

# BMDS 3.0 Analysis Report

Marx et al. 2018

For

Liver weight – male – 90-day oral study in rats

18.07.2022 14:17:49

## Analysis Info

Analysis Name: Marx et al. 2018 – male

Analysis Description: C:\bmds3201\BMDS3201

Model Type: Continuous

Selected Models:

- Frequentist Dichotomous Hill (restricted)

Option Sets:

- Option Set #1
  - BMR Type: Std. Dev.
  - BMRF: 1
  - Confidence Level: 0.95
  - Distribution: Normal
  - Variance: Constant

## Data

Marx et al. - Liver weight - male			
Source: Marx et al. 2018, Table 12, page 21			
CBD Dose *	N	Mean	Std. Dev.
mg/kg bw/day	male	g	g
0	10	9.65	0.95
25	10	9.7	1.04
90	10	11.05	0.79
180	10	13.5	1.37

\* Note: Dose levels adjusted from hemp extract to CBD assuming 26% of hemp extract are phytocannabinoids, from which 96% are CBD.

Adverse Direction: Automatic

## Frequentist Exponential Restricted Option Set #1

User Input																																		
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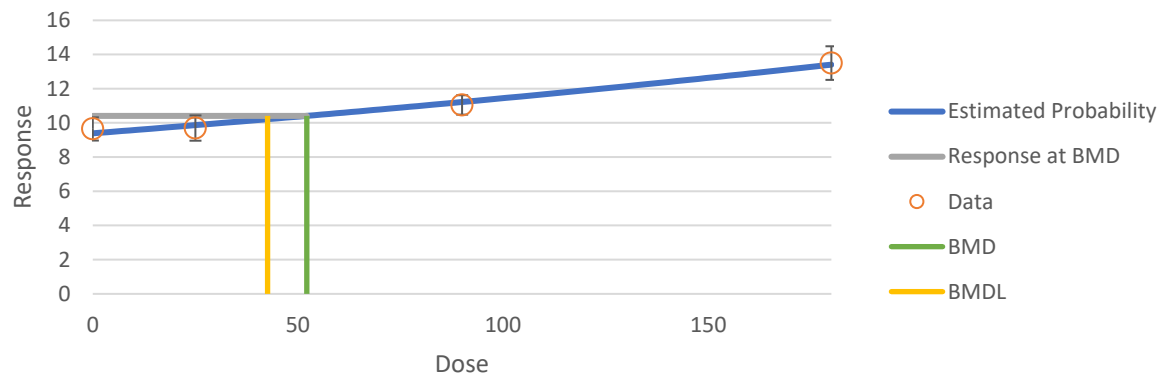
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Dose	Size	Estimated Median	Calc'd Median	Observed Mean	Estimated SD	Calc'd SD	Observed SD	Scaled Residual
0	10	9.392985341	9.65	9.65	1.02080265	0.95	0.95	0.79618888
25	10	9.869177117	9.7	9.7	1.02080265	1.04	1.04	-0.524082712
90	10	11.22333483	11.05	11.05	1.02080265	0.79	0.79	-0.536962602
180	10	13.41035252	13.5	13.5	1.02080265	1.37	1.37	0.27771307

Likelihoods of Interest			
Model	Log Likelihood*	# of Parameters	AIC
A1	-56.93965963	5	123.879319
A2	-55.32048927	8	126.640979
A3	-56.93965963	5	123.879319
fitted	-57.58685341	3	121.173707
R	-81.52370706	2	167.047414

Tests of Interest			
Test	-2*Log(Likelihood Ratio)	Test df	p-value
1	52.40643559	6	<0.0001
2	3.238340728	3	0.35631708
3	3.238340728	3	0.35631708
4	1.294387559	2	0.52351281

Frequentist Exponential Degree 2 Model with BMR of 1 Std.  
Dev. for the BMD and 0.95 Lower Confidence Limit for the  
BMDL



## Frequentist Exponential Restricted Option Set #1

User Input					
<b>Info</b>		<b>Model Options</b>		<b>Model Data</b>	
Model	frequentist Exponential degree 3 v1.1	BMR Type	Std. Dev.	Dependent Variable	mg/kg bw/day
Dataset Name	Marx et al. - Liver weight - male	BMRF	1	Independent Variable	g
User notes	[Add user notes here]	Tail Probability	-	Total # of Observations	4
Dose-Response Model	$M[\text{dose}] = a * \exp(\pm 1 * (b * \text{dose})^d)$	Confidence Level	0.95	Adverse Direction	Automatic
		Distribution Type	Normal		

Model Results	
<b>Benchmark Dose</b>	
BMD	70.43952942
BMDL	44.37955234
BMDU	107.3067368
AIC	122.1164805
Test 4 P-value	0.62626399
D.O.F.	1
<b>Model Parameters</b>	
# of Parameters	4
Variable	Estimate
a	9.573839514
b	0.002475164
d	1.317898041

