

SPECIES: BROILERS															
Hazard identified	Hazard characterization										Exposure assessment			Qualitative assessment of the uncertainty	
	Hazard description	Adverse effect description	Adverse effect type	Magnitude		Quantitative assessment of likelihood			Qualitative assessment of the uncertainty	Duration	Intensity / threshold	Quantitative assessment of P. of Exposure			
				Severity	Duration (minutes)	min	int	max				min	int		max
Unloading bay to lairage															
Crate design	Sharp angles (spikes), low volume, inadequate vents	increased breathing and body T, bruising, wounding	P, D	2	120	0	0.1	0.2	high	NA	0.0002	0.0005	0.001	high	
ventilation	ineffective (not in all parts)	increased breathing, body T	D, F, Fr	4	120	0.7	0.85	1	low	NA	0.02	0.035	0.05	high	
ventilation	low (increased body T)	increased breathing, body T	D, F, Fr	4	120	0.7	0.85	1	low	NA	0.02	0.035	0.05	high	
ventilation	high (decreased body T)	cold stress	D	3	120	0.2	0.25	0.5	low	NA	0.02	0.035	0.05	high	
air quality	temperature (standard 5 ° C to 30° C)), humidity (not > 80%)	aversion	D	2	120	0.2	0.25	0.5	high	NA	0.02	0.035	0.05	high	
stocking density in crates	overcrowding (standard 53 to 58 kg/m3)	heating up, low movement	D, Fr	2	120	0.7	0.85	1	low	NA	0.02	0.035	0.05	high	
use of unloading tools	impact of crates being dropped	bruising, broken bones	P, D, F	3	120	0.7	0.85	1	low	NA	0.02	0.035	0.05	high	
Pen															
ventilation	ineffective (not in all parts)	increased breathing, body T	D	2	5	0.2			low	NA	0.001	0.002	0.003	high	
ventilation	low	increased breathing, body T	D, F, Fr	4	120	0.7	0.85	1	low	NA	0.001	0.002	0.003	high	
ventilation	high	cold stress	D, F, Fr	4	120	0.7	0.85	1	low	NA	0.001	0.002	0.003	high	
air quality	temperature (high or low), humidity	aversion	D	3	120	0.2	0.25	0.5	low	NA	0.02	0.025	0.05	high	
stocking density in compartment	overcrowding	heating up, low movement	D	2	120	0.2	0.25	0.5	low	NA	0.02	0.025	0.05	high	
use of unloading tools	knocking, lack of motivation, dropping crates	bruising, broken bones	D, F, Fr	2	120	0.7	0.85	1	low	NA	0.001	0.002	0.003	high	
light	not blue (< 150 Lux)	insufficient rest	D, F, Fr	2	5	0.7	0.85	1	low	NA	0.001	0.002	0.003	high	
Passageway															
Race into stunning area															
use of automatic unloading tools	landing on moving top table	bruising, broken bones, luxations	D, F, Fr	2	5	0.7	0.85	1	low	NA	0.001	0.002	0.003	Medium	
light	not blue (< 150 Lux)	insufficient rest	D, F, Fr	2	5	0.7	0.85	1	low	NA	0.001	0.002	0.003	Medium	
Escaped or missed birds	Necessity to catch birds, accidental injury	bruising, broken bones, luxations	D, F, Fr	2	5	0.7	0.85	1	low	NA	0.0001	0.0002	0.0003	Medium	
Restraint															
a) Dimension and design	width, length, height	bruising, broken bones, luxations	P, D, E, Fr	2	2	0.7	0.85	1	low	NA	0.01	0.1	0.15	Medium	
h) Operator	hidden up by speed	bruising, broken bones, luxations	P, D, F, Fr	3	2	0.7	0.85	1	low	NA	0.2	0.35	0.5	Medium	
	untrained handlers, lack of motivation	bruising, broken bones, luxations	P, D, F, Fr	3	2	0.7	0.85	1	low	NA	0.2	0.35	0.5	Medium	
Shackling to stunning interval	Short interval, heads recoiled, flapping, struggling birds (> 45 s)	bruising, broken bones, luxations	P, D, F, Fr	3	2	0.7	0.85	1	low	NA	0.2	0.35	0.5	low	
Electrical waterbath															
Stunning for slaughter/killing															
a) Operator	Untrained, uncertified, careless	perception of physical injury, reflex activity, recovery	P, D, F, Fr	3	5	0.1	0.15	0.2	medium	NA	0.2	0.35	0.5	Medium	
b) Manual equipment	Poorly maintained, unsuitable for species, breed and size, malfunctioning	perception of physical injury, reflex activity, recovery	P, D, F, Fr	3	5	0.1	0.15	0.2	medium	NA	0.2	0.35	0.5	Medium	
c) Automatic equipment	Poorly maintained, unsuitable for species, breed and size, malfunctioning	perception of physical injury, reflex activity, recovery	P, D, F, Fr	3	5	0.1	0.15	0.2	medium	NA	0.02	0.035	0.05	Medium	
d) Electrical parameters	Incorrect voltage (<100 V), amperage (< 100 A), waveform (DC <150V??), frequency (> 1500 Hz)	perception of physical injury, reflex activity, recovery	P, D, F, Fr	3	5	0.1	0.15	0.2	medium	NA	0.8	0.9	1	low	
e) Stunning application	Incorrect target and area, faulty settings	perception of physical injury, reflex activity, recovery	P, D, F, Fr	3	5	0.1	0.15	0.2	medium	NA	0.5	0.75	1	low	
f) Shackling and hoisting	Delay before exsanguination (> 20 s), recovery	Recovery	P, D, F, Fr	3	5	0.1	0.15	0.2	medium	NA	0.2	0.25	0.5	Medium	
g) Exsanguination	Incorrect sticking (one side), delayed bleed out, recovery	Recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	NA	0.01	0.1	0.15	Medium	
Gasstunning CO2 combination															
Transfer from crates	Birds landing on each other, overcrowding,	skin lesions	P, D, F, Fr	3	5	0.1	0.15	0.2	medium	NA	0.01	0.1	0.15	high	
	Leakage of gas	aversion, escaping	P, D, F, Fr	3	5	0.1	0.15	0.2	medium	NA	0.001	0.002	0.003	high	
Operator/observer	Untrained, uncertified, careless	muscle cramps, convulsions	P, D, F, Fr	3	5	0.1	0.15	0.2	medium	NA	0.01	0.1	0.15	high	
Stunning equipment	Poorly maintained, unsuitable for species, breed and size, malfunctioning gas and display unit	aversion, muscle cramps, convulsions	P, D, F, Fr	3	5	0.1	0.15	0.2	medium	NA	0.001	0.002	0.003	high	
c) Gas parameters	Incorrect and inconsistent gas mixtures and concentration (> 10%),	aversion, muscle cramps, convulsions	P, D, F, Fr	3	5	0.1	0.15	0.2	medium	NA	0.001	0.002	0.003	high	
e) Stunning application	Faulty settings and operation	aversion, muscle cramps, convulsions	P, D, F, Fr	3	5	0.1	0.15	0.2	medium	NA	0.01	0.1	0.15	high	
f) Stunning to sticking interval	Delay before exsanguination, recovery	aversion, muscle cramps, convulsions	P, D, F, Fr	3	5	0.1	0.15	0.2	medium	NA	0.001	0.002	0.003	high	
g) Exsanguination	Incomplete neck cut, delayed bleed out, recovery		P, D, F, Fr	4	5	0.1	0.15	0.2	medium	NA	0.01	0.1	0.15	Low	

Stunning for emergency killing

Neck dislocation

a) Operator	Untrained, uncertified, careless	non lethal injuries to head and neck and vertebral column	D, F, Fr	4	5	0.1	0.15	0.2	medium	NA	0.001	0.002	0.003	high
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Electrical stunning

a) Operator	Untrained, uncertified, careless	perception of physical injury, reflex activity, recovery	D, F, Fr	4	5	0.1	0.15	0.2	medium	NA	0.001	0.002	0.003	Medium
b) Equipment	Poorly maintained, unsuitable for species, breed and size, malfunctioning	perception of physical injury, reflex activity, recovery	D, F, Fr	4	5	0.1	0.15	0.2	medium	NA	0.001	0.002	0.003	Medium
d) Electrical parameters	Incorrect voltage, amperage, waveform, frequency, duration	perception of physical injury, reflex activity, recovery		4	5	0.1	0.15	0.2	medium	NA	0.001	0.002	0.003	Medium
e) Stunning application	Incorrect target and area, faulty settings	perception of physical injury, reflex activity, recovery	D, F, Fr	4	5	0.1	0.15	0.2	medium	NA	0.001	0.002	0.003	low
g) Killing method	Delay before death, recovery	Recovery	D, F, Fr	4	5	0.1	0.15	0.2	medium	NA	0.001	0.002	0.003	Medium

Lethal injection

a) Operator	Untrained, unlicensed, careless	distress due to disorientation and ataxia, and possibly neuromuscular paralysis with consciousness	D, F, Fr	4	5	0.1	0.15	0.2	medium	NA	0.001	0.002	0.003	high
b) Drug/agent	Wrong choice, dose	distress due to disorientation and ataxia, and possibly neuromuscular paralysis with consciousness	D, F, Fr	4	5	0.1	0.15	0.2	medium	NA	0.001	0.002	0.003	high
c) Injection method	Wrong injection site, missed target, extravascular injection	distress due to disorientation and ataxia, and possibly neuromuscular paralysis with consciousness	D, F, Fr	4	5	0.1	0.15	0.2	medium	NA	0.001	0.002	0.003	high

Killing for disease control

Neck dislocation

a) Operator	Untrained, uncertified, careless	Wrong position, failure to restrain, dislocate immediately, delay before death	D, F, Fr	4	5	0.1	0.15	0.2	medium	NA	0.2	0.25	0.5	high
		<u>prolonged agony (ischemia > 25 s)</u>	D, F, Fr	4	5	0.1	0.15	0.2	medium	NA	0.2	0.25	0.5	high

Electrical stunning

a) Operator	Untrained, uncertified, careless	perception of physical injury, reflex activity, recovery	D, F, Fr	4	5	0.1	0.15	0.2	medium	NA	0.02	0.025	0.05	Medium
b) Equipment	Poorly maintained, unsuitable for species, breed and size, malfunctioning	perception of physical injury, reflex activity, recovery	D, F, Fr	4	5	0.1	0.15	0.2	medium	NA	0.8	0.9	1	Medium
d) Electrical parameters	Incorrect voltage, amperage, waveform, frequency, duration	perception of physical injury, reflex activity, recovery	D, F, Fr	4	5	0.1	0.15	0.2	medium	NA	0.8	0.9	1	Medium
e) Stunning application	Incorrect target and area, faulty settings	perception of physical injury, reflex activity, recovery	D, F, Fr	4	5	0.1	0.15	0.2	medium	NA	0.8	0.9	1	low
g) Killing method	Delay before death, recovery	Recovery	D, F, Fr	4	5	0.1	0.15	0.2	medium	NA	0.8	0.9	1	Medium

Lethal injection

a) Operator	Untrained, unlicensed, careless	distress due to disorientation and ataxia, and possibly neuromuscular paralysis with consciousness	D, F, Fr	4	5	0.1	0.15	0.2	medium	NA	0.01	0.1	0.15	high
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Lethal injection

b) Drug/agent	Wrong choice, dose	distress due to disorientation and ataxia, and possibly neuromuscular paralysis with consciousness	D, F, Fr	4	5	0.1	0.15	0.2	medium	NA	0.01	0.1	0.15	high
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Lethal injection

c) Injection method	Wrong injection site, missed target, extravascular injection	distress due to disorientation and ataxia, and possibly neuromuscular paralysis with consciousness	D, F, Fr	4	5	0.1	0.15	0.2	medium	NA	0.01	0.1	0.15	high
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Gas stunning CO2 combinations

a) Operator/observer	Untrained, uncertified, careless	aversion, escaping	D, F, Fr	4	5	0.1	0.15	0.2	medium	NA	0.001	0.002	0.003	high
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b) Stunning equipment	Poorly maintained, unsuitable for species, breed and size, malfunctioning gas and display unit	aversion, muscle cramps, convulsions	D, F, Fr	4	5	0.1	0.15	0.2	medium	NA	0.01	0.1	0.15	high
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c) Gas parameters	Incorrect and inconsistent gas mixtures and concentration,	aversion, muscle cramps, convulsions	D, F, Fr	4	5	0.1	0.15	0.2	medium	NA	0.01	0.1	0.15	high
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e) Stunning application	Faulty settings and operation, insufficient gas concentration at floor level	aversion, muscle cramps, convulsions	D, F, Fr	4	5	0.1	0.15	0.2	medium	NA	0.01	0.1	0.15	high
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Gas stunning N combinations

