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STUDY ON GLUCOSE AND LACTIC ACID PRODUCTION IN SHEEP NEMATODES FROM NANDURBAR,(M.S.),INDIA

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ABSTRACT :

Helminth worms in general lead a parasitic mode of life. Therefore it is not surprising that for most of their needs they depend up on the host. In order to understand their mode of life it is highly essential to enquire in to the reasons of parasitism. The reasons for the parasitism are manifold like shelter, nutrients, for the completion of the life cycle, for the lack of a metabolic steps etc. Therefore, the definition of parasitism will never be complete unless a clear knowledge about the habitat, nutritional requirements and their metabolic patterns are available. Hence the study of parasites require a multidimensional approach like phylogenetic relationship ecological morphological, physiological, chemotherapeutic, immunological and nutritional aspects.

Helminth parasites are known to metabolize carbohydrate mostly by glycolytic pathway with lactic acid as one of the main end products. Lactic acid is readily produced by Ascaris lumbricoides (Von Brand,1934) by A. megalocephalus (Toryu,1936) and A. galli (Shrivastava, ghatak and Murti, 1970) with a view to explain the extent of damage caused by the nematodes in different niches of the alimentary canal of sheep, the carbohydrate metabolism was studied in the stomach worm i. e. Oesophagostomum columbianum (Curtis, 1890) and O. asparum (Railliet et Henry, 1913). A study of uptake of glucose and conversion to lactic acid were discussed.

KEYWORDS : *Glucose metabolism , lactic acid , sheep , nematodes , Nandurbar .*

INTRODUCTION

Nandurbar District is located at the edge of Maharashtra Northern boundary enveloped by Madhya Pradesh on the North and the East and Gujarat on the West. The District is recognized for its tribal population and undulating landscapes of the Satpuda ranges on the Northern end of the District, Tapi running across the District and Narmada in the North. The District can be divided into two broad physiographic parts. One is hilly terrain of Satpuda ranges prominently dominated by tribals. Second part is Tapi river basin, which is comparatively more fertile and has good irrigation facilities. The District has dry climate in general, The temperature attained is of typical of tropical temperature zone. The summer is intolerably not. The average rainfall in the District is about 888mm and it is not uniform in all parts of the District.

Nematode parasites are differ in energy metabolism and their host is known for long time which is evident by the fact that all the nematodes are capable of consuming some oxygen, like their host but none can completely metabolize carbohydrates. Carbohydrates which are very essentional reserve energy sources in the animal parasitic nematodes at adult stages variation occurs in their number, composition,

way of metabolism, due to the factors like stage of development, sexual dimorphism, climate variations, sort of host and the parasite. Often carbohydrates in animal parasites occur more in the form of glucose and glycogen.

Carbohydrate dissimilatory pathways in most of helminthes differ from corresponding pathway in mammals. Parasitic helminths are not capable of complete oxidation of glucose regardless of their habitat (Von Brand 1937). They accumulate succinate (Sehiebel and Saz, 1966, Bueding and Saz 1968) by process of Co2 fixation. Pathway, which is described as partial reverse of the Kreb's cycle. A rapid synthesis of protein is also necessary in cestode because their immense fecundity. In the lipid metabolism there are striking differences between host and parasite. The parasite helminth do not synthesize de novo sterol and long chain fatty acids (Ginger and Fair bairn 1966) Hence they depend for their requirements completely on the host. The investigations of the biochemistry of parasites not only help in understanding the fundamental aspects of biological phenomenon but also in recognizing metabolic pathways.

Systematic attempt to understand the mode of life, pathway etc., started to initiate form the beginning of 19th century to understand physiology and biochemistry and metabolism at cellular level many workers studied *Ascaris lumbricoides* to a large extent because of its size and availability. The present knowledge of nomatology mainly resulted from the *Ascaris lumbricoidses* and its metabolism.

