

**SOMITE NUMBER EVOLUTION DURING EARLY  
EMBRYOGENESIS IN CHICKEN EMBRYOS FROM  
TRANSYLVANIAN NAKED NECK AND PLYMOUTH ROCK  
BREEDS**

**EVOLUȚIA NUMĂRULUI DE SOMITE ÎN EMBRIOGENEZA  
TIMPURIE LA EMBRIONII DE GĂINĂ DIN RASELE GÂT  
GOLAȘ DE TRANSILVANIA ȘI PLYMOUTH ROCK**

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*In Romania, the Transylvanian Naked Neck hen breed is considered to be an “endangered” population, reason for which we consider that a special attention should have been given until now. Plymouth Rock breed was imported for the first time to Romania from the Studler Company, France in 1969. This paper is aiming to perform a profound analysis of the development patterns of the somite number in the two breeds, by measurements carried out at 26, 30, 40, 50, and 60 hours of incubation. Observations demonstrate that somite forming is carrying on in a similar way as the other embryo complex characteristics following an undulatory curve whose curls are different in the two breeds, but the forming speed during the whole studied period is similar. We estimate that the two breeds have a good combinative capacity, which recommend the utilization of these genetic materials to obtain hybrids for producing “peasant-type” chicken meat, very well-appreciated by the Europeans between the two World Wars.*

**Key words:** embryos, Transylvanian Naked Neck, Plymouth Rock

### **Introduction**

The Transylvanian Naked Neck hen breed became known in 1875, when a Transylvanian peasant presented a homogenous group of naked-necked hens in an exhibition in Vienna. After that, this breed was presented in several exhibitions such as Universal Exhibition in Paris in 1878, Poultry Exhibition in London in 1900 etc. Also, it is a fact that around 1875 the Naked Neck hen was found and well-appreciated in Transylvania, where some breeders started to raise it on

rational basis and to make selection of this breed. These are the breeders we could owe the standard of the breed. Later, in year 1905, this standard was adopted and improved by the German Association of Transylvanian Naked Neck breeders from Silesia (Ștefănescu, 1956). Transylvanian Naked Neck breed has a special importance for our country that is why we should give it a special attention within the management of animal genetic resources.

Plymouth Rock breed belongs to the American dual-purpose breeds, being formed in Massachusetts. In Europe, it was imported in 1880 in England and in 1882 in the Netherlands. In year 1969 Romania imported N and H lines from Studler Company, France and S and F lines from Shaver Company, Canada. Also, in year 1984 some lines were imported from Ross Company, England.

Plymouth Rock is a genetic improver breed, being the third in the world as importance and population number in the industrial aviculture. It is used almost exclusively as broiler hens.

The aim of this paper was to carry out development patterns of the somite number during the early embryogenesis in order to achieve a more profound knowledge of these populations. The subsequent objective is to obtain hybrids for producing “peasant-type” chicken meat that was very well-appreciated by the Europeans between the two World Wars.

### **Materials and Methods**

When we discuss about somite development, actually we understand the development and evolution of the third embryo leaflet by the name of mesoderm. Mesoderm development starts with the primitive line emergence and continues with the cephalic prolongation, neural canal and cephalic processes development.

Short time after the cephalic fold appears in the fore part of the primitive line, cranial to the Hansen nodule, and to one and other side of the neural canal, in the paraxial mesodermal band a splinter appears followed by another one placed ahead of the first one. This defines the first pair of somites, event that occurs from 20 to 25 hours of incubation. Here is taking place a mesodermic cell conglomeration, circularly disposed around a cavity that slowly starts to continue laterally. The cavity is covered by two layers of cells that will form the walls of the embryo's body. The number of somites increase as embryo gets older. This is taking place by forming other pair of somites that will be placed inferior to the first ones. The above-described process is named mesoderm segmentation.

The measurements carried out in order to establish the standards of the somite number evolution during the early embryogenesis in the two hen breeds were carried out on 16-embryos groups at the age of 26, 30, 40, 50, and 60 hours of incubation. The method used was a special method developed in the Experimental Embryology Laboratory from the Timișoara Branch of the Romanian Academy.

Obtained data was statistically processed in order to quantify the influence of the genetic structure of each embryo category.

## Results and Discussions

Time evolution of the somite number in the two embryo groups is presented in Table 1.