a) Operator/observer	Untrained, uncertified, careless	escaping	D, F, Fr	3	5	0.1	0.15	0.2	medium	NA	0.01	0.1	0.15	high
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b) Stunning equipment	Poorly maintained, unsuitable for species, breed and size, malfunctioning gas and display unit	muscle cramps, convulsions	D, F, Fr	3	5	0.1	0.15	0.2	medium	NA	0.001	0.002	0.003	high
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c) Gas parameters	Incorrect and inconsistent gas mixtures and concentration,	muscle cramps, convulsions	D, F, Fr	3	5	0.1	0.15	0.2	medium	NA	0.01	0.1	0.15	high
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e) Stunning application	Faulty settings and operation, insufficient gas concentration at floor level	muscle cramps, convulsions	D, F, Fr	3	5	0.1	0.15	0.2	medium	NA	0.01	0.1	0.15	high
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SPECIES: BROILERS																		
Hazard Identified	Hazard characterization		Risk Characterization			Assessment results												
	Hazard description	Risk estimate (C195%)	Qualitative uncertainty of the risk estimate			Dist. P. Exposure	Dist Likelihood	Probability of Occurrence	Median P. Of occurrence	P95 of P. of occurrence	P90 of P. of occurrence	Magnitude	Risk	Median risk	P95 Risk	P90Risk	Risk with duration effect	Qualitative Uncertainty
Unloading bay to lairage																		
Crate design	Sharp angles (spikes), low volume, inadequate vents	0.003 [0.001 - 0.006]	High			0.000533	0.1	5.33333E-05	5.00481E-05	0.0001011	1.72039E-05	60	0.0032	0.0030029	0.0060674	0.0010322	0.0015014	High
ventilation	ineffective (not in all parts)	3.554 [2.566 - 4.631]	High			0.035	0.85	0.02975	0.02961608	0.0385925	0.021386688	120	3.57	3.5539296	4.631105	2.5664026	0.8884824	High
ventilation	low (increased body T)	3.553 [2.576 - 4.624]	High			0.035	0.85	0.02975	0.029605424	0.0385475	0.021463909	120	3.57	3.5526509	4.6257046	2.575660	0.8881627	High
ventilation	high (decreased body T)	0.865 [0.580 - 1.284]	High			0.035	0.2833333	0.009916667	0.009616514	0.0142675	0.006445706	90	0.8925	0.8546062	1.2840754	0.5801136	0.2884054	High
air quality	temperature (standard 5 ° C to 30° C), humidity (not > 80%)	0.578 [0.389 - 0.860]	High			0.035	0.2833333	0.009916667	0.009603886	0.0143331	0.006476996	60	0.595	0.5778532	0.8599859	0.3896197	0.2889266	High
stocking density in crates	overcrowding (standard 53 to 58 kg/m3)	1.776 [1.284 - 2.310]	High			0.035	0.85	0.02975	0.029608291	0.0385019	0.02139576	60	1.785	1.7646795	2.3101117	1.2834566	0.8882487	High
use of unloading tools	impact of crates being dropped	2.663 [1.923 - 3.473]	High			0.035	0.85	0.02975	0.029592079	0.0385905	0.02137144	90	2.6775	2.6632871	3.4731418	1.9234296	0.8877624	High
Pen																		
ventilation	ineffective (not in all parts)	#VALUE!	High			0.002	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	2.5	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	High
ventilation	low	0.203 [0.138 - 0.272]	High			0.002	0.85	0.0017	0.001693656	0.0022682	0.001150888	120	0.204	0.2032387	0.2721843	0.1381066	0.0508097	High
ventilation	high	0.203 [0.138 - 0.273]	High			0.002	0.85	0.0017	0.001692252	0.0022709	0.001147666	120	0.204	0.2030702	0.2725134	0.1377193	0.0507676	High
air quality	temperature (high or low), humidity	0.696 [0.474 - 1.046]	High			0.028333	0.2833333	0.008027778	0.007738274	0.0118357	0.005261354	90	0.7225	0.6964887	1.0625165	0.4735219	0.2321662	High
stocking density in compartment	overcrowding	0.464 [0.317 - 0.713]	High			0.028333	0.2833333	0.008027778	0.007741541	0.0118779	0.005282735	60	0.4816667	0.4644025	0.7126759	0.3186641	0.2321662	High
use of unloading tools	knocking, lack of motivation, droppings crates	0.101 [0.069 - 0.137]	High			0.002	0.85	0.0017	0.00168955	0.0022802	0.001155806	60	0.102	0.101373	0.136811	0.069484	0.0506865	High
light	not blue (< 150 Lux)	0.004 [0.003 - 0.004]	High			0.002	0.85	0.0017	0.001694165	0.0022739	0.001147481	2.5	0.00425	0.0042454	0.0056847	0.0028687	0.0021177	High
Passageway																		
Race into stunning area																		
use of automatic unloading tools	landing on moving top table	0.004 [0.003 - 0.006]	Medium			0.002	0.85	0.0017	0.001691919	0.0022706	0.00115472	2.5	0.00425	0.00423	0.0056765	0.0028688	0.0021165	Medium
light	not blue (< 150 Lux)	0.004 [0.003 - 0.006]	Medium			0.002	0.85	0.0017	0.001691128	0.0022753	0.001152743	2.5	0.00425	0.0042278	0.0056881	0.0028819	0.0021139	Medium
Escaped or missed birds	Necessity to catch birds, accidental injury	0.000 [0.000 - 0.001]	Medium			0.0002	0.85	0.00017	0.000169134	0.0002279	0.000115057	2.5	0.000425	0.0004228	0.0005696	0.0002876	0.0002114	Medium
Restraint																		
a) Dimension and design	width, length, height	0.081 [0.041 - 0.115]	Medium			0.093333	0.85	0.079333333	0.080532196	0.115396	0.040552914	1	0.0793333	0.0805322	0.115396	0.0405529	0.0402661	Medium
h) Operator	hidden up by speed	0.444 [0.321 - 0.578]	Medium			0.35	0.85	0.2975	0.295848363	0.3850697	0.214075812	1.5	0.44625	0.4438265	0.5776046	0.3211137	0.1479422	Medium
	untrained handlers, lack of motivation	0.444 [0.321 - 0.579]	Medium			0.35	0.85	0.2975	0.296039814	0.3861807	0.214141991	1.5	0.44625	0.4440997	0.579271	0.321213	0.1480199	Medium
	Short interval, heads recoiled, flapping, struggling birds (> 45 s)	0.445 [0.320 - 0.578]	Low			0.35	0.85	0.2975	0.296638234	0.3850527	0.213614444	1.5	0.44625	0.4495974	0.5775791	0.3204217	0.1483191	Low
Electrical waterbath																		
Stunning for slaughter/killing																		
a) Operator	Untrained, uncertified, careless	0.194 [0.134 - 0.268]	Medium			0.35	0.15	0.0525	0.051781197	0.071588	0.035865265	3.75	0.196875	0.1941795	0.2684551	0.1344947	0.0647265	Medium
b) Manual equipment	Poorly maintained, unsuitable for species, breed and size, malfunctioning	0.194 [0.135 - 0.268]	Medium			0.35	0.15	0.0525	0.051851558	0.0713405	0.035930787	3.75	0.196875	0.1944433	0.2675727	0.1347405	0.0648144	Medium
c) Automatic equipment	Poorly maintained, unsuitable for species, breed and size, malfunctioning	0.019 [0.013 - 0.027]	Medium			0.035	0.15	0.00525	0.00518564	0.0071533	0.0035583	3.75	0.0196875	0.0194461	0.0268249	0.0133436	0.006482	Medium
d) Electrical parameters	Incorrect voltage (<100 V), amperage (< 100 A), waveform (DC <150V?), frequency (> 1500 HZ)	0.505 [0.397 - 0.619]	Medium			0.9	0.15	0.135	0.134750811	0.1650642	0.105866888	3.75	0.50625	0.5053155	0.6189908	0.3970008	0.1684385	Medium
e) Stunning application	Incorrect target and area, faulty settings	0.418 [0.304 - 0.553]	Medium			0.75	0.15	0.1125	0.111479091	0.1475165	0.081080979	3.75	0.423875	0.4180466	0.5531869	0.3040537	0.1393489	Medium
f) Shackling and hoisting	Delay before exsanguination (> 20 s), recovery	0.154 [0.110 - 0.216]	Medium			0.283333	0.15	0.0425	0.041141938	0.0601406	0.029373783	3.75	0.159375	0.1542823	0.225273	0.1101517	0.0514274	Medium
a) Exsanguination	Incorrect sticking (one side) , delayed bleed out, recovery	0.070 [0.035 - 0.105]	Medium			0.093333	0.15	0.014	0.014005091	0.0210901	0.006925289	5	0.07	0.0700255	0.1054506	0.0346129	0.0175064	Medium
Gasstunning CO2 combination																		
Transfer from crates	Birds landing on each other, overcrowding, Leakage of gas	0.052 [0.026 - 0.079]	High			0.093333	0.15	0.014	0.013980034	0.021142	0.006945629	3.75	0.0525	0.0521551	0.0792824	0.0260461	0.017285	High
		0.001 [0.001 - 0.002]	High			0.002	0.15	0.0003	0.000296025	0.0004186	0.000194382	3.75	0.001125	0.0011101	0.0015696	0.0007289	0.00037	High
Operator/observer	Untrained, uncertified, careless	0.052 [0.026 - 0.080]	High			0.093333	0.15	0.014	0.013972488	0.0213129	0.007022171	3.75	0.0525	0.0523968	0.0799235	0.0263331	0.0174656	High
Stunning equipment	Poorly maintained, unsuitable for species, breed and size, malfunctioning gas and display unit	0.001 [0.001 - 0.002]	High			0.002	0.15	0.0003	0.000295916	0.0004215	0.000195083	3.75	0.001125	0.0011097	0.0015806	0.0007316	0.0003699	High
c) Gas parameters	Incorrect and inconsistent gas mixtures and concentration (> 10%),	0.001 [0.001 - 0.002]	High			0.002	0.15	0.0003	0.000296062	0.0004193	0.000194082	3.75	0.001125	0.0011102	0.0015725	0.0007278	0.0003701	High
e) Stunning application	Faulty settings and operation	0.052 [0.026 - 0.079]	High			0.093333	0.15	0.014	0.013982431	0.021125	0.006938244	3.75	0.0525	0.0524341	0.0792186	0.0260184	0.017478	High
f) Stunning to sticking interval	Delay before exsanguination, recovery	0.001 [0.001 - 0.002]	High			0.002	0.15	0.0003	0.00029602	0.0004211	0.00019501	3.75	0.001125	0.0011101	0.0015793	0.0007313	0.00037	High
g) Exsanguination	Incomplete neck cut, delayed bleed out, recovery	0.070 [0.035 - 0.106]	Medium			0.093333	0.15	0.014	0.01396482	0.0211159	0.006907858	5	0.07	0.0698241	0.1055793	0.0345393	0.017456	Medium

Stunning for emergency killing

Neck dislocation

a) Operator	Untrained, uncertified, careless	0,001 [0,001 - 0,002]	High	0,002	0,15	0,0003	0,000296408	0,0004203	0,000195798	5	0,0015	0,001482	0,0021013	0,0009779	0,0003705	High
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Electrical stunning

a) Operator	Untrained, uncertified, careless	0,001 [0,001 - 0,002]	Medium	0,002	0,15	0,0003	0,000296702	0,0004177	0,000194447	5	0,0015	0,0014835	0,0020883	0,0009722	0,0003709	Medium
b) Equipment	Poorly maintained, unsuitable for species, breed and size, malfunctioning	0,001 [0,001 - 0,002]	Medium	0,002	0,15	0,0003	0,000295991	0,0004178	0,000194808	5	0,0015	0,00148	0,0020888	0,000974	0,00037	Medium
d) Electrical parameters	Incorrect voltage, amperage, waveform, frequency, duration	0,001 [0,001 - 0,002]	Medium	0,002	0,15	0,0003	0,00029648	0,0004191	0,000193987	5	0,0015	0,0014824	0,0020955	0,0009699	0,0003706	Medium
e) Stunning application	Incorrect target and area, faulty settings	0,001 [0,001 - 0,002]	Medium	0,002	0,15	0,0003	0,000295488	0,0004214	0,000196255	5	0,0015	0,0014774	0,0021068	0,0009813	0,0003694	Medium
g) Killing method	Delay before death, recovery	0,001 [0,001 - 0,002]	Medium	0,002	0,15	0,0003	0,000295971	0,000419	0,000195342	5	0,0015	0,0014799	0,0020948	0,0009767	0,00037	Medium

Lethal injection

a) Operator	Untrained, unlicensed, careless	0,001 [0,001 - 0,002]	High	0,002	0,15	0,0003	0,000297473	0,0004191	0,000192294	5	0,0015	0,0014874	0,0020953	0,0009615	0,0003718	High
b) Drug/aagent	Wrong choice, dose	0,001 [0,001 - 0,002]	High	0,002	0,15	0,0003	0,00029585	0,0004214	0,000194166	5	0,0015	0,0014792	0,0021068	0,0009708	0,0003698	High
c) Injection method	Wrong injection site, missed target, extravascular injection	0,001 [0,001 - 0,002]	High	0,002	0,15	0,0003	0,000296335	0,000418	0,000194417	5	0,0015	0,0014817	0,00209	0,0009721	0,0003704	High

Killing for disease control

Neck dislocation

a) Operator	Untrained, uncertified, careless Wrong position, failure to restrain, dislocate immediately, delay before death	0,207 [0,146 - 0,299]	High	0,283333	0,15	0,0425	0,041306027	0,0597698	0,029201572	5	0,2125	0,2065301	0,2988491	0,1460079	0,0516325	High
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Electrical stunning		#VALUE!	Medium	0,283333	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	0	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	Medium
a) Operator	Untrained, uncertified, careless	0,021 [0,015 - 0,030]	Medium	0,028333	0,15	0,00425	0,004129434	0,0059958	0,002919428	5	0,02125	0,0206472	0,0299791	0,0145971	0,0051618	Medium
b) Equipment	Poorly maintained, unsuitable for species, breed and size, malfunctioning	0,673 [0,529 - 0,824]	Medium	0,9	0,15	0,135	0,134629446	0,1647402	0,105826607	5	0,675	0,6731472	0,8237008	0,529133	0,1682868	Medium
d) Electrical parameters	Incorrect voltage, amperage, waveform, frequency, duration	0,674 [0,530 - 0,824]	Medium	0,9	0,15	0,135	0,134784148	0,1648363	0,105924688	5	0,675	0,6739207	0,8241816	0,5296234	0,1684802	Medium
e) Stunning application	Incorrect target and area, faulty settings	0,673 [0,529 - 0,826]	Medium	0,9	0,15	0,135	0,134687456	0,165274	0,105786252	5	0,675	0,6734373	0,8263701	0,5289313	0,1683593	Medium
g) Killing method	Delay before death, recovery	0,673 [0,529 - 0,827]	Medium	0,9	0,15	0,135	0,134666431	0,1653658	0,105841002	5	0,675	0,6733322	0,826829	0,529205	0,168333	Medium

Lethal injection

a) Operator	Untrained, unlicensed, careless	0,070 [0,035 - 0,105]	High	0,093333	0,15	0,014	0,013978251	0,0209782	0,006915579	5	0,07	0,0698913	0,1048908	0,0345779	0,0174728	High
b) Drug/aagent	Wrong choice, dose	0,070 [0,035 - 0,106]	High	0,093333	0,15	0,014	0,014004743	0,0211567	0,006988772	5	0,07	0,0700237	0,1057834	0,0349439	0,0175059	High
c) Injection method	Wrong injection site, missed target, extravascular injection	0,070 [0,035 - 0,106]	High	0,093333	0,15	0,014	0,014003494	0,0211567	0,00693838	5	0,07	0,0700715	0,1059835	0,0346919	0,0175044	High

Gas stunning CO2 combinations

a) Operator/observer	Untrained, uncertified, careless	0,001 [0,001 - 0,002]	High	0,002	0,15	0,0003	0,000295688	0,0004202	0,000194778	5	0,0015	0,0014784	0,0021008	0,0009739	0,0003696	High
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b) Stunning equipment	Poorly maintained, unsuitable for species, breed and size, malfunctioning gas and display unit	0,070 [0,035 - 0,106]	High	0,093333	0,15	0,014	0,013986515	0,021136	0,006977679	5	0,07	0,0699326	0,1056799	0,0348884	0,0174831	High
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c) Gas parameters	Incorrect and inconsistent gas mixtures and concentration,	0,070 [0,035 - 0,105]	High	0,093333	0,15	0,014	0,014025654	0,0210583	0,006990672	5	0,07	0,0701283	0,1052917	0,0349534	0,0175321	High
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e) Stunning application	Faulty settings and operation, insufficient gas concentration at floor level	0,070 [0,035 - 0,106]	High	0,093333	0,15	0,014	0,013970404	0,0211422	0,006958328	5	0,07	0,069852	0,1057108	0,0347916	0,0174653	High
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Gas stunning N combinations

