

# CONCERNING POULTRY



Photo: Koen/archives AE

## CURLED TOES

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It's always a disappointment when chicks hatch in the incubator and some appear with curled toes. If you are experiencing this for the first time you will wonder why this happened. If the eggs came from another breeder, he will quickly get the blame, while he in his turn will say that it must have been the incubator.

The main suggestions offered are:

1. Incorrect incubator temperature
2. Incorrect brooder temperature
3. Vitamin shortage (in parents or chicks)
4. It never happens with chicks hatched under a broody hen
5. A genetic fault

The problem of curled/crooked toes is hard to solve especially when we don't know what causes it. So, let's look at this carefully.

### ***1. Incorrect (too high) incubator temperature***

The majority of modern incubators have thermostats regulating temperature very accurately and very efficient fans to spread the warmth throughout the machine.

Questions: Even if there were variations in temperature, why do only one or two eggs hatch chicks with this problem, particularly when they are often not side-by-side in the incubator?

Why should the other eggs not be affected when they are alongside the affected eggs?

### ***Point 2. Incorrect brooder temperature***

It could be caused by a too cold or slippery floor in the brooder.

Question: Again, like in item 1, why are only one or two birds affected and not any others?

### **3. Vitamin shortage (in parents or chicks)**

In this case it is often suggested that the curled toes are due to a shortage of riboflavin (vitamin B2), in the parents or the chicks.



Question: It also happens with chicks from parents that get the best food and also the chick starter is premium quality, according to the manufacturer.

### **4. It never happens with chicks hatched under a broody hen**

This claim can be discounted, because several breeders have claimed it happens with chicks that have hatched under a broody hen.

**Left: Pavlov hen with her chicks – these don't have crooked toes.**

**Photo: Frank Bridgland, UK.**

### **5. A genetic fault**

If all the above causes can be discounted, genetic weakness could be a possibility. If the problem occurs in rare breeds or breeds that are strictly

selected for particular characteristics or egg colour, it is tempting to say it is due to inbreeding. Still it is not that simple.

Question: How is it possible that, from the same breeding pen, even from the same brooding round, chicks hatch with normal toes, as well as some with curled toes?

These questions don't seem to provide many answers. However, the possible causes discussed are not without foundation. For example, **point 1** states: Too high temperature in the incubator, and **point 3**: Deficiency of vitamin with parents and/or chicks. These two issues are more closely linked than they seem—in fact it has been determined that the correct uptake of vitamins by the embryo during the incubating period is linked to the temperature in the incubator. Temperature extremes apparently have an effect on riboflavin uptake and reports suggest this effect is greater when the incubation temperature is too high. That only some chicks have crooked toes can be explained by some hens not having a vitamin B2 deficiency at the time of egg laying. It may even depend on the position of the egg in the incubator—there are always hotter and colder spots, or a ventilation issue. Except for the incubator temperature, embryo bone development is also influenced by oxygen concentration and eggshell conductivity.



**Right: Photo courtesy of**  
<http://poultrykeeper.com/>



Not all curled toes are the same—there is at least two types<sup>1</sup>. The toes can be curling under, like making a little 'fist', or more or less bending to the side.

The first type is mostly caused by a Vitamin B2 (riboflavin) deficiency in the diet of the chicks themselves or of the breeding stock producing them. In severe cases there is also partial paralysis of the legs which forces the bird to assume a squatting position. This type is seen directly after hatching or in the first days.

In the second type the crooked toes are usually caused by management faults during brooding—for instance, crowding under the hover, or having a smooth, slick floor in the brooder. The competition for a warm spot or the walking on a slick floor during early stages of bone formation can produce the deformity. The toes bend inward, making the chick walking on the sides of its feet, or sometimes two toes are bent inwards and one outwards. The toes of one or both feet may be affected. The birds walk in a normal upright fashion and have no apparent difficulty in locomotion, with sometimes only a slight impairment of balance seen.

This abnormality begins to show after a week or longer and thus suits **point 2**—Why are there only one or two chicks with crooked toes and the others not? This can depend on the amount of feed that the chicks eat. Chicks that cannot find a good place at the trough eat less and do not get enough vitamins, which may result in crooked toes. But chicks that grow too fast can get crooked toes too. If there is light day and night, the chicks can eat constantly and some chicks will do just that. As a result of excessive eating the muscle mass of the chick is continuously growing. The skeleton cannot keep up with this rapid growth and with the overweight body on the still weak toes, they can easily become bent. This can also happen if the feed has very high protein content, for example, feed milled specifically for meat chickens. Correspondingly, a wrong ratio may occur between calcium, vitamin D and/or vitamin K1, resulting in chicks with crooked toes (and possibly other skeletal abnormalities).



