IMMUNOLOGICAL STUDIES OF MOUSE DECIDUAL CELLS

I. Membrane Markers of Decidual Cells in the Days after Implantation*

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The mechanisms by which the mammalian embryo is protected from allograft rejection by the mother remain unclear at present although several hypotheses have been brought forward (1–3). Recent advances seem to favor the lack of detectable transplantation antigens on the postimplantation trophoblast (4, 5) and of blocking antibodies (6). On the other hand, the decidua in the pregnant uterus may provide a locally privileged environment to the embryo (7, 8). For example, extracts from artificially induced decidua have been shown recently to possess immunosuppressive properties (9).

Little is known of the exact role or origin of the decidua that develops and surrounds the postimplantation embryo in the pregnant uterus (10). Most decidual cells seem to be derived from uterine stroma cells that resemble embryonic fibroblasts (11, 12), but morphological data have suggested that some of the cells present in mouse and rat decidua may be lymphocytes or derived from lymphocytes (13, 14). Moreover, recent data show that immunoglobulin-containing cells are present in the mouse decidua shortly after implantation (15) as well as in the rat metrial gland at a later stage (16).

We report here the results of an attempt to define immunologically the cells of the mouse decidua in the days after implantation. It is shown that, in addition to H-2 antigens, Thy-1 antigen can be detected on a sizable fraction of decidual cells and that an apparently increasing number of cells bearing receptors for the Fc portion of immunoglobulin G can be detected in the decidua as pregnancy proceeds from day 6 to day 8.

Materials and Methods

Mice. Mice from various inbred and outbred strains were used. C57Bl/6 (B6) were purchased from Charles River Breeding Laboratories, Wilmington, Mass., The Jackson Laboratory, Bar Harbor, Maine, or came from Dr. E. A. Boyse's colony at Sloan-Kettering Institute. Females from congenic strains for Lyt-1, Lyt-2, Lyt-3, and Lyt-4 (Ly-5) came from Dr. E. A. Boyse's colony. A/J, AKR/J, and C3H/HeJ mice were purchased from The Jackson Laboratory. Random-bred CF1 or ICR albino mice were also used. Inbred, hybrid, or outbred matings were set up, and the day a vaginal plug was found was considered day 0 of pregnancy.

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Preparation of Decidual Cells. Primiparous females were killed by cervical dislocation at 6, 7, and 8 days. Decidual capsules were dissected out of the uterus and placed in medium consisting of Dulbecco's phosphate-buffered saline with calcium (Grand Island Biological Co., Grand Island, N. Y.), supplemented with 0.3% fructose and 0.3% dextrose. All steps of decidual cell preparation were carried out in the same medium. Each capsule was checked for the presence of a normally developed embryo, and the whole embryo and its immediate surroundings (remnants of uterine epithelium, Reichert's membrane, and trophoblast) were removed as completely as possible under a dissecting microscope. Only decidua actually containing a healthy looking embryo were used further in the preparation of decidual cells. Capsules from one or two litters were chopped with scissors in cold medium and transferred to 20 ml of 1 mg/ml collagenase type II (Sigma Chemical Co., St. Louis, Mo.) containing 5 μg/ml RNAse free-DNAse I (Worthington Biochemical Corp., Freehold, N.J.) in medium. Pieces of decidua were incubated in collagenase for 20 min at 37°C, then washed twice in medium, and incubated sequentially for four to eight 5-min periods in 1 mg/ml trypsin (1:250; Difco Laboratories, Detroit, Mich.) in medium containing 5 μg/ml DNAse. Trypsin was previously allowed to dissolve in medium for 30–60 min at room temperature and filtered just before use. Each 5-min incubation in trypsin was followed by gentle pipetting for 3 min in siliconized Pasteur pipettes. Supernates of each incubation period were filtered through a 37-μm nylon gauze mesh into medium containing 20% heat-inactivated, gammaglobulin-free fetal calf serum (IPT)[1] and 5 μg/ml DNAse. Cells were spun at 250 *g* and resuspended in 20% IPT and 5 ub/ml DNAse in medium. Cell viability was assessed by trypan blue exclusion. Fractions containing > 90% viable cells were pooled and used for tests. This usually involved fractions 2 to 5 or 6, except for decidual cell cultures where fractions 2 to 8 were used. The first fraction contained numerous erythrocytes, and viability of nucleated cells was less good. Under these conditions, one 7-day litter containing 6–10 capsules averaged a yield of 1.5–2.5 × 10^6 cells.