**Table 1**

**Evolution of the somite number in embryos from the two chicken breeds  
[somite pairs/hour]**

Embryo groups	Embryos age - hours of incubation				
	26	30	40	50	60
Plymouth Rock (NH)	0.43±0.98	3.29±1.00	10.35±1.49	17.19±1.38	27.76±2.9
Transylvanian Naked Neck	0.38±0.87	0.53±0.99	9.50±1.25	14.38±0.75	25.5±1.5
Differences	+0.05	+2.76	+0.85	+2.81	+2.26

Analyzing data in Table 1, we could see that the time evolution of the somite in the two embryo groups is carrying on using a different model. It should be observed that the mesoderm is increasing and segmenting in a different rhythm according to the embryos' age. During the first part of incubation the somite number that appears needs a longer time than after those embryos are going beyond the age of 30 hours of incubation. The literature says that the emergence of the first somite pair is accepted if takes place from 20 to 25 hours of incubation. Studied embryos have, on average, 0.38 to 0.43 somites at the age of 26 hours, with a very high variability of this parameter.

If at 30 hours of incubation Plymouth Rock embryos had 2.76 somite pairs advantage, this difference is decreasing to 0.85 at 40 hours of incubation. At 50 and 60 hours of incubation, the difference is maintained within the same limits +2.81 and +2.26, respectively. It is to note that the Transylvanian naked Neck breed had an intense activity of somite forming from 0.53 to 9.50 pairs during the time frame 30-40 hours of incubation, and from 14.38 to 25.50 pairs from 50 to 60 hours of incubation.

In order to make a more profound analysis of the development models of the two embryo groups, the average forming speed of the somite pairs during studied intervals is presented in Table 2.

**Table 2**

**Average speed of the somite formation in the two breeds [somite pairs/hour]**

Embryo group	Age interval of embryos				
	26-30	30-40	40-50	50-60	26-60
Plymouth-Rock (NH)	0.715	0.706	0.684	1.057	0.80
Transylvanian Naked Neck	0.0375	0.897	0.488	1.112	0.74
Differences	+0.6775	-0.191	+0.196	-0.055	+0.06

Table 2 shows that somite formation in the two breeds is taking place with a similar average speed during the studied period (26-60 hours). Also, data from Table 2 suggests that time required for mesoderm segmentation followed by new somite pair formation is different from an embryo development period to another.

Our calculations demonstrate that somite formation is taking place as the other embryo complex characteristics, following an undulatory curve whose curls are different for the two embryo groups having different genetic structures. If during the first studied period (26-30 hours) the Plymouth Rock embryos had a 0.675 somite pairs/hour higher speed, during the second studied period (30-40 hours) the Transylvanian Naked Neck embryos get up to a value of 0.897 somite pairs/hour compared to 0.706 somite pairs/hour for the other breed.

During the next time period (40-50 hours) the situation is the other way around in the favor of the Plymouth Rock breed, with a plus of 0.196 somite pairs/hour, because during this time interval the average somite formation speed in Transylvanian Naked Neck breed is halving (0.488 somite pairs/hour).

During the last studied interval (50-60 hours) the Transylvanian Naked Neck embryos showed a spectacular growth with an average speed of 1.112 somite pairs/hour, while the Plymouth Rock embryos are maintaining a speed of 1.057 somite pairs/hour. For the whole growth period (26-60 hours) the somite formation speed in the two breeds is estimated at 0.80 somite pairs/hour for Plymouth Rock breed and 0.74 somite pairs/hour for Transylvanian Naked Neck breed. Thus, a slight advantage of 0.06 somite pairs/hour was observed in favor of the first breed.

### **Conclusions**

As a result of the observations we could positively state that the differentiation and cell replication processes that contribute to the somite formation have an undulatory evolution pattern, the positive and negative curls of the curve being diametrically opposed in the two breeds.

We have to admit that both cell replication and differentiation dedicated to contribute to the somite formation are conducted by the genetic structure of the individual. Otherwise it could not be explained the high individual variability of embryos regarding the emergence and accumulation of the somite number and of other elements of the embryo complex. In this respect we state that each embryo develops with the vigor offered by its own aggregate genotype.

Thus, it is to be noticed that the overall studied period development speed have a close value, which demonstrates that the Transylvanian Naked Neck breed have a vigorous embryo development following an own pattern.

If we add to these conclusions the other renowned qualities of the two breeds, as well as the estimation that both have a good specific combinative capacity, we could recommend utilization of these genetic materials to obtain hybrids for producing the “peasant-type” chicken meat, very well-appreciated by Europeans between the two World Wars.

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