

Penguin Chick Rearing 101: Review of Penguin Egg Incubation and Hand-rearing Techniques

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Outline

- ▶ General Incubation
 - ▶ Parameters
 - ▶ Common Issues
 - ▶ Hatchability
- ▶ Chick rearing
 - ▶ Chick Set up
 - ▶ Formula/Feeding
 - ▶ Introduction to colony



Incubation

- ▶ General Parameters
- ▶ Artificial Incubation
- ▶ Natural Incubation
- ▶ Incubation Length
- ▶ Timing of hatching



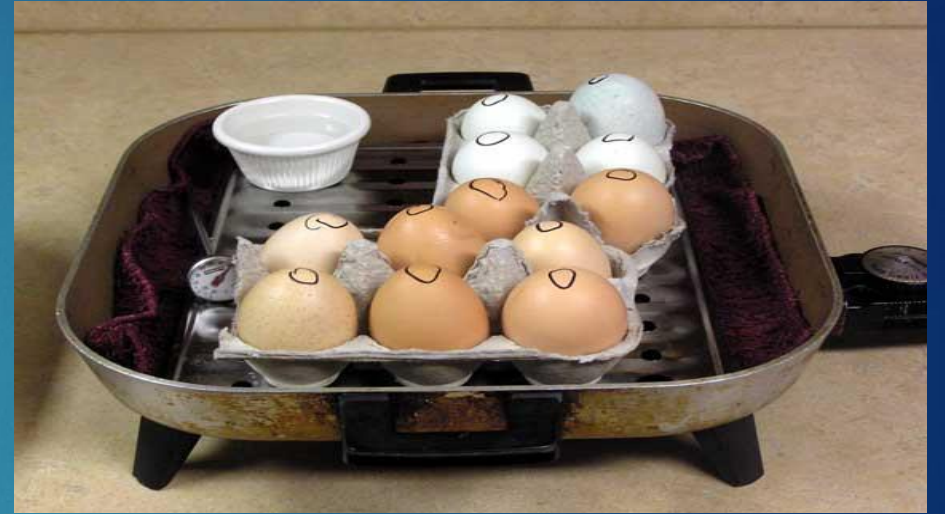
General Incubation Parameters

- ▶ **Emperor /King:**
 - ▶ **Dry Bulb:** 96.5° F **Wet Bulb:** 81-82° F
- ▶ **Magellanic and Humboldt:**
 - ▶ **Dry Bulb:** 97.5° F **Wet Bulb:** 82-83° F
- ▶ **Adelie**
 - ▶ **Dry Bulb:** 96.5° F **Wet Bulb:** 81-82° F
- ▶ **Macaroni and Gentoo:**
 - ▶ **Dry Bulb:** 97.5° F **Wet Bulb:** 82-83° F



More Incubation

- ▶ Turning – generally more is better, opposite directions to prevent rupture or over twisting of chalazae
- ▶ Position – should be on the side, air cell slightly elevated in a natural position
- ▶ Sanitation – microbes love warm moist places
- ▶ Physical trauma – breakage, vibration, rough handling



The “Trimesters”

- ▶ Early Embryonic Development:
 - ▶ Stages 1-19 \approx Penguin days 0 – 6
- ▶ Mid Embryonic Development:
 - ▶ Stages 20 – 39 \approx Penguin days 7 – 26
- ▶ Late Embryonic Development:
 - ▶ Stages 40 – 46 \approx Penguin days 27 - Hatch



What Could Go Wrong?

Before Lay:



- ▶ Genes – inbreeding, specific malformations
- ▶ Nutrition - deficiencies in macro- (protein, carb, fat) or micro- (vitamin, mineral) nutrients. Micro-nutrients in excess
- ▶ Toxins/Teratogens – pesticides, pollutants, radiation
- ▶ Physiology – age of hen, infectious disease, vertical transmission (hen to egg) of bacteria or viruses

After Lay but Before Incubation

- ▶ Infection – horizontal (shell-borne) disease transmission
- ▶ Physical trauma – rolling, jarring, shaking, vibration
- ▶ Environment – temperature, humidity, time between lay and incubation



What Could Go Wrong?

Throughout Incubation:

- ▶ Incubation temperature – too high, too low, power failure. Artificial incubators are unable to mimic reality
- ▶ Incubation humidity – too high or too low. Optimum humidity based on weight loss
- ▶ Ventilation – insufficient to provide O₂ and vent CO₂



What Could Go Wrong?

