



MORPHOLOGY AND MORPHOMETRIC FEATURES OF LYMPHOID NODULES OF THE COLON IN IRRADIATED RATS

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Abstract:

The immune system largely depends on age, health, stress, environmental conditions and other factors. The study found that the length of the colon of rats of intact and irradiated groups showed that there was a decrease in its length, which is most pronounced at 3 months of age, in the following months of observation, these indicators were at almost the same level. Thus, studies have shown that the morphometric parameters of the colon (length, perimeter, thickness) increase unevenly with age.

Keywords: large intestine, lymphoid structure, irradiation.

Results

According to our data, when modeling chronic radiation sickness, the colon length of 3-month-old irradiated rats, the following data were obtained: the length of the colon ranges from 212 to 254.0 mm, on average 233.5 ± 7.36 mm. The absolute increase in the length of the mesenteric colon is +215.7 mm, and the growth rate is +160.3%.

It was found that the diameter of the colon varies throughout the intestine, so the diameter of the cecum ranges from 20.5 to 26.7 mm, on average 23.1 ± 0.1 mm, the growth rate is +129.0%, the diameter of the colon decreases to 14.5 - 19.3 mm, on average 16.9 ± 0.13 mm, the growth rate is +133.3%, the diameter of the rectum is in the range from 16.0 mm to 18.4 mm, on average 17.2 ± 0.13 mm, the growth rate is +128.0%. The growth rate of the diameter of the mesenteric part of the colon is on average 128.6%, which is 2.3 times more than in newborns.

The total area of the colon ranged from 3074,5 mm² to 6781,8 mm², on average $4927,5 \pm 7,8$ mm², the growth rate is +499,03%.





At 3-month rats irradiated group, the thickness of the wall of the cecum varies from 460,3 to 833,4 μm , with an average $556,5 \pm 6,7 \mu\text{m}$ in the colon – 435,2-751,4 μm , with an average $545,0 \pm 5,1 \mu\text{m}$, in the rectum is within 365,1-710,5 μm in average – $508,5 \pm 8,5 \mu\text{m}$ [Fig. 3.2.1.]. The rate of increase of the wall thickness 3-month rats exposed group in the cecum equal 113,9% in the middle part – 146,0% and part – 174,0%.

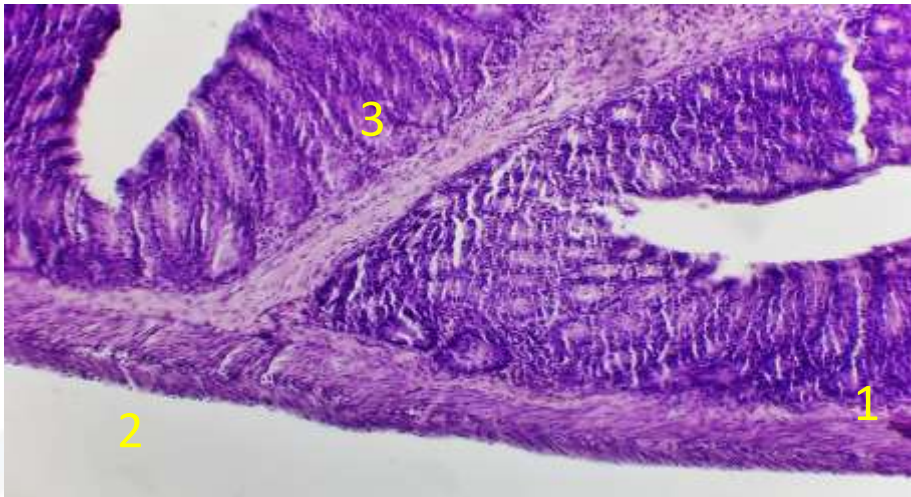


Fig. 1. The wall of the colon of a 3-month-old rat after chronic irradiation.

Staining with hematoxylin - eosin.

1 - a single-layer cylindrical epithelium [focal atrophy is noted], 2 - a circular sublayer of the muscular layer of the mucous membrane, 3 - a longitudinal sublayer of the muscular layer of the mucous membrane. Approx. 10x vol. 20.

The number of single lymphoid nodules [SLN] of the cecum of 3-month-old rats ranges from 2 to 6 per 1 mm² of the intestinal area, on average 4.0 ± 0.8 , their sizes range from 0.1 x 0.1 mm to 0.14 x 0.4 mm. In the colon, the amount of SLN per 1 mm² area ranges from 9 to 17, on average - 13.0 ± 0.6 , with dimensions from 0.11x0.11 mm to 0.17x0.17 mm. In the rectum SLN in disappeared.

GLN are located along the mesenteric wall of the colon and their number throughout the intestine ranges from 3 to 6, on average - 4.5 ± 0.11 . The growth rate of the number of GLN is 187.2%, which is 2.9 times more than in newborns.

