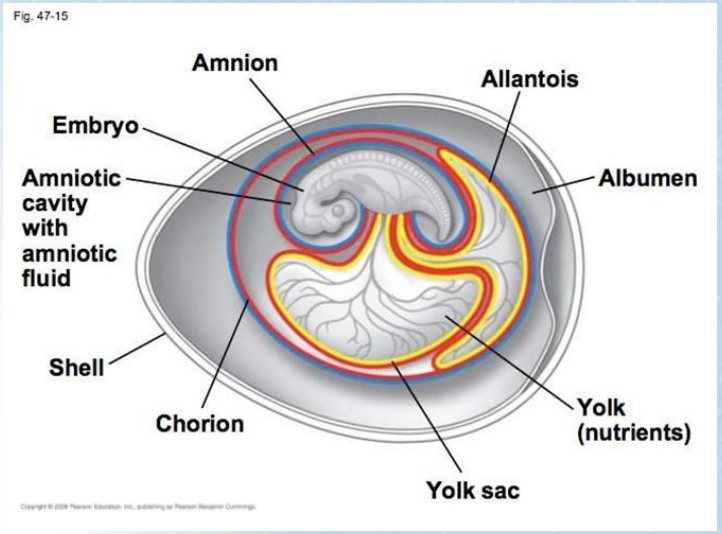
- France (Lanckriet)
- France (Hendrix Genetics)
- Germany (Vepymo)
- Norway (Sirevåg Rugeri AS, coming 2025)
- Switzerland (Animalco/Prodavi, coming 2025)

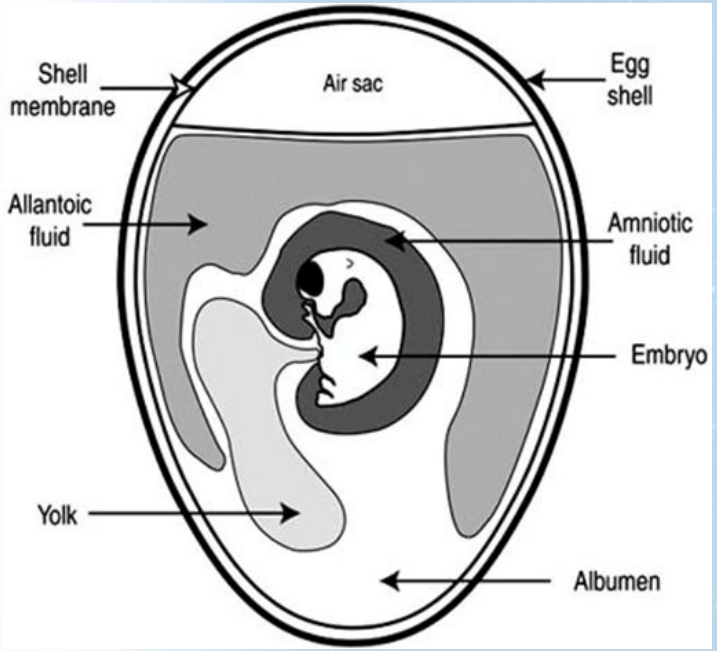
•Spektral imaging (Nectra)

- France (Novoponte)

FLUID BASED GENDER DETERMINATION

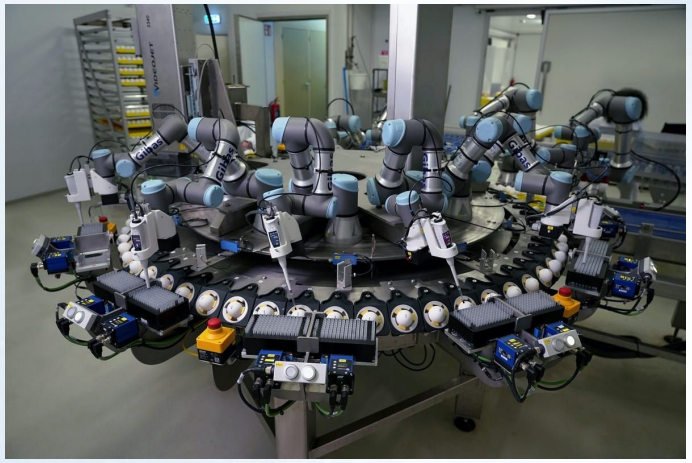
- Sample needed from each individual egg
- Gender determination via analyses of allantoic fluid
- Allantoic fluid maximum at day 13 of incubation