Sera. A anti-B6 leukemia EL4, an anti-H-2^b serum, was absorbed in vivo in B10.A or B6 mice before use and was a gift of Dr. E. A. Boyse. Titer of this serum in complement-dependent cytotoxicity on B6 lymph node cells is over 1/1,600.

(A-Thy-1.1 × AKR-H-2^b)F_1 anti-A strain leukemia ASL1, an anti-Thy-1.2 serum, was absorbed twice on the AKR tumor, K36, to remove autoantibodies. After these two absorptions, its titer, when tested in complement-dependent cytotoxicity on A/J thymocytes, is 1/50,000. Experimental absorptions of anti-Thy-1.2 serum on A/J or AKR/J thymocytes, respectively, were performed with 0.1 ml of serum diluted 1:100 and 20 × 10^6 thymocytes for 45 min at +4°C.

Anti-Lyt sera (anti-Lyt-1.2, anti-Lyt-2.2, anti-Lyt-3.2, and anti-Lyt-4.1) were prepared and absorbed as described (17). Anti-Lyt-2.2 serum was further absorbed once on the tumor K36 (vol/vol, at a 1:2 dilution of serum).

Complement-Mediated Cytotoxicity. Pooled decidual cells were pelleted and resuspended in medium 199 without serum at a concentration of 1.5 × 10^6 cells/ml. 25 μl of cell suspension was incubated for 45 min at 37°C with 25 μl of one of the various dilutions of serum to be tested and 25 μl of a 1:4 dilution of rabbit complement previously absorbed on mouse teratoma F9 cells (18). The number of live cells was assessed by trypan blue exclusion and results expressed as cytotoxicity index:

$$\frac{\text{percentage of dead cells incubated in serum and complement} - \text{percentage of dead cells in complement alone}}{100 - \text{percentage of dead cells in complement alone}}$$

Percentages of dead cells in complement controls averaged 20%.

Culture of Decidual Cells. Pooled decidual cells after trypsin treatment were spun and resuspended in Dulbecco's modified Eagle's minimal essential medium supplemented with 15% fetal calf serum and antibiotics, transferred to plastic Falcon culture dishes (Falcon Plastics, Div.

[1] *Abbreviations used in this paper:* B6, C57BL/6; BSS, balanced salt solution; CR, receptor for complement components; E rosette, rosette with nonsensitized SRBC; EA, sheep erythrocytes coated with 7S anti-SRBC antibody; EAC, sheep erythrocytes coated with 19S anti-SRBC antibody and mouse complement; FcR, receptor for Fc portion of IgG; IPT, heat-inactivated, gammaglobulin-free fetal calf serum; PBS, phosphate-buffered saline, pH 7.4; sIg, surface immunoglobulin; SRBC, sheep erythrocytes.

of BioQuest, Oxnard, Calif.) at a concentration of 1.5×10^6 cells per dish and placed in an incubator at 37°C under 12% CO_2. After 16–24 h, attached cells were washed twice in calcium-magnesium-free Earle's balanced salt solution (BSS), detached from the dish with 2 mM disodium EDTA in 2% chicken serum for 5 min at 37°C followed by pipetting. Cells were transferred to Hanks' BSS supplemented with 5% IPT and washed twice in this medium. Viability of the resulting cell suspension, as judged by trypan blue exclusion, averaged 80%.