During Hatch:

- ▶ Hatching temperature - proper temp is about 1°F lower than incubation temp. Chick makes some of its own heat.
- ▶ Hatching humidity – higher than incubation humidity
- ▶ Turning – no turning after external pip
- ▶ Malposition – may or may not be lethal



Hatching:

- ▶ **Adelie:** 24-96 hours
- ▶ **Emperor:** 24-48 hours
- ▶ **Gentoo:** < 24 hours
- ▶ **King:** 24-48 hours
- ▶ **Macaroni:** 24-72 hours
- ▶ **Humboldt:** 36-60 hours
- ▶ **Magellanic:** 24-48 hours



Brooder Set up

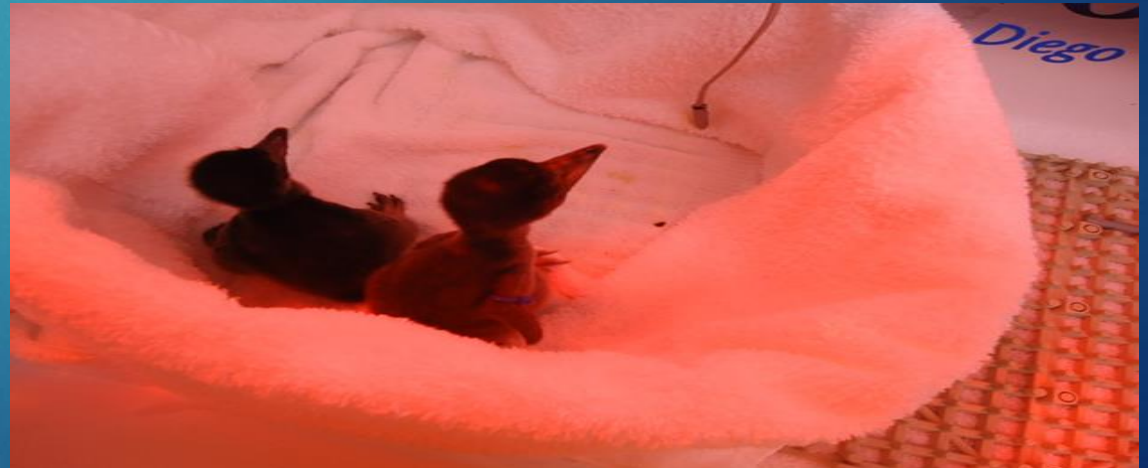
- ▶ Brooder with a heat source
- ▶ A rolled towel to keep chicks near heat.
- ▶ Penguin chicks require the lower humidity and good air circulation allowed by the open-topped brooder.



Brooders



- ▶ Rolled up towels: used as barriers
 - ▶ To separate chicks
 - ▶ Keep chicks from wandering away from heat.
- ▶ Rolled towels with a tented section or stuffed animals are used as brooding surrogates.
- ▶ Towels have little tractions. Dri-dek® or rocks can be placed to help traction



Housing Temperature

- ▶ Chicks under 7 days of age approximately 80-90°F (26.7-32.2°C)
- ▶ Chicks greater than 7 days are usually kept at approximately 70-80°F (21.1-26.7°C),
- ▶ Antarctic chicks get their second down, temperature may need to be adjusted below 70°F.



Common Issues: Overheating

- ▶ Posture outstretched feet and flippers out
- ▶ Feet warm to touch-feel hot for penguin
- ▶ Panting
- ▶ Lethargy
- ▶ Dehydration
- ▶ Disinterest in food



Common Issues: Under heated

- ▶ Shivering
- ▶ Huddle directly under the heat lamp
- ▶ Feet and flippers drawn in
- ▶ Feet and flippers cool to the touch
- ▶ Slow to respond to feeding stimulus



Formula and Feeding



Wash hands

Use anti-bacterial soap



Fresh Fish

Fish just off the block-slightly frozen-little frosty



Keep Cold

During prep keep fish on ice.

Prep area clean

Jamba-formula



Blend

Blend until all ingredients are smooth

Be aware of warming formula-
running of motor can warm formula



Strain

Mesh strainer to ensure formula is smooth



Storage

Clean container

Label with time and date

Formula good for 24 hours.

