



The behavior, physiology and immunity of pregnant sows housed in individual crate with different frequency of sham-chewing

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Abstract

The sham-chewing behavior indicates the poor welfare of sows and quite frequently occurs in confined environment. The purpose of this study was to evaluate the behavior, physiology and immunity of pregnant sows with different frequency of sham-chewing in order to reveal the physiological and immune mechanism of sham-chewing behavior of sows housed in individual crate.

Results

1. The results of the high-incidence period of sham-chewing behavior

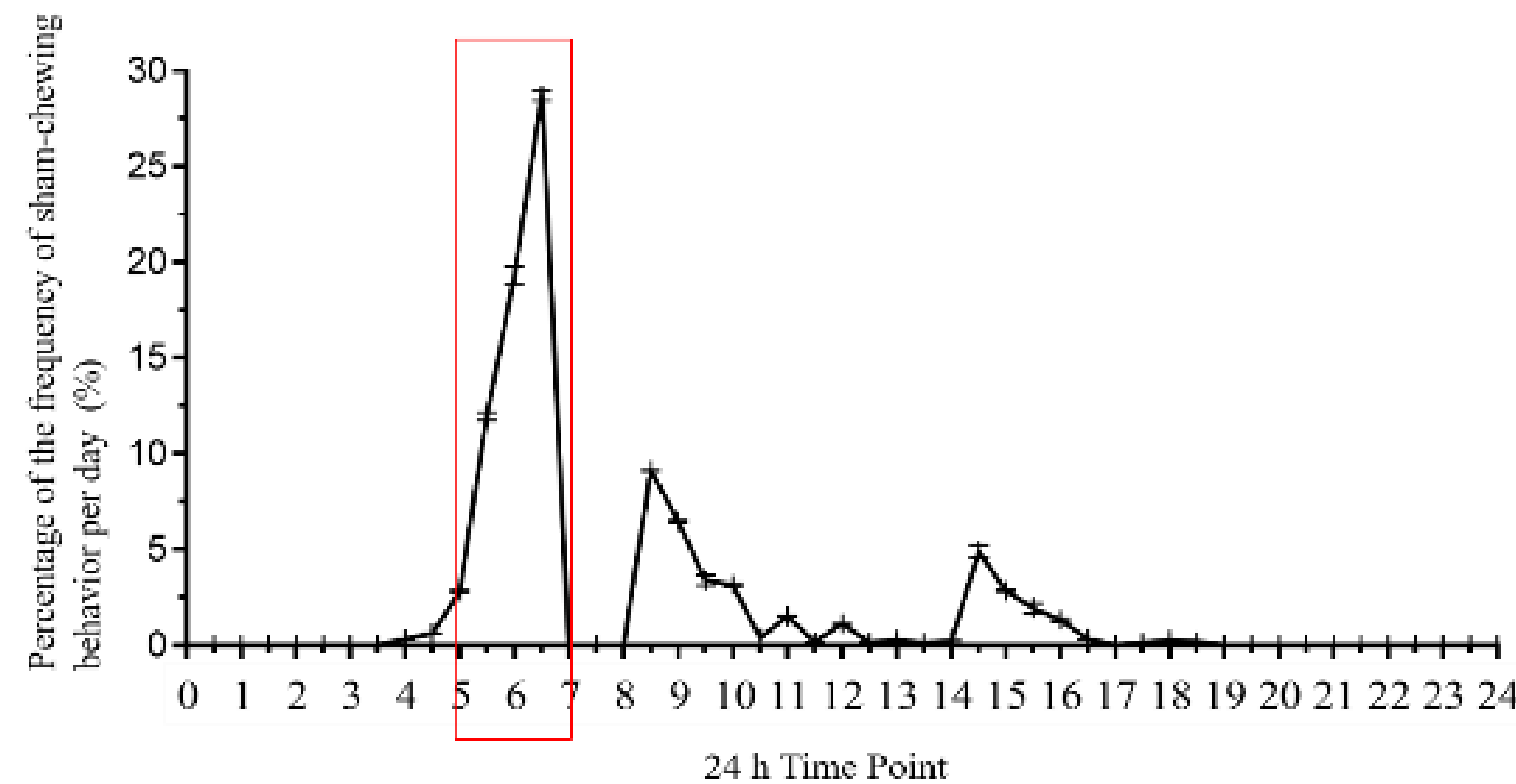


Figure 1. Analysis results of the frequency of sham-chewing behavior of sows

The Analysis results of the frequency of sham-chewing behavior of sows are shown in Figure 1. Among the 24-hour time points, the time point 10-14 was the high-incidence period of sham-chewing behavior and that was 4:30 a.m. to 6:30 a.m. (approximately 2 hours before feeding).

