Life profile of immunity

The innate defensive potencies *(natural resistance)* and the *acquired defensive capacities* (immunological processes) amount to a biological total achievement. Well though, theoretically, these concepts are separable, difficult to impossible in biology and clinic is the quantitative estimate of resistance and immunity. The sum of these processes serving for the integrity of an individual depends on many factors such as age, sex, general condition, climatic circum-

stances and accidental events. In spite of the latter, clinical experience as well as statistical and epidemiological recognition permits comparatively reliable conclusions about the life profile of the immunity. Like all biological processes, immunity is a developing, maturing, aging and disappearing phenomenon.

Embryo and fetus are, biologically, well tolerated homologous implants. Although proteins, chiefly in the liver, are formed in early stages of development, it has so far not been possible to win in any species traceable quantities of immunoglobulins during the normal fetal life (R. A. GOOD and B. W. PAPERMASTER). Through passive transmission from the mother, the new-born has first more gamma-globulins in the blood of the umbilical cord than the mother. But these quantities diminish rapidly in the absence of own synthetic performance.

Immunity is insufficient immediately after birth. In man and in most of the warm-blooded animals, immunological defence begins in the second week of life and is probably not sufficient before the 2nd to 4th years of life. The clinical observations are substantiated by

a) the absence of the plasma cells producing antibodies during the first 10 days of life,

b) symptoms of quantitative and qualitative insufficiency in the spectrum of the immunoglobulins,

c) comparatively weak mononuclear reactions in the new-born as a cellular response to non-specific inflammatory stimuli (SHELDON and CALDWELL).

The immunological maturation

follows the periods of immunotolerance of embryo and fetus and of insufficient immunity of the baby. The more the growing child gets into touch with his domestic and, later, extra-domestic environments, the more the antigens, against which antibodies are produced, will multiply. Immunoglobulins against most of the civilization diseases are acquired by natural infection or vaccination.

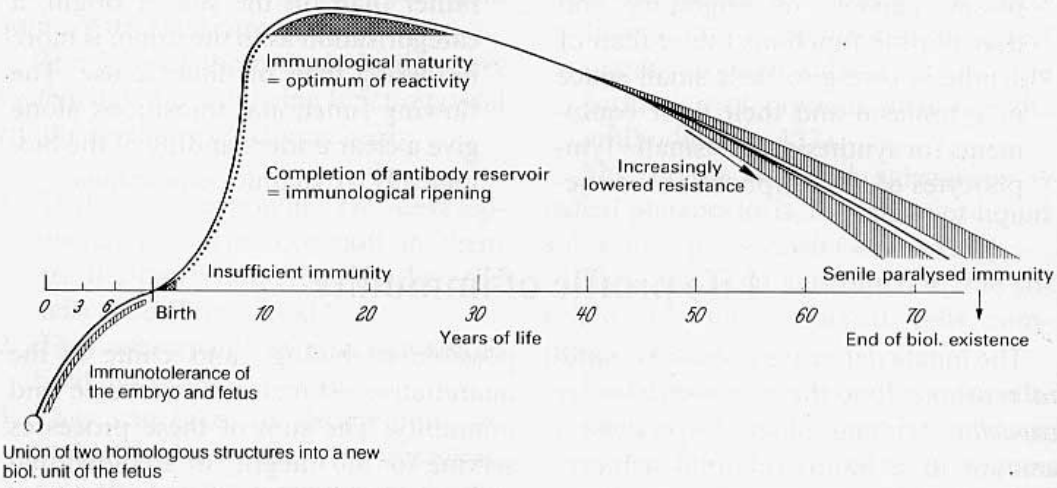

Fig. 138:
Scheme of the immunobiological life profile

The immunological maturity

is attained between the 7th and 12th years of age. Taking into consideration the immunoglobulin levels in the serum and the rates of morbidity and mortality, the maximum adaptability and power of defence are attained between the 10th and 12th years.

