NUTRITION OF THE DEVELOPING EMBRYO & HATCHLING

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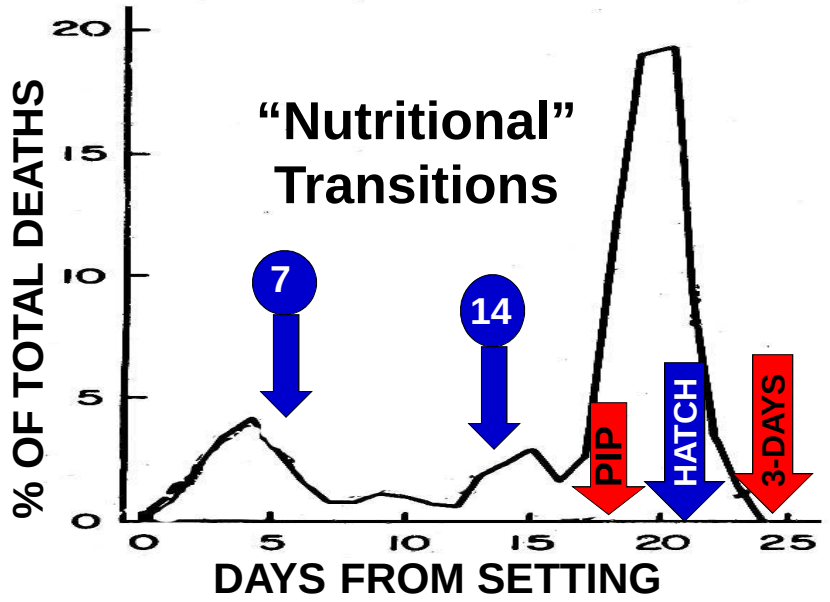
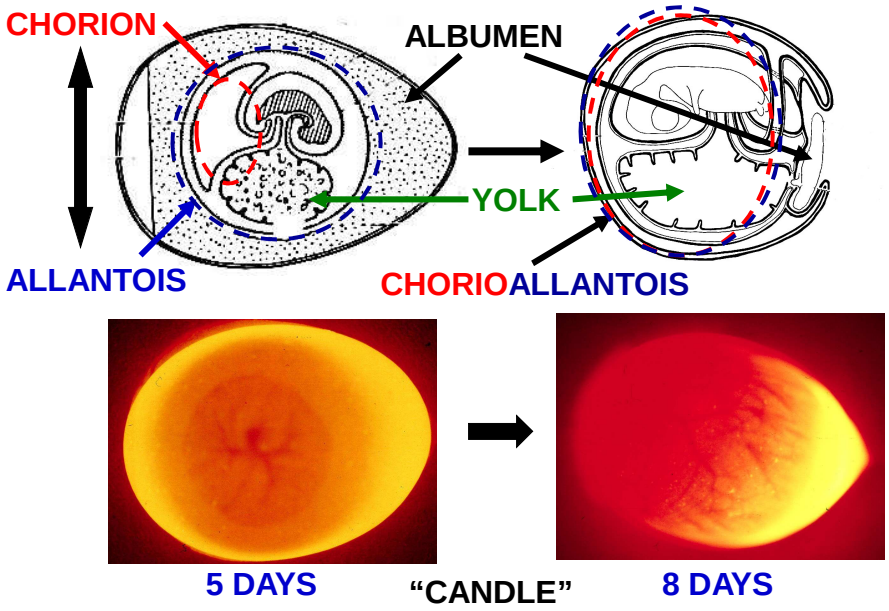
GERM TO "ESTABLISHED" CHICK



GERM & TRANSITION TO OXYGEN

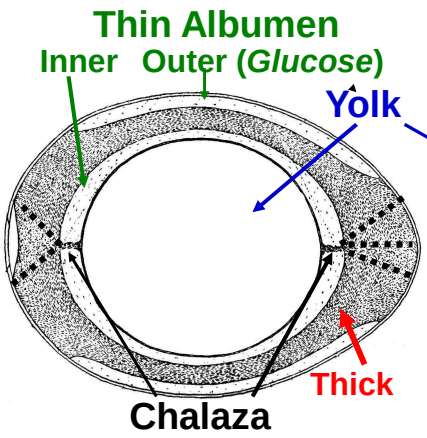


ANEROBIC → AEROBIC RESPIRATION

Chick Incub. Days	Albumen Glucose mg Tot.	Albumen Glucose % DM	Albumen Lactic Acid mg Tot.	Albumen Lactic Acid % DM
1	133	3.2	1.6	0.04
3	114	2.8	8.5	0.20
5	79	2.0	11.2	0.29
7	42	1.1	7.0	0.19
9	17	0.5	3.4	0.09

