

THESIS.
"CONDITIONS EFFECTING THE MORTAL-
ITY OF CHICKS."

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"CONDITIONS EFFECTING THE MORTALITY OF CHICKS."

At the present day one of the greatest problems confronting the old and especially the new breeder of poultry is the reason for the death of so many of our newly hatched chicks. In order for a breeder to successfully raise young poultry, he should in some measure be able to answer this question.

To get at the bottom of this problem we should begin with the parent stock. In the first place the parents should be strong, healthy and vigorous, and if possible allowed plenty of range. Food that is nitrogenous should predominate in the feeding, and the ratio of carbohydrates to proteids should be as 1 to 4. The exercise and green food problem can be solved by allowing plenty of range and pasture. It has been shown conclusively at the station here, that hens kept in small pens and not furnished with sufficient green or succulent food will not produce strong fertile eggs. If the eggs which are set with the intention of obtaining good chicks, are not strong and fertile to begin with, our success is doubtful.

After securing the proper basis for the production of our young poultry we must look to our means of incubation. It is a conceded fact that where poultry is to be raised in any number, incubators have by far the preference. The kind of incubator to be used for hatching chicks is something no one can tell, but from all indications shown here in the comparative uses of different incubators, the hot water machine has the preference. We cannot go into detail and tell just why this seems to be so, for that would involve an experiment along another line.

Absolute equality of temperature must be kept in the incubator to secure the best results. But a slight variation will sometimes cause no apparant reduction in the percentage of the hatch.

Now if the best kind of eggs have been properly hatched, a breeder naturally supposes that he has as strong a basis for healthy chicks as could possible be obtained, but still many of chicks die when 5 to 15 days of age. After looking into this for some length of time, the conclusion is that it must be on account of improper feeding. Nine out of every ten of the persons who raise poultry try to force food into the chick as soon as it is strong enough to move around. Is this the proper thing to do? Upon investigation it is found that without exception nature has furnished every living thing on this earth with some means of being cared for during its first days in the land of the living, which man must not and cannot interfere with. So upon this knowledge we base our right to begin an experiment to find what nature has provided for the young chick as a means of sustenance.

One-hundred and fourteen eggs taken from Van Dresser and Blanchard strains of White Leghorns that were hatched, raised and fed under the same conditions, were placed in a Fairfield incubator. At the end of the first week 30 eggs were candled out as infertile. At the end of the second week 20 eggs were tested out. The temperature of the incubator remained fairly constant except when the temperature dropped to 96° on the 9th, day of incubation. 50 eggs of the 64 remaining after the second candleing, hatched. Upon examination the remaining eggs were found to contain dead and partially undeveloped chicks. One egg was removed when first pipped

and weighed. This weight was 741 grains. The shell was removed and the chick was found to be covered with a very moist sticky substance which was used to furnish moisture during the period of hatching. This moist substance weighed 32 grains, and the shell weighed 43 grains. At the base of the abdomen and slightly below the vent was an orange colored sack which was attached to the intestines and yet was outside of the body. This sack weighed 200.2 grains and was 27 per cent of the total weight of the chick.

As soon as the first one hatched, which was 20 days after the eggs were set, it was weighed. The weight was 553 grains. Below the vent in the abdomen was a small opening just beginning to heal over. An incision was made at this place and a sack similar to the one found in the other chick, was removed. This sack was connected to the small intestines and upon examination was found to contain an orange yellow, sticky substance which quickly coagulated when allowed to stand in the open air. This substance is the albumen and lecithin from the original egg. The sack was divided into lobes and heavily veined, all leading towards the point from which a connecting cord was sent to the small intestines. What the uses of this sack and its contents are, must best be determined by what follows.

After all the chicks were hatched, 13 were placed on one side of a division of a brooder and the remainder placed on the other side. Of the thirteen, none were ever allowed food, excepting the sand on the floor and fresh water. The remainder were fed as soon as hatched, but internal examination proved that none ate until 35 hours old. From then on, every morning and evening one chick was killed, weighed and the sack removed and weighed, from each pen. The food given to the pen being fed, was Cyphers Patent chick food. The following data was obtained from this experiment.

WITHOUT FOOD.