On the other hand, this period of life is the age during which preferably many diseases originating from antigen-antibody reactions occur. They include: scarlet fever, rheumatic fever, glomerulonephritis, anaphylactoid purpura and hyperplasia of the lymphatic apparatus (hyperplasia of the tonsils, adenoids, lymphonodulitis mesenteralis).

Individually different transient depressions during puberty interrupt the period of maturity, which continues usually into the fifth decade of life.

The immunological regression

runs a slow course and sets in, individually different, in the 5th or 6th decade of life; it is characterised by an increased susceptibility to infection and by a decreasing protection of the integrity of autogenous tissular structures as the neoplasms are increasingly more endangered. The power of resistance to infections subsides at the end of biological existence as the senile immunoparalysis advances.

Natural resistance / Immunity

«Immunobiology» implies all processes serving for the protection of autonomous life and its integrity. Terminologically, it is divided into the «natural resistance» and the «immunity». By « natural resistance» we understand the individual, non-specific capacity to cope with heterogeneous noxae threatening the own existence. Components of «natural resistance» are the innate reactivity and responsiveness of the mesenchymal (reticulo-histiocytary) system, properdin, complement, opsonin, lysin, leukin, conglutinin and C-reactive protein.

«Immunity» is the acquired specific capability of preserving the own existence against certain foreign influences. The biological differentiation, however, is not as clear as the definition can distinguish the two phenomena because both elementary processes serving for the protection of the organism work into each other and even depend on each other.

Heterogeneous substances such as foreign proteins or infectious morbific agents that get into the organism by avoiding (as e.g. by vaccinations) or breaking through (e.g. lesion, failure owing to illness) the epithelial protective surface,

a) either are infiltrated (as far as suited) into the own metabolic cycles as working substrates
b) or (as far as unsuited to be disintegrated metabolically by homogenous enzymes) must be rendered biologically inert by protective globulins.

The latter process comprises the disintegration of the foreign substance to the antigenous determinants, which, as they cannot be broken down further, are

palliatively enveloped by high-molecular globulins, which must specially be made to measure. The process is biologically circumstantial, takes from 4–6 weeks and comprizes various phases.

The rapid evolution in the field for which in clinical usage the term «immunology» has been adopted, makes one sometimes believe that the defense of the body is a problem of the lymphocytes, thymus or «plasma cells», according to the experimental schools to which the authors may adhere. The more, however, the considerations draw nearer to the clinical problems and are confronted with practical decisions, the clearer the gaps of such one-sided interpretation of the highly differentiated and ingeniously arranged safety devices of the body will appear.

The following survey is to outline the arrangement and organisation of the organismic immunobiological system. The topographic «abstraction» is continued by the functional interrelations of importance for practical and clinical questions.

Specific or non-specific?

The classical science of immunity has been inclined to associate the processes of specific defence with *«immunity»* and to categorize the non-specific processes for the protection of the organism under the term *«natural resistance»*. Like in other fields of medicine, the question of specific or non-specific has lost importance also in immunology since it has been known how closely the processes are connected and work into each other.

The body-own defense preserves the individual integrity by means of «non-specific» and «specific» measures. The processes caused by a penetrating antigenous foreign substance are first non-specific. Among them are phagocytosis (LANGHANS, 1870; WYSSOKOVICH, 1886; METCHNIKOFF, 1892; F. SCHMID, 1967) and «parenteral digestion». If the latter cannot or not quite be effected because the body is inadequately provided with enzymes, the macroorganism must in another way bring about the biological inertia of the foreign substances (antigens, antigenous determinants): *it develops specific proteins for the palliative binding of the antigens, the antibodies (immunoglobulins)*. Only from this moment, the components of the process, antigen and antibody, become specific. Specific actions are necessary when the organism cannot degrade and incorporate a foreign substance by means of non-specific mechanisms i.e. with its metabolic potentialities.

The following chapters are to show how accurately these processes work into each other.