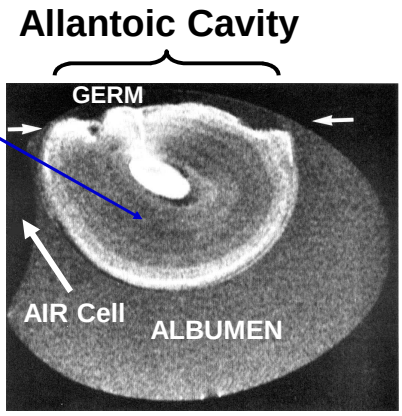
Romanoff & Romanoff, 1967

EGG STRUCTURE & EARLY INCUBATION



0-Day Saggital

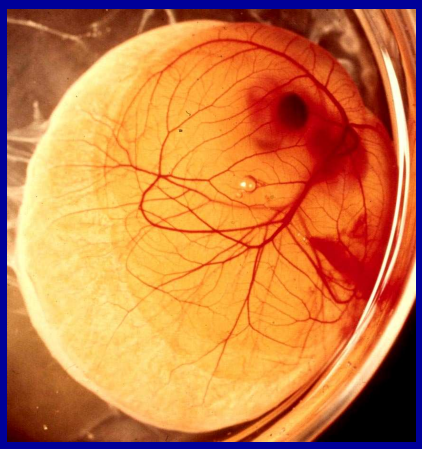
Romanoff & Romanoff, 1949

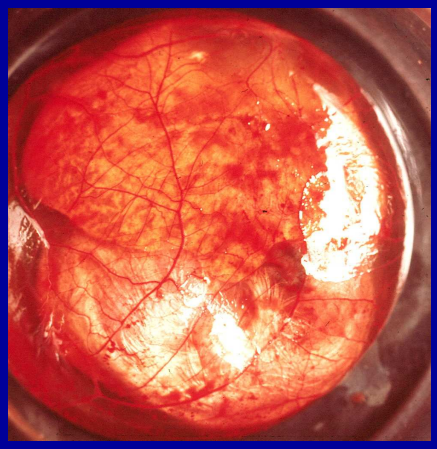


MRI Day 3

Falen *et al*., 1981

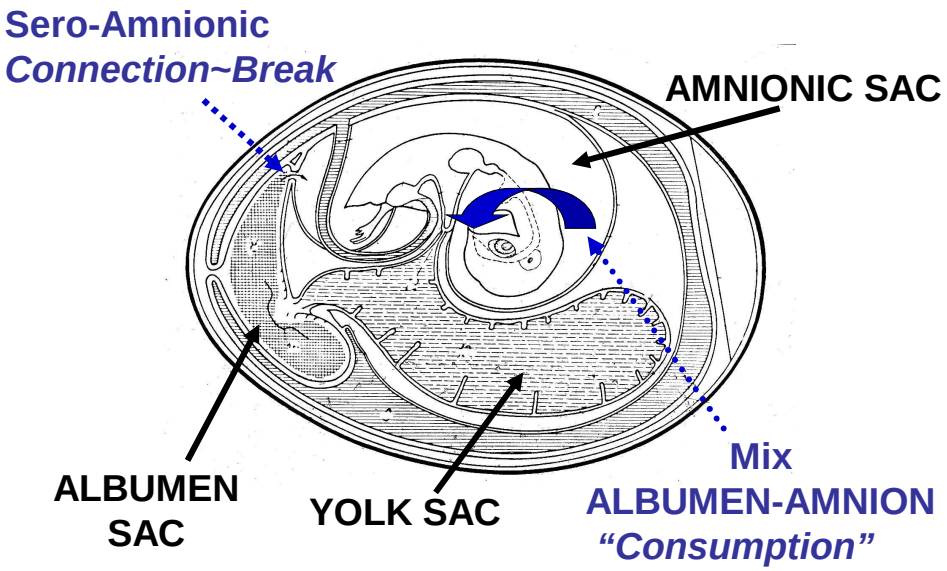