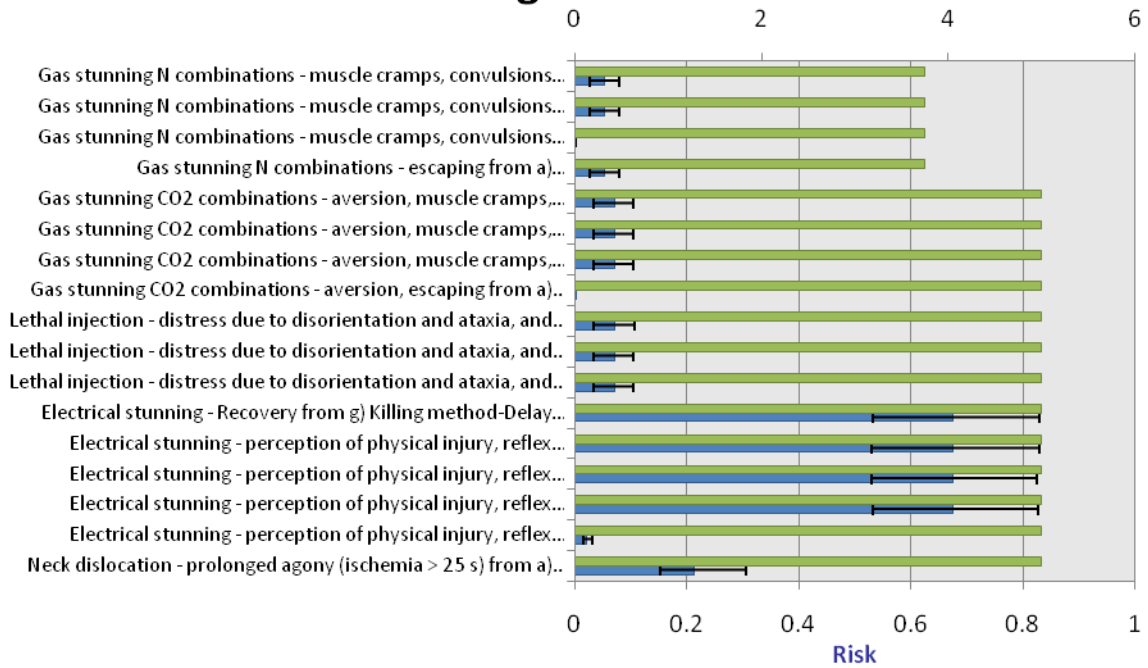
a) Operator/observer	Untrained, uncertified, careless	0,052 [0,026 - 0,079]	High	0,093333	0,15	0,014	0,013937133	0,0211426	0,006962789	3,75	0,0525	0,0522642	0,0792849	0,0261105	0,0174214	High
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b) Stunning equipment	Poorly maintained, unsuitable for species, breed and size, malfunctioning gas and display unit	0,001 [0,001 - 0,002]	High	0,002	0,15	0,0003	0,000295862	0,000421	0,000193641	3,75	0,001125	0,0011095	0,0015788	0,0007262	0,0003698	High
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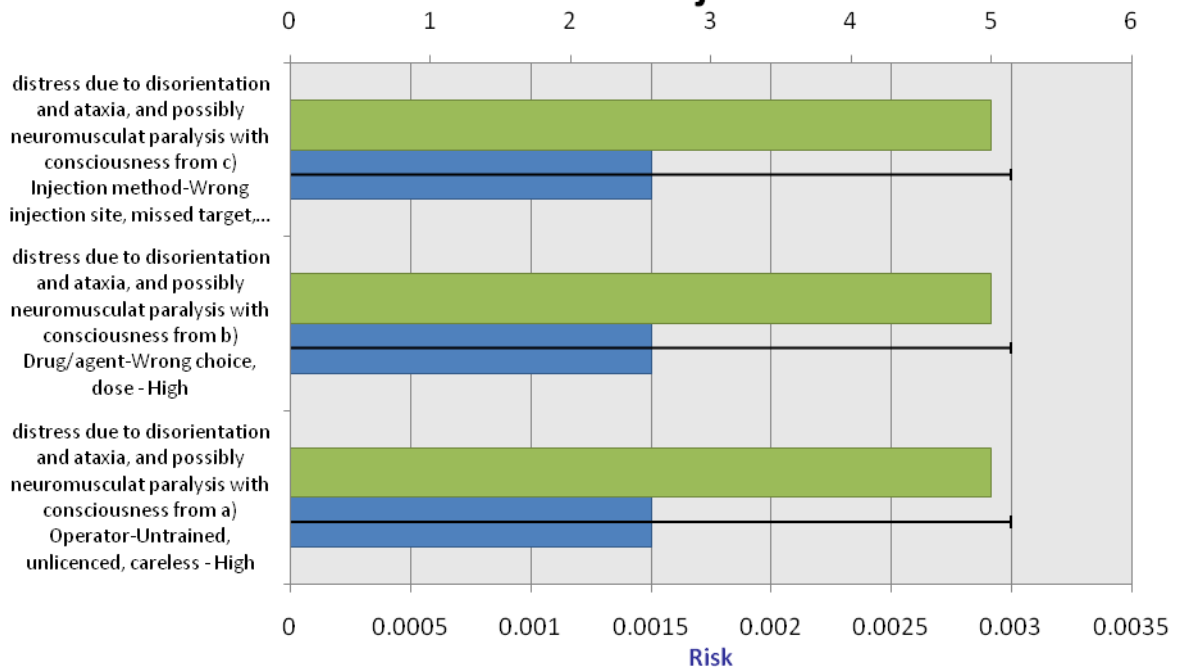
c) Gas parameters	Incorrect and inconsistent gas mixtures and concentration,	0,053 [0,026 - 0,079]	High	0,093333	0,15	0,014	0,014001562	0,0211737	0,006939079	3,75	0,0525	0,0525059	0,0794014	0,0260215	0,017502	High
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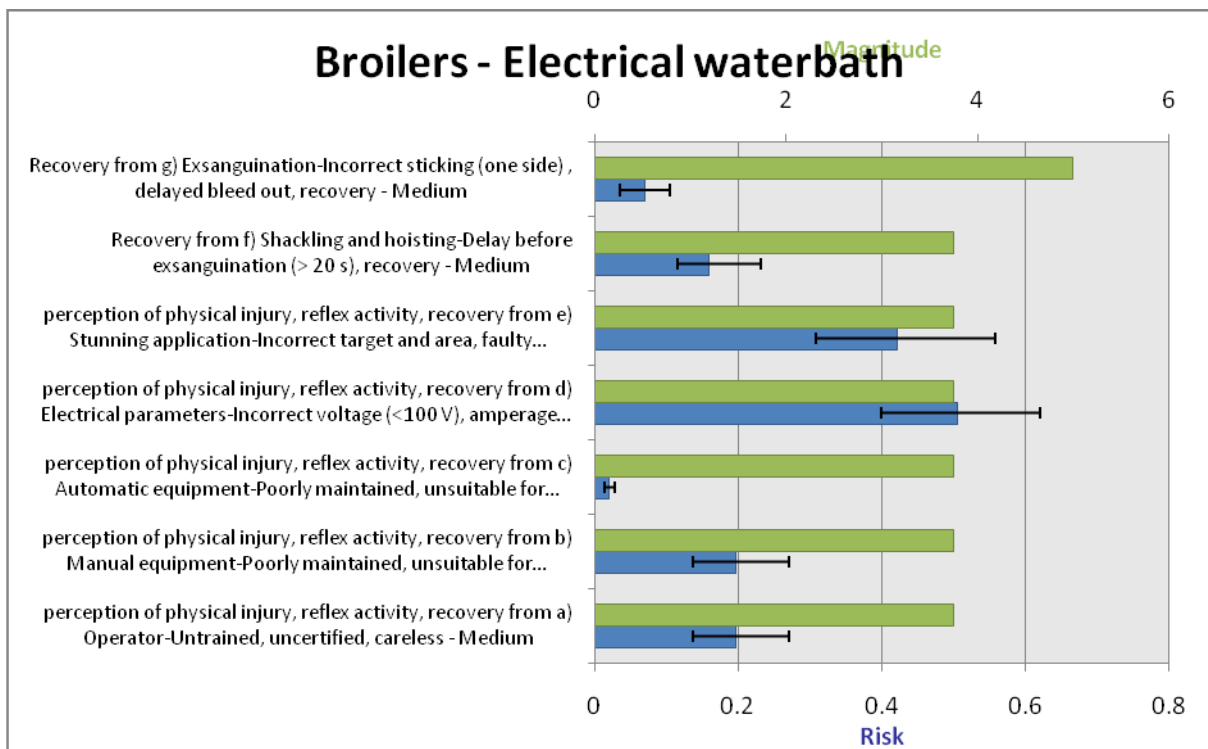
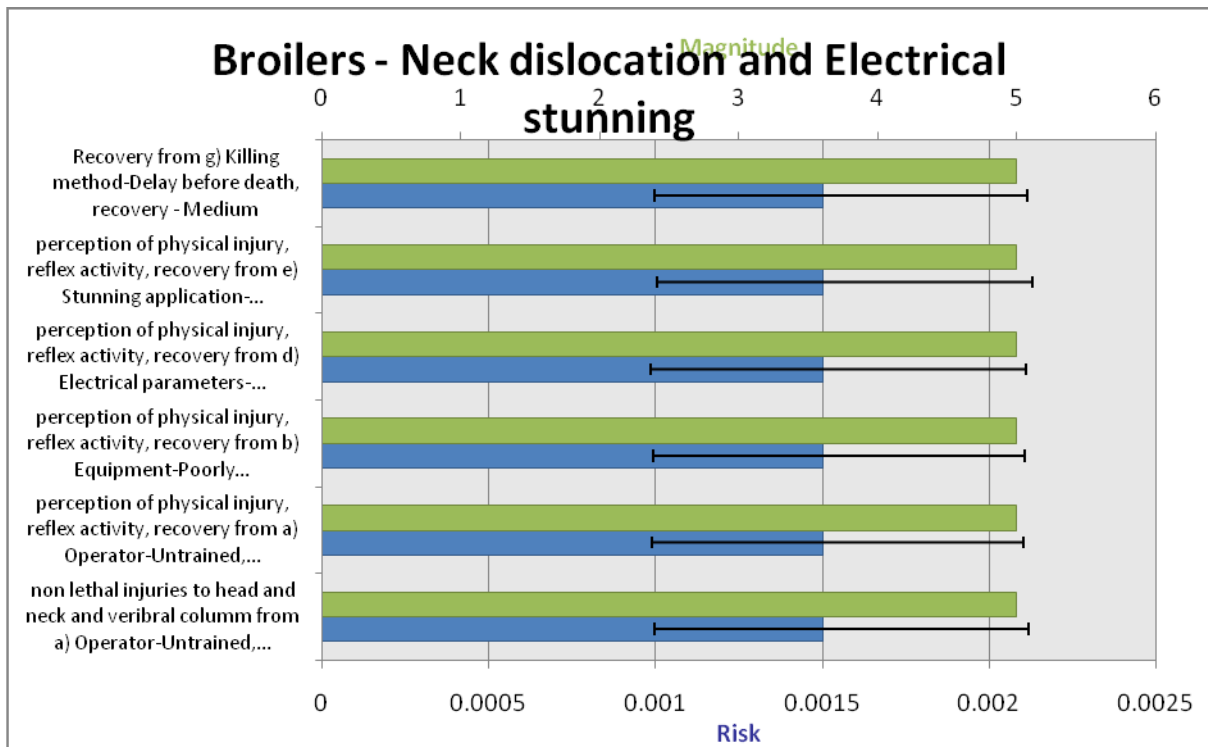
e) Stunning application	Faulty settings and operation, insufficient gas concentration at floor level	0,052 [0,026 - 0,079]	High	0,093333	0,15	0,014	0,013968267	0,0211295	0,006952903	3,75	0,0525	0,052381	0,0792316	0,0260734	0,0174603	High
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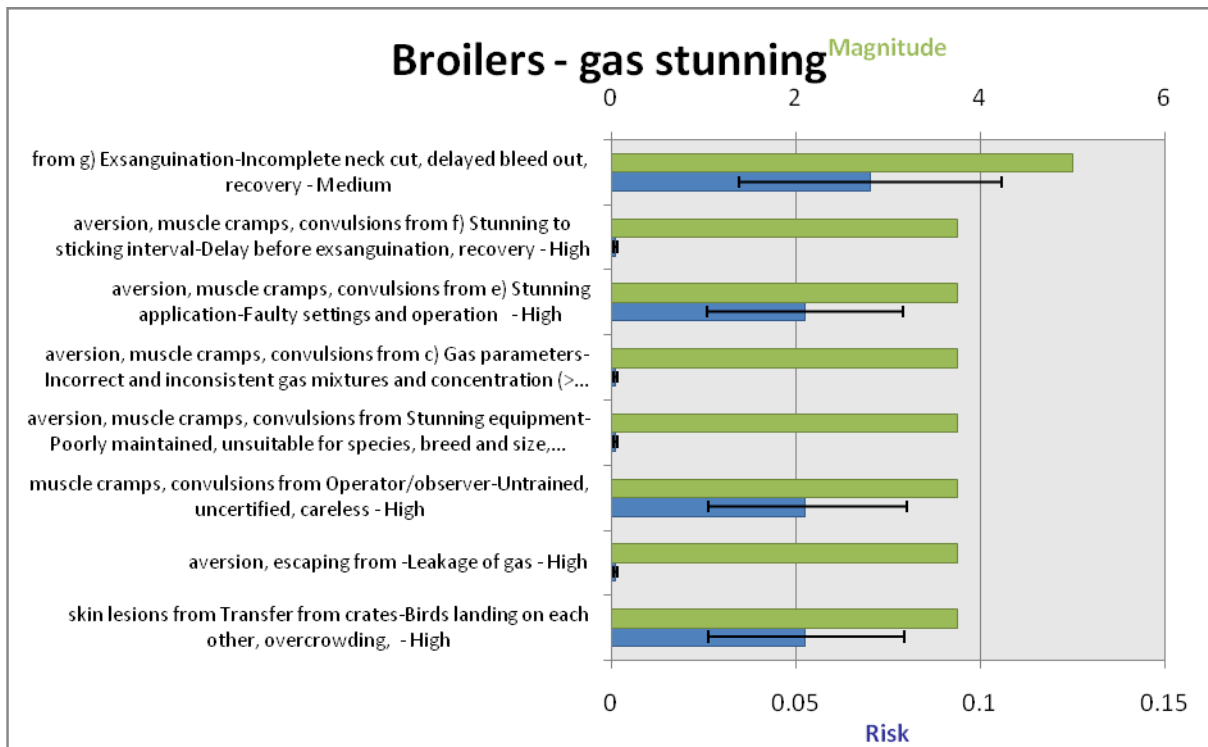
Broilers - Killing for disease control

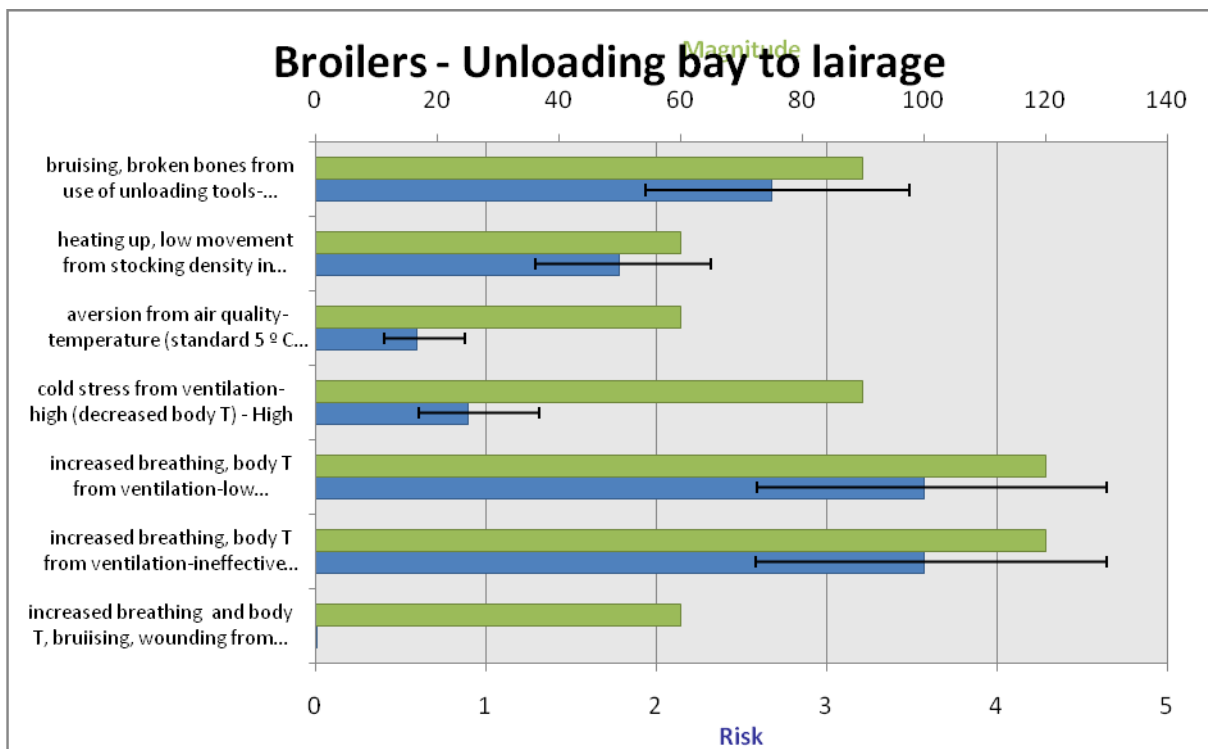
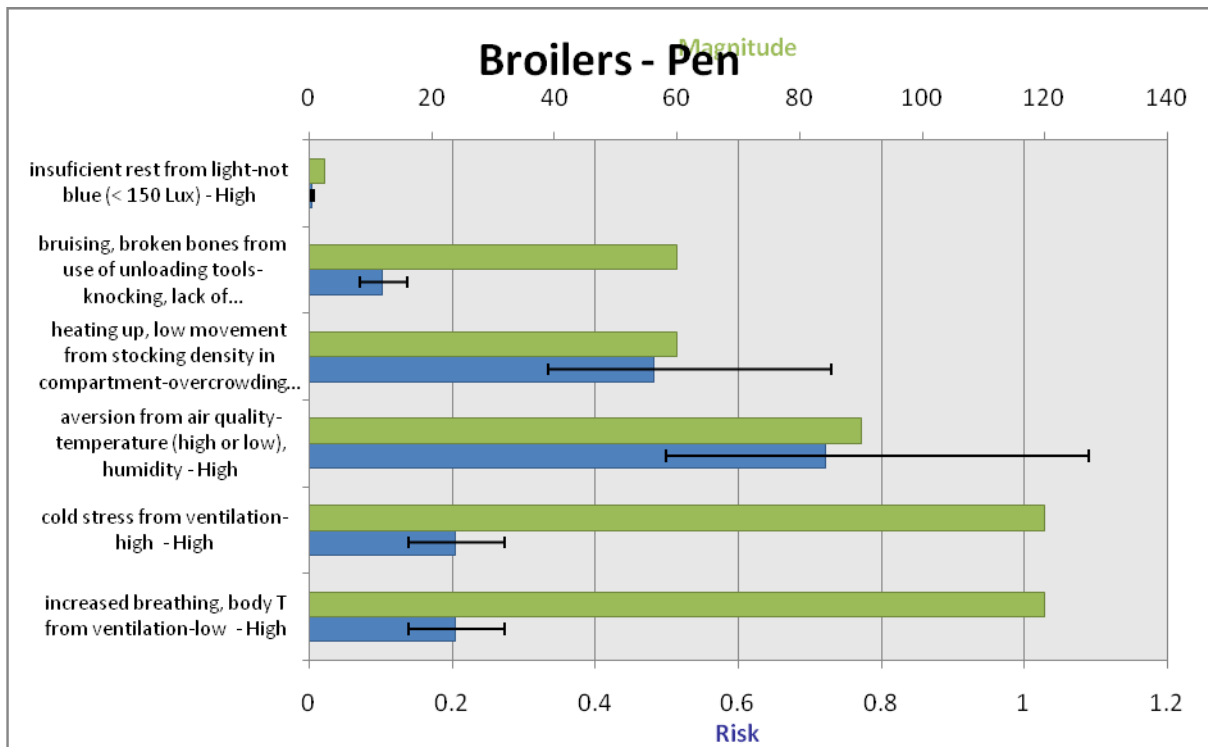


