

THE EFFECT OF SENSITIZATION ON PHAGOCYtic ACTIVITY OF PSEUDOEOSINOPHIL (NEUTROPHIL) GRANULOCYTES IN GUINEA PIGS AGAINST THE BACKGROUND OF THYMECTOMY

T. Ganchev, I. Kozarov

The changes in the phagocytic activity following thymectomy have been insufficiently investigated hitherto. According to reports by Miller, thymectomy increases the size and number of Kupffer's cells and enhances phagocytosis, investigated by means of purification of the blood from colloidal carbon. In the latter case, the role and significance of the various phagocytizing cells have not been defined. Insofar the influence of sensitization exerted upon the phagocytosis is concerned, the available data shows that it stimulates the phagocytic activity (1, 2, 5, 6, 10, 14). Very often, in case of a non specific object for phagocytizing, a reduction of phagocytosis is established by the authors (6,14). In the literature surveyed no reports were found referring to the influence of sensitization upon the phagocytosis after previously performed thymectomy. In the present study, we aim to verify the alteration of the opsono-phagocytic index after sensitization in guinea pigs after thymectomy, with a view to clarify the role played by the thymus in the mobile — cellular defense.

Material and Method

The experiments were performed on 40 clinically healthy guinea pigs, divided in two groups: group I: a) neonatally thymectomized animals, sensibilized at the age of one month — 9 animals, b) controls — 11 animals; group II: a) neonatally thymectomized, sensibilized at the age of 8 months — 9, b) controls — 11 animals. Thymectomy was carried out by surgical intervention. Sensitization was performed with bovine serum at dose 0,1 ml, subcutaneously, three times, blood was taken for investigation of the opsono-phagocytic index. The method of Wright and Douglass as modified by Valchanov was employed (3, 4, 5). Culture of killed bacteria (*Staphylococcus aureus*, strain 209), at concentration 2000 millions in 1 ml⁺⁺ was used. In 100 intact pseudoeosinophil (neutrophil) granulocytes, the phagocytized staphilococci were counted and the number of cocci phagocytized from a single cell was calculated, i. e. the opsono-phagocytic index (OPI) (5).

Results and Discussion

The opsono-phagocytic index of the neonatally thymectomized animals, sensibilized at the age of 1 month, was $0,22 \pm 0,10$ prior to sensitization. Fourteen days after the sensitization, the index fell to $0,19 \pm 0,09$, with the values in three of the animals displaying a slight increase. In four animals, OPI was investigated on the third post-sensitization day. It was found that it was likewise decreased, although lacking statistical reliability. In Table I, the mean results are presented in all groups of animals.

Table 1

Opsono-Phagocytic Index before and after Sensitization of Neonatally Thymectomized and Control Guinea Pigs

GROUPS	Number	Opsono-phagocytic Index		
		Before sensitiz.	After sensitiz.	Alteration in %
Group I: a) neonatally thymectomized, sensibilized at 1 month	9	$22 \pm 0,10$	$0,19 \pm 0,09$	-13,64
	b) controls	11	$0,14 \pm 0,03$	$0,15 \pm 0,02$
Group II: a) neonatally thymectomized; sensibilized at 8 months	9	$0,89 \pm 0,74$	$0,54 \pm 0,37$	-39,33
	b) controls	11	$0,62 \pm 0,49$	$0,31 \pm 0,15$

The changes in the control animals (merely sensibilized, of same age) disclosed the following values: before sensitization — $0,14 \pm 0,03$, and after sensitization — $0,15 \pm 0,02$. It is evident that the increase, amounting to 7,14% is insignificant. In the experimental group, a fall of OPI with 13,64% is recorded. The postsensitization increase of OPI is in compliance with the generally accepted enhancement of phagocytic activity after sensitization (1, 2, 5, 6, 10). A reduction of OPI is noted also in Group II, consisting of neonatally thymectomized and control animals, sensibilized at the age of 8 months. In the latter case, the thymectomized animals prior to sensitization had OPI $0,89 \pm 0,74$, which was lowered to $0,54 \pm 0,37$ after the antigenic influence. In this group, a reduction was obtained of the phagocytic activity in the control animals also from $0,62 \pm 0,49$, the value of the index after sensitization was lowered down to $0,31 \pm 0,15$. It should be stressed furthermore, that the fall in the control animals is much more pronounced as compared to that of thymectomized animals, and is statistically reliable at $P=0,05$. In the younger, 1-month-old, not-thymectomized animals of group I, the OPI is increased after sensitization, whilst in the elder controls of group II, it is considerably reduced. The latter fact might be explained by the extinction of the immune response in the adult organism, which plays an essential role in the phagocytic process (1, 5, 7, 8). Worthy of interest are also the data about the OPI changes after sensitization against the background of neonatally performed thymectomy. Table I shows that in both groups of thymectomized animals, OPI reveals

a tendency towards decrease after injection of the antigen. The substantially stronger reduction of OPI in elder animals — thymectomized and sensitized — might be explained, apart from the age-related reduction of immune reaction, also by the inhibitory effect of thymectomy, exerted upon the immuno-allergic processes (9, 11, 15, 16). Furthermore, here as in the control animals, probably, the circumstances that the object for phagocytizing is not specific plays an essential role. It is well known that in the latter case a reduction of phagocytic activity might occur (6, 14).