Rosette Studies. EA and EAC rosette studies were performed on decidual cell suspensions after enzyme treatment or on decidual cells recovered after culture (19). Briefly, sheep erythrocytes (SRBC), 2 wks old, were sensitized with either rabbit 7S anti-SRBC (Cordis Laboratories Inc., Miami, Fla.) (EA), or rabbit 19S anti-SRBC (Cordis Laboratories) and AKR/J mouse serum as a source of complement (EAC). 0.3 ml of decidual cell suspension at a concentration of 2.5×10^6/ml and 0.3 ml of EA or EAC was incubated at 37°C for 3 min after centrifugation at low speed (EA) or for 30 min without centrifugation (EAC). Controls were run simultaneously with nonsensitized SRBC (E rosettes). Cells were then left for at least 1 h at +4°C, and rosette-forming cells were counted in a hemocytometer, nucleated cells being stained by toluidine blue. At least 500 nucleated cells were counted in each sample, and the percentage of rosette-forming cells was established. This technique was also used for B6 or CF1 female spleen cell suspensions. Spleen cells were prepared either by chopping and pipetting in Hanks' BSS supplemented with 5% IPT or by collagenase and trypsin treatment of pieces of spleen as described in decidual cell preparation, to test the effect of enzyme treatment on EA or EAC rosette-forming cells. In one instance, spleen cells were treated with Ca^{++} Mg^{++}-free Earle's BSS and 2 mM disodium EDTA, followed by washes in Hanks' BSS with 5% IPT, as for cultured decidual cells, to study the possible role of this EDTA pretreatment on EAC rosettes.

In addition to E, EA, and EAC rosettes, the effect of EDTA during EAC rosette formation was tested on complement receptor-bearing spleen cells by adding 30 μl of 0.2% buffered EDTA to EAC rosette incubation medium.

Surface Immunoglobulins (sIg). 1–2 $\times 10^6$ decidual cells were resuspended in 0.1 ml of peroxidase-labeled sheep Fab anti-mouse immunoglobulin (Institut Pasteur, Paris) diluted 1:20 in Hanks' BSS containing 5% IPT and incubated for 1 h at +4°C.

Cells were then washed three times in Hanks' BSS and IPT, fixed in 2% glutaraldehyde in phosphate-buffered saline for 15 min at +4°C, washed three times in phosphate-buffered saline and stained for peroxidase activity for 3 min at room temperature in diaminobenzidine tetra HCl (50 mg/100 ml – in Tris HCl; pH 7.4) and 0.01% H_2O_2. sIg-bearing cells, which appear surrounded by a brown layer, were counted in a drop of cell suspension or after cytocentrifugation. Possible presence of endogenous peroxidase activity was tested by incubating decidual cells in Hanks' BSS and IPT in lieu of peroxidase conjugates. Further positive and negative controls, respectively, were done with spleen cells and thymocytes, under the same conditions. In some instances, spleen cells were first treated with collagenase and trypsin as described in decidual cell preparation, to check the possible role of trypsin on sIg detection under the conditions we used.

Results

Decidual Cell Suspension. Cells from 6-, 7-, and 8-day decidua were examined in suspension under the light microscope, to study their size and appearance. 80-85% of nucleated cells present in the preparation were made up of round cells, 10–15 μm in diameter. Staining with hematoxylin after fixation in glutaraldehyde and cytocentrifugation showed these cells to be often bi- or multinucleated. They are assumed to be mostly decidual cells proper. Larger cells, 20–30 μm in diameter, were 2–5% of the total. In addition, smaller cells, 7 μm in diameter when in suspension, averaged 10–15% of the cell preparation. These were round and mononucleated, like small lymphocytes. Erythrocyte counts showed only 50 erythrocytes per 100 nucleated cells. Inasmuch as, in the mouse, the average leukocyte cell count is 10^4 per cubic millimeter of blood and the average erythrocyte cell count 10^7 per cubic millimeter, virtually no circulating leukocytes appear to be present in the decidual cell preparations.