Feeding

► Syringes:

- 1cc-12 cc with catheter tip
- With feeding tube or not

► Formula:

- Heated to 95°F (35°C). In a heat proof container in water bath
- Keep warm in water bath
- Very young or finicky chicks: formula may need to be heated to 98°F (36.7°C)
- Youngest to oldest so youngest chick get warmest formula
- Ill bird –feed last to avoid contaminating the feeding area



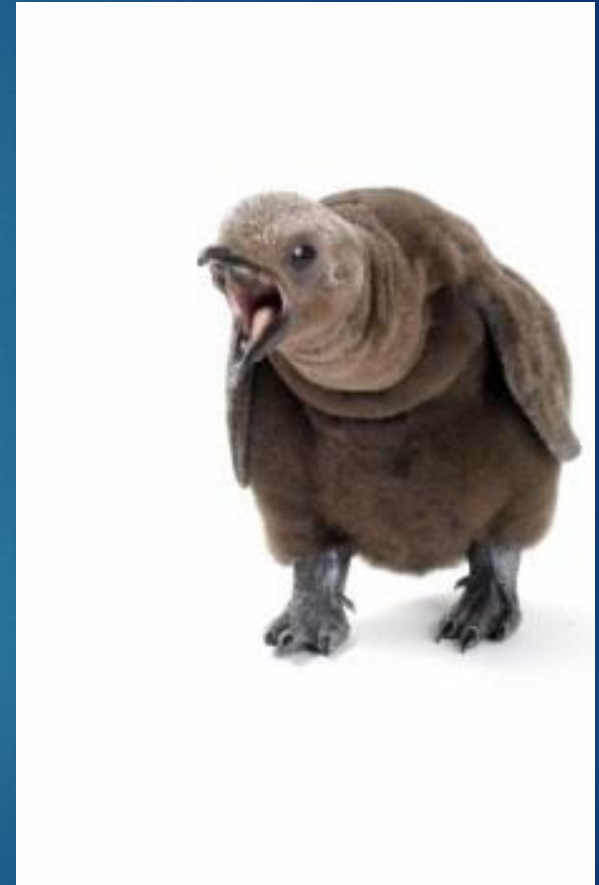
Record Keeping

- ▶ Accurate notes :
 - ▶ Morning Weight
 - ▶ Record Temperature
 - ▶ Behavior: BAR, QAR, responsive
 - ▶ Fecal output
 - ▶ Feeding amounts
 - ▶ Visual notes: eyes, beak, feet flippers
 - ▶ Feeding response: is it strong, chick eating well



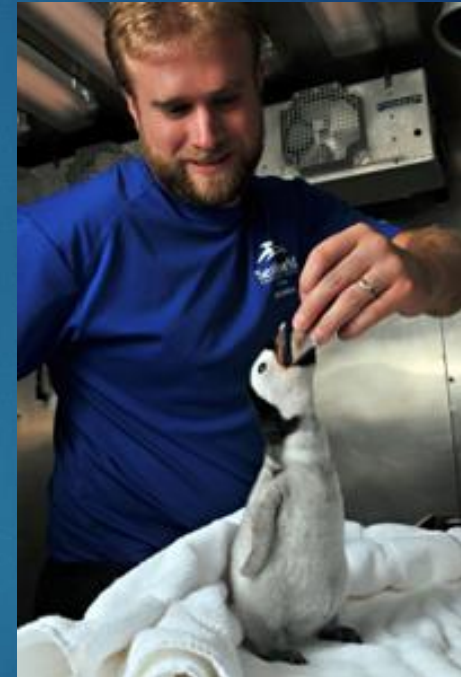
Feeding

- ▶ Feedings are 5 times a day ev. 3 hours.
- ▶ First 3 days slowly introducing formula- yolk may still be absorbing.
- ▶ Feeding amounts not to exceed 10% of am weight
 - ▶ **Day 1** 50:50 formula: water : 1-5g. (cc)
 - ▶ **Day 2** 75:25 formula: water: 4-8 g. (cc)
 - ▶ **Day 3:** Introduce straight formula :4-10 g. (cc)
 - ▶ **Day 4 & 5:** Try 10% of a.m. weight total intake per feeding of straight formula
- ▶ 7 days of age, but not before 100 gm a.m. weight, evaluate adding fish



Yummy Fish

- ▶ Small fillets/pieces: herring
- ▶ Fish is give with formula, not to exceed 10% am weight
 - ▶ **1st day of fish:** 3 g of fish given at second a.m. feeding
 - ▶ **2nd day on fish:** 3 - 5 g. fish given twice a day (BID) at second a.m. feeding and second to last feeding
 - ▶ 3rd day on fish: 3-5 g. maximum fish given every other feeding,
 - ▶ **4th – 6th day on fish:** gradually increase fish amounts at each feeding
 - ▶ **6th day:** 7-10 g maximum each feeding



Feeding:

- ▶ **300g:** 10 - 15 g. fish every feeding maximum
- ▶ **400g:** 15 – 20 g. fish every feeding
 - ▶ Begin vitamin supplements 25 mg B-1 BID.
- ▶ **500g:** Fish is 50% of total intake every feeding maximum in proportion with formula
- ▶ **1000g. or greater chick** may start to “wean themselves”
 - ▶ Formula may be reduced to 15 cc QID.
 - ▶ Feedings may be QID
 - ▶ Formula is eventually reduced to 30 cc SID
- ▶ **Fish:**
 - ▶ Herring fillets
 - ▶ Chunks



Fledging

- ▶ Transitions to exhibit
 - ▶ Temperature acclimation
 - ▶ Conspecifics
 - ▶ Temperature needs
 - ▶ Pool Access



Parent Reared Chicks

- ▶ Advantages:
 - ▶ Less resources
 - ▶ Parents are best
 - ▶ Acclimation
 - ▶ Habituation for Husbandry

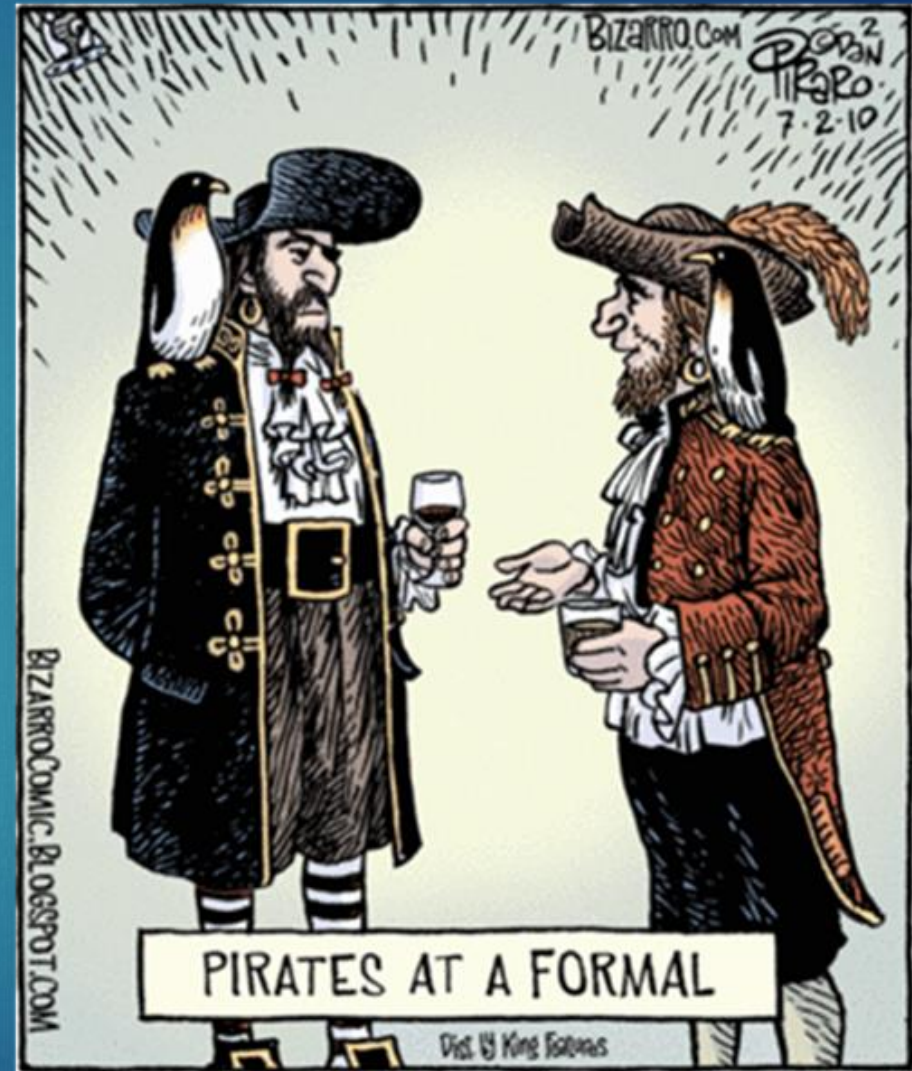


Thank you

- ▶ Stephanie Costelow
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- ▶ Entire SeaWorld San Diego Penguin Team
- ▶ Mike Aguilera
- ▶ Penguin TAG



Questions



SeaWorld San Diego Penguin Team

*TO LEAD IN PENGUIN EDUCATION, RESEARCH, AND CONSERVATION
THROUGH UNPARALLELED GUEST CONNECTIONS, INNOVATIVE
HUSBANDRY, SCIENTIFIC CONTRIBUTIONS, AND SUSTAINABLE
PRACTICES*

