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Ferments Activity in Pigs Digestive Organs at Postnatal Period of Different Stages

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***Abstract*— We have determined the patterns for age-specific changes related to activity of aspartateaminotransferase, alanineaminotransferase, gamma glutamyltransferase, α-amylase, alkaline phosphatase and acid phosphatase in different parts of the stomach, liver, pancreas, duodenal, empty, ileac, cecum, colic and straight intestine of large white pigs at the age of 1, 7, 14, 21, 28, 60, 120 and 180 days that have been grown up in a pig-breeding farm. We have defined the principles and strength of age-specific changes related to activity of the studied ferments at the colostric, colostric-dairy (at the first transitional), first dairy, second dairy, third dairy, dairy-definitive (at the second transitional), first definitive and second definitive feeding stages in the early postnatal period of the pig systemogenesis. We have found out that in each separate feeding stage the activity of the studied ferment in various parts of the digestive organ is different. The speed of the metabolic process in the digestive system tissues, the intensity of their maturation, and functioning of each part of the digestive organ at each feeding stage are quite different. The degree of structural and chemical changes in pigs is high at early stages of the postnatal period within the first four months of pig life. They are particularly distinctive at the transitional feeding stages. The terms of particular ferment activity stabilization in digestive organs have been determined. They can be indicated at the late stages of pig feeding.**

Keywords — pigs, functional system, systemogenesis, feeding stages, postnatal period

I. INTRODUCTION

Russian scientific literature is rich in studies of the postnatal period of animal ontogenesis [11]. In our opinion, nowadays the most fully developed hypothesis of productive animal ontogenesis is the ontogenesis pattern developed by L.P. Teltsov and his followers [8, 9].

At the same time, the offered pig ontogenesis pattern created by morphologists generally on the basis of Development Biology Theory is inconsistent for physiologists studying structural and functional development of organ system in animals at the postnatal period of ontogenesis. Now most physiologists consider ontogenesis on the basis of functional system and systemogenesis theories developed by academician A.P. Anokhin [18].

In the context of P.K. Anokhin theories, futher developed by E.L. Golubeva [4], V.F. Lysov [2], K.V. Sudakov [5, 6, 7] and other physiologists, systemogenesis is a selective maturation of functional systems and their separate components in ontogenesis. Principles concerning dynamic interaction of functional systems are based on selective maturation of functional systems and their particular parts within the postnatal systemogenesis. Functional systems are not formed simultaneously. Some of them, especially those related to metabolic and homeostatic levels, are genetically determined, while others are formed, first of all, within the formation and satisfaction of metabolic needs. Dynamically formed functional systems adapt structures and functions of digestive organs of growing pigs to the ultimate result, to consumption of constantly changing feed composition and quantity.

At the same time, domination of some metabolic processes in various parts of a digestive organ at different feeding stages of all-aged pigs indicates the consecutive interaction of functional systems. In a normal organism, functional systems consistently interact with each other, forming a continuous chain of functional activity when realization of one system is consistently replaced by realization of the other system. The consecutive chain of various functional system realization by particular nervous system centers is programmed and activated as per the advance mechanism: each result of activity of the realized functional system on the basis of feedback from the

nervous and humoral signal system is estimated by the relevant control centers, and then the other functional system realization is changed. Consecutive realization of functional systems of a homeostatic row is genetically rigidly predetermined and programmed.

According to this theory, physiologists distinguish the early, mature and late periods in a postnatal systemogenesis. On the basis of studies held within the early postnatal period of pigs systemogenesis, we have distinguished the following stages of feeding: colostric, colostric-dairy (or the first transitional), first dairy, second dairy, third dairy, dairy definitive (or the second transitional), first definitive and second definitive (see the table). Our scientific studies [1, 10, 12, 13, 14, 15, 16, 17] showed that principles of age-specific changes of such fermental systems as transferases (alanineaminotransferase – ALAT, aspartateaminotransferase – ASAT, gamma glutamyltransferase – GGT), phosphatases (alkaline – AlPH and acid – AcPH) and α-amylase, joining in various functional systems and providing structural and chemical formation of organs; at each systemogenesis stage of pig, digestive organs have their own specific features.

