difference in the number of plaques was observed between the two groups ($P > 0.5$).

These data suggest that ricin might exert a cytotoxic effect, which might be the basis for its adjuvant effect. Preliminary data supporting this possibility were obtained as follows. Mice were injected with the sheep red blood cells plus various amounts of either ricin or wax D. As shown in Figure 2, the numbers of whole viable cells were significantly decreased with the increase in the amount of ricin injected. In contrast, as shown in Figure 3, the number of whole viable spleen cells was significantly increased with the increase in the amount of wax D[4].

Zusammenfassung. Es wird gezeigt, dass Injektion von Rizinus-Extrakt die Plaque-Bildung im Jerne-Test fördert, was dafür spricht, dass die zytostatische Wirkung des Rizinus mit der Adjuvansfähigkeit gekoppelt ist.

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Placental Transfer of a Human IgG2 Monoclonal Protein

Among the four known human IgG heavy-chain subclasses[1,2] only IgG1 and IgG3 are known to be transferred across the placenta[3].

The finding during routine testing of a monoclonal IgG2 L protein in the serum of a healthy woman in her 6th month of pregnancy[4] provided a unique opportunity for the study of the placental transfer of this subclass.

Material and methods. Serum samples. Maternal serum samples were collected at the day of birth, and 3 months, 2, and 3 years after. All immunoglobulins remained quantitatively stable during the period of observation.

Serum samples were also collected from the infant, at the day of birth (cord's blood), and afterwards, at days 15, 30, 60, 90, 120, 150 and 215.

Electrophoretic and immunoelectrophoretic studies. All serum samples were studied electrophoretically on cellulose acetate[5,6] and immunoelectrophoretically in agar, according to the microtechnique described by SCHEIDEGER[7], using horse anti-whole human serum.

Quantitative assay of immunoglobulins. Immunoglobulins were quantitated by radial immunodiffusion[8].

Heavy and light chain typing of the monoclonal protein. The preparation of specific anti-heavy chain subclass sera has been described in detail elsewhere[9]. Anti-whole light chain antiserum, prepared in a rabbit by injection of isolated light chains obtained after reduction and alkylation of normal IgG[10], was rendered specific for κ- and λ-chains by absorption with isolated IgG monoclonal proteins of the opposite light chain type. Due to the presence of normal IgG, classification of the monoclonal protein was only possible by immunoelectrophoresis.

Quantitative assay of IgG subclasses. Titration of IgG subclasses was done as described elsewhere[8]. Titres were transformed into percentages of a normal standard after correction for total IgG content.

Calculation of half-lives for circulating IgG and IgG2 in the infant. The period of time necessary for a 50% decrease in circulating IgG and IgG2 was determined from plots of concentration versus time, where the slopes were drawn so as to represent an average rate of decline at total IgG levels higher than 500 mg/100 ml.

Results. A monoclonal component migrating in the fast γ-region was detected both in mother and infant's sera by cellulose acetate electrophoresis and immunoelectrophoresis. The abnormal protein could still be detected in infant's samples collected at days 120 and 150 after birth (by immunoelectrophoresis only, in the last). This protein was typed in both mother and infant's serum samples as IgG2 L. The results of immunoglobulin assay in serum samples obtained from mother and infant are shown in Table I.

IgG subclasses were titrated in serum samples collected from the mother at day of birth and from the infant at days 30, 60, 120 and 215 after birth, and results are given in Table II.

The results of the quantitative assay of IgG, IgG2, and IgM in infants samples are plotted versus time in the Figure. Half lives of 45 and 60 days were calculated for IgG and IgG2, respectively.

Discussion. The selectivity of the placental transfer of IgG[11] was observed in the present case, as shown by the similarity of the levels of this immunoglobulin in mother's and infant's sera at day of birth, and by the very low levels of IgA and IgM detected in the infant. IgG levels decreased during the first 3 months of life, as expected[12], and levels of IgA increased only slightly up to day 215, also in agreement with reported data for that immunoglobulin[12]. Less expected was the very early rise of IgM, reaching normal adult levels as soon as day 30. This data was confirmed immunoelectrophoretically.