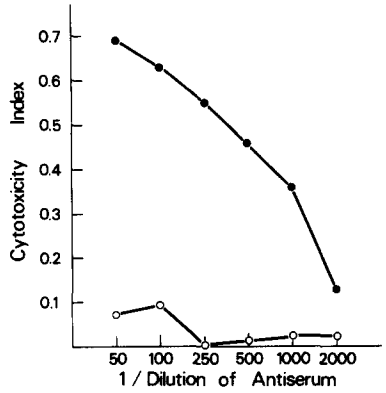

FIG. 1. Titration on 7-day B6 female × A/J male decidual cells of A anti-EL4 serum absorbed in vivo on B10.A (●) and B6 (○).

The presence of cells other than decidual cells proper cannot be excluded, however, especially leukocytes that could cross the blood barrier and be present in the decidua.

Decidual Cell Membrane Antigens

1. H-2 ANTIGENS. Studies of H-2 antigens were done on 7-day pregnant B6 mice sired by B6 or A/J males. Fig. 1 shows that H-2 antigens, as detected by A anti-EL4 serum absorbed in vivo on B10.A, are present on most decidual cells. No activity is detectable when the same serum is used after absorption in vivo on B6.

2. THY-1 ANTIGENS. Anti-Thy-1.2 serum was used in complement-dependent cytotoxicity tests on decidual cells from B6 females × A/J males and AKR/J × AKR/J matings at 6, 7, and 8 days. Fig. 2 shows the results of experiments done at 7 days. 45% of B6 decidual cells available for killing express Thy-1.2 antigen when serum is used at 1:100 dilution. Absorption on A/J thymocytes removes all activity, whereas absorption on AKR/J thymocytes leaves activity virtually identical. No activity could be detected when anti-Thy-1.2 was tested on AKR/J decidual cells. 6- and 8-day B6 decidual cells also express Thy-1, in a similar amount at 8 days (cytotoxicity index at 1:100=0.4) and in somewhat higher proportion at 6 days (cytotoxicity index at 1:100=0.6). The morphology of the dead cells can easily be studied because they are stained by trypan blue. Most of the dead cells looked like typical medium-size or large, granular, sometimes bi- or multinucleated decidual cells.

3. LYT ANTIGENS. All four anti-Lyt sera were first tested without absorption on K36 for complement-dependent cytotoxicity on B6 decidual cells and on the decidual cells of the four strains congenic for Lyt antigens. In two separate series of experiments with each of the anti-Lyt sera, only minor and variable differences (never exceeding 0.1) could be detected between cytotoxic indices on B6 and congenic decidual cells (data not shown). The highest difference was detected with anti-Lyt-2.2 serum. However, further absorption of anti-Lyt-2.2 on K36 removed all activity for B6 decidual cells but left intact activity for B6 thymocytes (Fig. 3).

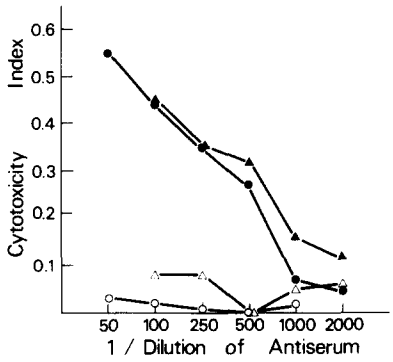

FIG. 2. Titration of anti-Thy-1.2 serum on 7-day decidual cells: B6 female × A/J male decidual cells (●), AKR/J female × AKR/J male decidual cells (○), B6 female × A/J male decidual cells after absorption on AKR/J thymocytes (▲) or after absorption on A/J thymocytes (△).