Investigators on the chemistry of glycogen showed that there is difference in the glycogen biochemical composition in the molecular chain length between the host and parasites and from parasite to parasite.

In the present work it has been attempted to understand the glucose metabolism and lactic acid production of the two nematode parasites i.e. *Oesophagostomium columbianium* and *O.asperum.* In the glucose metabolism production of lactic acid were studied which furnish the basic information of metabolism.

MATERIAL AND MATHODS

O.columbianum and *O.asparum* were collected manually from slaughtered sheep gut. These nematodes were washed with 0.85% Nacl and separated species wise for quantification of glucose content 40 males and females of each of two species of nematode parasites of sheep were taken. The nematode parasites were well dry within Whatman filter paper No.1 weighed separately and homogenized in cold distilled water to give a 10% w/v homogenate.

The rate of glucose amount was estimated by incubating for a period of 12 hr. At the maintained temperature on 37 ^{0}C .40 males and females of both the species put in separately in Petri dishes which containing 5ml of 0.85% Nacl. Glucose and lactic acid were estimated in the incubation media at intervals of 6 hrs. Carefully change the medium at interval of every 6 hrs and glucose was estimate by the method of Nelson and Somogyi (1965) and lactic acid by the method of Barker and Summerson (1941) absorbance was measured at 540 nm for glucose and 560 nm for lactic acid in spectrophotometer these quantification experiments were repeated five times to get mean values.

Map showing collection area from Nandurbar region

OBSERVATION TABLE: A

Comparative glucose profile (values= mean ± S.D.)

Name of the parasite	Glucose mg/gm (fresh weight)	Standard deviation	Male and female ratio
O. columbianum (male)	2.69	± 0.9	1:4
O.columbianum (female)	11.70	± 4.4	
O.asparum (male)	7.88	± 3.2	1:1.1
O. asparum (female)	8.91	± 3.5	

Above glucose content of the nematode parasites was estimated by homogenizing the worms and results are expressed in mg/gm.

OBSERVATION TABLE: B

Glucose content and lactic acid production in sheep nematodes

Incubation period in hrs	Sex	*O. columbianum*		*O.asparum*	
		Glucose µmol/gm	Lactic acid µmol/gm	Glucose µmol/gm	Lactic acid µmol/gm
0-6	Female	2.2 ± 0.7	3.0 ± 0.53	1.17 ± 0.09	1.70 ± 0.07
	Male	2.82 ± 0.83	2.50 ± 0.12	1.5 ± 0.04	1.61 ± 0.15
6-12	Female	0.20 ± 0.17	0.15 ± 0.01	0.62 ± 0.05	0.70 ± 0.05
	Male	0.10 ± 0.03	0.09 ± 0.01	0.37 ± 0.03	0.72 ± 0.04

RESULT AND DISCUSSION

From observation table- B it is proved that percentage of glucose metabolized to lactic acid. More percentage in both female nematode parasites of the *O. columbianum* and *O. asparum* of sheep. The percentage of glucose metabolism to lactic acid during second 6 hrs low in both species. Different glucose levels have been reported in different nematode parasites, *A. lumbricoides* (Von Brand , 1934), *A. megalocephalus* (Toryu,1936) and *A. galli*(Shrivastava et. al, 1970).In the present study glucose consumption and lactic acid production was observed to be maximum in female of *O. columbianum* and *O. asparum* as compare to male. Both glucose consumption and lactic acid production were found to decrease with the increase in time of incubation. It was observed that the both sexes of the nematode parasites maximum lactic acid was produced during first 6 hrs of incubation.

Hence the biochemical composition of the parasite is subjected to variations and these variations are likely to be influenced by the variations of the host. Some intestinal helminths have adapted to live anaerobically by evolving a special type of mitochondria called anaerobic mitochondria, which enables the parasites to fix Co_2 and to live in an environment (intestine) rich in Co_2. Biochemical studies have revealed important metabolic differences between the host and parasites.

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