Organic selenium supplementation improves sperm quality in dexamethasone-stressed breeder roosters

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Selenium (Se) is an essential element that participates at least in 25 selenoproteins (Kryukov et al., 2003). The main function of the selenoproteins such as glutathione peroxidase is antioxidative effects against various stress conditions. In fact, Se as a part of selenoprotein plays important roles in cell and tissue protection. In this regard, the reproductive system and semen, also, are dependent to selenoproteins. Avian sperm contain a high proportion of polyunsaturated fatty acids (PUFAs) that predisposes them to lipid peroxidation (Surai and Fisinin, 2014) and consequently, lower reproductive performance. Furthermore, spermatozoa and seminal leukocytes produce a high amount of reactive oxygen species (ROS) which have negative effects on viability and membrane integrity of spermatozoa. Lopes et al., (1998) reported ROS increase DNA fragmentation within the sperm nucleus. Nevertheless, some selenoproteins, such as glutathione peroxidase, as an antioxidative pathway try to inverse negative effects of ROS. It appears that Se can help selenoproteins maintain antioxidant defences and prevent damage to spermatozoa. This experiment was conducted to study whether dietary organic selenium can compensate the negative effects of dexamethasone-induced stress on sperm quality in broiler breeder rooster. Twenty-four 45-week-old Ross 308 breeder roosters were used in a 2 x 2 factorial experiment (n=8) with the main treatments being: 1) Subcutaneous Dexamethanasone [Control (CON) group vs Dexamenthasone (DEX) group subcutaneously injected with Dexamethasone, 3 times every other day, 4 mg/kg of body weight (DEX) to induce oxidative stress (Min et al., 2018)]; 2) Diet [0.3 mg/kg selenium (selmax) alone (SE) or similar to positive control group received dexamethasone (SeDEX)]. The experiment lasted for 6 weeks. Semen samples from broiler breeder roosters were collected weekly by abdominal massage. Sperm samples of birds within groups were pooled together in order to remove the individual effects. Excluding straight line velocity (15.24%), sperm track straightness (65.91%) and beat cross frequency (15.13 Hz), other traits including progressive motility (27.03%), viability (78.33%), membrane integrity (80.78%), curvilinear velocity (40.49 micron/sec) and amplitude of lateral head displacement (1.03 micron) were affected in DEX group because of induced stress, compared to control group (42.53, 73.58, 71.92, 74.09 and 2.01 respectively; $P<0.05$). Supplementation of organic selenium in SeDEX group improved progressive motility (59.06%), curvilinear velocity (105.21 micron/sec) and amplitude of lateral head displacement (3.59 micron) to significantly higher levels than the control group ($P<0.05$), The SeDEX group also had improved viability (87.75%) and membrane integrity of sperm (88.97%) ($P<0.05$). Similarly, inclusion of organic selenium in SE group improved viability and membrane integrity of sperm (93.57 and 94.38 respectively) compared to the control group ($P<0.05$), although there were not substantial differences between them in some other traits. It seems inclusion of organic selenium can prevent the negative effects of dexamethasone administration on sperm quality.

Table 1. The effects of organic selenium on different parameters of sperm motility.

Traits	Experimental groups				SEM	P-Value
	con	Dex	SE	SeDex		
TM (%)	79.4^{c}	62.2^{d}	92.66^{b}	99.56^{a}	0.63	<0.0001
PM (%)	42.53^{b}	27.03c	36.8^{b}	59.06^{a}	1.12	<0.0001
VAP (µm/s)	40.4^{ab}	17.96^{c}	28.76^{bc}	49.12^{a}	1.43	0.0014
VSL (µm/sec)	34.8^{a}	15.2^{4}	21.83^{b}	38.86^{a}	1.45	0.006
VCL (µm/sec)	74.09^{b}	40.49^{c}	68.64^{b}	105.21^{a}	1.67	<0.0001
ALH (µm)	2.01^{b}	1.03^{c}	2.05^{b}	3.59^{a}	0.3	<0.0001
BCF (Hz)	13.89^{a}	15.13^{a}	14.06^{a}	11.19^{b}	0.47	0.008
HOST (%)	71.92^{c}	80.78^{b}	94.38^{a}	88.9^{7a}	1.04	<0.0001
Viability (%)	73.5^{8b}	78.33^{b}	93.57^{a}	87.75^{a}	1.2	0.0019

TM: Total motility, PM: Progressive motility, VAP: Average path velocity, VSL: straight line velocity, VCL: curvilinear velocity, ALH: amplitude of lateral head, BCF: beat cross frequency.

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