Fc and Complement Receptors on Decidual Cells

1. FC RECEPTORS (FCR). Studies of EA rosette-forming cells in mouse decidua were done at day 6, 7, and 8 of pregnancy in B6 females mated with A/J males, C3H/HeJ females mated with C3H/HeJ males, and random-bred albino ICR or CF1 females mated with ICR males. Fig. 4 shows that FcR-bearing cells seem to be present in mouse decidua in increasing numbers as pregnancy proceeds. Virtually all EA rosettes consisted of nucleated cells surrounded by 12–15 SRBC. The rosetted cells were 10–15 μm in diamter, thus similar in size to most nonrosette-forming decidual cells (Fig. 5). Very rarely could a rosette be observed with a cell the size of a small lymphocyte, such as the ones present in the spleen. Very large cells did not form rosettes.

Because it could be suggested that some EA rosette-forming cells were of embryonic origin (especially those closely connected with the decidua, such as trophoblast or parietal endoderm), a test was done using 8-day B6 × A/J decidual cell preparation after the embryo, visceral yolk sac membrane, and early placenta had been removed, but Reichert's membrane left intact as much as possible. Fig. 4 shows that this manipulation did not alter the percentage of EA rosette-forming cells. Effect of time of sequential incubation in trypsin on the amount of FcR-bearing cells in resulting decidual cell suspensions was tested on 8-day B6 × A/J and CF1 × ICR matings. EA rosette-forming cells were studied, separately pooling early fractions (2 to 4) and late fractions (5 to 8). Similar numbers of cells (about 1.5×10^6) were recovered in early and late fractions. Fig. 4 indicates that, in both types of matings, twice as many FcR-bearing cells were present in early fractions as compared with late fractions.

2. COMPLEMENT RECEPTOR (CR). No EAC rosette-forming cells could be detected on decidual cell suspensions tested immediately after enzyme treatment. Because most CR are trypsin sensitive (20 and Table I), the conditions used in the preparation of decidual cells could have accounted for the lack of detectable EAC rosette-forming cells. Therefore decidual cells were cultured for 16–20 h to allow recovery of CR (21). Table I shows that no CR-bearing cells could be detected on attached cells released by EDTA treatment. FcR-bearing

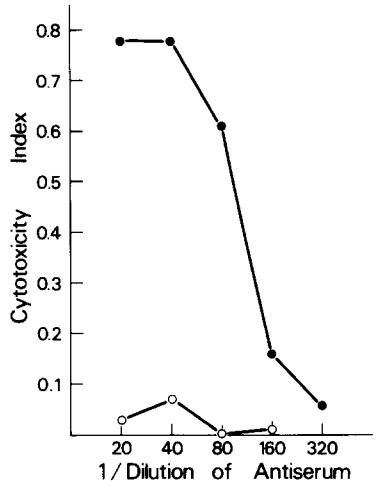

FIG. 3. Titration of anti-Lyt-2.2 serum absorbed on K36: on B6 8-day decidual cells (○), on B6 thymocytes (●).

cells were still present in a percentage similar to that just after trypsin treatment.

Because a population of EAC rosette-forming cells in the spleen is also sensitive to EDTA (20; see also Table I), EA and EAC rosettes were studied on spleen cells pretreated with EDTA as described in Materials and Methods. Table I indicates that EDTA pretreatment did not alter the number of EAC rosette-forming cells.

Surface Immunoglobulins (sIg). Under the conditions we used, <1% of B6 thymocyte cell membranes were labeled by sheep Fab anti-mouse Ig coupled with peroxidase, whereas 40–50% of B6 spleen cells were labeled. Under the same conditions, no sIg-bearing cell could be detected among decidual cells in five separate experiments involving various mating combinations (AKR × AKR, C3H × AKR, CF1 × ICR, ICR × ICR) at 7 and 8 days of gestation. Endogenous peroxidase was present in a few cells as cytoplasmic granules. To study the possible role of enzyme treatment to explain the lack of detectable sIg, a suspension of spleen cells was treated by collagenase and trypsin as used for decidual cell preparation. In two separate experiments, enzyme treatment did not alter the number of detectable sIg-bearing cells in the spleen.