Broilers - Lethal Injection



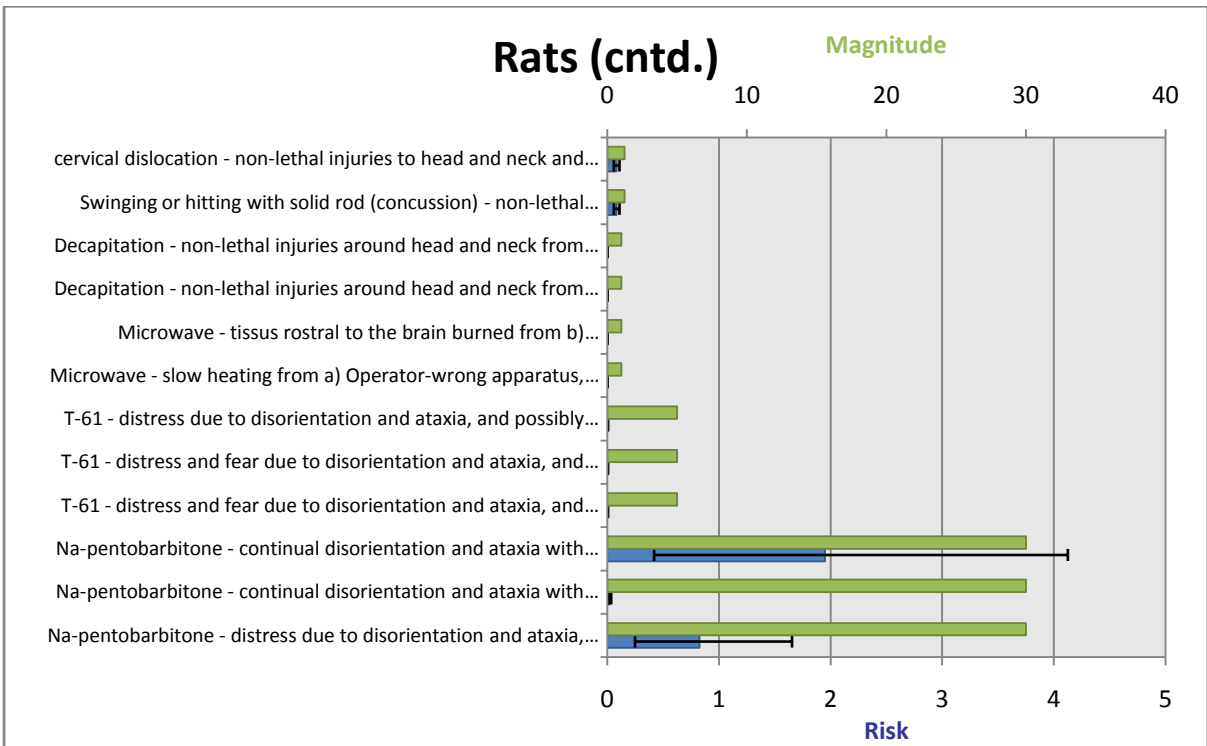
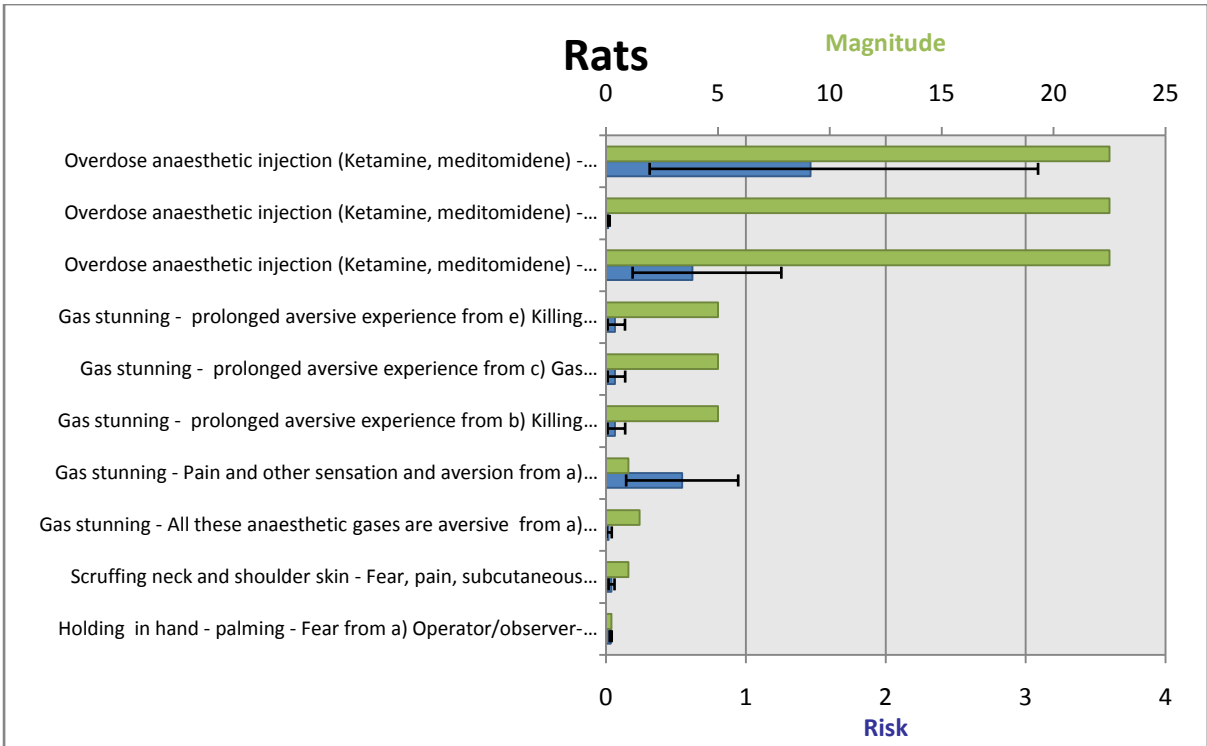






SPECIES:RATS																					
Hazard identified	Hazard characterization										Exposure assessment			Qualitative assessment of the uncertainty							
	Hazard description	Adverse effect description	Adverse effect type	Magnitude		Quantitative assessment of likelihood			Qualitative assessment of the uncertainty	Duration	Intensity	Quantitative assessment of P. of Exposure									
				Severity	Duration (minutes)	min	ml	max				min	ml		max						
Restraint																					
Method																					
Holding in hand - palming	Holding in hand - palming																				
a) Operator/observer	Untrained, uncertified, careless	Fear	F, D	1	1	0.8500	0.9000	0.9500	low			0.1000	0.1500	0.2000	medi						
Scruffing neck and shoulder skin																					
a) Operator/observer	Untrained, uncertified, careless	Fear, pain, subcutaneous bruising, drooping animal floor	P, D, F, V	4	1	0.1000	0.5000	0.9500	medium			0.0500	0.0750	0.1000	medi						
Killing																					
Gas stunning	a) Drug/agent	Halothane, enflurane, isoflurane, sevoflurane, desflurane	All these anaesthetic gases are aversive	D, F	2	3	0.2000	0.5000	0.8000	medium		0.0010		0.0500	high						
Gas stunning	a) Drug/agent	CO2	Pain and other sensation and aversion	P, D, F	4	1	1.0000	1.0000	1.0000	low		0.1000		0.9900	medi						
Gas stunning	b) Killing equipment	Poorly maintained, unsuitable for species, breed and size, malfunctioning gas and display unit	prolonged aversive experience	D, F	4	5	0.2000	0.5000	0.8000	medium		0.0010		0.0500	high						
Gas stunning	c) Gas parameters	Incorrect and inconsistent gas mixtures and concentration, Faulty settings and operation, insufficient gas concentration at animals nose level	prolonged aversive experience	P, D, F, Fr	4	5	0.2000	0.5000	0.8000	medium		0.0010		0.0500	high						
Gas stunning	c) Killing application		prolonged aversive experience	P, D, F	4	5	0.2000	0.5000	0.8000	medium		0.0010		0.0500	high						
Lethal injection																					
Overdose anaesthetic injection (Ketamine, medetomidine)																					
Overdose anaesthetic injection (Ketamine, medetomidine)	a) Operator	Application by untrained, unlicensed, careless operator	distress due to disorientation and ataxia	P, D, F	3	30	0.2000	0.5000	0.8000	medium		0.0100		0.1000	medi						
Overdose anaesthetic injection (Ketamine, medetomidine)	b) Drug/agent	Low dose	continual disorientation and ataxia with low doses	P, D, F	3	30	0.2000	0.5000	0.8000	medium		0.0010		0.0020	low						
Overdose anaesthetic injection (Ketamine, medetomidine)	c) Injection method	Wrong site	continual disorientation and ataxia with low doses	P, D, F	3	30	0.2000	0.5000	0.8000	medium		0.0100		0.2500	low						
Lethal injection Na-pentobarbitone			irritation of the peritoneal membranes if high pH solutions are used																		
Na-pentobarbitone	a) Operator	Untrained, unlicensed, careless	distress due to disorientation and ataxia, pain and (chemical) irritation	P, D, F	4	30	0.2000	0.5000	0.8000	medium	5	0.0100		0.1000	medi						
Na-pentobarbitone	b) Drug/agent	Wrong dose	continual disorientation and ataxia with low doses, pain and irritation	P, D, F	4	30	0.2000	0.5000	0.8000	medium	5	0.0010		0.0020	low						
Na-pentobarbitone	c) Injection method	wrong site	continual disorientation and ataxia with low doses, pain and irritation	P, D, F	4	30	0.2000	0.5000	0.8000	medium	5	0.0100		0.2500	low						
T-61		Neuromuscular paralysis may precede loss of consciousness	Distress and fear in not being able to breathe properly																		
T-61	a) Operator	Untrained, unlicensed, careless	distress and fear due to disorientation and ataxia, and possibly neuromuscular paralysis with consciousness	P, D, F	4	5	0.1000	0.1500	0.2000	medium	5	0.0020		0.0100							
T-61	b) Drug/agent	Wrong dose	distress and fear due to disorientation and ataxia, and possibly neuromuscular paralysis with consciousness	P, D, F	4	5	0.1000	0.1500	0.2000	medium	5	0.0020		0.0100							
T-61	c) Injection method	wrong site	distress due to disorientation and ataxia, and possibly neuromuscular paralysis with consciousness	P, D, F	4	5	0.1000	0.1500	0.2000	medium	5	0.0020		0.0100							
Microwave																					
Kills through the use of focussed microwaves in become burnt due to the high temperatures																					
Microwave	a) Operator	wrong apparatus, Untrained, uncertified, careless slow heating		P, D, F	4	1	0.1000	0.1500	0.2000	medium	5	0.0010		0.0020	high						
Microwave	b) Application	Failure to restrain properly	tissus rostral to the brain burned	P, D, F	4	1	0.1000	0.1500	0.2000	medium	5	0.0010		0.0020	high						
Decapitation																					
Decapitation	a) Operator	Untrained, uncertified, careless	non-lethal injuries around head and neck	P, D, F	4	1	0.1000	0.1500	0.2000	medium	5	0.0100		0.0200	high						
Decapitation	b) Application	Failure to restrain, delay before death	non-lethal injuries around head and neck	P, D, F	4	1	0.1000	0.1500	0.2000	medium	5	0.0100		0.0200	high						
Swinging or hitting with solid rod (concussion)																					
Swinging or hitting with solid rod (concussion)	a) Operator	Untrained, uncertified, careless	non-lethal injuries to head and neck and body	P, D, F	5	1	0.8500	0.9000	0.9500	low	5	0.0500		0.1000	medi						
cervical dislocation																					
cervical dislocation	a) Operator	Untrained, uncertified, careless	non-lethal injuries to head and neck and vertebral column	P, D, F	5	1	0.8500	0.9000	0.9500	low	5	0.0500		0.1000	medi						

SPECIES:RATS																	
Hazard identified	Hazard characterization		Risk Characterization		Assessment results												
	Hazard description	Risk estimate [C195%]	Qualitative uncertainty of the risk estimate	Dist. P. Exposure	Dist Likelihood	Probability of Occurrence	Median P. Of occurrence	P95 of P. of occurrence	P05 of P. of occurrence	Magnitude	Risk	Median risk	P95 Risk	P05risk	Risk w/ duration effect	Qualitative Uncertainty	
Restraint																	
	Method	Holding in hand - palming															
Holding in hand - palming	a) Operator/observer	Untrained, uncertified, careless	0,034 [0,027 - 0,041]	Medium	0.15	0.9	0.135	0.1350923	0.1634362	0.1067578	0.25	0.03375	0.0337731	0.040859	0.0266805	0.0337731	Medium
		Scruffing neck and shoulder skin															
Scruffing neck and shoulder skin	a) Operator/observer	Untrained, uncertified, careless	0,037 [0,018 - 0,061]	Medium	0.075	0.5083333	0.038125	0.0374847	0.0605932	0.0179581	1	0.038125	0.0374847	0.0605932	0.0179581	0.0093712	Medium
		Killing															
Gas stunning	a) Drug/agent	Halothane, enflurane, isoflurane, sevoflurane, desflurane	0,018 [0,002 - 0,040]	High	0.0255	0.5	0.01275	0.0120337	0.0266916	0.0016139	1.5	0.019125	0.0180506	0.0400374	0.0024208	0.0090253	High
Gas stunning	a) Drug/agent	CO2	0,545 [0,144 - 0,945]	Medium	0.545	1	0.545	0.5449593	0.945479	0.1444462	1	0.545	0.5449593	0.945479	0.1444462	0.1362398	Medium
Gas stunning	b) Killing equipment	Poorly maintained, unsuitable for species, breed and size, malfunctioning gas and display unit	0,061 [0,008 - 0,134]	High	0.0255	0.5	0.01275	0.0121095	0.0268192	0.0016496	5	0.06375	0.0605473	0.1340962	0.0082478	0.0151368	High
Gas stunning	c) Gas parameters	Incorrect and inconsistent gas mixtures and concentration,	0,060 [0,008 - 0,134]	High	0.0255	0.5	0.01275	0.012012	0.0267414	0.0016556	5	0.06375	0.0600602	0.1337068	0.0082778	0.015015	High
Gas stunning	e) Killing application	Faulty settings and operation, insufficient gas concentration at animals nose level	0,061 [0,008 - 0,133]	High	0.0255	0.5	0.01275	0.0121013	0.0265533	0.0016439	5	0.06375	0.0605067	0.1327664	0.0082193	0.0151267	High
		Lethal injection															
		Overdose anaesthetic injection (Ketamine, medetomidene)															
Overdose anaesthetic injection (Ketamine, medetomidene)	a) Operator	Application by untrained, unlicensed, careless operator	0,585 [0,156 - 1,220]	Medium	0.055	0.5	0.0275	0.0259835	0.0542232	0.006952	22.5	0.61875	0.5846287	1.2200209	0.1564205	0.1948762	Medium
Overdose anaesthetic injection (Ketamine, medetomidene)	b) Drug/agent	Low dose	0,016 [0,009 - 0,026]	Medium	0.0015	0.5	0.00075	0.0007279	0.0011583	0.0004171	22.5	0.016875	0.0163784	0.0260662	0.0093837	0.0054595	Medium
Overdose anaesthetic injection (Ketamine, medetomidene)	c) Injection method	Wrong site	1,383 [0,233 - 3,011]	Medium	0.13	0.5	0.065	0.0614754	0.1338073	0.0103583	22.5	1.4625	1.3831969	3.0106651	0.233061	0.4610656	Medium
Lethal injection		Na-pentobarbitone															
Na-pentobarbitone	a) Operator	Untrained, unlicensed, careless	0,781 [0,205 - 1,612]	Medium	0.055	0.5	0.0275	0.0260385	0.0537244	0.0068289	30	0.825	0.7811547	1.6117308	0.204867	0.1952887	Medium
Na-pentobarbitone	b) Drug/agent	Wrong dose	0,022 [0,012 - 0,035]	Medium	0.0015	0.5	0.00075	0.000728	0.0011582	0.0004147	30	0.0225	0.0218395	0.0347456	0.0124417	0.0054599	Medium
Na-pentobarbitone	c) Injection method	wrong site	1,838 [0,308 - 4,015]	Medium	0.13	0.5	0.065	0.0612754	0.1338346	0.0102744	30	1.95	1.838261	4.0150373	0.3082312	0.4595652	Medium
		T-61															
		Neuromuscular paralysis may precede loss of consciousness															
T-61	a) Operator	Untrained, unlicensed, careless	0,004 [0,002 - 0,008]	Medium	0.006	0.15	0.0009	0.0008873	0.0015132	0.0003552	5	0.0045	0.0044363	0.0075661	0.0017758	0.0011091	Medium
T-61	b) Drug/agent	Wrong dose	0,004 [0,002 - 0,008]	Medium	0.006	0.15	0.0009	0.0008833	0.0015159	0.0003519	5	0.0045	0.0044164	0.0075796	0.0017595	0.0011041	Medium
T-61	c) Injection method	wrong site	0,004 [0,002 - 0,008]	Medium	0.006	0.15	0.0009	0.0008862	0.0015203	0.0003535	5	0.0045	0.0044308	0.0076015	0.0017673	0.0011077	Medium
		Microwave															
		Kills through the use of focussed microwaves in about 10msec															
Microwave	a) Operator	wrong apparatus, Untrained, uncertified, careless	0,0002 [0,0001 - 0,0003]	High	0.0015	0.15	0.000225	0.000221	0.0003148	0.0001473	1	0.000225	0.000221	0.0003148	0.0001473	5.525e-05	High
Microwave	b) Application	Failure to restrain properly	0,0002 [0,0001 - 0,0003]	High	0.0015	0.15	0.000225	0.0002209	0.0003163	0.0001463	1	0.000225	0.0002209	0.0003163	0.0001463	5.521e-05	High
		Decapitation															
Decapitation	a) Operator	Untrained, uncertified, careless	0,002 [0,001 - 0,003]	High	0.015	0.15	0.00225	0.002216	0.0031492	0.0014644	1	0.00225	0.002216	0.0031492	0.0014644	0.000554	High
Decapitation	b) Application	Failure to restrain, delay before death	0,002 [0,001 - 0,003]	High	0.015	0.15	0.00225	0.002219	0.0031647	0.0014643	1	0.00225	0.002219	0.0031647	0.0014643	0.0005548	High
		Swinging or hitting with solid rod (concussion)															
Swinging or hitting with solid rod (concussion)	a) Operator	Untrained, uncertified, careless	0,084 [0,059 - 0,110]	Medium	0.075	0.9	0.0675	0.0674855	0.0879096	0.0471866	1.25	0.084375	0.0843569	0.109887	0.0589833	0.0168714	Medium
		cervical dislocation															
cervical dislocation	a) Operator	Untrained, uncertified, careless	0,084 [0,059 - 0,110]	Medium	0.075	0.9	0.0675	0.0674119	0.0878307	0.0471375	1.25	0.084375	0.0842648	0.1097884	0.0589218	0.016853	Medium