Age.	Weight of Chick, Grains.	Weight of Parent Food.	Percent of Sack to Chick.	Remarks.
Shell Pipped	741	200.2	27.	Shell wt.=43 gr. changings of chick =32 gr. parent food not taken into body. Chick surrounded by moist covering.
Early 24 hrs. newly hatched.	553	119	21.7	Chick well de- veloped, not en- tirely dry, hat- ched 24 hrs. ear- ly, vigorous.
Later 36 hrs. newly hatched.	661	136	20.5	Not dry, hatched 36 hrs. late, not extra vigorous.
9 hrs.	617	134.2	21.7	One of the three early hatched, vigorous.
24 "	548	114	20.8	One of the three early hatched.
35 "	542	106	19.6	Small amount of sand in gizzard very lively.
48 "	497	54.2	10.9	Same as above.
59 "	560	71.2	12.5	Small amount of sand in craw, giz- zard full, breast bone showing 1st, evidences of be- coming thin. Chi- cks cheep almost continually.

72 "	498	40	8.	Showing slight tendency towards weakness, breast bone thin, craw & gizzard same. Chicks keep under hover continually.
81"	512	28	5.4	Same as above.
98"	512	40.5	7.7	Same as above.
108"	539	27	5.1	Chicks lively, portion of abdomen formerly occupied by sack, now being occupied by intestines
122"	629	17	2.8	Food sack covered with dark distinct, red veins. Chicks very thin and hunt hover continually. Sack beginning to be covered with intestines.
132"	659.5	7	1.06	More intestines.
146"	572	10	1.07	Gizzard big, food dark yellow, somewhat coagulated.
156"	557	3	.54	Same as above.

WITH FOOD.

Age.	Wt. Chick, Grains.	Wt. of Par- ent Food.	Percent of Sack to chick.	Remarks.
Shell Pipped.	741	200.2	27.	Shell wt.=43 gr. Hang- ings of chick 32 gr. Par- ent food not yet taken into body. Chick surr- ounded by moist covering.
Newly Hatched.	553	119	21.7	Chick were developed, not entirely dry, hatch- ed 24 hrs. early, vigor- ous.
9"	617	134.2	21.7	One of three early hatch- ed.
24"	548	114	20.8	Began to eat food given.
35"	561	98	17.	Sand & food in gizzard & craw.
48"	544.5	66.7	12.	Same as above.
59"	799	97	12.1	Craw & gizzard full of feed & sand. Intestines showing over sack. Chick big, healthy, par- ent food slightly dis- colored blueish.
72"	658	97	15	Same as above.

81	729	36.	5	Gizzard growing.
Dead 81"	565	25.	4.6	Food coagulated, creamy & decomposing.
98"	618	53.	8.5	The intestines are developing more, and take up more room in the space formerly occupied by the sack.
108"	508	20.	3.9	Same as above.
122	626	47.7	7.3	Same as above.
Dead 122"	405	49.	12.	Abdomen full of air, odor of H 2 S., badly decomposed.
132"	470	39.	8.2	More intestines.
146"	381	39.5	10.4	Food normal. Chick weak, late hatched.

156	704	40	5.6	More intestinal development.
170	650	22	3.3	Red in color.
182	612.2	8	1.3	Hard, yellow.
194	592	.5	.09	Reddish orange, wrinkled, hard, all covered with intestines.
206	662	1.	.15	
218	628	Speck		
240	431	"		
240	650	"		

Immediately after this experiment was finished another one was carried out exactly like it and under the same conditions. 115 eggs were placed in the incubator, 20 being candled out at the end of the first week and 16 at the end of the second week. Of the remaining 79 eggs, 41 chicks were hatched. The temperature was fairly constant.

The same examinations were gone through with as in the first experiment. Sixteen of the chicks were not allowed any food at all, the rest were given the chance to eat immediately after hatched. The following was the result of the different examinations.

WITHOUT FOOD.