Discussion

Studies of membrane markers on mouse decidual cells as presented in this report indicate that, besides H-2 antigens, approximately 50% of decidual cells possess Thy-1 antigen, and that a seemingly increasing number of cells possess FcR. On the other hand, cell membrane markers such as sIg, four different Lyt antigens, and complement receptors were not detected under the conditions we used.

Thy-1 antigen was previously described on mouse thymocytes (22), peripheral T lymphocytes (23), brain cells (24, 25), epidermis (26), fibroblasts in culture (27), mammary tissue (28), and, at an early stage, in differentiation of muscle

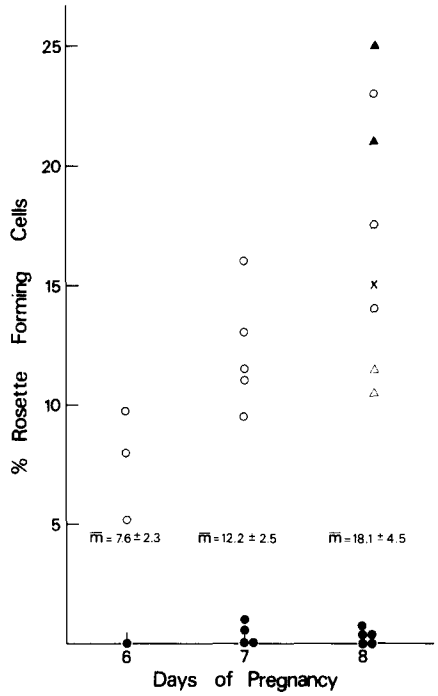

FIG. 4. EA rosette-forming cells in mouse decidua from day 6 to day 8 of pregnancy. Fractions used for tests were fractions 2 to 5 or 6 unless otherwise mentioned. (○) B6 × A/J, C3H × C3H, and CF1 or ICR × ICR matings. No significant strain difference was observed among these three mating combinations (m̄, mean of figures observed and standard deviation); (●) corresponding controls using unsensitized SRBC and decidual cells (E rosette); (×) B6 × A/J, without dissecting out Reichert's membrane; (▲) B6 × A/J or CF1 × ICR mating, fractions 2 to 4 only; (△) B6 × A/J or CF1 × ICR mating, fractions 5 to 8 only.

cells in culture (29). It is possible that expression of Thy-1 antigen on about 50% of mouse decidual cells as detected here reflects their fibroblastic origin; development of decidual cells from uterine stromal cells was suggested from morphological as well as autoradiographic observations (11, 12). Thy-1 being detectable on mouse fibroblasts in vitro, it can be suggested that, as uterine fibroblast undergo division and differentiatiqn into decidual cells, a fraction retains some features of their stromal origin. This might account for the slightly decreasing percentage of Thy-1-positive decidual cells as time proceeds. Preliminary observations indicate that, in artificially induced mouse decidua, 60–70% of the cells bear Thy-1 at day 6 of pseudopregnancy, a figure quite similar to that observed at day 6 of normal gestation in mice (O. Bernard, unpublished observations). Therefore, expression of Thy-1 on decidual cells does not depend on the actual presence of an embryo. Alternatively, it could be suggested that Thy-1 is a marker of some fully differentiated decidual cells, the expression of which could be under hormonal control. The role of Thy-1 antigen in mouse decidua remains largely a matter of speculation. Heterologous anti-thymocyte serum was reported to prevent normal implantation and/or early development in mice and rats (30, 31). Whether specific anti-Thy-1 serum can also reproduce