Information about the placental transfer of IgG sub classes was obtained in 2 different ways. The detection

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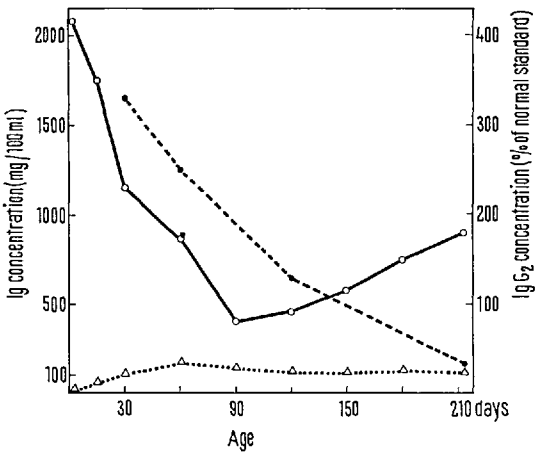
Table I. Immunoglobulin assay (mg/100 ml) in serum samples collected from the mother at day of birth, and from the infant at days 1–215.

	IgG	IgA	IgM
Mother (day of birth)	2080	110	154
Son age (days)			
1	2090	5	7.5
15	1750	10	60.3
30	1175	10	108
60	860	19	127
90	400	26	118
120	460	30	106
150	590	30	112
180	660	33	116
215	675	37	108



Evolution of the levels of IgG (○—○), IgG2 (●---●) and IgM (△·····△) in the infant, from birth to day 215. The levels of IgG and IgM are expressed in mg/100 ml, and the levels of IgG2 as percent of the IgG2 contained in a normal IgG standard.

Table II. IgG subclass assay (% of a normal standard) in serum samples collected from the mother at day of birth, and from the infant at days 30, 60, 120 and 215

	IgG1 (%)	IgG2 (%)	IgG3 (%)	IgG4 (%)
Mother (day of birth)	70	570	143	35
Son age (days)				
30	42	332	125	21
60	–	250	–	–
120	16	132	33	17
215	96	25	96	13

of the IgG2 L monoclonal protein in the serum collected from the infant at birth, and its progressive decline with time is conclusive evidence for the transfer of that subclass. Secondly, the good correlation between the levels of the other subclasses in the serum collected from the mother at day of birth, and from the infant at day 30 after birth (no earlier samples were available for subclass assay), and their decline with time, strongly suggest that all were transferred across the placenta.

The assay of IgG subclasses in serum collected from the infant at day 215 showed that IgG2 and IgG4 levels were still declining, but IgG1 and IgG3 were rising to normal levels. This dissociation in the start of the synthesis of the subclasses by the infant had been suggested by earlier observations[13].

Half lives for IgG and IgG2 were unexpectedly long, considering the reported half-life period of about 20 days for normal IgG and IgG2 proteins in the adult[14–17], and of 17–31 days in the infant[18,19]. The exceptionally slow decline of IgG2 levels could possibly account for the prolonged half-life of whole IgG. It must, however, be stressed that the half-life of 17–31 days for placentally-transferred IgG in the infant is based on studies of either single antibodies or total γ-globulin, the last of those having been carried out prior to the introduction of the reasonably accurate techniques for γ-globulin and IgG assay presently used[18]. The possibility that those values are not accurate and that the half-life of placentally-transferred IgG in the infant is longer than the accepted upper limit of 30 days must be considered. A slow catabolism of IgG would be of considerable advantage to the infant in his first months of life, enabling the maintenance of high levels of transferred IgG for a longer period of time.

Résumé. Étude du passage transplacentaire à son enfant des sousclasses de l'IgG chez une femme atteinte d'une forme benigne de gammapathie monoclonale. Le transfer de la paraprotéine IgG2 L a été établi avec certitude. Il est très probable que les autres sous-classes sont également transferées. Comparée aux résultats publiés sur catabolisme de l'IgG chez l'adulte, la durée de vie de l'IgG total et de l'IgG2 est très longue chez l'enfant.

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