GERM TO "COMPLETE" EMBRYO



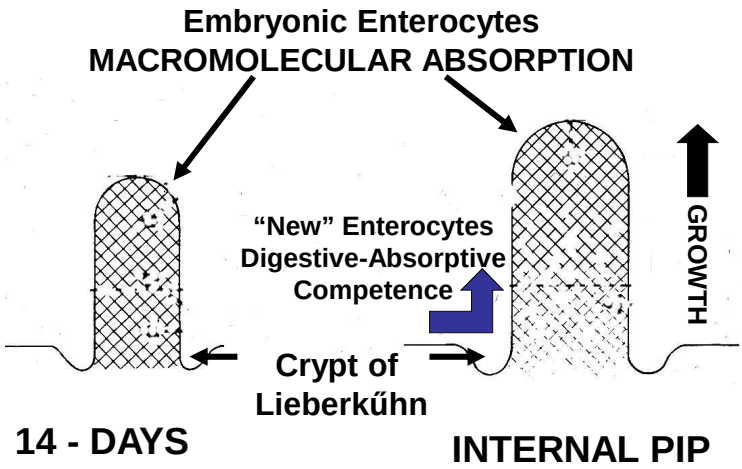


7 - DAYS → **14 - DAYS**

14 – DAY CHICK EMBRYO



CHICK EMBRYO INTESTINAL VILLUS

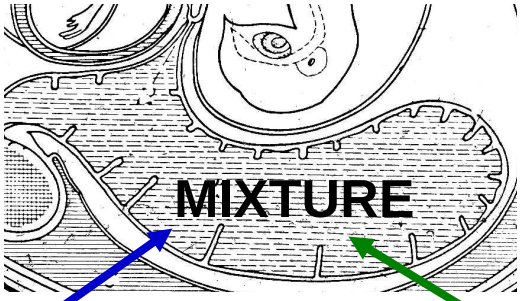


CHICK EMBRYO GLUCOSE

Incub Day	Blood mg /100 ml	mg / 100gm Liver	mg / 100gm Muscle
14	171	625	94
16	202	1648	217
18	228	2890	359