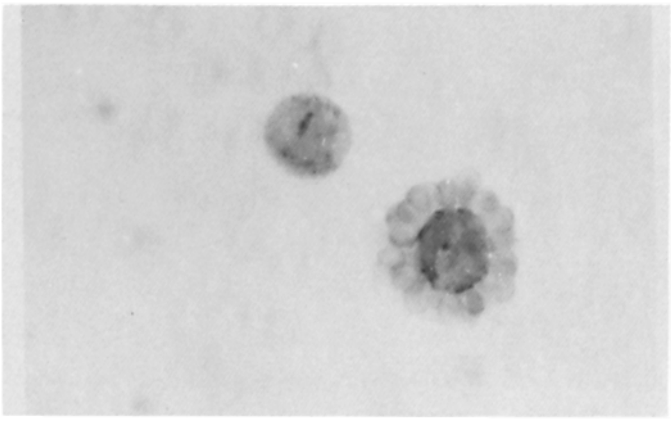

FIG. 5. EA rosette-forming and nonforming cells in 8-day mouse decidua (× 720).

this effect is not known at present but could possibly relate successful blastocyst implantation to the presence of Thy-1-bearing uterine cells undergoing decidualization.

Results presented here showing the absence of Lyt antigens and sIg do not support the idea that T or B lymphocytes are present in significant numbers in the mouse decidua in the days after implantation. It should be stressed, however, that lymphocytes might exist in the more internal layers of the decidua, closest to the embryo, which were selectively removed with the first cell fraction after 5 min of trypsin treatment. Alternatively, T cells present in the decidua could bear some other known, or as yet unknown, Lyt phenotypes. In any case, the lack of detectable Lyt antigens cannot be the result of trypsin treatment because it was previously shown that, like H-2 and Thy-1, these antigens are resistant to trypsin under conditions similar to those used in this study (26). The same comment can be made about lack of detectable sIg-bearing cells: identical enzyme treatment of mouse spleen did not alter the percentage of sIg-bearing cells in the spleen. The most likely hypothesis to account for the absence of both Lyt and sIg is that in the decidua proper virtually no "classic" T or B lymphocytes can be detected in significant amounts under the conditions we used.

However, FcR-bearing cells are present in apparently increasing numbers from day 6 to day 8 of gestation. It could be argued that this increase is partially owing to the increasing size of the decidual capsules, therefore allowing more decidual cells from superficial layers to be present in a given cell preparation at 8 days; as seen in Fig. 4, external layers of the decidua contain more FcR-bearing cells at 8 days than do deeper layers. The latter difference could merely be the consequence of increased sensitivity of FcR to trypsin as time of incubation in trypsin is prolonged. However, it is likely that these external, FcR-bearing cells correspond to Ig-containing cells detected by immunohistochemical methods in sections of postimplantation mouse decidua (15) and in rat metrial glands at 12 days of gestation (16). In the days after implantation, Ig-bearing cells in mouse decidua are present mostly in two areas: (*a*) in the outer layers, facing the myometrium where Ig appear as cytoplasmic granules and (*b*)

TABLE I
E, EA, and EAC Rosette-Forming Cells

	Decidual cells*		Collagenase- and trypsin-treated spleen cells‡	EDTA-pretreated spleen cells§	Untreated spleen cells‖
	7 day	8 day			
			%		
E rosettes	0	0	1.5	0.9	0.3
EA rosettes	10	16	39	39	37
EAC rosettes	0.5	0	2.5	25	23
EAC rosettes with Na EDTA	ND	ND	ND	11	14

* CF1 × ICR 7 and 8-day decidual cells left in culture for 16–20 h and released from culture dish with 2 mM Na EDTA.

‡ B6 female spleen cells treated with collagenase and trypsin (see Materials and Methods).

§ CF1 female spleen cells pretreated with 2 mM EDTA (see Materials and Methods).

‖ CF1 female spleen cells washed with Hanks' BSS with 5% IPT in lieu of each step of EDTA pretreatment.