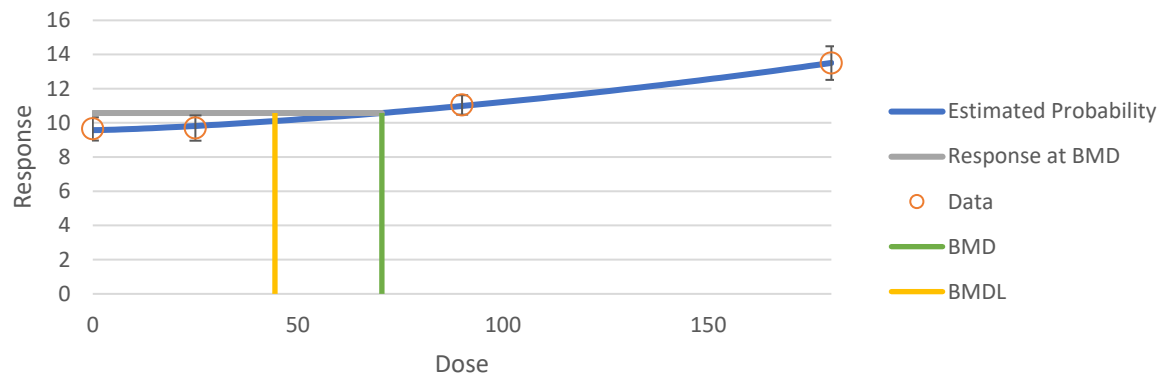
Goodness of Fit								
Dose	Size	Estimated Median	Calc'd Median	Observed Mean	Estimated SD	Calc'd SD	Observed SD	Scaled Residual
0	10	9.573839514	9.65	9.65	1.0075458	0.95	0.95	0.239036878
25	10	9.82159541	9.7	9.7	1.0075458	1.04	1.04	-0.381638677
90	10	10.99280207	11.05	11.05	1.0075458	0.79	0.79	0.179521108
180	10	13.51211157	13.5	13.5	1.0075458	1.37	1.37	-0.038013304

Likelihoods of Interest			
Model	Log Likelihood*	# of Parameters	AIC
A1	-56.93965963	5	123.879319
A2	-55.32048927	8	126.640979
A3	-56.93965963	5	123.879319
fitted	-57.05824024	4	122.11648
R	-81.52370706	2	167.047414

Tests of Interest			
Test	-2*Log(Likelihood Ratio)	Test df	p-value
1	52.40643559	6	<0.0001
2	3.238340728	3	0.35631708
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4	0.237161222	1	0.62626399



Frequentist Exponential Degree 3 Model with BMR of 1 Std.  
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## Frequentist Exponential Restricted Option Set #1

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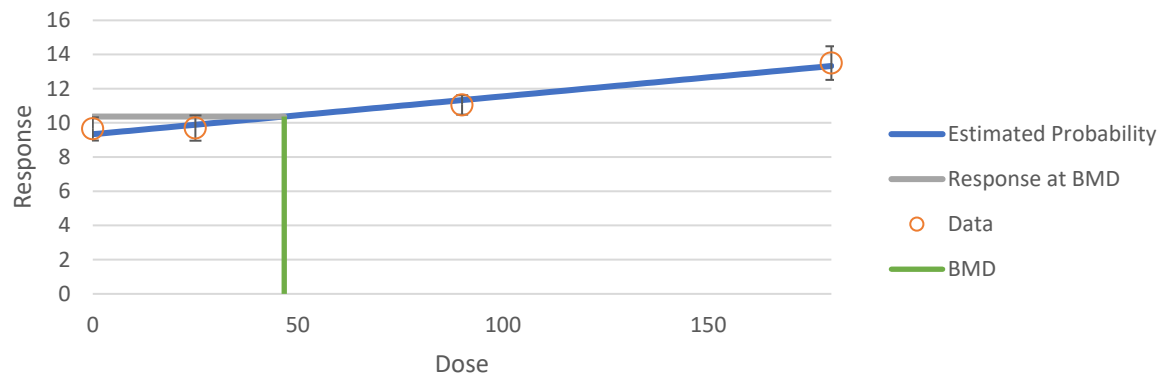
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Goodness of Fit								
Dose	Size	Estimated Median	Calc'd Median	Observed Mean	Estimated SD	Calc'd SD	Observed SD	Scaled Residual
0	10	9.34006967	9.65	9.65	1.03448997	0.95	0.95	0.947409628
25	10	9.894283135	9.7	9.7	1.03448997	1.04	1.04	-0.593893836
90	10	11.335236	11.05	11.05	1.03448997	0.79	0.79	-0.871922844
180	10	13.3303964	13.5	13.5	1.03448997	1.37	1.37	0.518452264