Romanoff & Romanoff, 1967

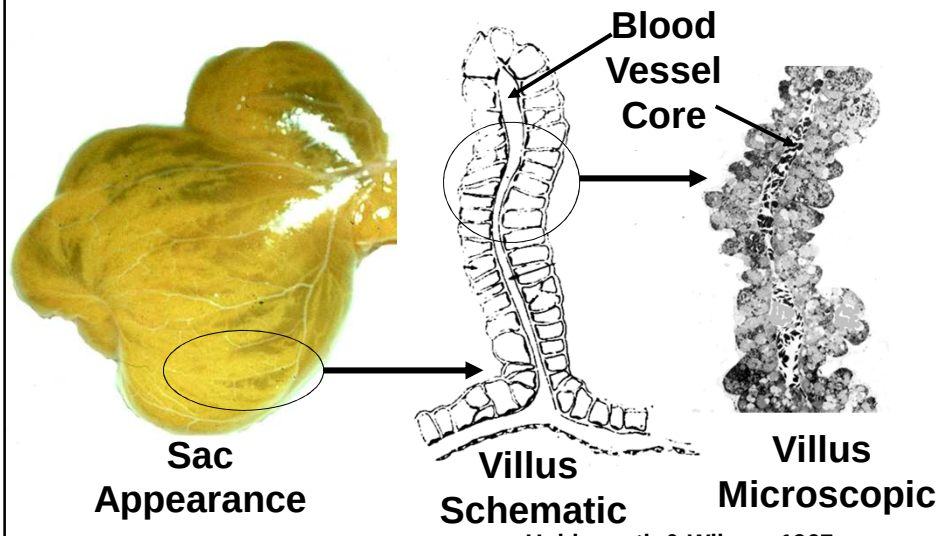
14 DAY EMBRYO YOLK SAC CONTENTS



ORIGINAL YOLK
- VLDL's
- Phosvitin-Lipovitellin

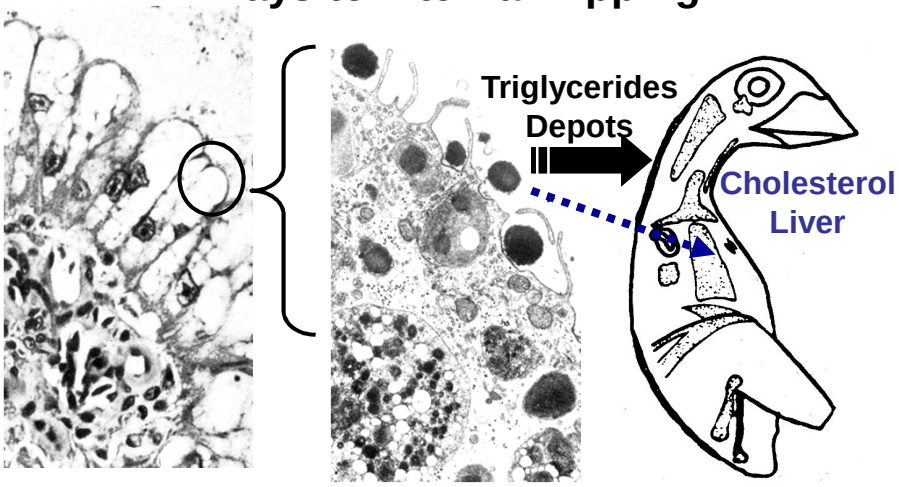
INTESTINAL ENTRANTS
- Residual Albumen+
- Pancreatic Enzymes

