EFFECTS OF *HIGHLY DISPERSED SILICA NANOPARTICLES* ON THE CRYORESISTANCE OF THE BOVINE CUMULUS-OOCYTE COMPLEXES

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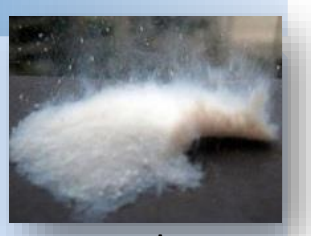
INTRODUCTION



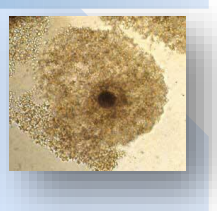
Products of nanotechnology are expected to revolutionize cell technology and biomedicine.

Highly dispersed silica is a broad-spectrum sorbent. The surface of the HDS is capable of replacing its hydroxyl groups with biomolecules, which makes it possible to use it as a matrix for the synthesis of nanobiomaterials.

AIM OF INVESTIGATION

The aim of study is to identify the effect of highly dispersed silica nanoparticles (HDSn) on the developmental competence of devitrified oocytes.

MATERIALS AND METHODS



* **Vitrification** was performed by equilibration of oocytes in three cryoprotectant solutions: CPA-1: 0.7 M dimethylsulphoxide (DMSO) + 0.9 M ethylene glycol (EG), 30 sec; CPA-2: 1.4 M DMSO + 1.8 M EG, 30 sec; CPA-3: 2.8 M DMSO + 3.6 M EG + 0.65 M trehalose, 20 sec and loading into straws.

* **Thawing** oocytes in 0.25 M, 0.19 M and 0.125 M trehalose in TCM-199 and finally in TCM-199.

** **IVM medium – TCM-199** with addition 10% FCS, 50 ng/ml prolactin, 10^6/ml granulosa cells (C-1,2), medium of experimental groups (E-1,2) were added by 0.001% of **HDSn**.

RESULTS

Morphology of cumulus and meiotic maturation of 429 oocytes also developmental competence of 412 fertilized oocytes were evaluated.

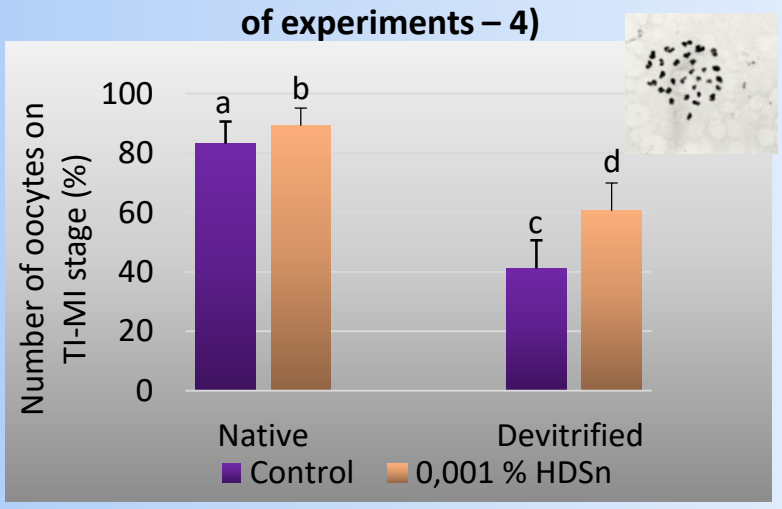
Table 1. **Cumulus morphology of native and devitrified bovine oocytes after 24 hours of culture (n of oocytes – 429, n of experiments - 3)**

Groups of oocytes	nHDS treatment	(%) number of oocytes with different level of expansion of cumulus cells		
		High	Medium	Low
Native	-	78 (79/101)[a]	16 (16/101)	6 (5/101)
	+	91 (102/112)[b]	- (/112)	9 (10/112)
Devitrified	-	31 (33/107)[c]	19 (20/107)	50 (54/107)
	+	59 (64/109)[d]	8 (9/109)	33 (36/109)

c:d; b:d; a:c P <0.001; a:b P <0.01, χ^2-test

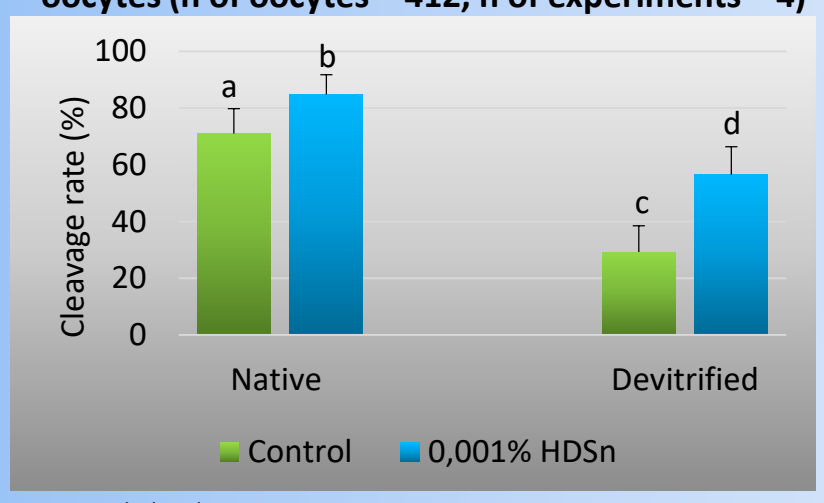
Level of oocytes with high expanded cumulus from control devitrified group was significantly lower than in devitrified oocytes treated by nHDS. [31 % (33/107) vs. 59 % (64/109), P <0.001] (***Table 1***).

Figure 1. **Meiotic maturation of native and devitrified bovine oocytes (n of oocytes – 429, n of experiments – 4)**



a:c; b:d;c:d P <0.001, χ^2-test

Figure 2. **Cleavage rate of native and devitrified bovine oocytes (n of oocytes – 412, n of experiments – 4)**



a:c; b:d; c:d P <0.001, χ^2-test

The portion of the matured oocytes and cleavage rate were significantly higher in E-2 than in C-2 [61 % (66/109) vs. 41 % (44/107) and 56 % (57/101) vs. 29 % (29/99), P<0/001, respectively] (***Figure 1*** and ***Figure 2***).

CONCLUSION

Treatment of oocyte by 0.001% of HDSn have a positive effect on the cryotolerance of oocytes. The mechanism of the influence of HDSn on other biomarkers of cryotolerance remains to be explored.

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