Qualitative and Quantitative Analysis of the Cellular Response in Sterile Acute Inflammation

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Abstract

A study of the cellular response in acute inflammation produced by the intraperitoneal injection of sterile egg-albumin in adult male rabbits was carried Out over a time interval of 06, 24 and 72 hours. The early response was stereotyped phenomenon and was accompanied by an increase in, polymorphs ($P < 0.01$) which completely disappeared at 24 hours. In the late hours gradual increase in mesothelial cells was noted which reached highest levels at 72 hours ($P < 0.01$). The levels of lymphocytes started rising in the exudate ($P < 0.05$) at 72 hours. The eggalbumin caused a marked response of mesothelialcells in the peritoneal cavity, when the initial response of polymorphs was over. (JPMA 35 : 215, 1985).

Introduction

The cellular response in acute inflammation differs with the type of stimulus, site of injury, time of sample collection and the species of animal.[1-5] As a common observation in early hours the acute inflammation is accompanied by polymorphs but reports on the quality of subsequent cell population differ in different studies[4,6] The present model is designed to study both early and late responses.

Material and Methods

The animals were divided into a control and a base line experimental group (Table-I).

Table - I

Grouping of Animals

Group		A (Control)			B (Experimental)		
Animal/Group		15			15		
Sub-groups		A1	A2	A3	B1	B2	B3
Animal/Sub-groups		5	5	5	5	5	5
Sensitizing dose		Distilled water			Egg-white		
Sampling	6 hours	A1			B1		
	24 hours	A2			B2		
	72 hours	A3			B3		

They were kept under normal conditions of animal house and were fed on green leaves and carrots. Their abdomens were shaved and steralized with diluted tincture of iodine. The needle was inserted tangentially through the anterior abdominal wall to the left of the left epigastric artery while the animal was in supine position. The peritoneal fluid was aspirated and smears prepared on glass slides. The smears were quickly fixed in adhesive-fixative mixture and stained with Papanicolaou's stain[7]. The total cell count was also carried out on the sample. The blood samples were simultaneously collected for total and differential cell count. The blood films were stained with Giemsa's stain[7].
The standard error were determined in order to define the mean differential count of each specimen. Probablity values (P) were used in the comparison of cell count of different groups.

Results and Observations

The mean total count of the various subgroups in the control aspirated at 6, 24 and 72 hours were almost similar. The dOminant cell types were mesothelial cells. The other common cell types were lymphocytes and histcytes but no J.P.M.A. July, T985 polymorphs were seen. The experimental groups aspirated at 6, 24 & 72 hours showed a rise in mean total cell count (P L 0.01). At 6 hours there was relative diminution in mesothelial cells and marked increase in polymorphs (P< 0.01). At 24 hours the polymorphs had completely disappeared and the increase in total count at this time was due to increase in mesothelial cells (P < 0.01). At 72 hours the mesothelial cells were still high and the lymphocytes showed significant increase (P< 0.05). The variation in other type of cells was slight (Table II).

Table - II

Mean of total and differential cell count of Exudates in control Group 'A' &Experimental Group 'B'

Group	A1	A2	A3	B1	B2	B3
Total cell count/cmm	460.00 ±204.11	515.00 ±187.51	65.00 ±42.27	4940.00 ±950.00	2070.00 ±220.00	5585.00 ±1400.00
Me/cmm	413.55 ±201.20	471.85 ±171.25	40.95 ±40.95	552.50 ±395.75	1749.95 ±214.05	4251.05 ±1870.00
L/cmm	17.35 ±8.67	30.65 ±19.61	3.15 ±3.14	121.65 ±23.53	267.50 ±47.50	489.95 ±201.65
H/cmm	3.00 ±3.00	3.40 ±2.32	- -	9.50 ±9.11	15.95 ±6.75	9.50 ±9.40
P/cmm	0.35 ±0.34	- -	- -	4412.00 ±930.00	- -	18.25 ±18.24
D/cmm	1.50 ±1.50	4.10 ±2.51	0.45 ±0.45	- -	18.35 ±8.55	18.25 ±18.24
BN/cmm	2.95 ±2.18	- -	0.45 ±0.45	- -	9.00 ±9.00	- -

KEY:- Me - Mesothelial cells.
L - Lymphocytes.
H - Histiocytes.
P - Polymorphonuclear Leukocytes.
D - Degenerate cell.
BN - Bare Nuclei.

Discussion

Peritoneal cavity is a reliable and simple site for the study of cellular phase of acute inflammation. A minor change in cell population can be detected and the total count of different cells at various time intervals can be monitored, accura=tely and easily.

The total cell count of the peritoneal fluid in nonstimulated rabbits vary widely. The count rported are 3600/cmm7 3240/cmm[7] and “0 10”[7] anu u.iu as compared to our control (Table II). This variation is due to age, sex in the species of animal, state of nutrition hy dration and method of sampling. The wide

variations in the normal emphasise the need for strict evaluation of individual control.

The cytodifferential count of the control in the present work revealed mesothehal cells as a dominant cell type. Similar observations were recorded by McGowan and Davis [8] though in some studies the peritoneal nacrophages were dominant with few serosal cells[4] others have described the dominant cell as mononuclear[7,9] - Slonecker and Lim[4] noted morphological heterogeneity and phagocytic activity, on these criterion he labelled them as macrophage cells though morphologic heterogeneity and phagocytic activity is also characteristic of mesothelial cells. The serosal cells in this study were few but showed phagocytosis of latex particles. In this study we divided them in mesothelial cells and histiocytes. The lymphocytes were, second common types which is in agreement with other [4,7-9] workers No polymorph was seen in the peritoneal fluid of the nonstimulated control animals either in this or in other studies[4,7-9]

The polymorphonuclear leukocytes seen in the peritoneal fluid were due to the stimulation of the cavity. The number of polymorphs coming in the exudate varies with the type of stimulus and dose of stimulus.[9] The duration of outpouring of polymorphs also varies with the types of stimulus[4,8,9] In this study the number was small and the duration of polymorphs lasting exudate was short which indicates the mild and sterile nature of the stimulus an egg-albumin.

After stimulation of the peritoneal cavity the peritoneal macrophages showed increase at 04 hours, peak at 30 hours, remained elevated over 72 hours and then declined[4] While in the present study the rise started at 24 hours and continued over 72 hours. It is possible that due to the mild and sterile nature, the egg-albumin elicits a poor response of polymorphs and remain for longer in the peritoneal cavity unlike the particulated latex. It is not quickly phagocytosed and so elicit a longer response by mesothelial cells as a type of phagocytic cell.

The increased number of lymphocytes in the exudate at 72 hours in our study contrasted with that of Sloncker and Lirn[4] where the rise was early, peak at, 24 hours and remained elevated over 72 hours. McGewan and Davis[8] noted an increase in lymphocytes after one hour of intraperitoneal injection of dextran.

In conclusion the early response was stereotype and the subsequent cellular response varied with different factors. The later hours response was exhibited by increase of mesothelial cells and they assume phagocytic quality. The lymphocytes were late comers and this might be due to the time taken in the initial priming of lymphocytes by egg-albumin and the release of chemotactic substances by polymorphs after their early hours response.

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