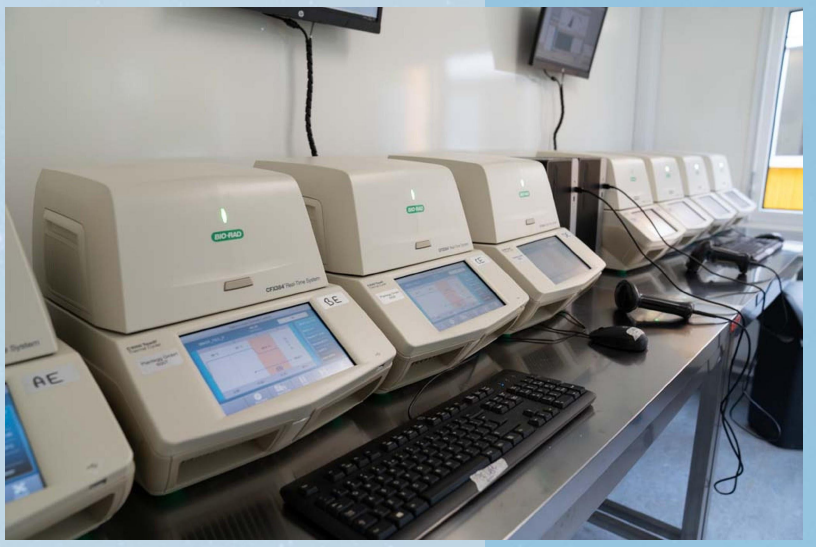


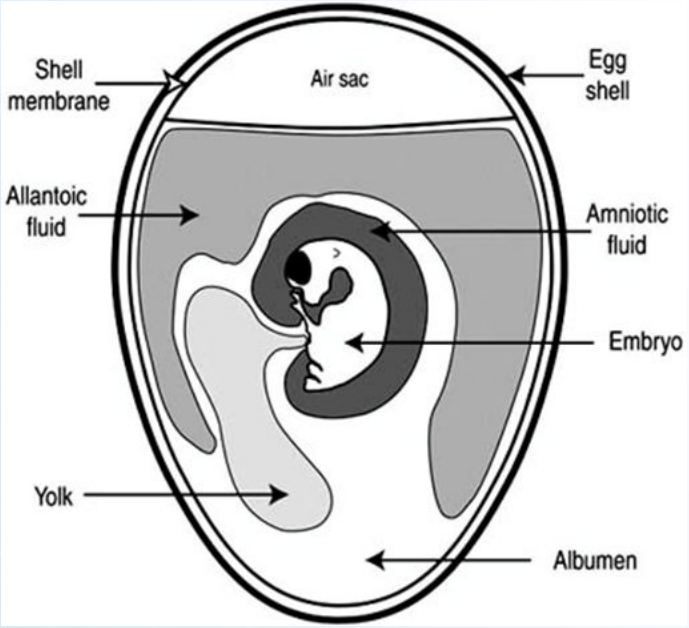


sources: ELD

PLANTEGG CIRCULUS - CIRCUIT

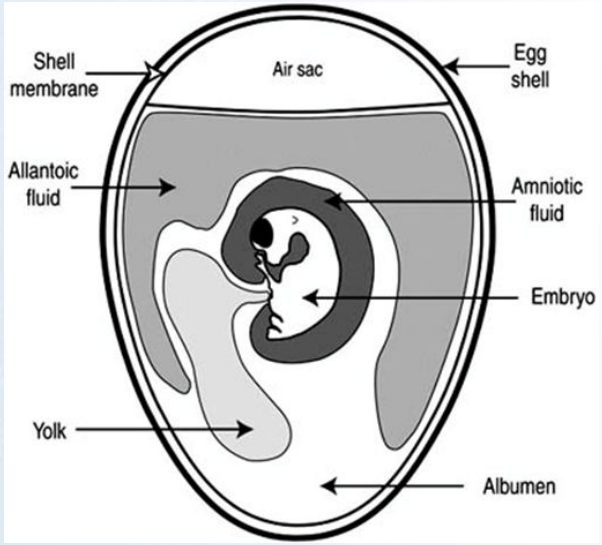


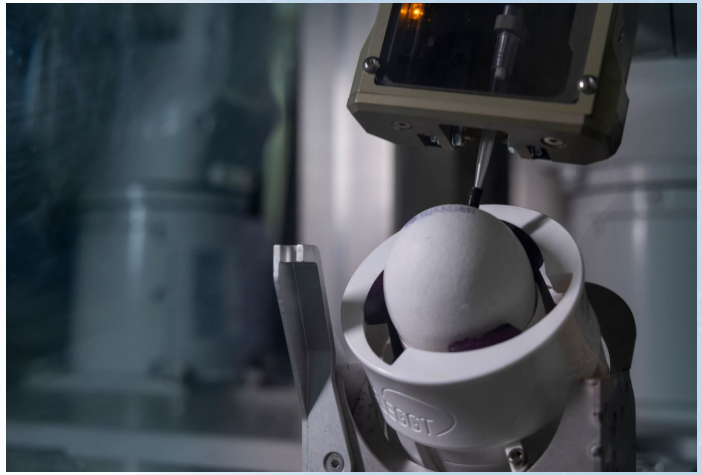




Pictures PlantEgg

SELEGGT CIRCUIT

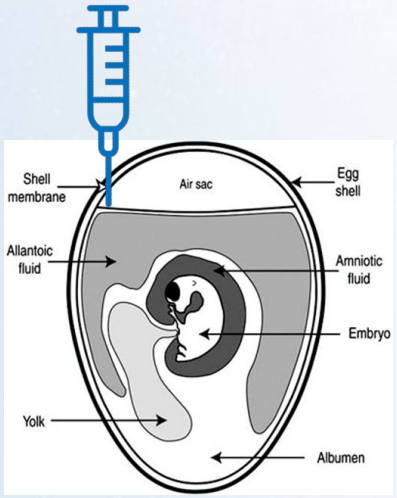




Pictures Seleggt