Likelihoods of Interest			
Model	Log Likelihood*	# of Parameters	AIC
A1	-56.93965963	5	123.879319
A2	-55.32048927	8	126.640979
A3	-56.93965963	5	123.879319
fitted	-58.11313334	3	122.226267
R	-81.52370706	2	167.047414

Tests of Interest			
Test	-2*Log(Likelihood Ratio)	Test df	p-value
1	52.40643559	6	<0.0001
2	3.238340728	3	0.35631708
3	3.238340728	3	0.35631708
4	2.346947419	2	0.30929069

Frequentist Exponential Degree 4 Model with BMR of 1 Std.  
Dev. for the BMD and 0.95 Lower Confidence Limit for the  
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## Frequentist Exponential Restricted Option Set #1

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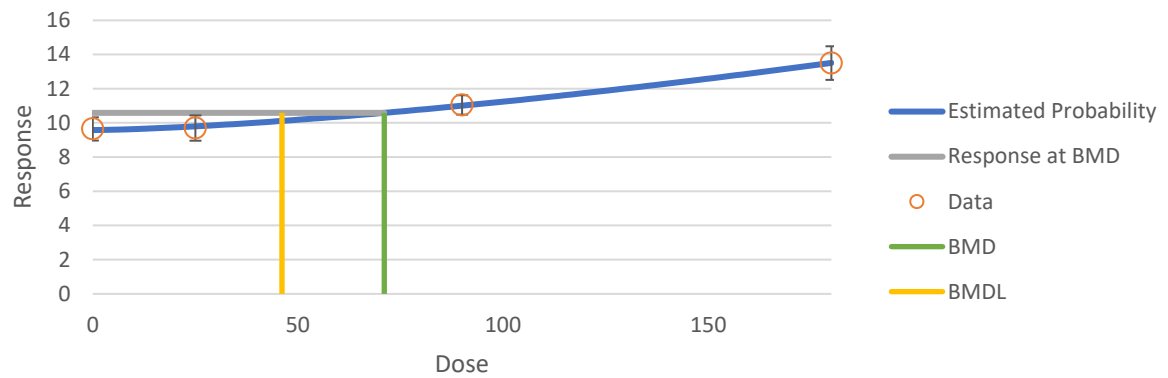
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25	10	9.801453598	9.7	9.7	1.00646987	1.04	1.04	-0.318762097
90	10	11.0066277	11.05	11.05	1.00646987	0.79	0.79	0.136273594
180	10	13.51008687	13.5	13.5	1.00646987	1.37	1.37	-0.031692445

Likelihoods of Interest			
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A2	-55.32048927	8	126.640979
A3	-56.93965963	5	123.879319
fitted	-57.02223917	5	124.044478
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1	52.40643559	6	<0.0001
2	3.238340728	3	0.35631708
3	3.238340728	3	0.35631708
4	0.165159071	0	NA

Frequentist Exponential Degree 5 Model with BMR of 1 Std.  
Dev. for the BMD and 0.95 Lower Confidence Limit for the  
BMDL



## Summary of Results

Option set #1 (Hover for details)											
Model	Analysis Type	Restriction	RiskType	BMD	BMDL	BMDU	Test 4 P-Value	AIC	Unnormalized Log Posterior Probability	BMDS Recommendation	BMDS Recommendation Notes
<a href="#">Exponential 2 (CV - normal)*</a>	frequentist	Restricted	Std. Dev.	52.15399	42.5823	67.221459	0.5235128	121.1737068	-	Viable - Recommended	Lowest AIC
<a href="#">Exponential 3 (CV - normal)</a>	frequentist	Restricted	Std. Dev.	70.43953	44.37955	107.30674	0.626264	122.1164805	-	Viable - Alternate	
<a href="#">Exponential 4 (CV - normal)</a>	frequentist	Restricted	Std. Dev.	46.66477	0	Infinity	0.3092907	122.2262667	-	Unusable	BMD computation failed BMDL not estimated
<a href="#">Exponential 5 (CV - normal)</a>	frequentist	Restricted	Std. Dev.	71.04215	46.10052	106.3789	NA	124.0444783	-	Questionable	d.f.=0, saturated model (Goodness of fit test cannot be calculated)

\*Constant variance case presented (BMDS Test 2 p-value = 0.35631707542798), with the selected model in bold; scaled residuals for selected model for doses 0, 25, 90, 180 were 0.796188879956889, -0.524082712364853, -0.536962602419896, 0.277713070349884 [units], respectively.



Model Summary with BMR of 1 Std. Dev. for the BMD and 0.95 Lower  
Confidence Limit for the BMDL