TABLE I. SCHEME OF THE EARLY POSTNATAL PERIOD OF PIG SYSTEMOGENESIS

Periods	Life stage	Feeding stage	Critical stages
1. Early postnatal period (from birth to 6 months)	1. Colostric-dairy (from birth to 28 days)	1. Colostric (from birth to 4 days) 2. Colostric-dairy or first transitional (from 5 to 7 days) 3. First dairy (from 8 to 14 days) 4. Second dairy (from 15 to 28 days)	1. Colostric (from birth to 4 days)
	2. Definitive (from 29 to 180 days)	5. Dairy and vegetative or second transitional (from 29 to 60 days) 6. First definitive (from 61 to 120 days) 7. Second definitive (from 121 to 180 days)	1. Dairy and vegetative or second transitional (from 29 to 60 days)

This work shows the results of studies related to age-specific changes of transferases, phosphatases and α-amylase in different parts of the stomach, liver, pancreas, duodenal, empty, ileac, cecum, colic and straight intestine of pigs at the colostric, colostric-dairy, dairy, dairy-definitive, and definitive feeding stages.

II. METHODS

To conduct the research we selected large white pigs at the age of 1, 7, 14, 21, 28, 60, 120 and 180 days under the compatible match principle, received from sows that had had 2-4 farrows, up to five heads in each age group. Those pigs had been grown up in pig-breeding farm JSC ´´Vurnarsky Meat-processing Plant´´ of Vurnarsky district, the Chuvash Republic. In our studies we used boar pigs at the age of 1 day to 2 weeks and hogs castrated at the age of 11-13 days. Breaking in to milk was done when the pigs were 4 weeks old.

The dry concentrate feeding with use of additional nutrition in the form of prestarter and a protein and vitamin and mineral concentrate is used in the pig-breeding farm.

Euthanasia of pigs and all manipulations were carried out according to "Rules of work with use of experimental animals" [19]. Digestive organs were taken from an abdominal cavity, cleaned from contents, washed out with physiological solution, weighed, digestive organs were sampled at different parts, and the samples were frozen in liquid nitrogen for further research.

Sample preparation and laboratory researches were conducted in scientific laboratory "The center of collective use of the Chuvash GSHA" where homogenates were made from the samples. The activity of ferments was determined by the spectrophotometric method (spectrophotometer Shimodry UV-1800) with use of reagents provided by JSC Vital Development Corporation, St Petersburg, in compliance with the standards. Calculation of activity of ferments was carried out according to the calibration schedule. In total, 3360 biochemical analyses have been carried out.

Digital material is statistically processed on the personal computer by the standard techniques of variation statistics with use of the MicrosoftExcel program. When processing the received data, an arithmetic average and an error percentage was determined. The degree of credibility for the average value difference was defined by Student's criteria. For credibility of assessments we determined significance levels $p<0,05$, $p<0,01$ and $p<0,001$.

III. RESULTS

After the birth, within the first 3-4 days of life, pigs eat colostrum, they are at the colostric feeding stage. Structures and functions of food functional systems are genetically programmed to provide the newborn pigs with means of colostrum assimilation. According to our data, at this feeding stage there is a relatively low activity of ALAT, ASAT and AcPH and high activity of α-amylase and AlPH is defined at different parts of a pig stomach. In the liver at the colostric stage there is a high activity of ALAT, ASAT and AcPH and a low activity of α-amylase and AlPH. In the pancreas there is a relatively high activity of ALAT, ASAT and AlPH and a low activity of α-amylase and AcPH. In the duodenum there are relatively low values of ALAT, ASAT, both AcPH and high values of α-amylase and AlPH. In the empty intestine at the colostric feeding stage there is a relatively high activity of ALAT, ASAT, α-amylase and AlPH, and a relatively low activity of AcPH. In the ileac intestine, there is a low activity

of ALAT, α-amylase and AcPH, and a high activity of ASAT and AlPH. In the cecum intestine at the colostric feeding stage there are relatively low values of ALAT, ASAT and GGT. In the colic intestine at this feeding stage of pigs, there is a relatively high activity of ALAT, ASAT, α-amylase, AlPH and AcPH, and a low activity of GGT. In the straight intestine, the activity of ALAT and ASAT is relatively high, and the activity of GGT and α-amylase, AlPH and AcPH is low.

