Effects of L-arginine on development of mouse pre-implantation embryos in culture media with high level of glucose

Amiri I. (Ph.D.) [1,2], Marzban H. (Ph.D.) [3], Barbarestani M. (Ph.D.) [3], Nematollahi N. (Ph.D.) [4].

1- Ph.D. student, Anatomy Department, Faculty of Medicine, Tehran Medical Sciences University, Tehran, Iran.
2- Instructor, Anatomy Department, Faculty of Medicine, Hamedan Medical Sciences University, Hamedan, Iran.
3- Assistant Professor, Anatomy Department, Faculty of Medicine, Tehran Medical Sciences University, Tehran, Iran.
4- Assistant Professor, Anatomy Department, Faculty of Medicine, Kerman Medical Sciences University, Kerman, Iran.

Abstract

It is accepted that maternal hyperglycemia causes delay in early embryonic development, spontaneous miscarriage & malformations. According to various studies, some of these problems occur in earlier stages of embryonic developmen especially pre-implantation stage. It seems that elevated glucose level of blood can have important role in this regard as potential teratogen factor. One of cases, which can be related to racousnesses resulting from glucose effects is Nitric Oxide (NO) system disorder in hyperglycemic condition. Some evidences show at first in hyperglycemic condition, L-arginine uptake of media by embryo increases and therefore leads to decrease amount of available L-arginine and since L-arginine is essential substrate for NO production, so it's decrease inhibits NO production. To examine this hypothesis, 2-cell embryos of mice were cultured in media of high concentration of glucose (30mM) and different concentrations of L-arginine (5, 10, 20 mM) and their growth and development were assessed and at the end, embryos were stained by Hoechst 33254 color and the number of their blactocysts were counted by use a Fluorescence microscope. Comparison of embryos culture in HTF culture media with different concentration of glucose and L-arginin showed in high glucose media up to 30 mM affects growth and development of embryos totally and decrease their blactocysts numbers, but addition of 5–10 mM L-arginine to this media significantly improves this condition. On the contrary addition of L-NAME (an antagonist of L-arginine) significantly inhibits the development of pre-implantation embryos. It seems that reduction in NO production in diabetes is due to decreases in amount of available L-arginine, because increase in L-arginine concentration in high glucose media up to 10 mM partially improves high glucose embryo toxicity. Base on acquired result, it seems use of L-arginine or material which cause NO release in media, can have important role in prevention of high glucosis embryo toxicity.

Keywords: Glucose, Pre-implantation, Embryo, Diabetes, L-arginine and Nitric Oxide.

Corresponding address: Dr. Amiri I., Anatomy Department, Faculty of Medicine, Hamedan Medical Sciences University, Abas Abad Street, Hamedan, Iran.
Email: amiri44@yahoo.com