SPECIES: TURKEYS															
Hazard identified	Hazard characterization								Exposure assessment						
	Hazard description	Adverse effect description	Adverse effect type	Magnitude		Quantitative assessment of likelihood			Qualitative assessment of the uncertainty	Duration	Intensity	Quantitative assessment of P _o of Exposure			Qualitative assessment of the uncertainty
				Severity	Duration (minutes)	min	int	max				min	int	max	
Unloading bay to lairage															
Design of crates	Sharp angles, low volume, inadequate vents	increased breathing, body T, bruising	D	2	5	0.2				NA		0.002	0.005	0.01	high
ventilation	ineffective (not in all parts)	increased breathing, body T	D, F, Fr	4	120	0.7	0.85	1	low	NA		0.02	0.035	0.05	high
ventilation	low (increased body T)	increased breathing, body T	D, F, Fr	4	120	0.7	0.85	1	low	NA		0.02	0.035	0.05	high
ventilation	high (decreased body T)	cold stress	D	3	120	0.2	0.25	0.5	low	NA		0.02	0.035	0.05	high
air quality	Temperature (standard 5 ° C to 30° C), humidity (not > 80%)	aversion	D	2	120	0.2	0.25	0.5	low	NA		0.02	0.035	0.05	high
stocking density in crates	overcrowding (standard 53 to 58 kg/m ³)	heating up, low movement	D, Fr	2	120	0.7	0.85	1	low	NA		0.02	0.035	0.05	high
use of unloading tools	knocking, lack of motivation, dropping crates	bruising, broken bones	D, F	2	5	0.7	0.85	1	low	NA		0.02	0.035	0.05	high
Pen															
ventilation	ineffective (not in all parts)	increased breathing, body T	D	2	5	0.2				NA		0.001	0.002	0.003	high
ventilation	too low	increased breathing, body T	D, F, Fr	4	120	0.7	0.85	1	low	NA		0.001	0.002	0.003	high
ventilation	too high	cold stress	D, F, Fr	4	120	0.7	0.85	1	low	NA		0.001	0.002	0.003	high
air quality	Temperature (high or low), humidity	aversion	D	3	120	0.2	0.25	0.5	low	NA		0.02	0.025	0.05	high
stocking density in compartment	overcrowding	heating up, low movement	D	2	120	0.2	0.25	0.5	low	NA		0.02	0.025	0.05	high
use of unloading tools	knocking, lack of motivation, dropping crates	bruising, broken bones	D, Fr	2	120	0.7	0.85	1	low	NA		0.001	0.002	0.003	high
light	not blue (< 150 Lux).	insufficient rest	D, F	2	5	0.7	0.85	1	low	NA		0.001	0.002	0.003	high
Passageway															
Race into stunning area															
use of automatic unloading tools	landing on moving top table	bruising, broken bones, luxations	D, F, Fr	2	5	0.7	0.85	1	low	NA		0.01	0.02	0.03	high
light	not blue	insufficient rest	D, F, Fr	2	5	0.7	0.85	1	low	NA		0.01	0.02	0.03	high
Escaped or missed birds	Necessity to catch birds, accidental injury	bruising, broken bones, luxations	D, F, Fr	2	5	0.7	0.85	1	low	NA		0.01	0.02	0.03	high
Restraint															
a) Dimension and design	width, length, height	bruising, broken bones, luxations	P, D, F, Fr	2	2	0.7	0.85	1	low	NA		0.01	0.1	0.15	high
h) Operator	hidden up by speed	bruising, broken bones, luxations	P, D, F, Fr	3	2	0.7	0.85	1	low	NA		0.2	0.25	0.5	high
	untrained handlers, lack of motivation	bruising, broken bones, luxations	P, D, F, Fr	3	2	0.7	0.85	1	low	NA		0.2	0.25	0.5	high
	Short interval, heads recoiled, flapping, struggling birds	bruising, broken bones, luxations	P, D, F, Fr	3	2	0.7	0.85	1	low	NA		0.2	0.25	0.5	high
Shackling to stunning interval															
Electrical waterbath															
Stunning for slaughter/killing															
a) Operator	Untrained, uncertified, careless	perception of physical injury, reflex activity, recovery	P, D, F, Fr	3	5	0.1	0.15	0.2	medium	NA		0.2	0.25	0.5	Medium
b) Manual equipment	Poorly maintained, unsuitable for species, breed and size, malfunctioning	perception of physical injury, reflex activity, recovery	P, D, F, Fr	3	5	0.1	0.15	0.2	medium	NA		0.2	0.25	0.5	Medium
c) Automatic equipment	Poorly maintained, unsuitable for species, breed and size, malfunctioning	perception of physical injury, reflex activity, recovery	P, D, F, Fr	3	5	0.1	0.15	0.2	medium	NA		0.02	0.025	0.05	Medium
d) Electrical parameters	Incorrect voltage (<100 V), amperage (< 100 A with <400 Hz and <400 with 400 to 1500 Hz), waveform (DC <150V), frequency (> 1500 HZ)	perception of physical injury, reflex activity, recovery	P, D, F, Fr	3		5	0.1	0.15	0.2	medium		0.8	0.9	1	low
e) Stunning application	Incorrect target and area, faulty settings	perception of physical injury, reflex activity, recovery	P, D, F, Fr	3		5	0.1	0.15	0.2	medium		0.5	0.75	1	low
f) Shackling and hoisting	Delay before exsanguination (> 20 s), recovery	Recovery	P, D, F, Fr	3		5	0.1	0.15	0.2	medium		0.2	0.25	0.5	Medium
g) Exsanguination	Incorrect sticking (one side), delayed bleed out, recovery	Recovery	P, D, F, Fr	4		5	0.1	0.15	0.2	medium		0.01	0.1	0.15	Medium
Gasstunning															
Transfer from crates	Birds landing on each other, overcrowding,	skin lesions	P, D, F, Fr	3		5	0.1	0.15	0.2	medium		0.01	0.1	0.15	high
Entry into stunning unit	Leakage of gas	aversion, escaping	P, D, F, Fr	3		5	0.1	0.15	0.2	medium		0.01	0.02	0.03	high
Operator/observer	Untrained, uncertified, careless	muscle cramps, convulsions	P, D, F, Fr	3		5	0.1	0.15	0.2	medium		0.01	0.1	0.15	high
Stunning equipment	Poorly maintained, unsuitable for species, breed and size, malfunctioning gas and display unit	aversion, muscle cramps, convulsions	P, D, F, Fr	3		5	0.1	0.15	0.2	medium		0.01	0.02	0.03	high
c) Gas parameters	Incorrect and inconsistent gas mixtures and concentration (> 10%).	aversion, muscle cramps, convulsions	P, D, F, Fr	3		5	0.1	0.15	0.2	medium		0.01	0.02	0.03	high
e) Stunning application	Faulty settings and operation	aversion, muscle cramps, convulsions	P, D, F, Fr	3		5	0.1	0.15	0.2	medium		0.01	0.1	0.15	high
f) Stunning to sticking interval	Delay before exsanguination, recovery	aversion, muscle cramps, convulsions	P, D, F, Fr	3		5	0.1	0.15	0.2	medium		0.01	0.02	0.03	high
g) Exsanguination	Incomplete neck cut, delayed bleed out, recovery		P, D, F, Fr	4		5	0.1	0.15	0.2	medium		0.01	0.1	0.15	Low

Stunning for emergency killing

Neck dislocation

a) Operator	Untrained, uncertified, careless		P, D, F Fr	4	5	0.1	0.15	0.2	medium	NA	0.01	0.02	0.03	high
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Electrical stunning

a) Operator	Untrained, uncertified, careless	perception of physical injury, reflex activity, recovery	P, D, F Fr	4	5	0.1	0.15	0.2	medium	NA	0.01	0.02	0.03	high
b) Equipment	Poorly maintained, unsuitable for species, breed and size, malfunctioning	perception of physical injury, reflex activity, recovery	P, D, F Fr	4	5	0.1	0.15	0.2	medium	NA	0.01	0.02	0.03	high
d) Electrical parameters	Incorrect voltage, amperage, waveform, frequency, duration	perception of physical injury, reflex activity, recovery	P, D, F Fr	4	5	0.1	0.15	0.2	medium	NA	0.01	0.02	0.03	high
e) Stunning application	Incorrect target and area, faulty settings	perception of physical injury, reflex activity, recovery	P, D, F Fr	4	5	0.1	0.15	0.2	medium	NA	0.01	0.02	0.03	high
e) Killing method	Delay before death, recovery	Recovery	P, D, F Fr	4	5	0.1	0.15	0.2	medium	NA	0.01	0.02	0.03	Medium

Lethal injection

a) Operator	Untrained, unlicensed, careless	distress due to disorientation and ataxia, and possibly neuromuscular paralysis with consciousness	P, D, F Fr	4	5	0.1	0.15	0.2	medium	NA	0.01	0.02	0.03	high
b) Drug/agent	Wrong choice, dose	distress due to disorientation and ataxia, and possibly neuromuscular paralysis with consciousness	P, D, F Fr	4	5	0.1	0.15	0.2	medium	NA	0.01	0.02	0.03	high
c) Injection method	Wrong injection site, missed target, extravascular injection	distress due to disorientation and ataxia, and possibly neuromuscular paralysis with consciousness	P, D, F Fr	4	5	0.1	0.15	0.2	medium	NA	0.01	0.02	0.03	high

Killing for disease control

a) Operator	Untrained, uncertified, careless	<u>prolonged agony (ischemia > 25 s)</u>	P, D, F Fr	4	5	0.1	0.15	0.2	medium	NA	0.2	0.25	0.5	high
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Electrical stunning

a) Operator	Untrained, uncertified, careless	perception of physical injury, reflex activity, recovery	P, D, F Fr	4	5	0.1	0.15	0.2	medium	NA	0.2	0.25	0.5	high
b) Equipment	Poorly maintained, unsuitable for species, breed and size, malfunctioning	perception of physical injury, reflex activity, recovery	P, D, F Fr	4	5	0.1	0.15	0.2	medium	NA	0.02	0.025	0.05	Medium
d) Electrical parameters	Incorrect voltage, amperage, waveform, frequency, duration	perception of physical injury, reflex activity, recovery	P, D, F Fr	4	5	0.1	0.15	0.2	medium	NA	0.8	0.9	1	Medium
e) Stunning application	Incorrect target and area, faulty settings	perception of physical injury, reflex activity, recovery	P, D, F Fr	4	5	0.1	0.15	0.2	medium	NA	0.8	0.9	1	low
g) Killing method	Delay before death, recovery	Recovery	P, D, F Fr	4	5	0.1	0.15	0.2	medium	NA	0.8	0.9	1	Medium

Lethal injection

a) Operator	Untrained, unlicensed, careless	distress due to disorientation and ataxia, and possibly neuromuscular paralysis with consciousness	P, D, F Fr	4	5	0.1	0.15	0.2	medium	NA	0.01	0.1	0.15	high
b) Drug/agent	Wrong choice, dose	distress due to disorientation and ataxia, and possibly neuromuscular paralysis with consciousness	P, D, F Fr	4	5	0.1	0.15	0.2	medium	NA	0.01	0.1	0.15	high
c) Injection method	Wrong injection site, missed target, extravascular injection	distress due to disorientation and ataxia, and possibly neuromuscular paralysis with consciousness	P, D, F Fr	4	5	0.1	0.15	0.2	medium	NA	0.01	0.1	0.15	high

Gas stunning CO2 combinations

a) Operator/observer	Untrained, uncertified, careless	aversion, escaping	P, D, F Fr	4	5	0.1	0.15	0.2	medium	NA	0.01	0.02	0.03	high
b) Stunning equipment	Poorly maintained, unsuitable for species, breed and size, malfunctioning gas and display unit	aversion, muscle cramps, convulsions	P, D, F Fr	4	5	0.1	0.15	0.2	medium	NA	0.01	0.1	0.15	high
c) Gas parameters	Incorrect and inconsistent gas mixtures and concentration,	aversion, muscle cramps, convulsions	P, D, F Fr	4	5	0.1	0.15	0.2	medium	NA	0.01	0.1	0.15	high
e) Stunning application	Faulty settings and operation, insufficient gas concentration at floor level	aversion, muscle cramps, convulsions	P, D, F Fr	4	5	0.1	0.15	0.2	medium	NA	0.01	0.1	0.15	high

Gas stunning N combinations

a) Operator/observer	Untrained, uncertified, careless	escaping	D, F, Fr	3	5	0.1	0.15	0.2	medium	NA	0.01	0.1	0.15	high
b) Stunning equipment	Poorly maintained, unsuitable for species, breed and size, malfunctioning gas and display unit	muscle cramps, convulsions	D, F, Fr	3	5	0.1	0.15	0.2	medium	NA	0.01	0.02	0.03	high
c) Gas parameters	Incorrect and inconsistent gas mixtures and concentration,	muscle cramps, convulsions	D, F, Fr	3	5	0.1	0.15	0.2	medium	NA	0.01	0.1	0.15	high
e) Stunning application	Faulty settings and operation, insufficient gas concentration at floor level	muscle cramps, convulsions	D, F, Fr	3	5	0.1	0.15	0.2	medium	NA	0.01	0.1	0.15	high

SPECIES:BULLS															
Hazard identified	Hazard characterization										Exposure assessment				
	Hazard description	Adverse effect description	Adverse effect type	Magnitude		Quantitative assessment of likelihood			Qualitative assessment of the uncertainty	Duration (minutes)	Intensity	Quantitative assessment of P. of Exposure			Qualitative assessment of the uncertainty
				Severity	Duration (minutes)	min	ml	max				min	ml	max	
Unloading bay to lairage															
a) Driveway design	Curvature (<120°)	balking, aggression, bruising, wounds,fractures, crowding	P, D, F, Fr	2	240	0.7	0.85	1	low	NA		0.7	0.85	1	low
	width, single file	balking, aggression, bruising, wounds,fractures, crowding	P, D, F, Fr	2	240	0.7	0.85	1	low	NA		0.7	0.85	1	low
	width, multiple file	balking, aggression, bruising, wounds,fractures, crowding	P, D, F, Fr	2	240	0.7	0.85	1	low	NA		0.7	0.85	1	low
	sharp protrusions and dead ends	balking, aggression, bruising, wounds,fractures, crowding	P, D, F, Fr	2	240	0.7	0.85	1	low	NA		0.7	0.85	1	low
b) Structure of driveway sides	sharp objects, partially open sides, short sides	balking, aggression, bruising, wounds,	P, D, F, Fr	2	240	0.7	0.85	1	low	NA		0.7	0.85	1	low
c) Floor surface and condition	slipperiness, gaps, potholes, steps, too rough,	balking, aggression, bruising, wounds, crowding	P, D, F, Fr	2	240	0.7	0.85	1	low	NA		0.7	0.85	1	low
d) Slope of the floor	too steep, up/down,	balking, aggression, bruising, wounds,fractures, crowding	P, D, F, Fr	2	240	0.7	0.85	1	low	NA		0.7	0.85	1	low
e) Gates	design (vertical or horizontal opening, opening size)	balking, aggression, bruising, wounds,fractures, crowding	P, D, F, Fr	2	240	0.7	0.85	1	low	NA		0.7	0.85	1	low
f) Sensory input (Sound Smell Light)	Glaring objects, noise from gates, light intensity, sudden change of light, hissing noise	balking, aggression, bruising, wounds,fractures, crowding	D, F	2	240	0.7	0.85	1	low	NA		0.7	0.85	1	low
g) Air quality	Noxious gasses (3 ml/L CO2; 0.02 ml/L NH3), draught, temperature (not > 30° C), humidity	balking, aggression, bruising, wounds,fractures, crowding	D, F	2	240	0.7	0.85	1	low	NA		0.7	0.85	1	low
h) Handlers	Hitting	balking, aggression, bruising, wounds,fractures, crowding	P, D, F, Fr	2	240	0.5	0.6	0.8	low	NA		0.5	0.65	0.8	low
	Shouting	balking, aggression, bruising, wounds,fractures, crowding	D, F	2	240	0.5	0.6	0.8	low	NA		0.5	0.65	0.8	low
	untrained handlers, lack of motivation	balking, aggression, bruising, wounds,fractures, crowding	P, D, F, Fr	2	240	0.5	0.6	0.8	low	NA		0.5	0.65	0.8	low
i) Use of driving tools	use of prods, electric goads, sticks	balking, aggression, bruising, wounds,fractures, crowding	P, D, F, Fr	2	240	0.5	0.6	0.8	low	NA		0.5	0.65	0.8	low
j) Animal troughput	high speed	balking, aggression, bruising, wounds,fractures, crowding	P, D, F, Fr	1	240	0.2	0.3	0.5	low	NA		0.2	0.35	0.5	low
Pen															
a) Height and dimensions	Appropriate for animal size	balking, aggression, bruising, wounds,fractures, crowding	P, D,	2	230	0.2	0.3	0.5	low	NA		0.2	0.35	0.5	low
b) Structure of pen	solid sides,partially open sides, short side, sharp objects,	balking, aggression, bruising, wounds,fractures, crowding	P, D,	2	230	0.2	0.3	0.5	low	NA		0.2	0.35	0.5	low
c) Floor surface and condition	Slipperiness, gaps, potholes, steps, too rough, Available, unavailable, wet, dirty, faecal contamination	balking, aggression, bruising, wounds,fractures, crowding	P, D,	2	230	0.2	0.3	0.5	low	NA		0.2	0.35	0.5	low
d) Bedding	Design (vertical or horizontal opening, opening size)	balking, aggression, bruising, wounds,fractures, crowding	P, D,	2	230	0.2	0.3	0.5	low	NA		0.2	0.35	0.5	low
e) Gates	Design (vertical or horizontal opening, opening size), gate handle type	balking, aggression, bruising, wounds,fractures, crowding	P, D,	2	230	0.2	0.3	0.5	low	NA		0.2	0.35	0.5	low
f) Sensory input	Smell,glaring objects, light intensity, sudden change of light, overall noise	balking, aggression, bruising, wounds,fractures, crowding	P, D	2	230	0.2	0.3	0.5	low	NA		0.2	0.35	0.5	low
g) Air quality	Noxious gasses, weather conditions, ventilation, temperature (high or low), humidity	balking, aggression, bruising, wounds,fractures, crowding	P, D	2	230	0.2	0.3	0.5	low	NA		0.2	0.35	0.5	low
h) Handlers	Hitting,	balking, aggression, bruising, wounds,fractures, crowding	P, D,	2	230	0.2	0.3	0.5	low	NA		0.2	0.35	0.5	low
	shouting,	balking, aggression, bruising, wounds,fractures, crowding	P, D	2	230	0.2	0.3	0.5	low	NA		0.2	0.35	0.5	low
	untrained handlers, lack of motivation	balking, aggression, bruising, wounds,fractures, crowding	P, D,	2	230	0.2	0.3	0.5	low	NA		0.2	0.35	0.5	low
i) Use of driving tools	Use of prods, electric goads, sticks, rattles, soft brushes, automatic gates and transfer	balking, aggression, bruising, wounds,fractures, crowding	P, D,	2	230	0.2	0.3	0.5	low	NA		0.2	0.35	0.5	low
j) Stocking density	Overcrowding (Standard 500 to 600 kg/m2)	balking, aggression, bruising, wounds,fractures, crowding	P, D,	2	230	0.2	0.3	0.5	low	NA		0.2	0.35	0.5	low
k) Mixing	Aggression, fighting, mounting behaviour	balking, aggression, bruising, wounds,fractures, crowding	P, D,	2	230	0.2	0.3	0.5	low	NA		0.2	0.35	0.5	low
l)Drinker availability	No drinkers available	balking, aggression, bruising, wounds,fractures, crowding	D, F	2	230	0.2	0.3	0.5	low	NA		0.2	0.35	0.5	low
m) Food availability	No food available	balking, aggression, bruising, wounds,fractures, crowding	D, F	2	230	0.2	0.3	0.5	low	NA		0.2	0.35	0.5	low

