

# Hatchery Talks

## Egg turning



# Before we start ...

- **Polls**
- **Questions in chat**
- **Webinar-replay + hand-out**



# Contents

- **Turning in nature**
- **Turning and embryo physiology**
- **Turning in daily hatchery practice**
- **Recognize turning problems**
- **Summary**





# **Hatchery Talks**

## **Turning in nature**



Turning in nature

# Turning frequency

Species	Turns per hour
Forster's terns	3,8 +/- 0,8
Western gulls	2,1 +/- 0,4
Laysan albatrosses	2,1 +/- 0,7
Domestic fowl	1-4
Black-billedgull	1,9
Cassin's auklets	1,8 +/- 0,3
Black-headedgull	1,6
Adélie penguins	1,4-3,2
Laughing gull	1,2
Herring gull	0,5
Great black-backed gull	0,3

Sources: Shaffer et al., 2014, Taylor et al., 2018, Beaulieu et al., 2010b, Thierry et al., 2013a, Beer (1961), Drent (1970), Impehoven (1973), Butler and Janes-Butler (1983), Olsen (1930), Kuiper and Ubbels (1951)





# **Hatchery Talks**

## **Turning & embryo physiology**



# Poll

## **Turning in incubators is important to:**

1. Evenly spread temperature across the egg
2. Keep the embryo in the middle of the egg
3. Stimulate rate of sub-embryonic fluid formation



# Effect turning on development

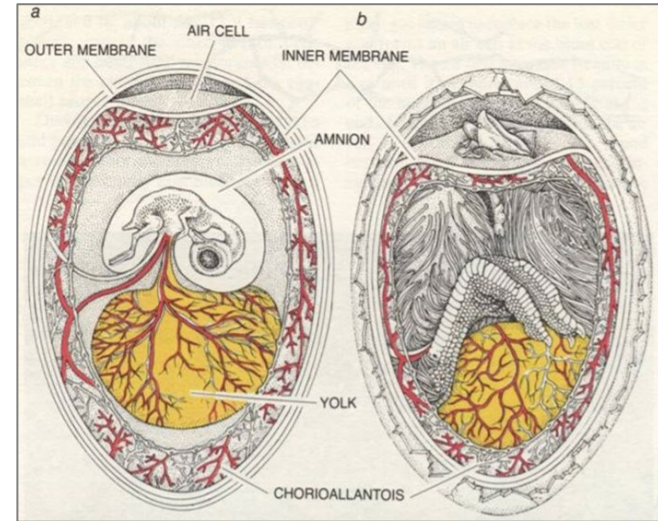
- Prevents adhesion of the embryo to inner shell membrane
- Stimulates rate of development of area vasculosa and chorioallantois





# Effect turning on development

- **Allows normal transfer of albumen proteins into amniotic fluid**
- **Promotes growth of embryo and reduces incidence of malpositions**
- **Stimulates rate of sub-embryonic fluid formation**



# No embryonic development without extra-embryonic tissues and fluid compartments

The embryo, extra-embryonic tissues and compartment develop in synchrony



# Sub-embryonic fluid development



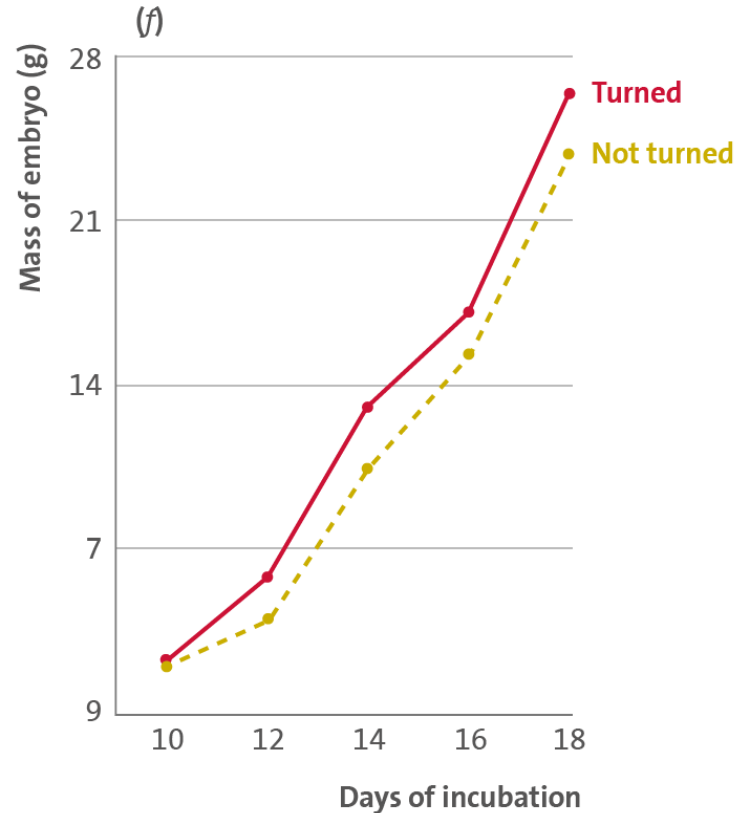
Ref	SEF mass (g)		SEF water Part (%)	
	Turned	Unturned*	Turned	Unturned
Chicken	15.47	13.98	90.5	93.29
Turkey	23.24	21.63	91.79	95.93
Duck	23.74	18.24	84.45	86.24