YOLK SAC ABSORPTIVE VILLUS



Holdsworth & Wilson, 1967

YOLK SAC VLDL RECOVERY & DEPOSITION
14 Days to Internal Pipping

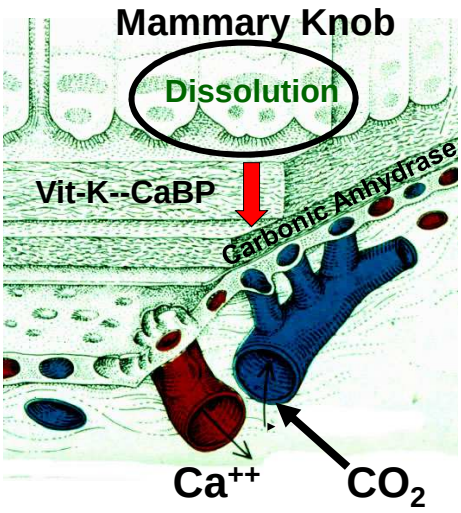


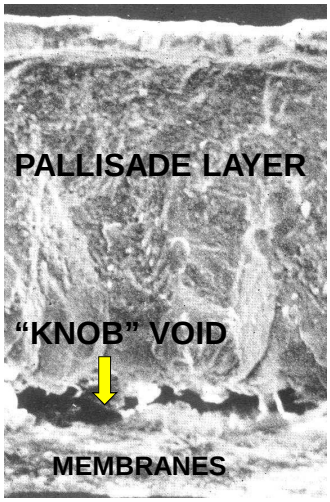
CHICK EMBRYONIC SKELETON

15- DAYS

INTERNAL PIP

CHORIOALLANTOIS & SHELL CALCIUM

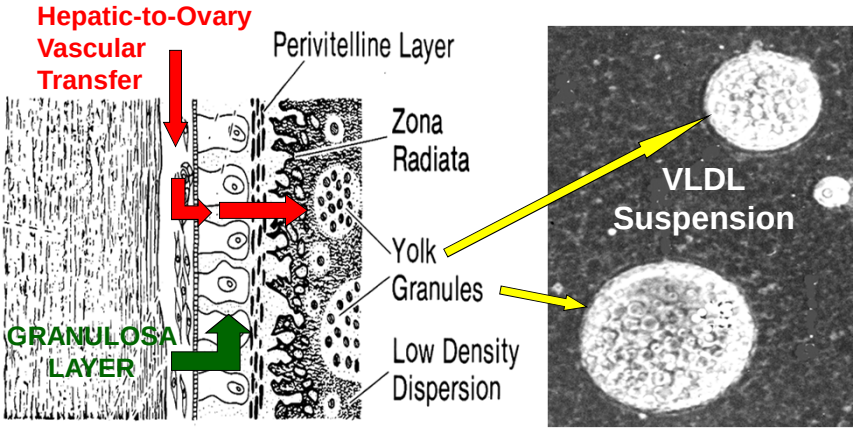




INCUBATION LOSS

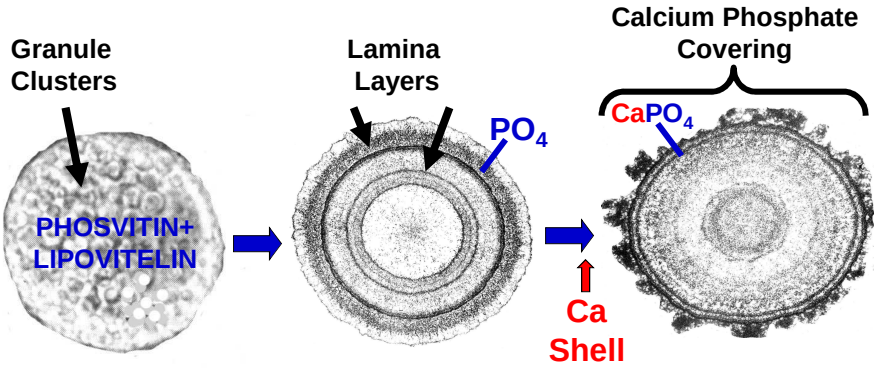
Doskoch *et al*., 1985

OVUM WALL & YOLK FORMATION



VITELOGENIN → PHOSVITIN + LIPOVITELIN

YOLK SPHERE TRANSITIONS

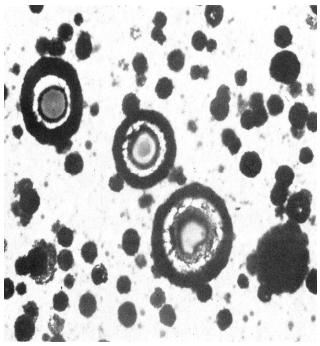


AT SETTING → APEARANCE +14 DAYS → ACCRUED TO PIPPING

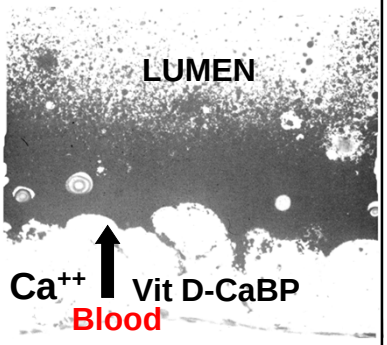
Cheville & Coignuol, 1984

YOLK SAC CALCIFIED SPHERES ACCRUAL 14 DAY TO PIPPING

[Von Kossa H&E – Calcium]