Passageway

a) Dimension and design of driveway	Curvature, Sharp angles, width	balking, aggression, bruising, wounds,fractures, crowding	P, D,	2	5	0.7	0.85	1	low	NA	0.7	0.85	1	low
b) Structure of driveway sides	Sharp objects, partially open sides, short sides	balking, aggression, bruising, wounds,fractures, crowding	P, D,	2	5	0.7	0.85	1	low	NA	0.7	0.85	1	low
c) Floor surface and condition	Slipperiness, gaps, potholes, steps, too rough,	balking, aggression, bruising, wounds,fractures, crowding	P, D,	2	5	0.7	0.85	1	low	NA	0.7	0.85	1	low
d) Angle and design of floor	Foot steep, up/down, steps	balking, aggression, bruising, wounds,fractures, crowding	P, D,	2	5	0.7	0.85	1	low	NA	0.7	0.85	1	low
e) Gates	Design (vertical or horizontal opening, opening size)	balking, aggression, bruising, wounds,fractures, crowding	P, D,	2	5	0.7	0.85	1	low	NA	0.7	0.85	1	low
f) Sensory input (Sound Smell Light)	Glaring objects, noise from gates, light intensity, sudden change of light, hissing noise	balking, aggression, bruising, wounds,fractures, crowding	D, F,	2	5	0.7	0.85	1	low	NA	0.7	0.85	1	low
g) Air quality	Noxious gasses, draught, temperature (high or low), humidity	balking, aggression, bruising, wounds,fractures, crowding	D, F,	2	5	0.7	0.85	1	low	NA	0.7	0.85	1	low
h) Handlers	Hitting	balking, aggression, bruising, wounds,fractures, crowding	P, D,	2	10	0.5	0.6	0.8	low	NA	0.5	0.65	0.8	low
	Shouting	balking, aggression, bruising, wounds,fractures, crowding	D, F,	2	10	0.5	0.6	0.8	low	NA	0.5	0.65	0.8	low
	untrained handlers, lack of motivation	balking, aggression, bruising, wounds,fractures, crowding	P, D,	2	10	0.5	0.6	0.8	low	NA	0.5	0.65	0.8	low
k) Driving system	Uncontrolled system if automatic,inadequate handling if manual	balking, aggression, bruising, wounds,fractures, crowding	P, D,	2	10	0.5	0.6	0.8	low	NA	0.5	0.65	0.8	low
l) Non return gates	Faulty operating gates	balking, aggression, bruising, wounds,fractures, crowding	D, F,	1	5	0.1	0.2	0.5	low	NA	0.1	0.3	0.5	low
m) Moving into single file	Funnelling and jamming, balking	balking, aggression, bruising, wounds,fractures, crowding	P, D,	1	5	0.1	0.2	0.5	low	NA	0.1	0.3	0.5	low
n) Continuity of race	Dead ends	balking, aggression, bruising, wounds,fractures, crowding	P, D, F	1	5	0.1	0.2	0.5	low	NA	0.1	0.3	0.5	low

Race into stunning area

a) Dimension of driveway	Curvature, dead end, Sharp angles, width	balking, aggression, bruising, wounds,fractures, crowding	P, D,	2	5	0.5	0.6	0.8	low	NA	0.5	0.65	0.8	low
b) Structure of driveway sides	sharp objects, partially open sides, short sides	balking, aggression, bruising, wounds,fractures, crowding	P, D,	2	5	0.5	0.6	0.8	low	NA	0.5	0.65	0.8	low
c) Floor surface and condition	Slipperiness, gaps, potholes, steps, too rough,	balking, aggression, bruising, wounds,fractures, crowding	P, D,	2	5	0.5	0.6	0.8	low	NA	0.5	0.65	0.8	low
d) Slope of the floor	too steep, up/down,	balking, aggression, bruising, wounds,fractures, crowding	P, D,	2	5	0.5	0.6	0.8	low	NA	0.5	0.65	0.8	low
e) Gates	design (vertical or horizontal opening, opening size)	balking, aggression, bruising, wounds,fractures, crowding	P, D,	2	5	0.5	0.6	0.8	low	NA	0.5	0.65	0.8	low
f) Sensory input (Sound Smell Light)	Glaring objects, noise from gates, light intensity, sudden change of light, hissing noise	balking, aggression, bruising, wounds,fractures, crowding	D, F,	3	5	0.7	0.85	1	low	NA	0.7	0.85	1	low
h) Handlers	Hitting	balking, aggression, bruising, wounds,fractures, crowding	P, D, F,	3	10	0.5	0.6	0.8	low	NA	0.5	0.65	0.8	low
	Shouting	balking, aggression, bruising, wounds,fractures, crowding	D, F,	3	10	0.5	0.6	0.8	low	NA	0.5	0.65	0.8	low
	untrained handlers, lack of motivation	balking, aggression, bruising, wounds,fractures, crowding	P, D, F, Fr	3	10	0.5	0.6	0.8	low	NA	0.5	0.65	0.8	low
i) Use of driving tools	use of prods, electric goads, sticks	balking, aggression, bruising, wounds,fractures, crowding	P, D, F, Fr	3	10	0.5	0.6	0.8	low	NA	0.5	0.65	0.8	low
j) Animal troughput	high speed	balking, aggression, bruising, wounds,fractures, crowding	P, D, F, Fr	3	10	0.5	0.6	0.8	low	NA	0.5	0.65	0.8	low

Restraint

a) Dimension and design	Sharp objects, width, length, height	balking, aggression, bruising, wounds,fractures	P, D, F, Fr	2	5	0.5	0.6	0.8	low	NA	0.5	0.65	0.8	low
b) Floor type and design	Slippery, obstacles, too rough, Improper design head restrainer, belly plate,	balking, aggression, bruising, wounds,fractures	P, D, F, Fr	2	5	0.5	0.6	0.8	low	NA	0.5	0.65	0.8	low
c) Restraining devices	rump push	balking, aggression, bruising, wounds,fractures	P, D, F, Fr											
d) Sensory input	Light intensity, overhead lighting, noise	balking, aggression, bruising, wounds,fractures	D, F,	3	5	0.7	0.85	1	low	NA	0.7	0.85	1	low
h) Operator	Hitting	balking, aggression, bruising, wounds,fractures	P, D, F, Fr	3	5	0.1	0.2	0.5	low	NA	0.1	0.3	0.5	low
	Shouting	balking, aggression, bruising, wounds,fractures	D, F,	3	5	0.1	0.2	0.5	low	NA	0.1	0.3	0.5	low
	untrained handlers, lack of motivation	balking, aggression, bruising, wounds,fractures	P, D, F, Fr	3	5	0.1	0.2	0.5	low	NA	0.1	0.3	0.5	low

Stunning for slaughter/killing

Captive bolt stunning

a) Operator	Untrained, uncertified, careless	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	NA	0.2	0.35	0.5	medium
b) Gun	Wrong model, poorly maintained Incorrect strength (< highest available), grain size	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	NA	0.2	0.35	0.5	medium
c) Cartridge	Inaccurate target (not directed to brain center)	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	NA	0.2	0.35	0.5	medium
d) Shooting position	Inaccurate target area and angle	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	NA	0.2	0.35	0.5	medium
e) Air pressure	Insufficiently low	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	NA	0.2	0.35	0.5	medium
f) Shackling and hoisting	Delay before exsanguination	Recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	NA	0.2	0.35	0.5	medium
g) Exsanguination	Incorrect sticking, delayed bleed out	Recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	NA	0.2	0.35	0.5	medium

Electrical stunning

a) Operator	Untrained, uncertified, careless	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	NA	0.2	0.35	0.5	medium
b) Manual equipment	Poorly maintained, unsuitable for species, breed and size, malfunctioning	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	NA	0.2	0.35	0.5	medium
c) Automatic equipment	Poorly maintained, unsuitable for species, breed and size, malfunctioning	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	NA	0.001	0.0015	0.02	medium
d) Electrical parameters	Incorrect voltage, amperage (1 A), waveform (sinus), frequency (< 1500 Hz), duration (> 1 s)	perception of physical injury, reflex activity, recovery	P, D, F, Fr	3	5	0.1	0.15	0.2	medium	5	0.8	0.9	1	low
e) Stunning application	Incorrect voltage, amperage (1 A), waveform (sinus), frequency (< 1500 Hz), duration (> 1 s)	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	5	0.5	0.75	1	low
f) Shackling and hoisting	Delay before exsanguination	Recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	5	0.2	0.35	0.5	Medium
g) Exsanguination	Incorrect sticking, delayed bleed out	Recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	5	0.01	0.1	0.15	Medium

Stunning for emergency killing

Captive bolt stunning

a) Operator	Untrained, uncertified, careless	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.01	0.02	0.03	high	NA	0.2	0.35	0.5	high
b) Gun	Poorly maintained, unsuitable for species, breed and size, malfunctioning, no back-up stunner	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.01	0.02	0.03	high	NA	0.2	0.35	0.5	high
c) Cartridge	Incorrect strength, grain size	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.01	0.02	0.03	high	NA	0.2	0.35	0.5	high
d) Shooting position	Inaccurate target area and angle	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.01	0.02	0.03	high	NA	0.2	0.35	0.5	high
e) Air pressure	Insufficient	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.01	0.02	0.03	high	NA	0.2	0.35	0.5	high
f) Killing method	Delay before death	Recovery	P, D, F, Fr	4	5	0.01	0.02	0.03	high	NA	0.2	0.35	0.5	high

Free bullet

a) Operator	Untrained, uncertified, careless	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.001	0.0015	0.002	high	NA	0.001	0.0015	0.002	high
b) Gun	Poorly maintained, unsuitable for species, breed and size, malfunctioning, no back-up stunner	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.001	0.0015	0.002	high	NA	0.001	0.0015	0.002	high
c) Cartridge	Incorrect strength, grain size	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.001	0.0015	0.002	high	NA	0.001	0.0015	0.002	high
d) Shooting position	Inaccurate target area and angle	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.001	0.0015	0.002	high	NA	0.001	0.0015	0.002	high

Electrical stunning

a) Operator	Untrained, uncertified, careless	perception of intense muscle contractions, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	5	0.000001	0.000002	0.000003	high
b) Manual equipment	Poorly maintained, unsuitable for species, breed and size, malfunctioning	perception of intense muscle contractions, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	5	0.000001	0.000002	0.000003	high
d) Electrical parameters	Incorrect voltage, amperage, waveform, frequency, duration	perception of intense muscle contractions, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	5	0.000001	0.000002	0.000003	high
e) Stunning application	Incorrect target and area, faulty settings	perception of intense muscle contractions, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	5	0.000001	0.000002	0.000003	high
g) Killing method	Delay before death	perception of intense muscle contractions, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	5	0.000001	0.000002	0.000003	high

Lethal injection

a) Operator	Untrained, unlicensed, careless	disorientation and ataxia	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	5	0.000001	0.000002	0.000003	high
b) Drug/agent	Wrong choice, dose	continual disorientation and ataxia with low doses	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	5	0.000001	0.000002	0.000003	high
c) Injection method	Wrong injection site, missed target, extravascular injection	continual disorientation and ataxia with low doses	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	5	0.000001	0.000002	0.000003	high

Killing for disease control

Captive bolt stunning

a) Operator	Untrained, uncertified, careless	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.01	0.02	0.03	high	NA	0.01	0.02	0.03	high
b) Gun	Poorly maintained, unsuitable for species, breed and size, malfunctioning, no back-up stunner	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.01	0.02	0.03	high	NA	0.01	0.02	0.03	high
c) Cartridge	Incorrect strength, grain size	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.01	0.02	0.03	high	NA	0.01	0.02	0.03	high
d) Shooting position	Inaccurate target area and angle	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.01	0.02	0.03	high	NA	0.01	0.02	0.03	high
e) Air pressure	Insufficient	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.01	0.02	0.03	high	NA	0.01	0.02	0.03	high
f) Killing method	Delay before death, recovery	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.01	0.02	0.03	high	NA	0.01	0.02	0.03	high

Free bullet

a) Operator	Untrained, uncertified, careless	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.001	0.0015	0.002	high	NA	0.001	0.0015	0.002	high
b) Gun	Poorly maintained, unsuitable for species, breed and size, malfunctioning, no back-up stunner	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.001	0.0015	0.002	high	NA	0.001	0.0015	0.002	high
c) Cartridge	Incorrect strength, grain size	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.001	0.0015	0.002	high	NA	0.001	0.0015	0.002	high
d) Shooting position	Inaccurate target area and angle	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.001	0.0015	0.002	high	NA	0.001	0.0015	0.002	high

Electrical stunning

a) Operator	Untrained, uncertified, careless	perception of intense muscle contractions, reflex activity, recovery	P, D, F, Fr	4	5	0.01	0.015	0.2	high	NA	0.000001	0.000002	0.000003	high
b) Manual equipment	Poorly maintained, unsuitable for species, breed and size, malfunctioning	perception of intense muscle contractions, reflex activity, recovery	P, D, F, Fr	4	5	0.01	0.015	0.2	high	NA	0.000001	0.000002	0.000003	high
d) Electrical parameters	Incorrect voltage, amperage, waveform, frequency, duration	perception of intense muscle contractions, reflex activity, recovery	P, D, F, Fr	4	5	0.01	0.015	0.2	high	NA	0.000001	0.000002	0.000003	high
e) Stunning application	Incorrect target and area, faulty settings	perception of intense muscle contractions, reflex activity, recovery	P, D, F, Fr	4	5	0.01	0.015	0.2	high	NA	0.000001	0.000002	0.000003	high
g) Killing method	Delay before death, recovery	perception of intense muscle contractions, reflex activity, recovery	P, D, F, Fr	4	5	0.01	0.015	0.2	high	NA	0.000001	0.000002	0.000003	high

Lethal injection

a) Operator	Untrained, unlicensed, careless	disorientation and ataxia	P, D, F, Fr	4	5	0.01	0.015	0.2	high	NA	0.000001	0.000002	0.000003	high
b) Drug/agent	Wrong choice, dose	continual disorientation and ataxia with low doses	P, D, F, Fr	4	5	0.01	0.015	0.2	high	NA	0.000001	0.000002	0.000003	high
c) Injection method	Wrong injection site, missed target, extravascular injection	continual disorientation and ataxia with low doses	P, D, F, Fr	4	5	0.01	0.015	0.2	high	NA	0.000001	0.000002	0.000003	high