\* Effects of failure to turn eggs during first 1/3 of incubation



# Embryo growth

Turning during the first 7 days of incubation promotes development in the setter



Deeming et al, 1967





# Hatchery Talks

**Turning in daily hatchery practice**



Turning in daily hatchery practice

# Poll

**In which period in embryonic development is a turning failure most critical?**

**Day 3, 7 or 18**



Turning in daily hatchery practice

# Relation to daily hatchery practice

## Effects of turning failures in embryonic growth and hatchability

Day turned	Hatchability (%)	Embryo mass at 16days
0-21	78.6	18.5
<b>3-7</b>	<b>76.9</b>	<b>17.0</b>
7-21	64.3	16.5
0-3	64.3	15.6
<b>0-3 &amp; 7-21</b>	<b>42.9</b>	<b>15.2</b>
0	50	15.5

Deeming (2002)

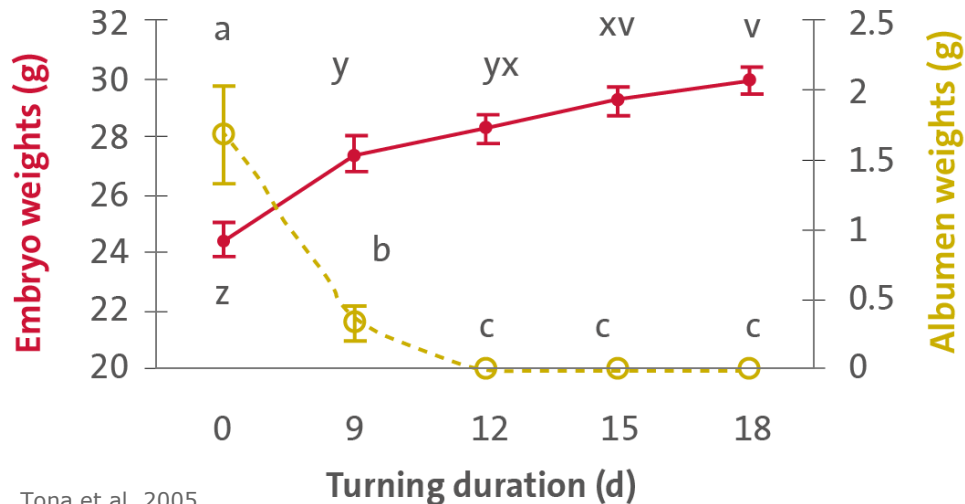


Turning in daily hatchery practice

# Turning duration

Turning required until day 12, at least,  
and should not be stopped until day 15