Contents
Lumen

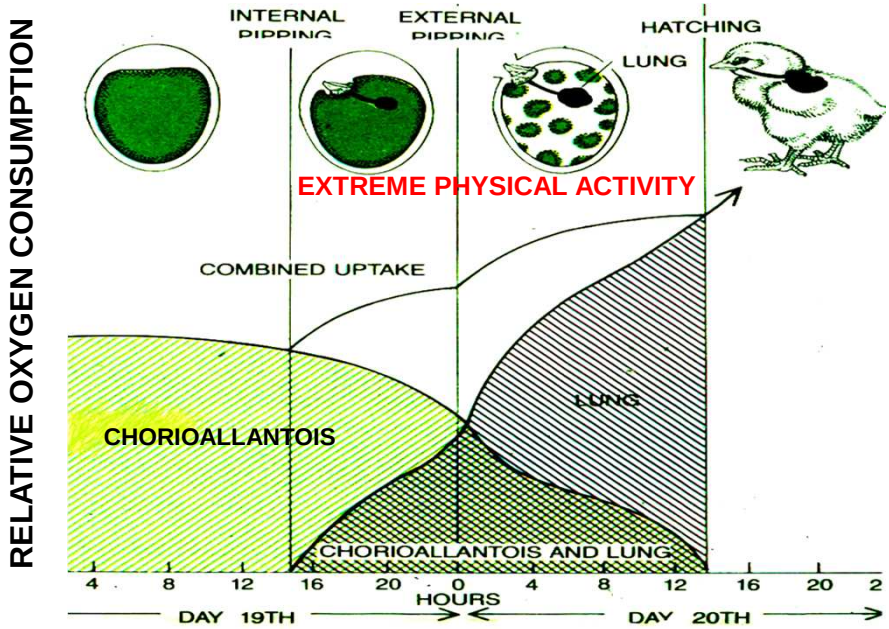


APPEARANCE

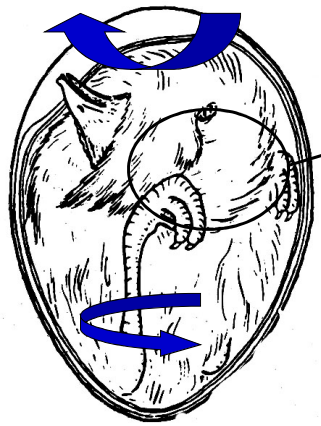
WALL & VILLI

Cheville & Coignuol, 1984

EMERGENCE & RESPIRATORY TRANSITION



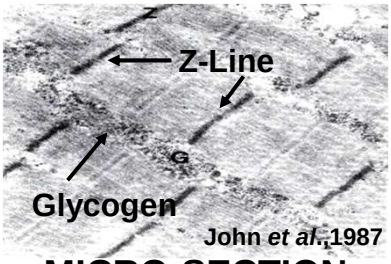
EMBRYONIC EMERGENCE



Romanoff & Romanoff, 1949

Fazekas *et al*., 1985

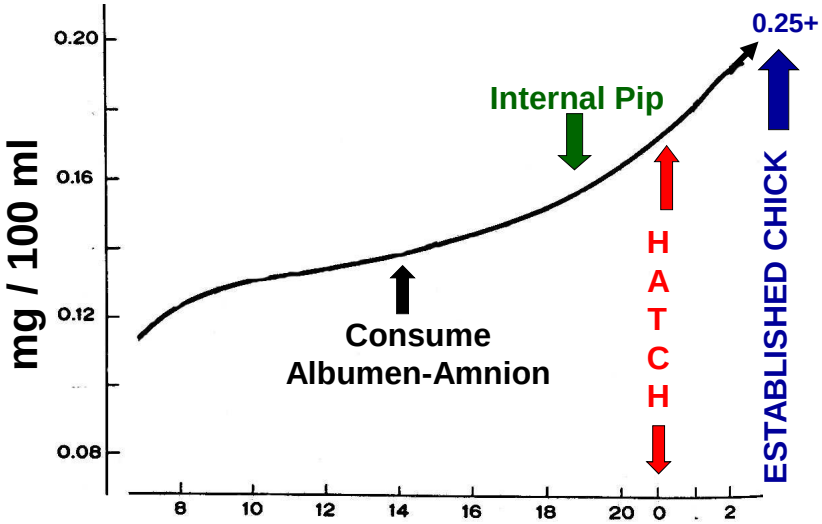
"HATCHING" MUSCLE



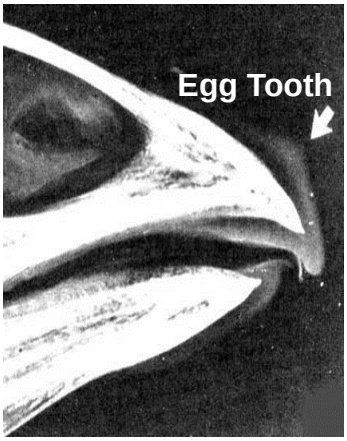
John *et al*., 1987

MICRO-SECTION

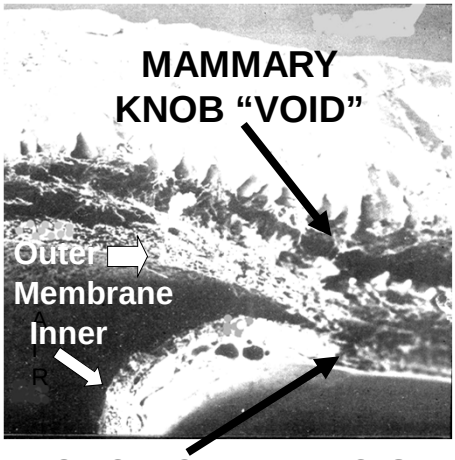
CHICK EMBRYO BLOOD GLUCOSE



AIR CELL- SHELL @ PIPPING



