

Malnutrition associated to experimental giardiasis: an impact on the permeability and intestinal morphology

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Giardiasis, enteroparasitosis induced by *Giardia lamblia* protozoan, is one of the diseases more recurrent in the world. Giardiasis' clinical signs may differ depending of the individuals' immunological and nutritional status. Immunological and nutritional disturbances can lead to serious consequences in the physical and cognitive development of those infected. The aim of the study was to evaluate the impact of malnutrition and giardiasis on the intestinal permeability of experimentally infected and malnourished gerbils. A total of 28 male gerbils were used, aged between 4 to 6 weeks, divided into 4 groups: Control (CT), Infected Control (InCT), Malnourished (MN) and Infected Malnourished (InMN). The animals of the InCT and InMN groups were infected by gavage with 1×10^6 trophozoites of *G. Lamblia*. After the tenth day of infection, a solution containing the diethylenetriaminepentaacetic acid labeled with the radioisotope ^{99m}Techetium was administered to the animals of all groups. After 4 hours of gavage the blood was collected to quantify the radioactivity using a gamma radiation counter. Then the animals were euthanized and the intestine was processed for hematoxylin and eosin (H & E).

There was no change in the average of the weekly food intake between the experimental groups. The qualitative analysis of the intensity of the parasitism showed no significant difference between the groups. The initial weight was homogeneous between the groups evaluated CT (48.94 ± 3.405 g), InCT (50.87 ± 2.294 g), MN (47.44 ± 3.408 g), InMN (51.13 ± 6.662 g) and statistically unlikely when compared to the final weight CT (61.29 ± 4.102 g) and InCT (63.66 ± 3.185 g), and in relation to the malnourished animals of the MN groups (40.88 ± 2.907 g), InMN (39.98 ± 6.724 g) ($p < 0.01$).

The height of intestinal villi in the MN group (364.3 ± 50.84 μ m) was significantly lower when compared to the CT (498.5 ± 59.00 μ m) and InCT (471.1 ± 81.69 μ m) groups ($p < 0.01$). The intestinal crypts depth in the InCT group (97.10 ± 18.82 μ m) was higher compared to the crypts of the MN (41.90 ± 7.070 μ m) and InMN (60.18 ± 6.071 μ m) groups ($p < 0.01$). The crypts depth in the InMN group was statistically higher than in the MN group ($p < 0.05$). The CT group presented lower crypt depth (40.17 ± 4.533 μ m) when compared to the infected groups InCT (97.1 ± 18.83) and InMN (60.18 ± 6.071). On the other hand, a significant increase in crypt / villus ratio was observed in the CT group (12.44 ± 1.122) compared to InCT ($5,009 \pm 1,376$), MN ($8,892 \pm 1,830$) and InMN ($6,316 \pm 1,044$) ($p < 0, 01$).

The intestinal permeability was more evident in the InMN group (0.3409 ± 0.09473) than the others - CT (0.08764 ± 0.06311), InCT (0.08869 ± 0.0499) and MN (0.1729 ± 0.08258) ($p < 0.01$), suggesting that malnutrition had an impact on the pathophysiology of giardiasis, inducing increased permeability in the intestines of the experimental animals.

Key words: *Giardia lamblia*; malnutrition; intestinal permeability.