2. Groups of sham-chewing behavior

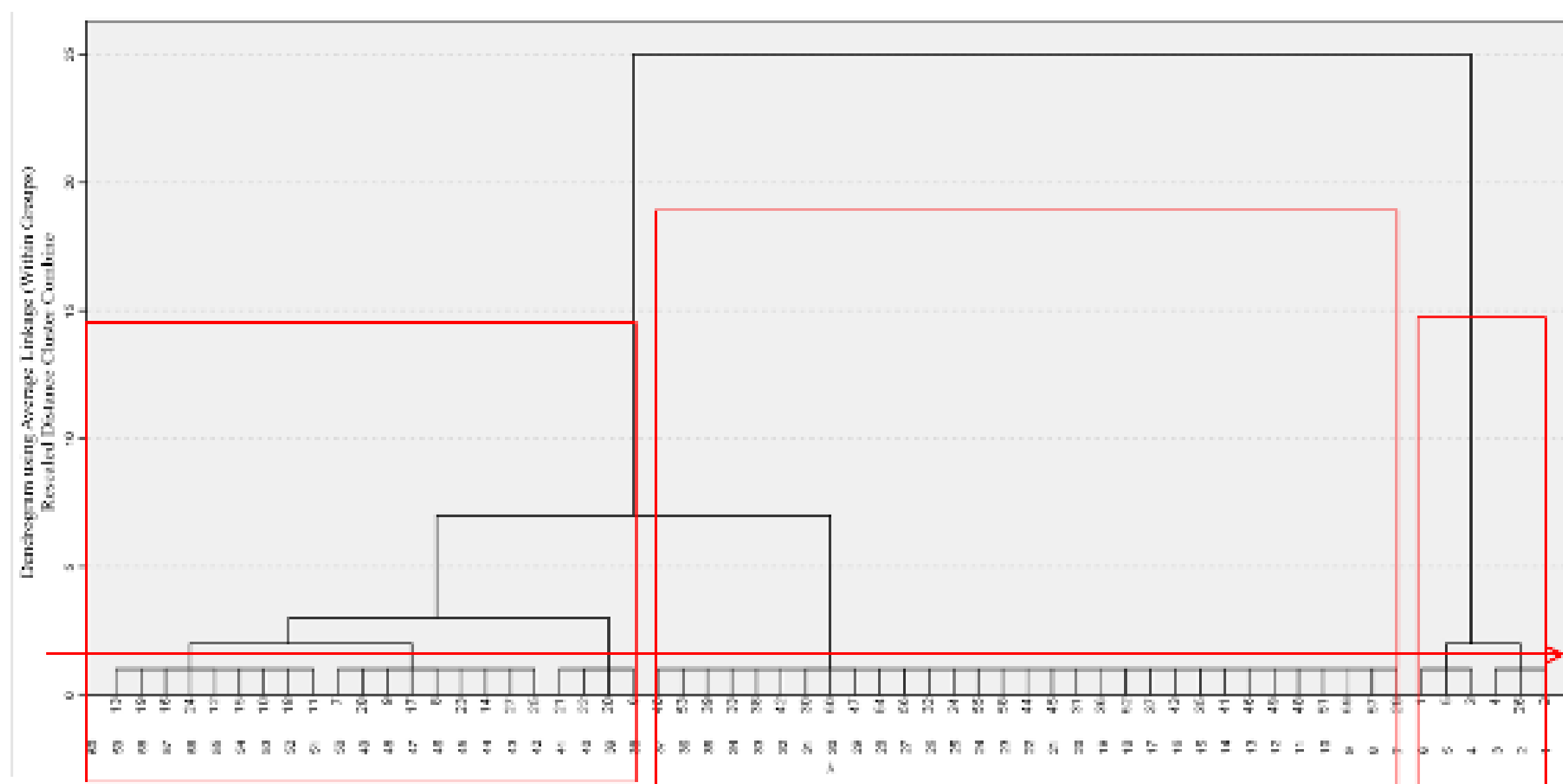


Figure 2. The dendrogram of frequency of sham-chewing by Hierarchical Cluster Analysis

The frequency groups of the sham-chewing behavior of sows are shown in Figure 2. At the abscissa 5 of the dendrogram, they were divided into the high frequency group, middle frequency group and low frequency group.