Age	Wt. of chick, Grains.	Parent food Grains	Percent	Remarks.
Egg Pipped	640	200.2	31.2	Egg wt. 81.9 gr. shell wt.=94 gr. Moist surr- ounding of chick wt.= 85 gr.; egg pipped 24 hrs. early; sack not taken into body.
Newly Hat- ched 24 hrs. early.	654	155	23.7	Chick dry, lively, of six early hatched, sack normal.
12"	552	107	17.5	Dry, lively, gizzard & craw empty.
24"	523	123	23.5	Gizzard and craw empty.
36"	562	111	17.9	Sand in gizzard & craw, small clog at place where sack was taken into body, this caus- ing a small coagula- tion.
48"	567	98	17.2	Sand in craw & gizzard, intestines beginning to show plainly in low- er part of abdomen.
60"	433	68.2	15.7	Sand in gizzard, sack not so well seen upon first examination, more intestinal development. Small clog at sack en- trance.

72"	537	43	8.19	Darker color, gizzard larger and more in view. Sack pushed back.
72"	512	45	8.9	Same as above.
84"	543	47	8.6	Gizzard full, craw empty, sack darker in color, chicks continually hunt hover and cheep continually.
96"	508.8	49.2	9.8	Craw empty, gizzard full of sand.
108"	485	23	4.9	Craw empty, gizzard full of sand, sack dark green.
120"	400.4	19	4.7	Chicks thin. Same as above.
Dead 120"	390	87.2	24.	Dead, contents of sack dirty yellow rotten, odor of H 2 S.
132"	399	12.	3	Wings droopy, craw & gizzard empty, all hunt hover.

Dead 144"	412	60	12.1	Chick skinny, sack rotten & decomposed, chick had just died.
Dead. 156"	416	13	3.	Sack darker & partly black, odor of H 2 S, chick had just died.

WITH FOOD.

Age.	Wt. of chick Grains.	Parent food Grains.	Per-cent.	Remarks.
Egg Pipped.	640	200.2	31.2	Egg wt.=81.9 gr; shell wt.=94 gr. moist surrounding of chick wt.=85 gr. egg pipped 24 hrs. early; sack taken into body.
Newly hatched, 24 hrs. early.	654	155	23.7	Chick dry, lively, of six early hatched, sack normal.
12"	552	107	17.5	Dry lively gizzard & craw empty.
24"	523	123	23.5	Gizzard & craw empty.
36"	562	111	17.9	Sand in gizzard & craw, small clog at place where sack was taken into body, this causing a small coagulation.
48"	567	98	17.2	Sand in craw & gizzard, intestines beginning to show in lower part of abdomen.
60	563	117	20.8	Harder, more concentrated, a small clog, more signs of intestinal development, craw & gizzard full.

72"	550	69	12.5	Gizzard pushed around into plainer view, gizzard & craw full, chicks begin to be weak.
84"	559	44	7.9	More intestines.
96"	539	65	12.	Craw full of liquid, sack darker colored, harder, intestines more prominent.
108"	660	25.5	3.8	Big chick, same as above.
120"	610	29.	4.7	Big chick, sack a rich yellow color, inside of it darker.
132"	598	34.	5.7	Sack harder, same as above.
144"	554	23.	4.1	Craw partly filled, sack partly dark, rest yellow, chicks not eating as heartily as they should, lively but not as hardy as they should be.
156"	515	28.	5.4	Sack compact, solid but not hard, greenish in color with yellow stripes.

168"	538	20	3.7	Sack compact, dark green in color, partly yellow near intestines connection.
180"	562	10	1.7	Craw full deep yellow, harder albumen appears to be used first.
192"	530	34.	6.6	Little in craw, chick lively, entrails well developed.
204"	654	14.5	2.1	Sack compact, part dark green & rest rich yellow.
216"	562	9.	1.5	Sack hard and blackish in parts, rest green.
228"	564	1.	.17	Creamy yellow, coagulated.

By looking over the above data we find irregularities that no one can possibly account for. If the same chick could be used every twelve hours, the results would probably be absolutely correct. But never the less we find that many conclusions can be drawn from the above data.

Nature has provided for the chick enough food to keep life for 5 to 6 days. This food is partly protein food, called albumen, made from the white of the egg, and used for muscle building, And the rest is lecithan made from the yolk and containing phosphorous and a proteid.