It is worth mentioning that OPI in thymectomized animals both before and after sensitization, displays higher values as compared to control animals. This is evident in Table 1, as well as in Table 2 where the percentual differences are shown of OPI between thymectomized and control animals, prior to and after the antigen injection.

Table 2

	Before sensibil. in %	After sensibil. in %
Group I — Thymectomized sensitized at 1 month compared to controls	+36,36	+21,00
Group II — Thymectomized sensitized at 8 months compared to controls	+30,33	+42,59

The above data comply with Miller's report, claiming an increase of phagocytosis after thymectomy (13). In the particular case discussed, this increase is at the expense of the pseudo eosinophil (neutrophil) granulocytes in the circulating blood. Although unreliable statisticalwise, due to the small numbers of animals on which our experiments were carried out the differences exist. Concerning the difference of OPI in sensitized at 1 and 8 months, neonatally thymectomized and control animals, probably an important role is played also by the age-dependent development of the hypothalamo-hypophyse-adrenal system (12), which stimulates the phagocytic activity (5) and, in all likelihood, explains the higher OPI values in the 8-month-old animals.

It is quite possible that the reduced immunologic reactivity subsequent to thymectomy leads to the mobilization of other compensatory mechanisms and regulatory nerve-humoral links, lending support to the defensive processes by way of stimulating the phagocytic process. According to the results of this study the pseudo eosinophil (neutrophil) granulocytes in the circulating blood also participate in the compensatory processes referred to.

Inference

1. Neonatal thymectomy in immediate and later periods accounts for inhibition of the phagocytic activity subsequent to sensitization of guinea pigs.

2. In thymectomized guinea pigs, the opsono-phagocytic index of the pseudoeosinophil (neutrophil) granulocytes is higher as regards to non-thymectomized animals.

3. The opsono-phagocytic index value in control and neonatally thymectomized animals, sensibilized at the age of 8 months is higher than that of the control and neonatally thymectomized animals sensibilized at the age of one.

REFERENCES

1. Адо, А. Д. Патологическая фагоцитоз, М., 1961, 295.
2. Анина-Радченко, Н. Д. *Журнал микроб. эпидем. и иммунол.*, 1949, 8, 26—29.
3. Вълчанов, Х. В. *Природа* (БАН), 1953, 2, 5, 50—55.
4. Вълчанов, Х. В. *Изв. биол. и-т БАН*, 1954, 5, 411—418.
5. Вълчанов, Х. В. Фагоцитоза, атроцитоза и иммуногенеза, С., БАН, 1966.
6. Гельдыева, А. Г., И. Н. Ивашурова. *Труды Туркменск. мед. и-та*, Ашхабад, 1960, 10, 153—158.
7. Давыдовский, Н. В. Геронтология, М., 1966, 300.
8. Елин, В. Л. Общие вопросы инфекционного и иммунного процессов. Киев, 1961, 216.
9. Зинзар, С. Н. *Бюл. exper. биол. и мед.*, 1968, 65, 1, 81—83.
10. Каплин, В. Н. *Бюл. exper. биол. и мед.*, 1964, 7, 63—66.
11. Кемилева, З., И. Козаров. *Эксперим. мед. и морфол.*, 1969, VIII, 2, 65—69.
12. Маркова, И. В. *Бюл. exper. биол. и мед.*, 1962, 12, 61—63.
13. Миллер, Д. *Патол. физ. и эксп. терапия*, 1965, 5, 3—13.
14. Шовкун, А. Г. *Сборник научн. трудов, Рост. на Дону, мед. ин-та*, 1963, 19, 127—136.
15. Archer, O. K. and al. *Nature*, 1962, 195, 191—191.
16. Halpern, V. N. *Rev. Franc. Allerg.*, 1963, 3, 131—133.

ЭФФЕКТ СЕНСИБИЛИЗАЦИИ У МОРСКИХ СВИНОК НА ФОНЕ ТИМЭКТОМИИ НА ФАГОЦИТАРНУЮ АКТИВНОСТЬ НЕЙТРОФИЛЬНЫХ ГРАНУЛОЦИТОВ

Т. Ганчев, И. Козаров

РЕЗЮМЕ

Авторы исследовали у 40 морских свинок, разделенных на опытные и контрольные группы, опсонофагоцитарный индекс (ОФИ) нейтрофильных гранулоцитов. В опытных группах животных — неонатально тимэктомированных и sensibilizированных сывороткой на 1 и 8-месяц устанавливается тенденция к уменьшению ОФИ через 14 дней после sensibilизации. В контрольных группах — нетимэктомированных и sensibilizированных животных — устанавливается увеличение ОФИ у sensibilizированных на 1-месяце и значительное его уменьшение у sensibilizированных на 8-месяце животных — на 50%. Сравнение ОФИ между тимэктомированными и нетимэктомированными животными перед sensibilизацией показывает более высокие значения у тимэктомированных: у sensibilizированных на 1-месяце на 36,36% и 30,33% у sensibilizированных на 8-месяце после тимэктомии. После sensibilизации разница является соответствующе 21% и 42,59%. Значения ОФИ у 8-месячных животных больше, чем значения у 1-месячных во всех группах животных.