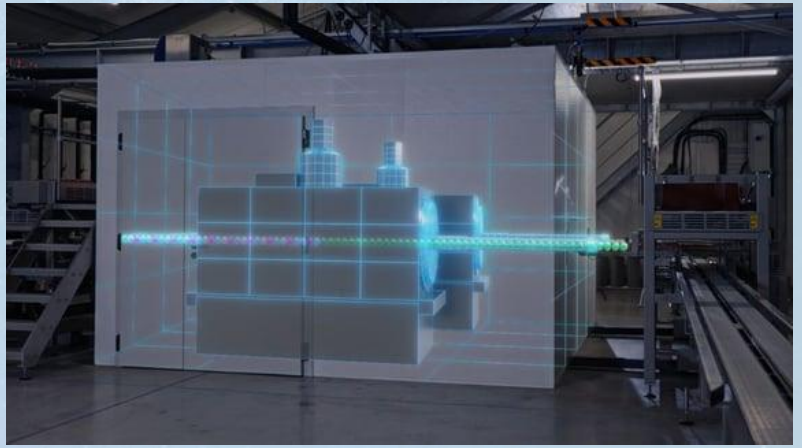
sources: ELD

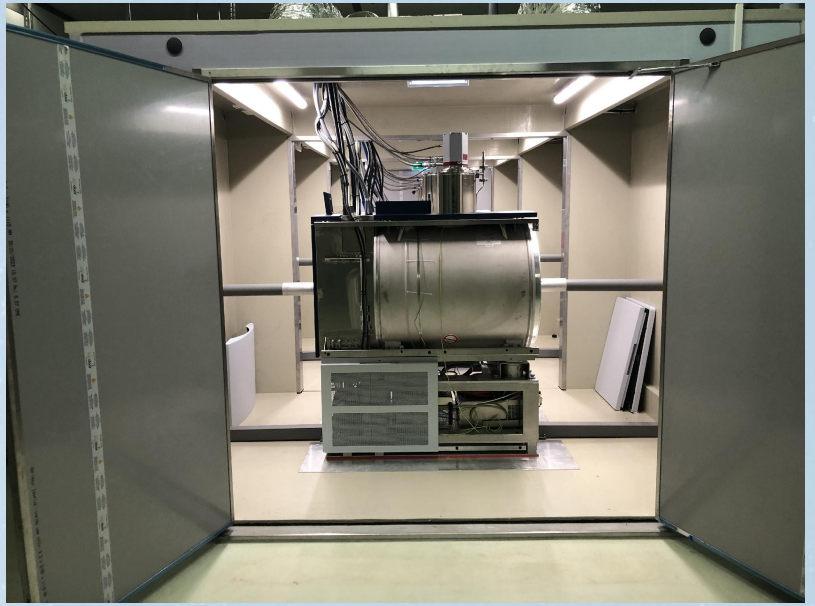
IN OVO, LEIDEN ELLA



sources: ELD

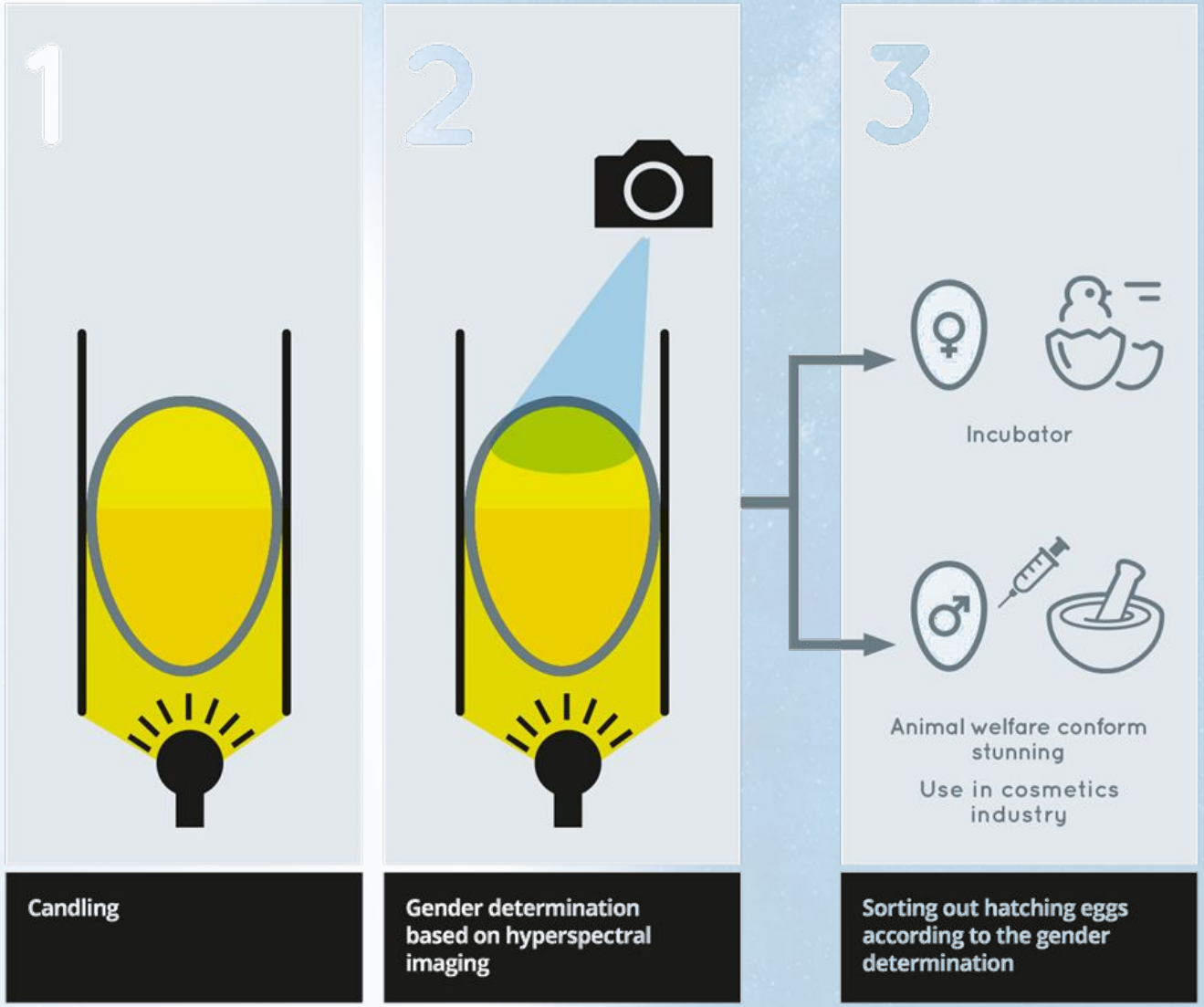
ORBEM / GENUS FOCUS





sources: ELD

AAT HYPERSPECTRAL IMAGING



based on WO 2014/033544 A9 PCT patent publication „Spectrophotometric analysis of embryonic chick feather color“

sources: ELD

HYPERSPECTRAL IMAGING

- Fully automated, high capacity (up to 25.000 eggs/hour, flocksizes >75.000 female chicks possible)
- No expensive consumables, no chemicals
- Accurate and efficient
- Specific use for color sexable brown egg layers (RIR x RIW)