Within the next 5-7 days of pigs life at the colostic dairy feeding stage, or the first transitional stage, the composition of the food coming into digestive organs significantly changes, the amount of organic substances decreases, the water percentage raises. The new food functional systems formed in advance adapt digestive organs to assimilation of new food composition. In our research under these conditions, at the colostic dairy stage in all four parts of the stomach the activity of ALAT, ASAT and ACPH does not change significantly, while the activity of α-amylase sharply falls. In the liver at this stage the activity of ALAT, ASAT and ACPH significantly decreases, the activity of α-amylase and ALPH rise sharply. In both parts of the pancreas at the colostic dairy stage the activity of ALAT significantly decreases, the activity of ASAT of α-amylase and ACPH sharply increases, the activity of ALPH remains at the same level. In duodenal intestine at this stage, the activity of ALAT and ASAT will not significantly change in comparison with the previous stage, the activity of α-amylase and ALPH increases, and the activity of ACPH decreases. In proximal, medial and distal parts of the empty intestine at the colostic dairy feeding stage the activity of ALAT increases, the activity of ASAT, α-amylase, ALPH and ACPH remains at the previous stage level. In two parts of the ileac intestine, the activity of ALAT, ALPH and ACPH remains at the previous level, the activity of α-amylase increases, and the activity of ASAT decreases. In the cecum intestine at this feeding stage, the activity of ALAT and ASAT remains at the previous stage, the activity of GGT increases. In external and internal colic intestine tissues the activity of ALAT and ALPH increases, ASAT, α-amylase and ACPH decrease, in internal tissues the activity raises. The activity of GGT increases in both parts of the cecum intestine, the activity of α-amylase, ALPH and ACPH remains at the previous level. In proximal and distal parts of the straight intestine the activity of ASAT and GGT increases, the activity of ALAT decreases, and the level of other ferments does not change.

From the 8th to 14th day of pigs life, during the first phase of dairy food, the forming food functional systems provide assimilation of the complex milk composition due to the start of feeding pigs with prestarter. During this period of pigs life, the level of the studied ferments in the examines parts of the stomach remains at the level of the previous feeding stage. In liver lobes under these conditions, the activity of ALAT and ASAT continues to decrease, the activity of α-amylase remains at the previous level, and the activity of ALPH and ACPH raises. In the two parts of the pancreas at the first dairy feeding stage, the activity of ALAT, ASAT and α-amylase significantly falls, stage changes of activity of ALPH and ACPH are minor. In proximal, medial and distal parts of the duodenum at this feeding stage the activity of ALAT and ASAT decreases, the activity of α-amylase and ACPH increases, and the activity of ALPH does not change. In all three studied parts of the empty intestine at the first dairy feeding stage, the activity of ALAT, ASAT and ALPH decreases, the activity of ACPH decreases, and the activity of α-amylase – does not change. In the two parts of the ileac intestine the activity of ALAT in comparison with the previous level does not change, the activity of ASAT, α-amylase and ACPH increases, and the activity of ALPH decreases. In the medial part of the cecum intestine at this feeding stage, the activity of ALAT and GGT significantly increases, and in the proximal and distal parts of the intestine the activity falls. The activity of ASAT decreases in the proximal part of the intestine and increases in the medial part of the intestine. In all three parts of the colic intestine at this stage the activity of ALAT and ASAT decreases, the activity of GGT, α-amylase, ALPH and ACPH significantly increases. In the proximal and distal parts of the straight intestine at the first dairy feeding stage the activity of ALAT and ASAT decreases, and the activity of GGT, α-amylase, ALPH and ACPH increases.

At the second dairy feeding stage, from 15th to 21th day of pigs' life, new food functional systems join in processes of digestion and absorption of the increased quantity and the changed quality of mother milk and prestarter components. The level of the studied ferments in fabrics of the studied parts of a stomach of pigs in this phase of food does not significantly change. In the studied liver lobes activity of ALAT, ASAT and α-amylase considerably raises, the activity of ALPH and ACPH remains at the same level. In pancreas at the first dairy feeding stage there are no major changes of ALAT, ASAT, α-amylase and ALPH, the activity of ACPH considerably falls. In all three studied parts of a duodenum at the second dairy stage the activity of ALAT and ASAT in comparison with the previous stage does not change, the activity of α-amylase and ALPH decreases, and the activity of ACPH increases. In the empty intestine at the dairy feeding stage, the activity of ALPH decreases, α-amylase and ACPH raises; the activity of ALAT and ASAT remains at the same level. At this feeding stage in the ileac intestine, the activity of ALAT does not change; the activity of ASAT and α-amylase increases, and the activity of ACPH and ALPH decreases. In fabrics of the cecum intestine at the second dairy feeding stage, the activity of ALAT significantly increases in the medial and distal parts of the intestine. The activity of ASAT considerably increases only in its medial part. In the colic intestine at this stage the activity of ALAT, ASAT, α-amylase and ACPH does not differ from the previous stage, and the activity of GGT and ALPH sharply falls. In the straight intestine, the activity of ALAT increases, the activity of GGT, ALPH and α-amylase decreases, and ASAT and ACPH do not change.