SPECIES: PIGS														
Hazard identified	Hazard characterization							Exposure assessment						
	Hazard description	Adverse effect description	Adverse effect type	Magnitude		Quantitative assessment of likelihood			Qualitative assessment of the uncertainty	Duration (minutes)	Quantitative assessment of P of Exposure			Qualitative assessment of the uncertainty
				Severity	Duration (minutes)	min	int	max			Intensity	min	int	
Unloading bay to lairage														
a) Dimension of driveway	Curvature, dead end, Sharp angles, width	increased breathing and body T, bruising, wounding	P, D, F, Fr	3	5	0.7	0.85	1	low	NA	0.7	0.85	1	low
b) Structure of driveway sides	sharp objects, partially open sides, short sides	increased breathing and body T, bruising, wounding	P, D, F, Fr	3	5	0.7	0.85	1	low	NA	0.7	0.85	1	low
c) Floor surface and condition	slipperiness, gaps, potholes, steps, too rough,	increased breathing and body T, bruising, wounding	P, D, F, Fr	3	5	0.7	0.85	1	low	NA	0.7	0.85	1	low
d) Slope of the floor	too steep, up/down,	increased breathing and body T, bruising, wounding	P, D, F, Fr	3	5	0.7	0.85	1	low	NA	0.7	0.85	1	low
e) Gates	design (vertical or horizontal opening, opening size)	increased breathing and body T, bruising, wounding	P, D, F, Fr	3	5	0.7	0.85	1	low	NA	0.7	0.85	1	low
f) Sensory input (Sound Smell Light)	Glaring and distracting objects, noise from gates, light intensity, sudden change of light, hissing noise	increased breathing and body T, bruising, wounding	P, D, F, Fr	3	5	0.7	0.85	1	low	NA	0.7	0.85	1	low
g) Air quality	Noxious gasses, draught, temperature (high or low), humidity	increased breathing and body T, bruising, wounding	D, F	3	5	0.7	0.85	1	low	NA	0.7	0.85	1	low
h) Handlers	Hitting, shouting, untrained handlers, lack of motivation	increased breathing and body T, bruising, wounding	P, D, F	4	10	0.5	0.6	0.8	low	NA	0.5	0.6	0.8	low
i) Use of driving tools	use of prods, electric goads, sticks	increased breathing and body T, bruising, wounding	D, F	4	10	0.5	0.6	0.8	low	NA	0.5	0.6	0.8	low
j) Animal troughput	high speed	increased breathing and body T, bruising, wounding	P, D, F	3	10	0.5	0.6	0.8	low	NA	0.5	0.6	0.8	low
i) Use of driving tools	use of prods, electric goads, sticks	increased breathing and body T, bruising, wounding	P, D, F	4	10	0.5	0.6	0.8	low	NA	0.5	0.6	0.8	low
j) Animal troughput	high speed	increased breathing and body T, bruising, wounding	P, D, F	2	10	0.2	0.3	0.5	low	NA	0.2	0.3	0.5	low
Pen														
a) Height and dimensions	Appropriate for animal size	increased breathing and body T, bruising, wounding	P, D	3	120	0.2	0.3	0.5	low	NA	0.2	0.3	0.5	low
b) Structure of pen	Solid sides, partially open sides, short side, sharp objects,	increased breathing and body T, bruising, wounding	P, D	3	120	0.2	0.3	0.5	low	NA	0.2	0.3	0.5	low
c) Floor surface and condition	Slipperiness, gaps, potholes, steps, too rough, distracting objects	increased breathing and body T, bruising, wounding	P, D	3	120	0.2	0.3	0.5	low	NA	0.2	0.3	0.5	low
d) Bedding	Available, unavailable, wet, dirty, faecal contamination	increased breathing and body T, bruising, wounding	P, D	3	120	0.2	0.3	0.5	low	NA	0.2	0.3	0.5	low
e) Gates	Design (vertical or horizontal opening, opening size), gate handle type	increased breathing and body T, bruising, wounding	P, D	3	120	0.2	0.3	0.5	low	NA	0.2	0.3	0.5	low
f) Sensory input	Smell, glaring and distracting objects, light intensity, sudden change of light, overall noise	increased breathing and body T, bruising, wounding	P, D	3	120	0.2	0.3	0.5	low	NA	0.2	0.3	0.5	low
g) Air quality	Noxious gasses, weather conditions, ventilation, temperature (high or low), humidity	increased breathing and body T, bruising, wounding	P, D	3	120	0.2	0.3	0.5	low	NA	0.2	0.3	0.5	low
h) Handlers	Hitting, shouting, untrained handlers, lack of motivation	increased breathing and body T, bruising, wounding	P, D	3	120	0.2	0.3	0.5	low	NA	0.2	0.3	0.5	low
i) Use of driving tools	Use of prods, electric goads, sticks, rattles, soft brushes, automatic gates and transfer	increased breathing and body T, bruising, wounding	P, D	3	120	0.2	0.3	0.5	low	NA	0.2	0.3	0.5	low
j) Stocking density	Overcrowding	increased breathing and body T, bruising, wounding	P, D	3	120	0.2	0.3	0.5	low	NA	0.2	0.3	0.5	low
k) Mixing	Aggression, fighting, mounting behaviour	increased breathing and body T, bruising, wounding	P, D	3	120	0.2	0.3	0.5	low	NA	0.2	0.3	0.5	low
l) Drinker availability	No drinkers available	increased breathing and body T, bruising, wounding	P, D	3	120	0.2	0.3	0.5	low	NA	0.2	0.3	0.5	low
m) Food availability	No food available	increased breathing and body T, bruising, wounding	P, D	3	120	0.2	0.3	0.5	low	NA	0.2	0.3	0.5	low
Passageway														
a) Dimension and design of driveway	Curvature, Sharp angles, width	increased breathing and body T, bruising, wounding	P, D, F, Fr	3	5	0.7	0.85	1	low	NA	0.7	0.85	1	low
b) Structure of driveway sides	Sharp objects, partially open sides, short sides	increased breathing and body T, bruising, wounding	P, D, F, Fr	3	5	0.7	0.85	1	low	NA	0.7	0.85	1	low
c) Floor surface and condition	Slipperiness, gaps, potholes, steps, too rough,	increased breathing and body T, bruising, wounding	P, D, F, Fr	3	5	0.7	0.85	1	low	NA	0.7	0.85	1	low
d) Angle and design of floor	Too steep, up/down, steps	increased breathing and body T, bruising, wounding	P, D, F, Fr	3	5	0.7	0.85	1	low	NA	0.7	0.85	1	low
e) Gates	Design (vertical or horizontal opening, opening size)	increased breathing and body T, bruising, wounding	P, D, F, Fr	3	5	0.7	0.85	1	low	NA	0.7	0.85	1	low
f) Sensory input (Sound Smell Light)	Glaring objects, noise from gates, light intensity, sudden change of light, hissing noise	increased breathing and body T, bruising, wounding	D, F	3	5	0.7	0.85	1	low	NA	0.7	0.85	1	low
g) Air quality	Noxious gasses, draught, temperature (high or low), humidity	increased breathing and body T, bruising, wounding	D, F	3	5	0.7	0.85	1	low	NA	0.7	0.85	1	low
h) Handlers	Hitting	increased breathing and body T, bruising, wounding	P, D, F	3	10	0.5	0.6	0.8	low	NA	0.5	0.6	0.8	low
	Shouting	increased breathing and body T, bruising, wounding	D, F	3	10	0.5	0.6	0.8	low	NA	0.5	0.6	0.8	low
	untrained handlers, lack of motivation	increased breathing and body T, bruising, wounding	P, D, F	3	10	0.5	0.6	0.8	low	NA	0.5	0.6	0.8	low
k) Driving system	Uncontrolled system if automatic, inadequate handling if manual	increased breathing and body T, bruising, wounding	P, D, F	3	10	0.5	0.6	0.8	low	NA	0.5	0.6	0.8	low
l) Non return gates	Faulty operating gates	increased breathing and body T, bruising, wounding	D, F	3	5	0.1	0.2	0.5	low	NA	0.1	0.2	0.5	low
m) Moving into single file	Funnelling and jamming, balking	increased breathing and body T, bruising, wounding	P, D, F	3	5	0.1	0.2	0.5	low	NA	0.1	0.2	0.5	low
n) Continuity of race	Dead ends	increased breathing and body T, bruising, wounding	P, D, F	3	5	0.1	0.2	0.5	low	NA	0.1	0.2	0.5	low

		Stunning for emergency killing																		
Captive bolt stunning																				
a) Operator	Untrained, uncertified, careless	perception of physical injury, reflex activity, recovery	P, D, F, Fr																	
b) Gun	Poorly maintained, unsuitable for species, breed and size, malfunctioning, no back-up stunner	perception of physical injury, reflex activity, recovery	P, D, F, Fr																	
c) Cartridge	Incorrect strength, grain size	perception of physical injury, reflex activity, recovery	P, D, F, Fr																	
d) Shooting position	Inaccurate target area and angle	perception of physical injury, reflex activity, recovery	P, D, F, Fr																	
e) Air pressure	Insufficient	perception of physical injury, reflex activity, recovery	P, D, F, Fr																	
f) Killing method	Delay before death	Recovery	P, D, F, Fr																	
Electrical stunning																				
a) Operator	Untrained, uncertified, careless	perception of intense muscle contractions, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	NA		0.2	0.25	0.2	medium					
b) Manual equipment	Poorly maintained, unsuitable for species, breed and size, malfunctioning	perception of intense muscle contractions, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	NA		0.2	0.25	0.2	medium					
c) Automatic equipment	Incorrect voltage, amperage, waveform, frequency, duration	perception of intense muscle contractions, reflex activity, recovery	P, D, F, Fr	4	5	0.01	0.015	0.02	medium	NA		0.1	0.15	0.2	medium					
d) Electrical parameters	Incorrect target and area, faulty settings	perception of intense muscle contractions, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	NA		0.2	0.25	0.2	medium					
e) Stunning application	Delay before death	perception of intense muscle contractions, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	NA		0.2	0.25	0.2	medium					
g) Killing method	Delay before death	Recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	NA		0.2	0.25	0.2	medium					
		Killing for disease control																		
Captive bolt stunning																				
a) Operator	Untrained, uncertified, careless	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.5	high	NA		0.01	0.025	0.02	medium					
b) Gun	Poorly maintained, unsuitable for species, breed and size, malfunctioning, no back-up stunner	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.01	0.02	0.03	high	NA		0.01	0.02	0.03	high					
c) Cartridge	Incorrect strength, grain size	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.01	0.02	0.03	high	NA		0.01	0.02	0.03	high					
d) Shooting position	Inaccurate target area and angle	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.01	0.02	0.03	high	NA		0.01	0.02	0.03	high					
e) Air pressure	Insufficient	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.01	0.02	0.03	high	NA		0.01	0.02	0.03	high					
f) Killing method	Delay before death	Recovery	P, D, F, Fr	4	5	0.01	0.02	0.03	high	NA		0.01	0.02	0.03	high					
Electrical stunning																				
a) Operator	Untrained, uncertified, careless	perception of intense muscle contractions, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	NA		0.2	0.25	0.2	medium					
piglets >25 kg																				
b) Manual equipment	Poorly maintained, unsuitable for species, breed and size, malfunctioning	perception of intense muscle contractions, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	NA		0.2	0.25	0.2	medium					
c) Mobile equipment	Incorrect voltage, amperage, waveform, frequency, duration	perception of intense muscle contractions, reflex activity, recovery	P, D, F, Fr	4	5	0.01	0.015	0.02	medium	NA		0.1	0.15	0.2	medium					
d) Electrical parameters	Incorrect target and area, faulty settings	perception of intense muscle contractions, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	NA		0.2	0.25	0.2	medium					
e) Stunning application	Delay before death	perception of intense muscle contractions, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	NA		0.2	0.25	0.2	medium					
g) Killing method	Delay before death	Recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	NA		0.2	0.25	0.2	medium					
slaughter pigs																				
b) Manual equipment	Poorly maintained, unsuitable for species, breed and size, malfunctioning	perception of intense muscle contractions, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	NA		0.2	0.25	0.2	medium					
c) Mobile equipment	Incorrect voltage, amperage, waveform, frequency, duration	perception of intense muscle contractions, reflex activity, recovery	P, D, F, Fr	4	5	0.01	0.015	0.02	medium	NA		0.1	0.15	0.2	medium					
d) Electrical parameters	Incorrect target and area, faulty settings	perception of intense muscle contractions, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	NA		0.2	0.25	0.2	medium					
e) Stunning application	Delay before death	perception of intense muscle contractions, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	NA		0.2	0.25	0.2	medium					
g) Killing method	Delay before death	Recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	NA		0.2	0.25	0.2	medium					
sows and boars																				
b) Manual equipment	Poorly maintained, unsuitable for species, breed and size, malfunctioning	perception of intense muscle contractions, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	NA		0.2	0.25	0.2	medium					
c) Mobile equipment	Incorrect voltage, amperage, waveform, frequency, duration	perception of intense muscle contractions, reflex activity, recovery	P, D, F, Fr	4	5	0.01	0.015	0.02	medium	NA		0.1	0.15	0.2	medium					
d) Electrical parameters	Incorrect target and area, faulty settings	perception of intense muscle contractions, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	NA		0.2	0.25	0.2	medium					
e) Stunning application	Delay before death	perception of intense muscle contractions, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	NA		0.2	0.25	0.2	medium					
g) Killing method	Delay before death	Recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	NA		0.2	0.25	0.2	medium					
Lethal injection																				
a) Operator	Untrained, unlicensed, careless	disorientation and ataxia	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	5		1E-06	2E-06	3E-06	high					
b) Drug/agent	Wrong choice, dose	continual disorientation and ataxia with low doses	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	5		1E-06	2E-06	3E-06	high					
c) Injection method	Wrong injection site, missed target, extravascular injection	continual disorientation and ataxia with low doses	P, D, F, Fr	4	5	0.1	0.15	0.2	medium	5		1E-06	2E-06	3E-06	high					

SPECIES: SALMON																	
Hazard identified	Hazard characterization							Exposure assessment					Risk Characterization				
	Hazard description	Adverse effect description	Adverse effect type	Magnitude		Quantitative assessment of likelihood			Qualitative assessment of the uncertainty	Duration	Slatted floor (Fully and partially)	Quantitative assessment of P. of Exposure			Qualitative assessment of the uncertainty	Risk estimate (CRSI)	Qualitative uncertainty of the risk estimate
				Severity	Duration (minutes)	min	nl	max				min	nl	max			
11.1.3. a Poor flooring conditions	Pain (leg injuries)			3	100	0.98	0.99	1	low			0.2	0.5	0.7	Medium 2	[0.240 - 0	Medium
11.1.3. b	Stress (lack of good lying facilities, aggression due to)			2	100	0.98	0.99	1	low			0.2	0.5	0.7	Medium 1	[0.160 - 0	Medium
Loading bay to lairage																	
Design of tubes																	
	Sharp angles, low volume, inadequate throughputs	Bruising, skin lesions, fractures	D, F, Fr	2	5	0.2	0.25	0.5	low			0.1	0.1	0.1	high	????	
circulation	ineffective (not in all parts)	decrease O2 uptake	D, F, Fr	4	5	0.7	0.85	1	low			0.1	0.1	0.1	high	?????	
O2-saturation	too low	decrease O2 uptake	D, F, Fr	4	5	0.7	0.85	1	low			0.1	0.1	0.1	high	?????	
O2-saturation	too high	induction to narcosis	D	3	5	0.2	0.25	0.5	low			0.1	0.1	0.1	high	????	
water quality	Noxious gasses, draught, temperature (high or low), humidity	aversion	D	2	5	0.2	0.25	0.5	low			0.1	0.1	0.1	high	?????	
stocking density in crates	overcrowding	low movement	D, Fr	2	5	0.7	0.85	1	low			0.1	0.1	0.1	high	?????	
use of pumping system	bombing to wall, lack of motivation	Bruising, skin lesions, fractures	D, F	2	5	0.7	0.85	1	low			0.1	0.1	0.1	high	????	
Lairage																	
Design of net																	
	Sharp angles, low volume, inadequate throughputs	Bruising, skin lesions, fractures	D	2	1440	0.2	0.25	0.5	low			0.001	0.001	0.001	high		
circulation	ineffective (not in all parts)	decrease O2 uptake	D, F, Fr	4	1440	0.7	0.85	1	low			0.001	0.001	0.001	high		
O2-saturation	too low	decrease O2 uptake	D, F, Fr	4	1440	0.7	0.85	1	low						high	?????	
O2-saturation	too high	cold stress	D	3	1440	0.2	0.25	0.5	low						high	?????	
water quality	Noxious gasses, draught, temperature (high or low), humidity	aversion	D	2	1440	0.2	0.25	0.5	low						high	?????	
stocking density in crates	overcrowding	low movement	D, Fr	2	1440	0.7	0.85	1	low			0.02	0.025	0.05	high		
use of pumping system	bombing, lack of motivation	Bruising, skin lesions, fractures	D, F	2	5	0.7	0.85	1	low			0.02	0.025	0.05	high		
Passageway																	
Design of tubes																	
	Sharp angles, low volume, inadequate throughputs	Bruising, skin lesions, fractures	D, F, Fr	2	5	0.2	0.25	0.5	low			0.01	0.1	0.15	high		
use of automatic pumping system	landing on moving top table	bruising, broken bones, luxations	D, F, Fr	2	5	0.7	0.85	1	low			0.05	0.1	0.15	high		
Escaped or missed fish	Necessity to catch fish, accidental injury	bruising, broken bones, luxations	D, F, Fr	2	5	0.7	0.85	1	low			0.05	0.1	0.15	high		
Restraint																	
a) Dimension and design																	
	dimensions	bruising, broken bones, luxations	P, D, F, Fr	2	2	0.7	0.85	1	low			0.01	0.1	0.15	high		
h) Operator																	
	hidden up by speed	bruising, broken bones, luxations	P, D, F, Fr	3	2	0.7	0.85	1	low			0.05	0.1	0.15	high		
	untrained handlers, lack of motivation	bruising, broken bones, luxations	P, D, F, Fr	3	2	0.7	0.85	1	low			0.05	0.1	0.15	high		
Stunning for slaughter/killing																	
Electrical head to body stunner																	
a) Operator																	
	Untrained, uncertified, careless	extreme muscle contractions	P, D, F, Fr	3	5	0.1	0.15	0.2	low			0.01	0.1	0.15	high	????	
c) Automatic equipment																	
	Poorly maintained, unsuitable for species, breed and size, malfunctioning (tail first)	extreme muscle contractions	P, D, F, Fr	4	5	0.1	0.15	0.2	low			0.8	0.9	1	high		
d) Electrical parameters																	
	Incorrect voltage, amperage, waveform, frequency, duration	extreme muscle contractions, immobilisation	P, D, F, Fr	4	5	0.1	0.15	0.2	low			0.8	0.9	1	high		
e) Stunning application																	
	Incorrect target and area, faulty settings	extreme muscle contractions, immobilisation	P, D, F, Fr	4	5	0.1	0.15	0.2	low			0.8	0.9	1	high		
a) Exsanguination																	
	Incorrect cutting, delayed bleed out, recovery		P, D, F, Fr	4	5	0.1	0.15	0.2	low			0.01	0.1	0.15	high		
Gasstunning																	
Operator/observer																	
	Untrained, uncertified, careless	escaping, muscle cramps	P, D, F, Fr	3	5	0.1	0.15	0.2	high						high	????	
Stunning equipment																	
	Poorly maintained, unsuitable for species, breed and size, malfunctioning (tail first)	escaping, muscle cramps	P, D, F, Fr	3	5	0.1	0.15	0.2	high						high	?????	
c) Gas parameters																	
	Incorrect and inconsistent gas mixtures and concentration	escaping, muscle cramps	P, D, F, Fr	3	5	0.1	0.15	0.2	high						high	?????	
e) Stunning application																	
	Faulty settings and operation	escaping, muscle cramps	P, D, F, Fr	3	5	0.1	0.15	0.2	high						high	????	
f) Stunning to sticking interval																	
	Delay before exsanguination, recovery		P, D, F, Fr	3	5	0.1	0.15	0.2	high						high	?????	
g) Exsanguination																	
	Incomplete neck cut, delayed bleed out, recovery		P, D, F, Fr	4	5	0.1	0.15	0.2	high						high	?????	
Stunning for emergency killing																	
Percussion																	
a) Operator																	
	Untrained, uncertified, careless	escaping	P, D, F, Fr	4	5	0.1	0.15	0.2	medium			0.8	0.9	1	high		
b) Application																	
	Failure to restrain, dislocate immediately, delay before	broken skull, broken bones	P, D, F, Fr	4	5	0.1	0.15	0.2	medium			0.5	0.7	1	high	?????	
Lethal injection																	
a) Operator																	
	Untrained, unlicensed, careless	escaping	P, D, F, Fr	4	5	0.1	0.15	0.2	medium			0.0001	0.0001	0.0001	high		
b) Drug/agent																	
	Wrong choice, dose	escaping	P, D, F, Fr	4	5	0.1	0.15	0.2	medium			0.0001	0.0001	0.0001	high		
c) Injection method																	
	Wrong injection site, missed target, extravascular injection	escaping	P, D, F, Fr	4	5	0.1	0.15	0.2	medium			0.0001	0.0001	0.0001	high		