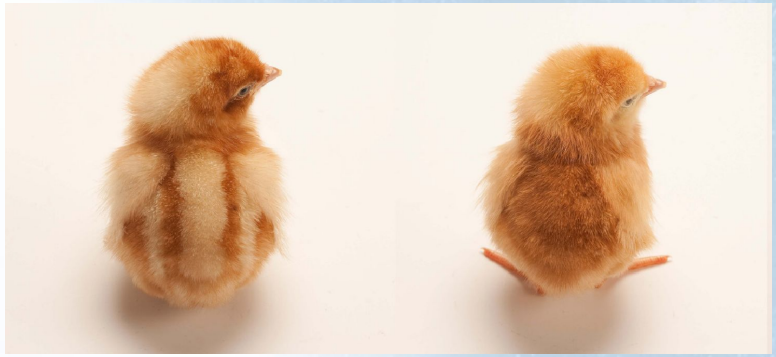
sources: ELD

HYPERSPECTRAL IMAGING WITH CHEGGY AUTOMATION

sources: ELD

THE AAT/CHEGGY CHALLENGE

♀



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sources: ELD

IMPORTANT FOR BROAD MARKET ACCEPTANCE

- Works for all colors of eggs (white, brown,…)
- Accurracy > 98,5%
- Low female embryo loss
- Identify the sex at the earliest possible stage before possible onset of pain
- High throughput of hatching eggs per hour
- Avoid disturbance of the embryo´s or their hatchability
- Low impact on production cost
- Sustainable and low usage of consumables

- Present market ready in ovo technologies don´t comply with all needed requirements