ND: not done.

in the inner layers, facing the embryo, where Ig can be detected between each decidual cell or, possibly, on the cell membrane proper (15). If, as we suggest, FcR-bearing cells are actually located in these two areas of Ig-containing cells, it is to be expected that they will be chiefly recovered in the first cell fractions when pieces of decidua are sequentially incubated in trypsin.

So far it must be said that, as much as the biological role of the FcR on lymphocytes (as discussed in references 32 and 33) is still a mystery, so, too, is the functional significance of FcR on decidual cells. FcR may be merely used for the uptake of circulating Ig as a means of nutrition for the rapidly growing decidua, or for clearing uterine stroma infiltrated with Ig at the time of implantation (15) even though monomeric or free IgG in general is more weakly bound than aggregate Ig or antigen-complexed Ig (34, 35). However, it is tempting to suggest an immunological role for FcR-bearing cells, especially with respect to the maternal-fetal relationship. These cells might comprise a particular class of lymphocytes with Lyt-negative, sIg-negative, FcR-positive phenotype, or could be macrophages with phagocytic properties, as described in the 12-day rat placenta (36, 37). However, lack of detectable CR, the fact that FcR-bearing cells can attach to culture dishes over a period of 20 h (Table I), and previously mentioned immunohistological data indicate that FcR-bearing cells are probably decidual cells proper involved in some as yet unknown interaction with trophoblast, maternal tissues, and/or antigen-antibody complexes. This interaction may be similar to that described for antibody-dependent cell-mediated cytotoxicity (38) or natural cytotoxicity against tumor cells (39), and may prevent trophoblasts from extensively invading maternal tissues. Significantly, when ectoplacental cones are transplanted to the uterus under conditions where no decidual reaction can be evoked, a massive invasion by trophoblast results (40).

Alternatively, FcR-bearing decidual cells may contribute to protection of the embryo by binding maternal (blocking?) antibodies and carrying them over to

the trophoblast where they could interact with embryonic or transplantation antigens. Resulting antigen-antibody complexes would be internalized in the trophoblast (15, 41) or shed from trophoblast cell membrane and released in the circulation (42, 43). It was indeed shown that the junctional zone between decidua and trophoblast is often underlined by heavy deposits of Ig (15). This could provide an explanation for the apparent protection afforded to skin or blastocyst transplanted in allogenic uteri in rats and mice (7, 8). Preliminary experiments also indicate that FcR are detectable in artificially induced decidua, thus suggesting again that the presence of FcR-bearing cells in the decidua is independent of the embryo proper and may be a programmed mechanism under hormonal control.

FcR-bearing decidual cells may have some similarities to FcR-positive cells described within tumors (44), but it should be stressed that they are probably different from the FcR-bearing cells described in mouse and human placenta at later stages in pregnancy. These were reported to be chiefly fetal (trophoblastic) in origin (45, 46). Our observations that FcR-positive cells are found in similar amounts in artificially induced mouse decidua[2] at comparable stages suggest that no embryonic cells contribute to the FcR-bearing cell population in the decidua of the pregnant mouse.

Summary

Mouse decidual cell suspensions from day 6 to day 8 of gestation were prepared by enzymatic treatment with collagenase and trypsin and tested for various membrane markers.

(*a*) Besides H-2 antigens, Thy-1 antigens are present on about 50% of the cells; this may reflect the fibroblastic origin of decidual cells or be a marker expressed on some decidual cells possibly under hormonal control.

(*b*) T or B lymphocytes, as defined by four Lyt antigens or surface immunoglobulins, are not present in significant amounts.

(*c*) A substantial number of cells bearing receptors for the Fc portion of IgG (FcR) is detectable in the decidua, probably closely connected with trophoblast cells; these FcR-bearing cells may act in preventing excessive invasion of uterine tissue by trophoblast or could contribute to the protection of the embryo by interacting with maternal blocking antibodies and trophoblast. No receptors for complement were detected, even after 16–20 h in culture after trypsin treatment.

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