In the third dairy feeding stage, from 22nd to 28th day of life, due to activization of proteolytic ferments in digestive organs, and qualitative change of the absorbed nutrients, food functional systems change, become more complicated and improve for assimilation of new components of milk. Under new conditions, the level of the studied ferments decreases in

the diverticulum and pyloric part of the stomach, and increases in other stomach parts. In the liver at the third dairy feeding stage, age-specific changes of the studied ferments are subtle. In pancreas at the third dairy feeding stage, the activity of ALAT, ASAT, α-amylase and ALPH remains at the previous level, the activity of ACPH significantly falls. In duodenum at the third dairy feeding stage, the activity of ALAT and ASAT is defined at the second dairy feeding stage, the activity of α-amylase, ALPH and ACPH increases. In the empty intestine at the third phase of dairy food, the activity of ferments remains at the previous level. In the ileac intestine at this feeding stage the activity of ALAT and ACPH does not change; the activity of ASAT and ALPH decreases, the activity of α-amylase increases. In the cecum intestine, the activity of GGT increases. In the colic intestine at the third dairy feeding stage the activity of ASAT, GGT and ACPH increases, the activity α-amylase remains the same as at the previous stage, and the activity of ALAT and ALPH sharply falls. In the straight intestine at this feeding stage the activity of ALAT and GGT and ACPH increases, the activity of ALAT decreases, the activity of ALPH does not change.

At the pig-breeding farm where the studies were conducted the pigs were weaned at the age of 29 days. At the second transitional, dairy-definitive feeding stage, when the weaned pigs are from 29 to 60 days old, the new food functional systems providing processes of digestion and absorption of nutrients of combined feed, cow milk, prestarter, and removal of non-absorbed feed particles are formed. Under these conditions the level of the studied ferments in the stomach and liver increases, only the activity of ACPH significantly decreases. In pancreas at the second transitional feeding stage the activity of ALAT and ALPH increases, the activity of ASAT and ACPH remains the same, and the activity of α-amylase decreases. In the duodenum tissues at the second transitional stage the activity of ALAT, ASAT and α-amylase increases, the activity of ALPH decreases, and the activity of ACPH remains the same. In the empty intestine at the second transitional stage the activity of ALAT, ASAT and ALPH increases, the activity of α-amylase and ACPH decreases. In the ileac intestine the activity of ALAT remains the same, the activity of ASAT and ALPH increases, the activity of α-amylase and ACPH falls. In the cecum intestine the at this feeding stage the activity of ALAT and GGT changes insignificantly, the activity of ASAT considerably increases. In the colic intestine at this stage the activity of ALAT and GGT is equal to the activity at the previous stage, the activity of ASAT and ALPH increases, the activity of α-amylase and ACPH decreases. In the straight intestine at the transitional feeding stage the activity of ALAT, ASAT, GGT, α-amylase and ALPH increases, the activity of ACPH decreases.