Day 18 of incubation



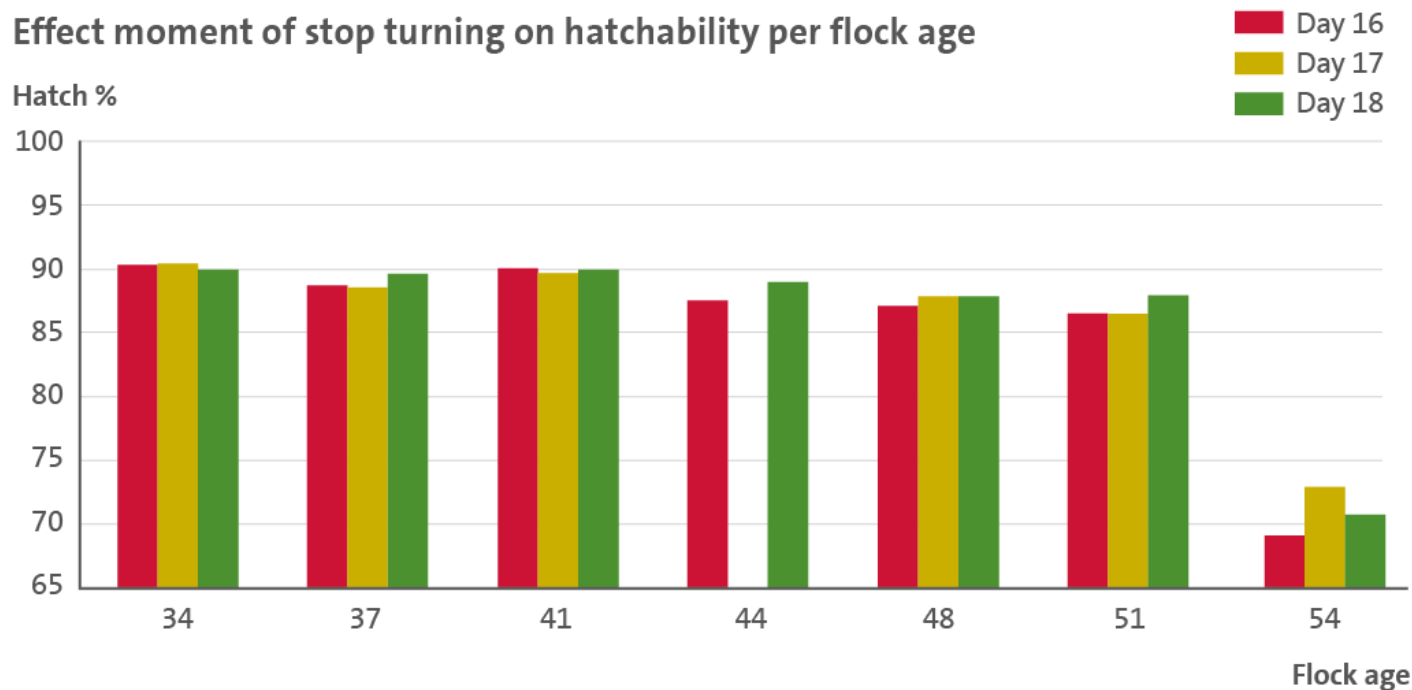


Turning in daily hatchery practice

# Turning duration



Effect moment of stop turning on hatchability per flock age



Turning in daily hatchery practice

# Turning duration

Turning problems not 'early detectable'...

Turning	% Embryo weight/egg weight	% CAM closure	HH stage	% Early mortality
0-7	7,33	48%	36,9	35%
3-7	7,42	47%	36,9	27%
0-3	7,36	40%	36,7	30%

Turning experiments, Royal Pas Reform (2021)



Turning in daily hatchery practice

# Turning angle



Reference	Turning angle	Hatch of Fertile (%)	Early mortality (%)	Mid mortality (%)	Late mortality (%)	Residual Albumen (%)	Malpositioned (%)
Cutchinet al., 2009	15	50,91*	-	1,97*	25,16*	20,98*	
Cutchinet al., 2009	45	91,41*	-	0,63*	2,50*	0,88*	
Elibol and Bra ke, 2006	35	86,17	7,76a	0,55	3,17	-	1,72A
Elibol and Bra ke, 2006	40	88,02	5,50b	0,76	4,31	-	0,66B
Elibol and Bra ke, 2006	45	87,74	7,21ab	0,64	3,88	-	0,32B

# Turning frequency

- **24x/day → optimal hatchability**
- **3,6,12x/day → significant losses**

The less turning per day, the higher the early and late mortality (Oliveira et al., 2020)

- 96x/day → higher %HoF, lower % late death (Elibol and Brake, 2003) and less malpositioning (Elibol and Brake, 2006)