In the cecum, the number of GLN varied from 1 to 3, on average - 2.0 ± 0.18 , their sizes range from 0.7 x 0.7 mm to 1.6 x 1.6 mm, on average - $1.0 \pm 0.1 \text{ mm} \times 1.13 \pm 0.1 \text{ mm}$. The number of lymphoid nodules in the GLN ranges from 5 to 6, on average - 5.85 ± 0.18 . Lymphoid nodules in the GLN were mostly rounded. GLNs are located at a distance from 17 mm to 48 mm, on average - $34.7 \pm 2.15 \text{ mm}$ from each other.



From 2 to 4 GLN were found in the colon, on average - 3.0 ± 0.18 , and their sizes range from 0.93×0.93 mm to 3.1×3.6 mm, on average - 1.75 ± 0.1 mm \times 1.95 ± 0.1 mm. The number of lymphoid nodules in the GLN increases from 5 to 8, on average - 6.26 ± 0.18 . Lymphoid nodules in the GLN were mostly rounded and irregular in shape. The distance between the GLN varied from 18 to 65 mm, with an average of 34 ± 6.0 mm.

No GLN was found in the rectum of 3-month-old rats of the irradiated group. The total area of the colon GLN during its course varied from 51.0 mm² to 83.7 mm², on average - 77.4 ± 0.3 mm². The area occupied by the GLN is on average 1.8% of the total area of the colon.

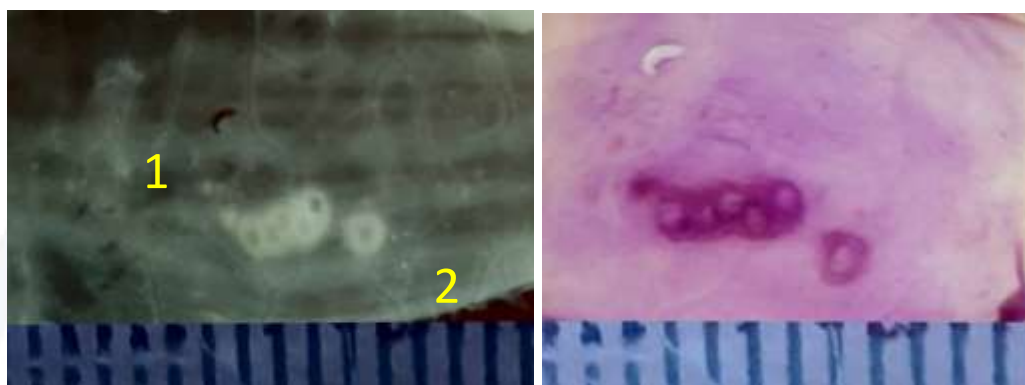


Fig. 2. Aggregated lymphoid nodule of the irregular oval shape of the colon of a 3-month-old rat after chronic irradiation. Coloring by Helman. Uv 5 times.

1 – the wall of the colon, 2 - the lymphoid nodule of the plaque.

In 6-month-old rats of the irradiated group, the colon length ranges from 263 to 285 mm, on average 274 ± 9.9 mm. The absolute increase in the length of the large intestine of baby rats is +50.7 mm, the growth rate is 15.9%. The total area of the colon ranged from 4584.0 mm² to 7313.0 mm², on average - 5948.0 ± 10.2 mm².

The study showed that the diameter of the large intestine decreases from the proximal to the distal.

The diameter of the cecum ranges from 22.7 to 27.9 mm, on average - 25.3 ± 0.17 mm, the diameter of the colon - from 17.4 to 22.8 mm, on average - 20.1 ± 0.16 mm, the diameter of the rectum ranges from 16.8 mm to 22.37 mm, on average - 19.6 ± 0.18 mm. The growth rate of the colon diameter in the blind is 7.0%, in the middle part - 14.3% and in the final part - 14.0%. The growth rate of the diameter of the mesenteric part of the colon is 10.9%, which is 1.1 times more than 3 months.