**Above: Make sure the size of the feeder is big enough so that all chicks can eat at the same time.**

Thus remains **point 5**, a genetic defect. Indeed, it is proven that some breeds or strains more often suffer from crooked toes. But a genetic error does not necessarily mean that it is hereditary nor that it is due to inbreeding—a cry that is almost always used in such cases. It has been sometimes assumed that this problem arises because certain breeds (such as the white Leghorn) apparently have a greater need for certain vitamins.

So all these possible causes (except point 4) are more-or-less correct and also (partly) related to each other.



### **Vitamin B2** <sup>2,3,4</sup>

The egg is composed of many nutrients that come from the parent, so, to ensure a healthy hatched chick, the parent needs plenty of nutrients at least two weeks prior to laying. Although the various vitamins are present in large quantities in the raw materials, also extra vitamins are added in the poultry feed. Yet it may happen that a particular bird does not get enough vitamins. This may be because the feed in the plant is not properly mixed, or due to too long or improper storage of the feed. Also, if a lot of grain is fed in addition to the mash or pellet feed, so that some chickens will be eating less of the mash feed than others. Another cause could be that the bird can absorb insufficient vitamins as a result of inflammation of the intestines; especially inflammatory bowel diseases are the cause of deficiency of different types of vitamins. This answers the questions at **point 3**.

**Right: Riboflavin.** Flavin comes from the Latin *flavus* = yellow). The reduced form, which occurs in metabolism along with the oxidized form, is colourless.  
**Photo: PatriciaR.**



If the food is exposed to light during storage, the stability of vitamin B2 will be questionable, and this also is true in yogurt and other dairy foods. There seems to be no credible reports of toxicity from vitamin B2 so it is highly unlikely that your chickens could eat too much.

When curled toes appear, a shortage of vitamin B2 (riboflavin) is immediately considered. Vitamin B2 deficiency is normally seldom diagnosed in more than a few chickens in a flock. Vitamin B2 is passed into the egg by the hen. Older birds with a deficiency of vitamin B2 lay fewer eggs and moreover hatchability will be severely reduced. Riboflavin is an essential vitamin to sustain the embryo's growth until hatching.

But even if everything with the hen and the egg is in order, there may still be a shortage for the developing embryo, perhaps due to the incubator temperature being too hot. The deficit in the first place causes disease symptoms in the young chicks that have hatched. They grow very slowly. The weak chicks do not have an appetite, and in severe cases, the leg nerves are affected. This causes a convulsive contraction of the toes, making the toes curl. Chicks walk as little as possible, eventually becoming totally paralysed.



Above: To compare, straight and crooked toes. Photo: Monique de Vrijer.

### Prevention and treatment

1. Chicks that have curled toes at hatching or soon afterwards.
  - Give the chicks some brewer's yeast in the feed (max 2 per cent) as soon as possible, or vitamin B2 (or a multivitamin, which also contains B2) during the first five to seven days. A drinking water supplement is



ideal in chicks that hardly eat but are still drinking. If the curled toes are indeed caused by vitamin B2 shortage, there is a good chance that the toes will become straight again—without the use of tape/splints. Usually this results in a rapid response, however, if treatment is delayed irreparable damage to the sciatic nerve will occur and administration of riboflavin will be of no use.

- Ensure that the breeding birds get enough vitamin B2 in order to prevent this from recurring. Switch to a special breeder feed during the breeding season. Some breeders add brewer's yeast to the feed, and vitamin B2 is also found in grasses and dairy and meat products.
2. Chicks that get crooked toes during their first week in the brooder.

- Provide a rough (not smooth) surface in the brooder.
- Do not provide 24-hour lighting, such as infrared bulbs. Instead, use a ceramic emitter heater, which emits only heat. Moreover under the influence of the infrared radiation a portion of the vitamins in the feed will destabilise. Under normal circumstances riboflavin has good stability when added to mixed feeds, but considerable loss may occur if foods are over-exposed to light.