Turning in daily hatchery practice

# Turning frequency

## Effect higher frequency on % early embryonic mortality

	Turning/day	% Embryo/ egg weight	% Early mortality	ED at measuring
Experiment 1	24	1,67a	16,9	07.16 (HH29)
	96	1,76b	13,3	07.16 (HH29)
Experiment 2	24	2,84	1,7	08.19 (HH34)
	96	2,94	8,6	08.19 (HH34)
Experiment 3	24	2,70	10	08.16 (HH35)
	96	2,77	0	08.16 (HH35)

Turning experiments, Royal Pas Reform (2021) (Unpublished)



# Turning frequency & angle

- **Turning 3 times per hour at 15° resulted in higher hatch of fertile (64,09%)**
- **Compared to 1 time per hour at 15° (44,46%)**
- **Standard turning of 1 time per hour with 45° (91,30%)**  
(Cutchin and Wineland, 2009)
  
- **Turning 4 times per hour at 35° → lower % malpositioned**  
(Elibol and Brake, 2006)



Turning in daily hatchery practice

# Turning frequency



**Why more frequent turning  
in practice can be a good  
idea...**



Turning in daily hatchery practice

# Turning speed

	<b>% Hatchability</b>	<b>% Early mortality</b>	<b>% Late mortality</b>
<b>Continuous slow turning 1x/hour</b>	<b>87,24</b>	<b>5,53 A</b>	<b>5,30</b>
<b>Rapid turning 1x/hour</b>	<b>86,76</b>	<b>8,00 B</b>	<b>3,75</b>

Ozlu et al. 2008







# Hatchery Talks

## Recognize turning problems

Recognize turning problems

# Recognize turning problems

- **Increased (mid and late) embryonic mortality**
- **Blood vessels CAM less developed**
- **Residual albumen in bottom egg**
- **Chicks less developed, lighter**
- **Sticky chicks**

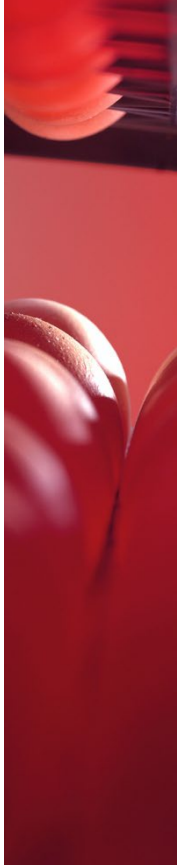


Recognize turning problems

# Embryonic mortality

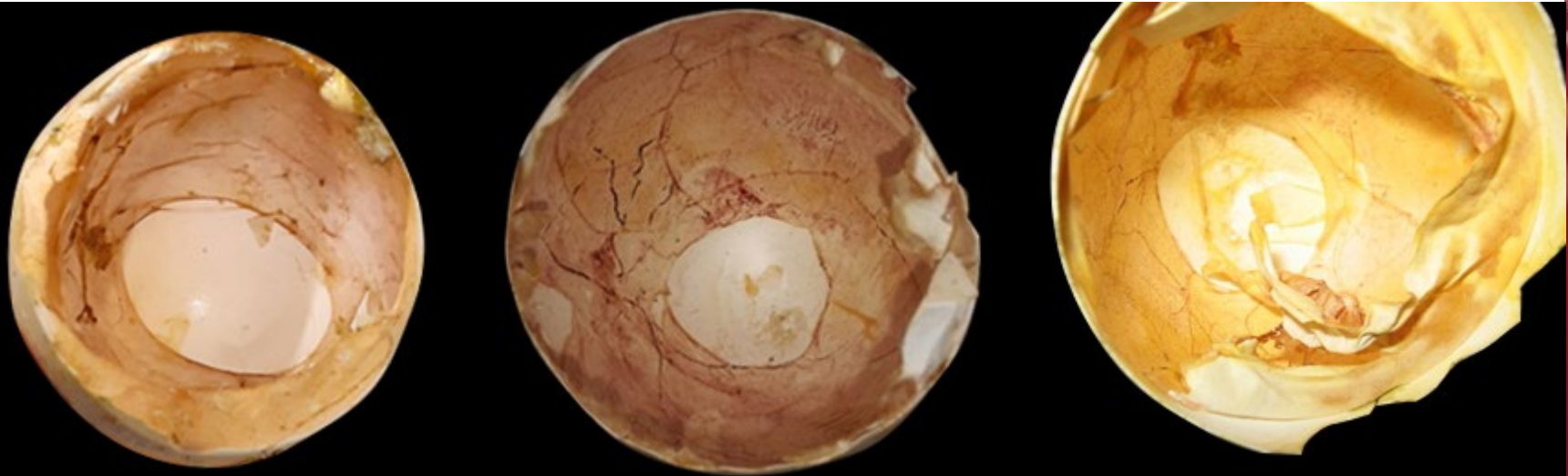
- **Data analysis > detect trends in mortality**
- **Compared to own hatchery records or breed specific embryo mortality records**
- **For example: Cobb 500**

