OXYGEN CONSUMPTION AND DIFFUSION IN ISOLATED HUMAN TERM PLACENTAL LOBULES PERFUSED IN VITRO

Andrée Guiet-Bara

Université Pierre et Marie Curie,
Biologie de la Reproduction (Pr. M. Panigel)
7 Quai St Bernard, 75230 Paris Cedex 05, France

An in vitro model has been perfected to perfuse maternal and foetal circulations in the isolated lobule of term human placentae. The present paper gives the results obtained using this experimental model to investigate placental oxygen consumption and oxygen diffusion from the maternal to the foetal placental circulation.

MATERIAL AND METHODS

A hundred placental lobules have been subjected to the dual perfusion technique in a constant temperature room (37°C) immediately after natural delivery or cesarean section. On the foetal side, plastic tubings are introduced into the branches of the umbilical blood vessels on the chorial plate and advanced until they reach the arterial and venous cotyledonary stem vessels. On the maternal side, a fine glass cannula is introduced into the opening of a uteroplacental spiral artery or used to perforate the basal plate. The perfusion of the physiologic fluid is then initiated in a special chamber, both on the maternal and the foetal side (fig. 1).

The perfusion medium is Earle's physiological salt solution equilibrated with one of the following gas mixtures: A (5% O₂ + 5% CO₂ + 90% N₂) or B (95% O₂ + 5% CO₂). Mixture A, poor in oxygen, imitates the oxygen concentration in the foetal blood circulating in the umbilical arteries and mixture B, rich in oxygen, imitates the oxygen concentration of the maternal blood spurting from the uteroplacental arteries.
To evaluate oxygen consumption of the placental tissue, only the foetal placental circulation of the lobule is perfused (single perfusion). Half an hour later, samples are taken from the inflowing and outflowing of perfusion media in the foetal cotyledonary vascular circuit.

To evaluate oxygen diffusion from the maternal to the foetal side of the placenta, we have used the dual perfusion technique. After beginning the perfusion of the foetal placental circulation