From the figures obtained from the chicks given no food, we find that between the 60th, and 72nd, hours of life there is a sudden diminishing of the weight of the sack containing the parent food. This seems to be fair evidence that at that time, there appears to be some need of some food, to aid the parent food in sustaining life for the chick. The intestines at this time are fairly well developed in the lower part of the abdomen and appear in such a condition that they can begin their work of digesting grain food. The chicks show their first signs of weakness, and begin to keep in the hover continually, cheep considerably and show considerable hunger when the other chicks are fed.

Along about the fifth day the chicks begin to lose all the vigor which they may possess, droop their wings and huddle. In the last experiment, they begin to die at this age and those that did die showed a larger percentage of food sack than those living at that age. The sack of the chicks who died, had expanded until it was tight and the contents had coagulated and become considerably decomposed. The odor was that of rotten eggs. This showed the lack of proper assimilation of the food, hence its deterioration.

The decrease in the percent of sack to the chick was not regular, because of the difference in the chicks, their vigor and temperment.

Of the chicks fed we met with some probable disappointing results. It was expected that the chicks would die from being fed too soon. Only in the first experiment did we have any die from being over fed. Upon examination these showed plainly a decomposition and hardening of the contents of the sack, thus causing the death of the chick.

The food was put before them as soon as they were placed in the brooder, and without exception they refused to eat until from 24 to 48 hours old. This variance in their beginning to eat, helped to cause the lack of a regular decrease in the percentage of sack to chick.

In both experiments the egg sack lasted as long as the number of chicks did. In the first it was 10 days and in the second it was $9\frac{1}{2}$ days, with all evidence pointing towards a continuation of its presence.

In these chicks, a quicker development in the size of the gizzard and intestines was shown than among the other chicks. The gizzard seemed really almost abnormal, taking up most of the space in the abdomen.

Some of the chicks always had their craws full of feed and seemed to be ready for more, while others showed a disposition just the opposite. This overeating and lack of eating is one of the causes of the irregularities in the percentage decrease.

A couple of side investigations were made with chicks hatched a little later than the schedule 21 days. These were fed as soon as hatched and with only a few possible exceptions did they fail to die when from 8 to 12 days old. Upon examination, the sack had hardened and decomposed, thus causing their death.

This leads us to believe that if the parent stock, environments, and vigor of the chicks are strong, there will be no noticeable decrease in their mortality. If however, a chick has a tendency towards weakness, this early feeding will cause it to put all its strength towards the digestion of the grain rather than that of the parent food, hence taking all its strength and causing a deterioration of the parent food and the untimate death of itself.

So we can see that conditions and circumstances after cases, some chicks may live and thrive even if fed wet corn chop on the ground before they are hardly dry. Then again they may not. If the parent stock is hardy and the eggs well fertilized and incubated there are all possible chances of such chicks living. If these conditions do not prevail the chances are towards the loss of the chicks.

This causes us to believe that a happy medium, with the chances both ways being taken into consideration should be struck. This medium can be found by feeding the chicks when about 60 to 72 hours of age.

The opening below the vent in the chick which correspondes to the navel in mammals begin to heal as soon as hatched. Not one of these hatched showed any trouble at this place, as is often found in many chicks. This healing was finished in the unfed chicks about the fifth day and in the fed chicks about the eighth

day. Thus more of a tendency was shown towards the proper development of the chick among those that were never fed.

The fact that water was given to the chicks with out food helped to prolong their lives. The sand allowed them, helped in giving the muscles of the walls of the gizzard some work to do, thus lengthening their days of living. If neither water nor sand had been allowed the non-fed chicks they in all probability would not have lived as long as they did.

Taking the fed chicks in general, they did not show the liveliness, vigor nor increase in growth that they should. Evidently all their growing tendencies were used towards overcoming the tendency towards deterioration which the early feeding influenced. No appreciable increase in size was shown at all among any of the chicks in the experiment. None of them started to feather properly.

To close this, we find that the eight weeks spent in this experiment were but a small beginning towards intricate investigations about the conditions effecting the mortality of chicks. The subject is deep and the more we work on it the more we find we want to branch out and find the answers for the questions which arise in our minds. But we can only find a few points at a time and though none may be clear to any reader of this. The writer feels that he has been shown many profitable ideas and has reaped a few good results.