

NATURE OF THE TOXIC FACTORS IN BURNS  
STUDIED IN GERM-FREE GUINEA PIGS

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Toxicity (action on migration of leukocytes in culture) of the serum and saline extracts of the internal organs after burns was studied in experiments on germ-free and contaminated guinea pigs. Despite the total absence of a microbial flora, the toxic properties of the serum and extracts of internal organs of the germ-free animals were the same as those of the contaminated guinea pigs. The results point to the important role of histiogenic factors in the development of burn toxemia.

KEY WORDS: burns; toxemia; germ-free animals.

The suggestion has been made that toxic products formed in burns and concerned in the pathogenesis of severe disturbances of the bodily functions are histiogenic in origin. However, bacterial toxins of exogenous and endogenous origin are also certainly present in burned animals [2, 3, 8]. In experiments on ordinary laboratory animals the problem of the sources of toxic burn products is very difficult to solve. The use of germ-free animals provides good opportunities for differentiating the role of infectious and noninfectious factors. Most investigators have found no sharp differences in the mortality of germ-free and ordinary animals after burns [5-7].

In experiments on germ-free rats [4] the writers showed that the course of toxemia is the same in these animals as in ordinary animals. However, three nonpathogenic microorganisms were present in the "germ-free" rats and their participation in the formation of burn toxemia could not be completely ruled out.

In the present investigation the course of burn toxemia was accordingly studied in germ-free animals by comparison with ordinary contaminated animals.

EXPERIMENTAL METHOD

Experiments were carried out on 39 germ-free and 33 contaminated guinea pigs. The germ-free animals were obtained by hysterotomy, using the surgical gnotobiological isolator manufactured by the firm of "Celster isotechnie" (France). Semiliquid food was sterilized in an autoclave at 1.2 atm for 30 min and passed in a special container through the lock system of the isolator. A microbiological sterility control was maintained throughout the experiment. Samples for sterility control (stools, washings from the surface of the animal, water, food, bedding, and so on) were taken at least once a week. A burn was applied to the shaved surface of the body by means of a metal plate, heated to 250°C, applied for 7-8 sec. Before and during the week after infliction of the burn, the toxic properties of the serum and of saline extracts of the liver and kidneys of the animals, obtained under sterile conditions, were investigated. Toxicity was determined from migration of the leukocytes in a leukocyte film culture [1].

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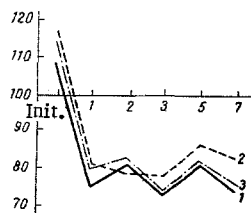


Fig. 1

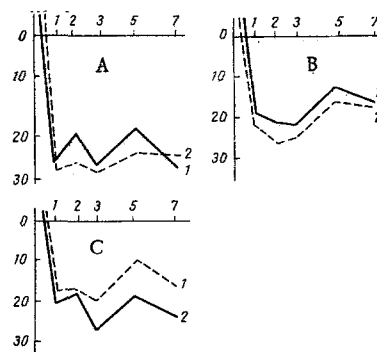


Fig. 2

Fig. 1. Toxic properties of serum and extracts of internal organs of germ-free guinea pigs after burning: 1) change in migration produced by serum, 2) by extract of liver, 3) by extract of kidneys. Abscissa, time after burning (in days); ordinate, migration of leukocytes in experimental cultures (test fluid added to nutrient medium) as a percentage of migration in control group (Ringer's solution added to nutrient medium), taken as 100%.

Fig. 2. Comparison of toxic properties of serum (A) and extracts of internal organs (liver - B and kidneys - C) of germ-free (1) and contaminated (2) guinea pigs. Abscissa and ordinate as in Fig. 1.

#### EXPERIMENTAL RESULTS

As Fig. 1 shows, before the burn the serum and extracts of organs of the germ-free guinea pigs stimulated leukocyte migration. A definite and approximately equal toxic effect of both serum and organ extracts was found 24 h after burning.

The sera and organ extracts from germ-free and contaminated, burned animals had a similar ( $P > 0.05$ ) toxic action on leukocyte migration throughout the period of observation (Fig. 2).

The absence of any microbial flora in the germ-free burned animals suggests that the toxic products which they accumulated were histiogenic in origin. However, this does not rule out an important pathogenic role for the microbial flora in the body after burning under ordinary conditions. At the same time, therapeutic measures in burns must be aimed not only at the control of infection, but also at the prevention of effects of toxic products of tissue origin.

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