In at the first definitive feeding stage, at the age of 60-120 days, the PVMA (protein vitamin and mineral additive) PANTO F-10 was introduced into the feed of the growing pigs. The food coming into the digestive organs of pigs was considerably enriched with mineral and vitamin additives. New food functional systems change the structure and functions of digestive organs by adapting them to the ultimate result, assimilation of new feed components. At the first definite feeding stage, the ALAT and ASAT in the stomach are stabilized at a relatively high level, the activity of α-amylase and ALPH continues to increase, the activity of ACPH continues to decrease. In the right medial lobe, the right lateral lobe and the square lobe of the liver the ALAT and ASAT level definitely increases, the activity of ALPH considerably increases, the activity of ACPH decreases, and the activity of α-amylase is stabilized. In the pancreas at the first definitive feeding stage the activity of ALAT decreases, the activity of ASAT, ALPH and ACPH α-amylase is stabilized. In the duodenum at the fist definitive feeding stage the activity of ALAT and ASAT decreases, the activity of α-amylase increases, the activity of ALPH and ACPH does not change. In the empty intestine gut at the fist definitive feeding stage the activity of ALAT, ASAT, ALPH and ACPH remains at the same level, the activity of α-amylase increases. In the ileac intestine the activity of ALAT, ASAT and α-amylase, ALPH and ACPH in comparison with the previous stage. In the cecum intestine at this stage the activity of ALAT considerably increases, the activity of GGT decreases, the activity of ASAT remains the same. In the colic intestine at this stage the activity of ALAT, ASAT and α-amylase increases, the activity of GGT does not change; the activity of ALPH and ACPH is stabilized at a lower level. In the straight intestine at this feeding stage the activity of α-amylase increases, the activity of GGT decreases, the activity of other ferments remains the same as at the previous stage.

At the second definitive feeding stage, at the age of 120-180 days, the fed pigs form new food functional systems to ensure intensive assimilation of significantly increased quantity of feed components typical for fed animals. During this life period of pigs, there are no significant changes of the studied ferments level in the stomach, the liver and the pancreas. In the duodenum at this definitive feeding stage the activity of α-amylase is stabilized at the level of 120 days, the activity of ALAT, ASAT, ALPH and ACPH raises. In the empty intestine the activity of ALAT and ASAT increases, the activity of α-amylase, ALPH and ACPH is stabilized at the level of 120 days. In ileac intestine the activity of ALAT increases, the activity of ASAT, α-amylase and ALPH is stabilized at a higher level, and the activity of ACPH is stabilized at a lower level. In the cecum intestine at the second definitive feeding stage, the activity of ALAT is stabilized at a high level, the activity of ASAT and GGT considerably increases. In the colic intestine at this feeding stage, the activity of ALAT is stabilized at a relatively high level, the activity of ASAT, GGT and α-amylases raises. In the straight intestine at this feeding stage, the activity of ALAT, ASAT, GGT, α-amylases considerably increases, at the same time, the activity of ALPH and ACPH remains at the same level as it was at the previous stage.

IV. Evaluation of Results

Thus, the described results of our studies prove uneven and heterochronic age-specific changes in the activity of fermental systems in each separate part of pig digestive organs. Due to the genetic peculiarities of pig digestive organ development and the change of quantity and quality of the feed, one can determine different stage alterations in the activity of the studied transferases, phosphatases and the amylase that proves

asynchronous age-specific changes of metabolic process intensity in digestive organs of the growing pigs.

Rises and falls of metabolic process intensity in different lobes and parts of pig digestive organs at different stages, apparently, show asynchrony of their postnatal development and activation of dynamically formed food functional systems that are aimed at regulation of synthesis of organic structures in the digestive organs providing digestion of the incoming feed and absorption in its components.

The analysis of the received results demonstrates that the most intensive age-specific changes of metabolic processes in the studied digestive organs are found in pigs between the colostic dairy and the first dairy, between the first and the second dairy, between the third dairy and the dairy definitive and between the first and the second definitive stages in the pancreas, duodenum, empty intestine, ileac intestine, cecum intestine, external and colic intestine, and straight intestine. These periods of pig life should probably be called critical stages.

The received data demonstrate that there is a stage age-specific change in food functional systems at the molecular level that allows reacting adequately and anticipatory to the change of feed composition and quantity.

To sum up the results of studies conducted to establish nature of stage changes and speed of metabolic processes in pig digestive bodies at an early postnatal systemogenesis, it is possible to make the conclusion that intensive metabolic processes in pig digestive organs take place at colostic, colostic-dairy and the first and the second definitive stages. The lowest activity of metabolic processes in pig digestive organs is determined at the first, second and third dairy feeding stage, and the second transitional stage is an intermediate one.

The unevenness in intensity of metabolic processes in pig digestive organs complies with the principle of hierarchy of functional systems. In one organism, separate functional systems interact under the "current domination" neurophysiological mechanism: at each particular moment the activity of an organism is defined by this or that functional system satisfying the current need, at the moment the main need is to survive and the maximum need is to adapt to the environment.