**Above, right: Aubiose (Hemp litter). Photo archief AE.  
Left: Ceramic emitter heater. Photo Archief AE.**



- Make sure the size of the feeder is big enough so that all chicks can eat at the same time, and see to it that all chicks have a proper place under the heater.
  - If appropriate, switch from industrial chick starter to a starter for hobby chickens—after all our chickens don't need to grow that quickly.
- Give the chicks vitamin B2, in the form of brewer's yeast or yogurt, or mix both together. If chicks seem to improve after a vitamin boost, then it can be assumed the problem was caused by a vitamin B2 shortage. Ensure the chick starter feed is fresh. Feed that is too old will have the vitamins denatured and worthless.

### Comments and opinions

Opinions are divided about curing crooked toes, or the usefulness of any attempt to do so. It is not always realised, that crooked toes caused by poor nutrition or poor management are distinctly different types that each need their own specific treatment.

*An Australian breeder of Modern Game bantams told us: "Crooked toes are very common in Modern Games that are hatched in the incubator, so much so I don't bother with incubators for those anymore and only use broodies, without any problem. I am no expert but it seems to happen most often in incubators with chicks that are incubated too hot and ones that come out some days late.*

"I just cull everything with bad toes as soon as I see them—usually when they come out of the incubator at day old. I have seen some people try to splint crooked feet with wires and little cardboard shoes, but personally I can't see the point. Such birds are defective and will always be defective.

"I believe the crooked ones have an inherent weakness and should be discarded".

*A breeder from the UK wrote:* "My thinking is that curled and dislocated or sharply bended toes are a genetic problem and that there may be a recessive gene involved. I have had a lot of problems with curled and bent toes with my Chamois Brabanten. My original line was from Germany and I did not have the problems until I introduced a Chamois Brabanter line from another breeder. So the only thing to do is carefully select breeding stock if you think the problem is hereditary".

*A Dutch breeder wrote:* "In the past, I have had problems with it. The curled toes started to appear when the chicks were two to three weeks old. I usually weigh the chicks on the 16th day, and the chicks with crooked toes turned out to be heavier than the others, especially the roosters.

"The solution was to stop 24 hours of light a day. I used to have infrared bulbs as a heat lamp, but I switched to the ceramic bulbs. The vet gave me vitamin B and there was some improvement, but it didn't help sufficiently for the really crooked toes.

"The chicks with the crooked toes weighed 180 to 220 grams at 16 days old; now the heaviest chicks are 150 to 160 grams and no more crooked toes".



**Above: Chicks warmed by means of a Ceramic Bulb. Such a heat lamp emits only heat and no light, ensuring that chicks have a natural growth rate and aren't kept awake 24hrs a day. Photo: AE.**

*Herman Garretsen, director of Garvo Feed<sup>5</sup>, states:* "Crooked toes may be associated with vitamin deficiency. Due to various reasons, not all chickens will get enough required nutrients and this eventually shows in the health and resilience of the different breeding lines, and may lead to reduced fertility, poor hatching results and even deformed chicks.

"Also stress conditions will add to the problem and clearly affect the absorption capacity of the intestine. These may include effects of environmental pollution, presence of mycotoxin<sup>6</sup>, polluting metals, or incubator settings... also heat stress and breeding stress where chickens in the breeding pen are not matched properly.

"In many cases, the effects are attributed to hereditary deficiencies, however I believe that it is more related to defects caused by the circumstances in which chickens are kept".

"This is the reason why Garvo recommends in those cases in which this type of problem occurs, to feed a specialty fancy chicken breeder mash for most of the year, but at a minimum of two months prior to collection of hatching eggs.<sup>7</sup>

The level of vitamins is at least 50 per cent higher than in standard chicken feed. The vitamin B2 level is at 7.2mg/kg. Of course there are also B vitamins in the raw materials (including yeast), but they are not quantified.

In practice, this will clearly provide more vitality in the chicks."



*From research<sup>8</sup>:* By a selection program combined with inbreeding in a Single Comb White Leghorn flock, crooked toes were found to be a polygenic trait characterised by semi-dominance and variable penetrance. Inbreeding per se increased incidence, and increased incidence was accompanied by increased expressivity. However, the behaviour of matings between parents with varying degrees of crooked toe incidence was unpredictable.

#### Resources:

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