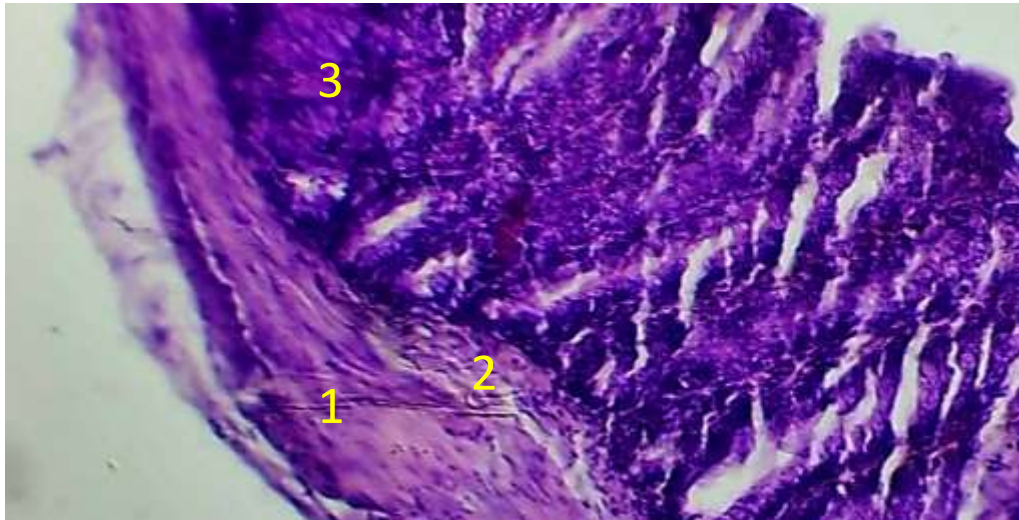


Fig. 3. The colon wall of a 6-month-old rat after chronic irradiation. Staining with hematoxylin - eosin. 1 - the muscular membrane 2 - the submucosa, 3 - the mucous membrane. Approx. 10x vol. 20.

In 6-month-old rats of the irradiated group, the thickness of the cecum wall ranges from 445.6 to 776.1 microns, on average -585.2 ± 6.6 microns, in the colon - 436.1 - 776.4 microns, on average -577.2 ± 7.3 microns, in the final part is within 427.6-731.5 microns, on average -538.0 ± 6.9 microns [Fig.3.2.3]. The growth rate of the wall thickness of 6-month-old rats of the irradiated group in the cecum is 5.16%, in the middle part - 5.91%, and in the final part - 5.80%.

The number of single lymphoid nodules [SLN] of the cecum of 6-month-old rats ranges from 3 to 6 per 1 mm² of the intestine area, on average 4.5 ± 0.4 their sizes range from 0.13x0.13 mm to 0.18x0.18 mm. In the colon, the amount of SLN per 1 mm² area ranges from 13 to 20, on average -15.2 ± 0.5 , with dimensions from 0.13x0.13 mm to 0.21x0.21 mm [Fig.3.2.4.]. In the rectum, the number of OLS is from 13 to 25, on average -20.3 ± 1.6 . The sizes of OLS in this department range from 0.13x0.13 mm to 0.21x0.21 mm. SLN are located in small quantities along the wall of the colon and are mostly rounded and irregular in shape.

In the cecum, the number of GLN ranges from 1.0 to 2.0 on average 1.5 ± 0.18 , their sizes ranged from 0.3 x 0.3 to 0.8 x 0.8 mm, on average $0.49 \pm 0.03 \times 0.57 \pm 0.07$ mm.

From 5 to 9 nodules are detected in the GLN, on average it was equal to 6.8 ± 0.18 . The distance between the GLN is from 26 to 57 mm, on average 38 ± 0.7 mm.

In the colon, the amount of GLN increases from 2 to 3, on average 1.5 ± 0.11 . The dimensions of the GLN varied from 0.46 x 0.46 to 0.81 x 0.81mm, on average $0.57 \pm 0.05 \times 0.62 \pm 0.06$ mm. From 6 to 11 nodules are found in the GLN, on average -9.2 ± 0.11 . The distance between the GLN ranges from 28 mm to 63 mm, on average -45.7 ± 3.1 mm.



No GLN was found in the rectum of 6-month-old rats of the irradiated group. Most of the GLN had a rounded or quadrangular rarely oval shape. The total area of the colon GLN during its course varied from 112.3 mm² to 164.1 mm², on average 123.0±0.35 mm². The area occupied by the GLN is, on average, 2.21% of the total area of the colon.

The diameter of the cecum of rats ranges from 26.5 to 31.1 mm, on average - 28.8 ± 0.16, the growth rate is -100.0%, the diameter of the colon of rats is 20.2 to 24.79, on average - 22.5 ± 0.15 mm, the growth rate is - 1.39%. and the diameter of the rectum varied from 19.7 to 24.5 mm, on average - 22.1 ± 0.19 mm, the growth rate was 100%. The growth rate of the diameter of the mesenteric part of the colon is 2.8%, which is 1 times more than 6 months.

In 9-month-old rats of the control group, the length of the colon ranges from 280 to 305 mm, on average 292.5 ± 10.3 mm. The absolute increase in the length of the colon of 9 month-old rats in the amount of GLN of the colon is +30 mm, the growth rate is 3.1%.

The total area of the colon varied from 4975.0 mm² to 7684.0 mm², on average - 6329.0 ± 6.6 mm².

In 9-month-old rats of the irradiated group, the thickness of the cecum wall ranges from 472.0 to 793.4 microns, on average -602.4 ± 6.13 microns, in the colon -476.3 - 791.6 microns, on average -593.0±6.5 microns, in the final part is within 438.5-745.2 microns, on average - 553.3± 5.7 microns. The rate of increase in the wall thickness of 9-month-old rats of the irradiated group is observed only in the middle part – 1.64%, in the initial and final increments were not observed.

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