SPECIES:DEER															
Hazard group	Hazard	Adverse effect description	Adverse effect type	Hazard characterization					Exposure assessment						
				Magnitude		Quantitative assessment of likelihood			Qualitative assessment of the uncertainty	Duration	Intensity	Quantitative assessment of P. of Exposure			Qualitative assessment of the uncertainty
				Severity	Duration (minutes)	min	ml	max				min	ml	max	

Catching of animal, transport to slaughterhouse (or driving animals in pens, restraint) and stunning and further procedures as for farm animals
 Slaughter in field (fenced)
 Slaughter in field (unfenced)

1 Preslaughter handling

Driving into a pen

balking, aggression, bruising, wounds, fractures, crowding, self injury P, D, F, Fr 3 15 0.1 0.5 0.9 high

a) Driveway design

Curvature (<120°)

balking, aggression, bruising, wounds, fractures, crowding, self injury P, D, F, Fr 2 240 0.7 0.85 1 low NA 0.7 0.85 1 low

width, single file

balking, aggression, bruising, wounds, fractures, crowding P, D, F, Fr 2 240 0.7 0.85 1 low NA 0.7 0.85 1 low

width, multiple file

balking, aggression, bruising, wounds, fractures, crowding, self injury P, D, F, Fr 2 240 0.7 0.85 1 low NA 0.7 0.85 1 low

sharp protrusions and dead ends

balking, aggression, bruising, wounds, fractures, crowding, self injury P, D, F, Fr 2 240 0.7 0.85 1 low NA 0.7 0.85 1 low

sharp objects, partially open sides, short sides

balking, aggression, bruising, wounds, P, D, F, Fr 2 240 0.7 0.85 1 low NA 0.7 0.85 1 low

c) Floor surface and condition

slipperiness, gaps, potholes, steps, too rough,

balking, aggression, bruising, wounds, P, D, F, Fr 2 240 0.7 0.85 1 low NA 0.7 0.85 1 low

d) Slope of the floor

too steep, up/down,

balking, aggression, bruising, wounds, fractures, crowding P, D, F, Fr 2 240 0.7 0.85 1 low NA 0.7 0.85 1 low

e) Gates

design (vertical or horizontal opening, opening size)

balking, aggression, bruising, wounds, fractures, crowding P, D, F, Fr 2 240 0.7 0.85 1 low NA 0.7 0.85 1 low

Glaring objects, noise from gates, light intensity, sudden change of light, hissing noise

D, F 2 240 0.7 0.85 1 low NA 0.7 0.85 1 low

Noxious gasses (3 ml/L CO2; 0.02 ml/L NH3), draught, temperature (not > 30° C), humidity (not > 80%)

D, F 2 240 0.7 0.85 1 low NA 0.7 0.85 1 low

g) Air quality

Hitting

balking, aggression, bruising, wounds, fractures, crowding P, D, F, Fr 2 240 0.5 0.6 0.8 low NA 0.5 0.65 0.8 low

Shouting

D, F 2 240 0.5 0.6 0.8 low NA 0.5 0.65 0.8 low

untrained handlers, lack of motivation

balking, aggression, bruising, wounds, fractures, crowding P, D, F, Fr 2 240 0.5 0.6 0.8 low NA 0.5 0.65 0.8 low

i) Use of driving tools

use of prods, electric rods, sticks

balking, aggression, bruising, wounds, fractures, crowding P, D, F, Fr 2 240 0.5 0.6 0.8 low NA 0.5 0.65 0.8 low

j) Animal throughput

high speed

balking, aggression, bruising, wounds, fractures, crowding P, D, F, Fr 1 240 0.2 0.3 0.5 low NA 0.2 0.35 0.5 low

Restraint in pen

Appropriate for animal size

balking, aggression, bruising, wounds, fractures, crowding P, D, F, Fr 3 15 0.1 0.5 0.9 high

solid sides, partially open sides, short side, sharp objects,

balking, aggression, bruising, wounds, fractures, crowding P, D, 2 230 0.2 0.3 0.5 low NA 0.2 0.35 0.5 low

b) Structure of pen

Slipperiness, gaps, potholes, steps, too rough,

balking, aggression, bruising, wounds, fractures, crowding P, D, 2 230 0.2 0.3 0.5 low NA 0.2 0.35 0.5 low

c) Floor surface and condition

Available, unavailable, wet, dirty, faecal contamination

balking, aggression, bruising, wounds, fractures, crowding P, D, 2 230 0.2 0.3 0.5 low NA 0.2 0.35 0.5 low

Design (vertical or horizontal opening, opening size), gate handle type

balking, aggression, bruising, wounds, fractures, crowding P, D, 2 230 0.2 0.3 0.5 low NA 0.2 0.35 0.5 low

e) Gates

Smell, glaring objects, light intensity, sudden change of light, overall noise

balking, aggression, bruising, wounds, fractures, crowding P, D, 2 230 0.2 0.3 0.5 low NA 0.2 0.35 0.5 low

f) Sensory input

Noxious gasses, weather conditions, ventilation, temperature (high or low), humidity

balking, aggression, bruising, wounds, fractures, crowding P, D, 2 230 0.2 0.3 0.5 low NA 0.2 0.35 0.5 low

h) Handlers

Hitting,

balking, aggression, bruising, wounds, fractures, crowding P, D, 2 230 0.2 0.3 0.5 low NA 0.2 0.35 0.5 low

shouting,

balking, aggression, bruising, wounds, fractures, crowding P, D, 2 230 0.2 0.3 0.5 low NA 0.2 0.35 0.5 low

untrained handlers, lack of motivation

balking, aggression, bruising, wounds, fractures, crowding P, D, 2 230 0.2 0.3 0.5 low NA 0.2 0.35 0.5 low

i) Use of driving tools

Use of prods, electric rods, sticks,

balking, aggression, bruising, wounds, fractures, crowding P, D, 2 230 0.2 0.3 0.5 low NA 0.2 0.35 0.5 low

rattles, soft brushes, automatic gates and transfer

balking, aggression, bruising, wounds, fractures, crowding D, F 2 230 0.2 0.3 0.5 low NA 0.2 0.35 0.5 low

i) Stocking density

Overcrowding (Standard 500 to 600 kg/m2)

balking, aggression, bruising, wounds, fractures, crowding P, D, 2 230 0.2 0.3 0.5 low NA 0.2 0.35 0.5 low

k) Mixing

Aggression, fighting, mounting behaviour

balking, aggression, bruising, wounds, fractures, crowding P, D, 2 230 0.2 0.3 0.5 low NA 0.2 0.35 0.5 low

l) Drinker availability

No drinkers available

balking, aggression, bruising, wounds, fractures, crowding D, F 2 230 0.2 0.3 0.5 low NA 0.2 0.35 0.5 low

m) Food availability

No food available

balking, aggression, bruising, wounds, fractures, crowding D, F 2 230 0.2 0.3 0.5 low NA 0.2 0.35 0.5 low

Head restraint in pen

animals panicked or hurt

balking, aggression, bruising, wounds, fractures, crowding P, D, F, Fr 3 5 0.1 0.5 0.9 high

Driving animals during hunt (battues)

animals disturbed, panicked or hurt

agression, bruising, wounds, fractures, crowding P, D, F, Fr 2 120 0.1 0.15 0.2 high

Shooting in groups

bystanding animals disturbed, panicked or hurt

agression, bruising, wounds, fractures, crowding P, D, F, Fr 3 20 0.1 0.15 0.2 high

2 Stunning and killing

2_1		Stunning / killing for slaughter									
2_1_1	2_1_1_1	Stunning in pen	Captive bolt stunning								
	a) Operator	Untrained, uncertified, careless	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.01	0.02	0.03	high	
	b) Gun	Wrong model, poorly maintained	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.01	0.02	0.03	high	
	c) Cartridge	Incorrect strength (< highest available), grain size	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.01	0.02	0.03	high	
	d) Shooting position	Inaccurate target (not directed to brain center) area and angle	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.01	0.02	0.03	high	
	e) Air pressure	Insufficiently low	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.01	0.02	0.03	high	
	f) Shackling and hoisting	Delay before exsanguination	Recovery	P, D, F, Fr	4	5	0.01	0.02	0.03	high	
	g) Exsanguination	Incorrect sticking, delayed bleed out	Recovery	P, D, F, Fr	4	5	0.01	0.02	0.03	high	
2_1_1_2		Electrical stunning									
	a) Operator	Untrained, uncertified, careless	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	high	
	b) Manual equipment	Poorly maintained, unsuitable for species, breed and size, malfunctioning	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	high	
	c) Automatic equipment	Poorly maintained, unsuitable for species, breed and size, malfunctioning	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	high	
	d) Electrical parameters	Incorrect voltage, amperage, wavefor , frequency, duration	perception of physical injury, reflex activity, recovery	P, D, F, Fr	3	5	0.1	0.15	0.2	high	
	e) Stunning application	Incorrect voltage, amperage, waveform, frequency, duration	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	high	
	f) Shackling and hoisting	Delay before exsanguination	Recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	high	
	g) Exsanguination	Incorrect sticking, delayed bleed out	Recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	high	
2_1_1_3		free bullet- close range									
	a) Operator	Untrained, uncertified, careless	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	high	
	b) Firearm	Poorly maintained, caliber unsuitable for species, malfunctioning	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	high	
	c) Cartridge	inappropriate bullet type, incorrect strength	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	high	
	d) Shooting position	Inaccurate target area	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	high	
	e) exsanguination	Incorrect sticking, delayed bleed out	reflex activity	P, D, F, Fr	4	5	0.1	0.15	0.2	high	
2_1_2	2_1_2_1	Killing for slaughter in fenced area or open range	long range rifle "heart-lung" with exsanguination								
	a) Operator	Untrained, uncertified, careless	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	high	
	b) Gun and aiming devices (e.g. telescopic sight)	Poorly maintained, caliber unsuitable for species, malfunctioning	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	high	
	c) Cartridge	inappropriate (non-deforming/fragmenting) bullet type, bullet nose deformed, incorrect powder charge	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	high	
	d) Shooting position	Inaccurate target area	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	high	
	e) exsanguination	Incorrect sticking, delayed bleed out	reflex activity	P, D, F, Fr	4	5	0.1	0.15	0.2	high	
2_1_2_2		long range rifle "heart-lung" without exsanguination									
	a) Operator	Untrained, uncertified, careless	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	high	
	b) Gun and aiming devices (e.g. telescopic sight)	Poorly maintained, caliber unsuitable for species, malfunctioning	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	high	
	c) Cartridge	inappropriate (non-deforming/fragmenting) bullet type, bullet nose deformed, incorrect powder charge	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	high	
	d) Shooting position	Inaccurate target area	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	high	
2_1_2_3		long-range rifle - "head" with exsanguination									
	a) Operator	Untrained, uncertified, careless	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	high	
	b) Gun and aiming devices (e.g. telescopic sight)	Poorly maintained, caliber unsuitable for species, malfunctioning	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	high	
	c) Cartridge	bullet nose deformed, incorrect powder charge	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	high	
	d) Shooting position	Inaccurate target area	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	high	
	e) exsanguination	Incorrect sticking, delayed bleed out	reflex activity	P, D, F, Fr	4	5	0.1	0.15	0.2	high	
2_1_2_4		long-range rifle - "head" without exsanguination									
	a) Operator	Untrained, uncertified, careless	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	high	
	b) Gun and aiming devices (e.g. telescopic sight)	Poorly maintained, caliber unsuitable for species, malfunctioning	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	high	
	c) Cartridge	bullet nose deformed, incorrect powder charge	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	high	
	d) Shooting position	Inaccurate target area	perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.1	0.15	0.2	high	

2_3		Killing for disease control									
2_3_1		Close range or in pen									
2_3_1.1		Captive bolt stunning									
a) Operator	Untrained, uncertified, careless		perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.01	0.02	0.03	high	
b) Gun	Poorly maintained, unsuitable for species, breed and size, malfunctioning, no back-up stunner		perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.01	0.02	0.03	high	
c) Cartridge	Incorrect strength, grain size		perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.01	0.02	0.03	high	
d) Shooting position	Inaccurate target area and angle		perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.01	0.02	0.03	high	
e) Air pressure	Insufficient		perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.01	0.02	0.03	high	
f) Killing method	Delay before death, recovery		perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.01	0.02	0.03	high	
2_3_1.2		Free bullet									
a) Operator	Untrained, uncertified, careless		perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.001	0.0015	0.002	high	
b) Gun	Poorly maintained, unsuitable for species, breed and size, malfunctioning, no back-up stunner		perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.001	0.0015	0.002	high	
c) Cartridge	Incorrect strength, grain size		perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.001	0.0015	0.002	high	
d) Shooting position	Inaccurate target area and angle		perception of physical injury, reflex activity, recovery	P, D, F, Fr	4	5	0.001	0.0015	0.002	high	
2_3_1.3		Electrical stunning									
a) Operator	Untrained, uncertified, careless		perception of intense muscle contractions, reflex activity, recovery	P, D, F, Fr	4	5	0.01	0.015	0.2	high	
b) Manual equipment	Poorly maintained, unsuitable for species, breed and size, malfunctioning		perception of intense muscle contractions, reflex activity, recovery	P, D, F, Fr	4	5	0.01	0.015	0.2	high	
d) Electrical parameters	Incorrect voltage, amperage, waveform, frequency, duration		perception of intense muscle contractions, reflex activity, recovery	P, D, F, Fr	4	5	0.01	0.015	0.2	high	
e) Stunning application	Incorrect target and area, faulty settings		perception of intense muscle contractions, reflex activity, recovery	P, D, F, Fr	4	5	0.01	0.015	0.2	high	
a) Killing method	Delay before death, recovery		perception of intense muscle contractions, reflex activity, recovery	P, D, F, Fr	4	5	0.01	0.015	0.2	high	
2_3_1.4		Lethal injection									
a) Operator	Untrained, unlicensed, careless		disorientation and ataxia	P, D, F, Fr	4	5	0.01	0.015	0.2	high	
b) Drug/agent	Wrong choice, dose		continual disorientation and ataxia with low doses	P, D, F, Fr	4	5	0.01	0.015	0.2	high	
c) Injection method	Wrong injection site, missed target, extravascular injection		continual disorientation and ataxia with low doses	P, D, F, Fr	4	5	0.01	0.015	0.2	high	
f) Shackling and hoisting	Delay before exsanguination, recovery		Recovery	P, D, F, B, SL, Fr	4	5	0.1	0.15	0.2	medium	
g) Exsanguination	Incorrect sticking, delayed bleed out, recovery		Recovery	P, D, F, B	4	5	0.1	0.15	0.2	medium	
2_3_2		Killing for disease control in fenced area or open range									
		see case 2_1_2									