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The effect of surgical glove powder on cleavage of two-cell mouse embryos in an *in vitro* fertilization programme

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Summary

The effect of surgical glove powder on the development of early mouse embryos was studied. Embryos from F1 hybrid mice (C57 B1/6 x CBA) were suspended in Whittingham's T6 growth medium with 10% human serum, using Petri dishes (Falcon 3001). Contamination was brought about by a sterile, powdered, surgical glove touching the surface of the growth medium for less than a second in group I, and in group II the same procedure was followed but the glove was rinsed beforehand with sterile, four times distilled water and air-dried. In the control group (group III) no contamination with surgical glove powder occurred. In group I only 9 of 137 embryos (7%) reached the blastocyst stage, in contrast with 110 of 196 (56%) in group II and 258 of 287 (90%) in group III. The differences in results between groups I and III, groups I and II, and groups II and III were found to be statistically significant ($P < 0{,}001$) by the chi-square test.

It is concluded that surgical gloves are a potent inhibitor of early embryonic growth. In an *in vitro* fertilization programme including follicle aspiration and embryo transfer, contamination of embryos with these gloves should be avoided at all costs.

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Surgical gloves are widely used by medical and laboratory staff. Since these gloves are usually powdered, contamination of patients or laboratory equipment with the powder can easily occur. In an *in vitro* fertilization programme it is of the utmost importance to avoid contamination with any toxic substance which can reduce the viability of embryos and thus the success rate of the programme.[1] In the light of this, the question of the effect of surgical glove powder needs to be clarified. We studied the effect of surgical glove powder on the cleavage rate of mouse embryos used for quality control in an *in vitro* fertilization programme.

Materials and methods

F1 hybrid female mice (C57 B1/6 x CBA) were treated with 10 IU human menopausal gonadotrophin, followed by 10 IU human chorionic gonadotrophin 45 hours later to achieve superovulation. At the time of ovulation the females were mated with singly housed F1 hybrid studs. The females were sacrificed by cervical dislocation 44 hours after mating. Thereafter two-cell embryos were obtained from these mice, as described by Biggers *et al.*,[2] and placed in Whittingham's T6 growth medium to which human serum was added up to 10% of the medium. The osmolarity was 282 - 288 mmol/kg (Wescor Inc. 5100C). After preparation of the medium, it was exposed to 5% CO_2 in air for 24 hours. Thereafter the pH of the medium was recorded with an 83 Autocal pH meter. The pH ranged between 7,3 and 7,5.

The embryos studied were randomly selected from the common pool in the growth medium. With a sterile pipette and careful avoidance of contamination with any foreign substance, the embryos were placed in Petri dishes (Falcon 3001) with the growth medium, 10 embryos per dish. Thereafter the embryos were divided into three groups, two study groups (groups I and II) and a control group (group III). There were 137 embryos in group I, 196 in group II and 287 in group III. In group I contamination was brought about by an operator wearing sterile, unrinsed, powdered surgical gloves just touching the surface of the growth medium with one finger for less than a second. In group II the same procedure was followed

TABLE I. CLEAVAGE OF TWO-CELL MOUSE EMBRYOS TO THE BLASTOCYST STAGE

	Group I		Gropup II		Group III	
Experiment	No.	%	No.	%	No.	%
1	0/20	0	12/14	85,7	51/55	92,7
2	0/26	0	8/19	42,1	47/50	94,0
3	9/31	29,0	10/27	37,0	38/44	86,4
4	0/13	0	5/10	50,0	21/24	87,5
5	0/15	0	31/50	62,0	20/23	86,9
6	0/12	0	12/37	32,4	32/37	86,5
7	0/10	0	19/25	76,0	18/20	90,0
8	0/10	0	13/14	92,0	31/34	91,2
Total	9/137	6,6	110/196	56,1	258/287	89,9

after the gloves had been rinsed with sterile, four times distilled water and air-dried. In group III care was taken to avoid any contact between surgical gloves and growth media containing the embryos. Thereafter, all embryos were incubated at 37°C.

After 72 hours' incubation, one of the authors (T. F. K.) evaluated the number of embryos that had undergone cleavage and had reached the blastocyst stage, without knowing to which group each embryo belonged. The experiment was repeated 8 times and then the results in group I were compared with those in the other two groups.

Results

Only 9 of the 137 embryos (6,6%) in group I reached the blastocyst stage, while 110 of the 196 group II embryos (56,1%) and 258 of the 287 control embryos (89,9%) reached this stage. Applying the chi-square test to these results significant statistical differences were demonstrated between the results in group I and group III, as well as between those in groups II and III, and groups I and II ($P <$ 0,001) (Table I). In experiment 3, 29% of the embryos in group I cleaved and reached the blastocyst stage. No explanation was found for the difference between this and the 0% in group I in all the other experiments.

Discussion

This study clearly demonstrates the inhibiting effect of surgical glove powder on early embryonic growth. In an *in vitro* fertilization programme surgical gloves are not used in the laboratory,[4] but they are always used during laparoscopy and follicle aspiration. Some *in vitro* fertilization teams wear gloves during the embryo transfer procedure. During these two phases of the programme contact between surgical gloves and embryos can easily occur. The aspiration needle and embryo transfer catheter are at particular risk of contamination. Even contamination of the cervix during vaginal examination before embryo transfer may be of significance. Our study clearly demonstrated that even rinsed gloves produced a significant inhibition of embryonic cleavage.

Surgical glove powder is a potent inhibitor of early embryonic growth. Meticulous care is taken in the laboratory to avoid contamination between toxic substances and growing embryos but glove powder is often overlooked in this respect, especially by the clinician. For the success of the *in vitro* fertilization programme, this contamination must be avoided at all costs. Although the nature of the specific toxic agent responsible for inhibiting cleavage is still being evaluated, we believe that the preliminary results must be published to assist other groups. Surgical glove powder contamination may be an easily eliminated cause of poor fertility rates in other units. We recommend that the gloves worn by the surgical team be rinsed before the follicle aspiration procedure and that the tip of the aspiration needle never be touched. We are convinced that gloves should not be used in an embryo transfer procedure.

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