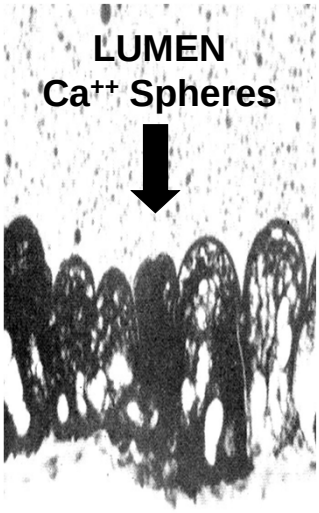
BEAK TIP



CHORIOALLANTOIS

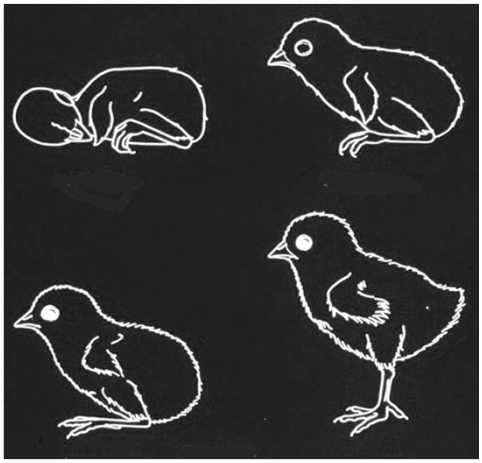
Bartels & Meyer, 1993

POST-PIP CALCIFICATION & YOLK SAC SPHERES



WALL VILLI

Cheville & Coignuol, 1984



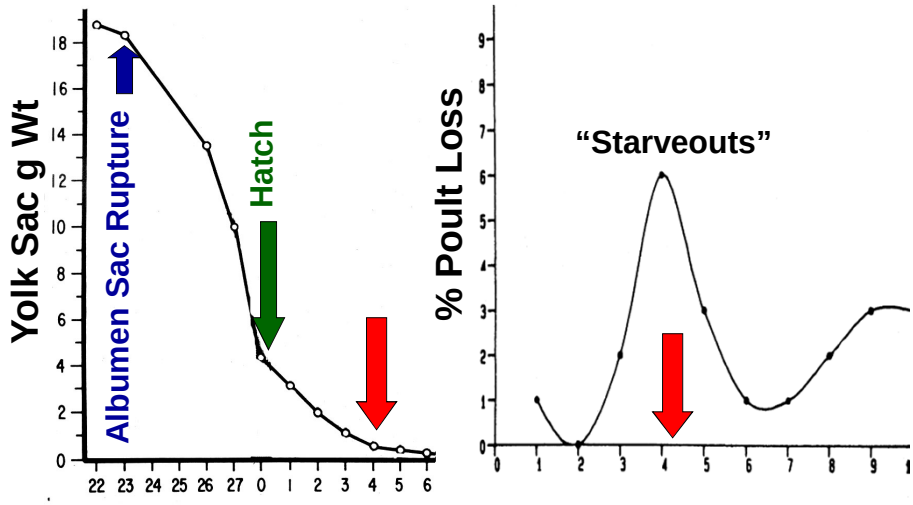
EMERGENCE & POSTURE

BREEDER FEED % Total P →	0.2	0.6	1.0
Chick	At Hatch		
BW (g)	43.4	43.2	43.5
Yolk P (mg / g)	9.4	9.5	9.8
Plasma P (mg / l)	34.4	36.2	38.8
Tibia			
Elasticity (N^2)	3.9	4.2	4.6
Stiffness (N / cm)	205	207	211
Ash (%)	34.0	35.1	38.5

(Triuwanta *et al*., 1992)