3. The results of behaviors

Table 1. Behavioral results among different groups during pregnancy period

Behavioral indexes	Groups	Pregnancy period			P-value
		Early Pregnancy	Middle Pregnancy	Late Pregnancy	
Standing	H	49.500 ^a ±5.908	25.500 ^b ±5.004	17.667 ^b ±5.788	P=0.004
	M	43.500 ^b ±8.988	25.167 ^b ±2.855	17.167 ^b ±3.212	P=0.020
	L	27.000±7.045	23.333±4.993	18.667±4.711	P=0.596
	P-value	P=0.127	P=0.933	P=0.974	
Sitting	H	2.500 ^a ±1.264	17.333 ^{ab} ±9.433	26.333 ^b ±9.433	P=0.107
	M	2.000 ^a ±0.726	7.500 ^{ab} ±1.318	12.500 ^{ab} ±2.946	P=0.008
	L	5.333±3.714	10.333±3.147	15.333±2.846	P=0.137
	P-value	P=0.560	P=0.487	P=0.199	
Ventral lying	H	1.500 ^{ax} ±1.500	13.167 ^{bx} ±3.122	19.833 ^{bx} ±4.933	P=0.009
	M	5.667 ^{axy} ±4.060	24.833 ^{by} ±0.553	40.833 ^{cy} ±6.175	P<0.001
	L	15.667 ^{ay} ±4.460	24.333 ^{aby} ±2.718	34.167 ^{bxy} ±2.007	P=0.006
	P-value	P=0.044	P=0.008	P=0.024	
Lateral lying	H	48.000±5.777	44.000±5.661	40.167±6.288	P=0.655
	M	48.833±8.798	39.667±4.990	29.500±9.297	P=0.265
	L	52.000±9.862	42.000±7.172	31.833±5.267	P=0.219
	P-value	P=0.938	P=0.879	P=0.557	
Sham-chewing	H	9649.600 ^{ax} ±393.611	4759.800 ^{bx} ±145.036	336.400 ^c ±177.882	P<0.001
	M	3275.000 ^{ay} ±322.045	1938.600 ^{by} ±217.963	156.400 ^c ±49.706	P<0.001
	L	452.800 ^z ±229.909	263.200 ^z ±128.067	104.600±44.932	P<0.001
	P-value	P<0.001	P<0.001	P=0.327	
Bar-biting	H	7.200 ^a ±1.281	11.600 ^b ±1.503	13.200 ^{bx} ±1.068	P=0.018
	M	6.800 ^a ±0.970	11.800 ^{ab} ±1.655	16.400 ^b ±2.400	P=0.008
	L	8.000 ^a ±1.009	14.400 ^{ab} ±2.088	19.600 ^{by} ±2.293	P=0.007
	P-value	P=0.836	P=0.479	P=0.121	
Rooting	H	14.000 ^a ±3.209	9.000 ^{ab} ±2.881	4.600 ^b ±2.088	P=0.094
	M	15.600 ^{ax} ±2.943	11.600 ^{ab} ±2.112	6.800 ^b ±1.594	P=0.055
	L	7.000 ^y ±1.140	5.200±0.800	5.000±1.517	P=0.448
	P-value	P=0.082	P=0.141	P=0.649	

4. The results of physiological and immune contents

Table 2. Physiological and immune contents among different groups during pregnancy period

Contents	Groups	Pregnancy Period			P-value
		Early Pregnancy	Middle Pregnancy	Late Pregnancy	
CRP	H	2182.291 ^a ±138.811	2861.475 ^{bx} ±209.769	2798.564±271.291	P=0.083
	M	2731.529±212.678	2620.543 ^{xy} ±187.024	2482.241±193.670	P=0.681
	L	2273.064±252.986	2122.207 ^y ±240.137	2264.940±233.609	P=0.886
	P-value	P=0.175	P=0.065	P=0.307	
IFN-γ	H	1739.416 ^b ±78.132	1839.799 ^y ±61.262	1905.142 ^z ±73.091	P=0.290
	M	2416.184 ^a ±28.936	2455.205 ^x ±294.534	2334.549 ^{xy} ±219.052	P=0.941
	L	2538.100 ^x ±189.333	2500.163 ^x ±121.110	2452.376 ^x ±154.747	P=0.929
	P-value	P=0.017	P=0.050	P=0.076	
IL-10	H	194.813±19.313	188.466 ^{xy} ±17.945	204.622 ^x ±17.507	P=0.823
	M	195.103±12.552	198.287 ^x ±7.626	203.172 ^x ±14.309	P=0.890
	L	161.746±4.320	57.359 ^y ±3.764	153.540 ^y ±11.612	P=0.745
	P-value	P=0.177	P=0.065	P=0.049	

The results in Table 1 showed that the frequency of sham-chewing significantly reduced with the increase of the pregnancy period (P < 0.001) and the difference among three groups was significant in early and middle pregnancy (P < 0.001). In late pregnancy, bar-biting of Group H was significantly increased (P = 0.018), while rooting was decreased (P = 0.033).

The standing behavior in Group H and M decreased significantly (P = 0.004; P = 0.020). Sitting, ventral lying and lateral lying behaviors were significantly lower in early pregnancy than those in late pregnancy (P < 0.05).

Conclusion

Therefore, the pregnant sows with different frequency of sham-chewing showed differences in standing and lateral lying behaviors. The expression of sham-chewing reflects the higher level of stress and lower level of immunity and may indicate the maladaptation of pregnancy sows to the confined environment.

Acknowledgments

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