Judging by terms of stabilization of the studied fermental systems, pig digestive organs are chemically and structurally formed at different feeding stages. The activity of ALAT and ASAT in the diverticulum and the fundal part of the stomach is stabilized staring from the first definitive feeding stage, and the activity of these ferments in the cardiac and the pyloric parts of the stomach is stabilized staring from the dairy definitive stage. The activity of GGT in the stomach is stabilized starting from the first definitive stage. The activity of α-amylase in the diverticulum is stabilized starting from the second dairy stage, in the fundal part – from the third dairy stage, in the cardiac and the pyloric parts – from the first definitive stage. The activity of ALPH and ACPH in all studied parts of the stomach is stabilized starting from the first definitive stage. In in the right medial, the right lateral, the left lateral and the square liver lobes the activity of the ALAT is stabilized starting from the first definitive stage, in the left medial lobe the ferment is stabilized starting from the dairy definitive stage. The activity of ASAT is stabilized in the right medial, the right lateral, the left lateral and the square lobes starting from the dairy definitive stage, and in left medial lobe the ferment is stabilized starting from the second dairy stage. The activity of α-amylase in the right medial lobe is stabilized starting from the second dairy stage, in the left medial, the right lateral, the left lateral and the square lobes – starting from the dairy definitive stage. The activity of ALPH and ACPH in the liver is stabilized from the first definitive stage. The activity of ALAT and GGT in the pancreas left and right parts is not stabilized during the studied early postnatal systemogenesis. The activity of ASAT in the pancreas left part is stabilized from the first dairy feeding stage, and in pancreas right part – from the second dairy feeding stage. The activity of α-amylase in the pancreas left and right parts is stabilized from the dairy definitive stage. The activity of ALPH and ACPH in the pancreas is also stabilized from the dairy definitive stage. In the duodenum, the activity of ALAT, ASAT and GGT is not stabilized during the studied early postnatal systemogenesis. The activity of α-amylase in the medial and distal parts of the duodenum is stabilized from the dairy definitive stage, and in the proximal part – from the first definitive stage. The activity of ALPH and ACPH in the duodenum during the studied early postnatal systemogenesis. In the empty intestine, the activity of ALAT, ASAT and GGT is not stabilized during the studied early postnatal systemogenesis. The activity of α-amylase in the empty intestine is stabilized from the first definitive stage, and the activity of ALPH and ACPH in in the empty intestine – from the dairy definitive stage. In the ileac intestine, the activity of ALAT and ASAT is not stabilized during the studied early postnatal systemogenesis. In the ileac intestine, the activity of GGT is stabilized starting from the first definitive stage, the activity of α-amylase, ALPH and ACPH – from the dairy definitive stages. In the cecum intestine, the activity of ALAT in the proximal and distal parts is stabilized from the first definitive stage, and in the medial part the activity is not determined. The activity of ASAT, GGT and α-amylase is not stabilized in the cecum intestine during the studied early postnatal systemogenesis. The activity of ALPH and ACPH in this intestine is stabilized from the first definitive stage. In the external and internal colic intestines, the activity of ALAT is stabilized from the first definitive stage. The activity of ASAT, GGT and α-amylase in the external and internal colic intestines is not stabilized during the studied early postnatal systemogenesis. The activity of ALPH and ACPH in these intestines is stabilized from the first definitive stage. In the straight intestine there ALAT, ASAT, GGT and α-amylase are not stabilized during the studied early postnatal systemogenesis. The activity of ALPH and ACPH in this intestine is stabilized from the dairy definitive stage.

Thus, judging by stabilization of activity of the studied ferments, structural and chemical formation of the stomach and liver, as well as full maturation of their food functional systems starts from the first definitive stage. At the same time, during the studied early postnatal systemogenesis, structural and chemical formation of tissues and maturation of food

functional systems of the pancreas, duodenum, empty intestine, ileac intestine, cecum intestine, external and colic intestines, and straight intestine is not complete.

V. Conclusions

We have found out that in the early postnatal ontogenesis, pig digestive organs are formed through colostric, colostric-dairy (at the first transitional), first dairy, second dairy, third dairy, dairy-definitive (at the second transitional), first definitive and second definitive stages.

We have established that in different parts of the studied digestive organs, the nature and intensity of age-specific changes of the studied ferments and the period of their stabilization is different.

The advance formation of the new food functional systems adapting the structure and functions of growing pig digestive organs to assimilation of food components of food is asynchronical and heterochronic.

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