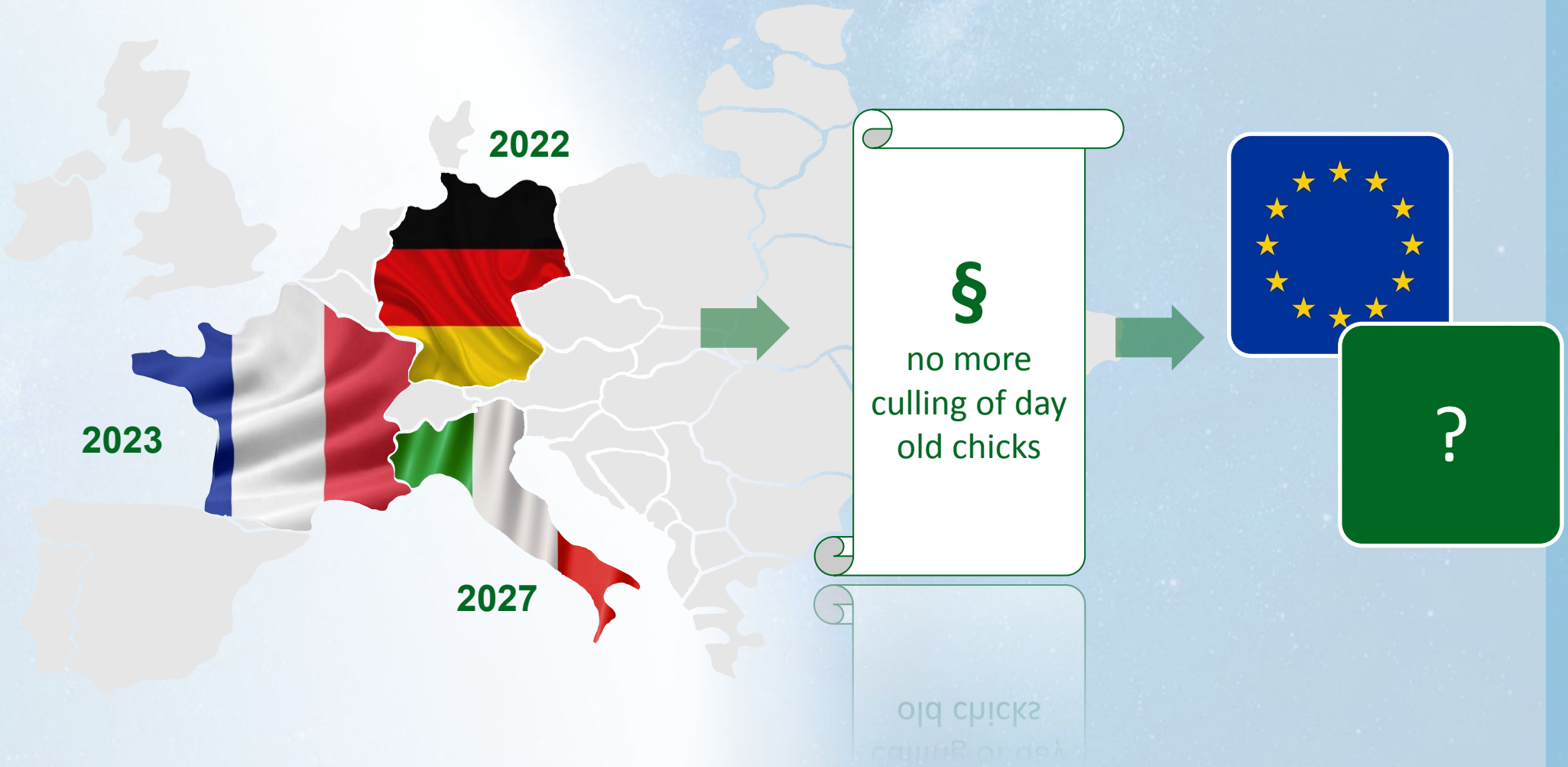
sources: ELD

OVERVIEW OF CRITERIA MOST USED MARKET READY SOLUTIONS

Criteria	Seleggt	In Ovo	AAT	Orbem
Works for all layer breeds				
Accuracy >98,5%				
Female embryo loss				
Early detection before onset of pain				
High throughput				
Low impact on hatchability				
Low costprice				
Sustainability, consumables				

sources: ELD

Banning of chick culling



sources: ELD

Banning chick culling

No unique European approach

Germany:

- Ban of chick culling since 1.1.2022
- For all brown- and white layers, including breeder level
- Sexing errors need to be raised till 12 weeks of age
- AAT first technology provider for in ovo sexing in a German hatchery
- Adaptation of the law 2024: in ovo sex determination only before day 13 of incubation

France:

- Ban of chick culling since 1.1.2023
- All technologies until day 15 of incubation allowed
- Only for brown color sexable commercial layers
- Derogation for white and non color sexable breeds
- No need to rear sexing errors (if used for animal feed)

Italy:

- Ban of chick culling from 1.1.2027 onwards
- All technologies until day 14 of incubation allowed
- For brown and white commercial layer breeds
- No need to rear sexing errors (if used for animal feed)

Switzerland / Austria:

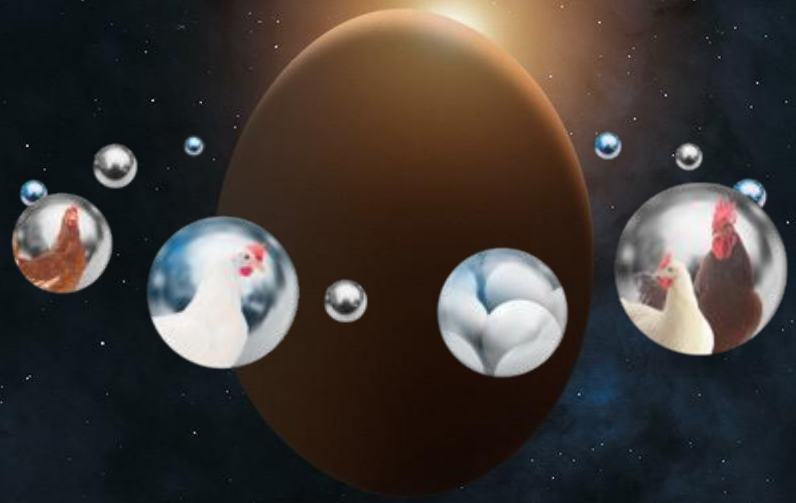
- Industry agreements
- Euthanized males to be used for animal feed
- Male killing forbidden from 2025 onwards
- MRI technology before day 13 of incubation

Spain / Portugal:

- Supporting phase-out

sources: ELD

Thank you for your attention



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