Week	Fertility %	Hatchability %	Embryo Diagnosis %				HOF %
			Infertile	Early	Mid	Late	
25	90.0	75.0	10.0	6.9	0.5	7.6	83.3
26	92.6	78.0	7.4	6.6	0.5	7.5	84.2
27	94.0	80.5	6.0	5.8	0.5	7.2	85.6
28	95.0	82.8	5.0	5.0	0.5	6.7	87.2
29	95.6	84.7	4.4	4.6	0.5	5.8	88.6
30	96.1	86.1	3.9	4.4	0.5	5.1	89.6
31	96.4	87.4	3.6	4.0	0.5	4.5	90.7
32	96.6	88.4	3.4	3.5	0.5	4.2	91.5
33	96.7	89.3	3.3	3.3	0.5	3.6	92.3
34	96.7	90.0	3.3	2.8	0.5	3.4	93.1
35	96.7	89.9	3.3	2.9	0.5	3.4	93.0
36	96.7	89.5	3.3	3.1	0.5	3.6	92.6
37	96.6	89.1	3.4	3.3	0.5	3.7	92.2
38	96.6	88.7	3.4	3.5	0.5	3.9	91.8
39	96.5	88.3	3.5	3.6	0.5	4.1	91.5
40	96.5	87.8	3.5	3.7	0.5	4.5	91.0
41	96.4	87.4	3.6	3.8	0.5	4.7	90.7
42	96.3	86.9	3.7	4.2	0.5	4.7	90.2
43	96.2	86.4	3.8	4.5	0.5	4.8	89.8
44	96.1	86.0	3.9	4.5	0.5	5.1	89.5
45	96.1	85.5	3.9	4.8	0.5	5.3	89.0
46	96.0	85.1	4.0	4.9	0.5	5.5	88.6
47	95.7	84.7	4.3	5.0	0.5	5.5	88.5
48	95.5	84.3	4.5	5.2	0.5	5.5	88.3
49	95.2	83.9	4.8	5.3	0.5	5.5	88.1
50	95.0	83.5	5.0	5.4	0.5	5.6	87.9
51	94.7	83.0	5.3	5.4	0.5	5.8	87.6
52	94.4	82.6	5.6	5.5	0.5	5.8	87.5
53	94.2	82.1	5.8	5.6	0.5	6.0	87.2
54	93.8	81.6	6.2	5.8	0.5	5.9	87.0
55	93.4	81.1	6.6	5.8	0.5	6.0	86.8
56	92.9	80.6	7.1	5.8	0.5	6.0	86.8
57	92.3	80.0	7.7	5.8	0.5	6.0	86.7
58	91.9	79.6	8.1	5.8	0.5	6.0	86.6
59	91.3	79.0	8.7	5.8	0.5	6.0	86.5



Recognize turning problems

# Closure CAM



Recognize turning problems

# Sticky chicks



# Hatchery Talks Summary



# Summary



	<b>Perfect world</b>	<b>Reality</b>	<b>Danger zone</b>
<b>Angle</b>	<b>45°</b>	<b>40-45°</b>	<b>&lt;38°</b>
<b>Frequency</b>	<b>Every 15minutes</b>	<b>1/hour</b>	<b>&lt;12/day</b>
<b>Embryonic day</b>	<b>18/19</b>	<b>15/16</b>	<b>&lt;12</b>
<b>Smoothness/ speed</b>	<b>?</b>	<b>Within minutes</b>	<b>Too fast, with shocks</b>

# Thanks for watching!

- **Webinar-replay + hand-out**
- **Knowledge section at our website**

**See you at our next webinar!**







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Youtube.com/pasreformbv