POULT "FLIP" @ PLACEMENT

TURKEY YOLK SAC & POST-HATCH DEATH

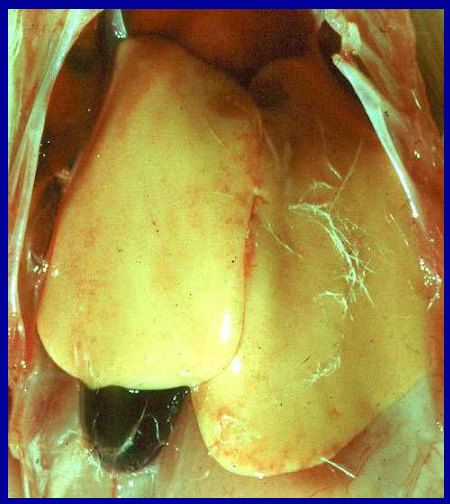


- DAYS -

CHICK FAT DEPOTS

LOCATIONS AT HATCH

CHICK- DEPOT & LIVER LIPIDS



CHOLESTEROL

↓

MEMBRANE GROWTH

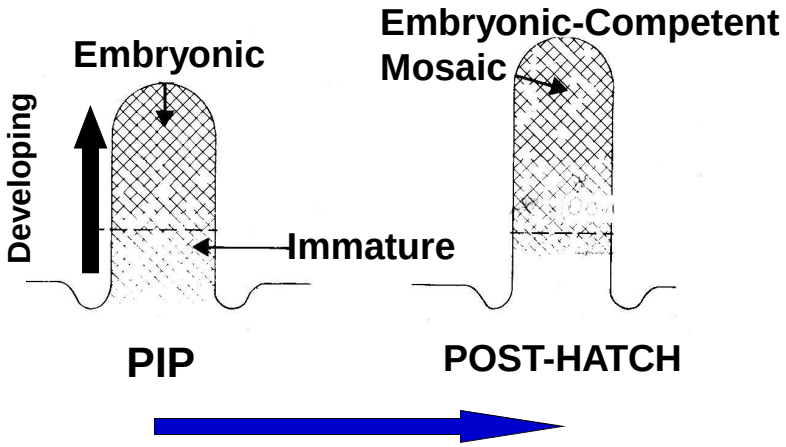
↑

FATTY ACIDS

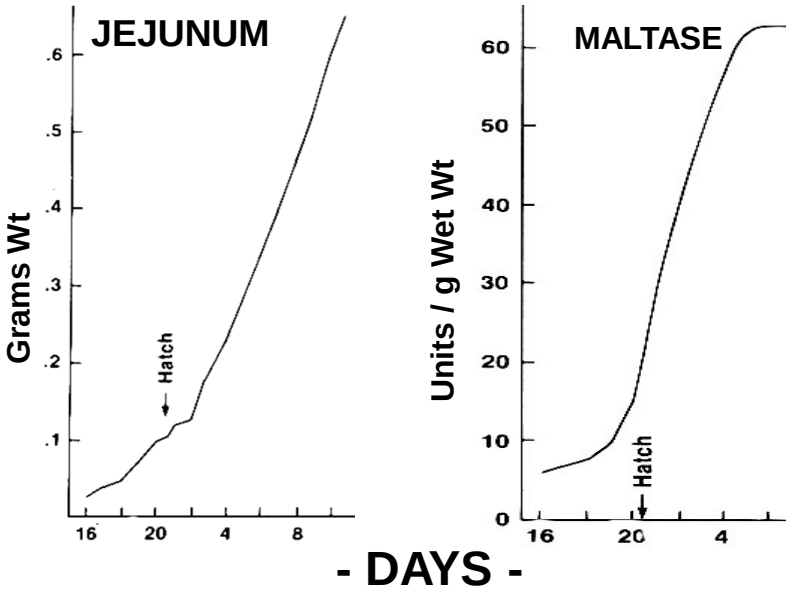
↓ *[Glucose]*

ATP + HEAT + WATER

INTESTINAL ENTEROCYTE TRANSITION



EMBRYONIC DIGESTIVE TRANSITION



NUTRITIONAL FOCUS OF EMBRYO

Days	Activity	Central Nutrient
0-7	Establish Germ	CHO & O_2
7-14	Body Completion	FA Oxidation
14-19	Emergence Prep'n	CHO-Fat-CaP
19-21	Establish Lungs	O_2-CHO-CaP
21-24	Reserves ➡ Feed	Fat(CHO)-H_2O