January 2005 - Phase 2 proposal

Appendix 1

Power Simulations for Experimental Designs and Statistical Tests for Endocrine Disruption Experiments

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The purpose of this simulation study was to explore the effects of number of replicates per treatment, allocation of replicates to treatments, number of subjects per replicate, number of treatment groups, and statistical test selection on the ability to detect statistically effects that might appear in an endocrine disruption study. The simulations were based on data collected in Phase 1 studies done in Japan and Germany for amphibian hindlimb length, but the results are general and apply to many measured responses. Additional simulations are under way and will be reported at a later date that specifically address developmental staging. Nevertheless, results from the simulation study reported here provide guidance for staging as well as hindlimb length and other measured response.

Two experimental Designs are considered. The first of these is allocation of equal numbers of replicates to each dose or treatment group. Thus the control and treatment groups all receive the same number of replicates and same number of subjects per replicate.

The second design assigns the same number of replicates to all treatment groups but more replicates to the control. Since the control group is used in every comparison of treatment to control, allocating more subjects to the control group than to the treatment groups will optimize power for a given total number of replicates. The total number of replicates is the same in both cases. Such a design also provides better estimation of the "natural" condition of experimental subjects and provides some protection against loss of a control replicate.

The statistical tests considered were the trend tests Williams and Jonckheere (both asymptotic and exact permutation) applied in a step-down fashion, and the pairwise tests Dunnett, Dunn, Mann-Whitney (asymptotic and exact permutation).

Some details of these tests and of the second design are given below. For simplicity, the term "dose" is used throughout as the exposure variable and does not imply any particular exposure mechanism.

At this stage of the simulation study, clear choices for experimental design and statistical test are evident. Further simulations, under way, are needed to translate these results into the power to detect changes of a specified size in continuous responses, such as hindlimb length, and ordinal responses, such as developmental stage. Also, tables rather than power curves are presented. When more complete simulations are available in a few weeks, power curves can and will be generated.

Summary of Findings

Design Issues

1) The minimum nominal number of replicates per treatment is recommended to be four. This is appropriate especially if a pairwise approach might be used, since for fewer than four replicates, the Dunn test is the only non-parametric test with positive power and its power properties are poor for fewer than four replicates.
2) Increased power is achieved through allocating replicates to control and treatment groups following the so-called square-root allocation rule.
3) It is clear from the simulations that for a given number of animals, much better power is obtained by putting fewer animals in more replicates than by putting more animals in fewer replicates.
4) The simulations also make clear that power is very clearly affected by test selection and allocation rule, power is largely determined by the number of replicates.

Test Selection Issues

5) Where a monotone dose-response is expected biologically, the Williams or Jonckheere tests have approximately equal power, have superior power to pairwise tests, and are recommended, with a slight preference for Williams when the data are normally distributed and of homogeneous variance. For ordinal data, such as developmental stage, only the Jonckheere test is appropriate.
6) For fewer than four replicates per group, the Mann-Whitney test should not be used. With equal allocation of replicates, Mann-Whitney should not be used with fewer than five replicates.
7) For four replicates (or more) and square-root allocation of replicates, the Mann-Whitney test has good statistical properties when the normality and variance homogeneity requirements of Dunnett's test are not satisfied. Indeed, the Mann-Whitney powers exceed Dunnett test powers as the number of replicates per dose increases. As the number of replicates increases, the power of the Mann-Whitney test rivals that of Williams and Jonckheere.
8) The Dunnett test has lower power than either trend test under most conditions, but higher power than Dunn's test.
9) If a non-parametric test must be used, such as when no normalizing, variance stabilizing transform can be found or the data are inherently ordinal rather than quantitative, then the Dunn test is the choice for 3 or fewer replicates with square-root allocation and four or fewer replicates with equal allocation, while Mann-Whitney is the choice for 4 or more replicates per dose.

The improvement in the power properties of the tests from using the square-root allocation rule is real but generally less pronounced than the choice of test statistic or number of replicates. The square-root allocation affects some tests, such as Jonckheere, more than others. The square-root allocation should not be used when the nominal number of replicates per dose is 2 since this allocates only one replicate to each treatment group.

For experimental design, the square-root allocation rule with a nominal value of four replicates per dose is suggested. This puts three replicates in each positive dose group and in the controls puts 7 replicates (for 4-dose experiment), 8 replicates (for 5 dose experiment), and 9 replicates (for 6 dose experiment). For equal allocation, five replicates per dose is recommended.

Details of Findings

Tables 1, 4, and 7 show the comparisons of the seven tests under each choice of number of doses, number of replicates, and allocation rule. Tables 2, 5, and 8 compare the two allocation rules for each choice of number of doses, number of replicates, and test statistic. Tables 3, 6, and 9 show the effect of the number of replicates on each test statistic for each choice of number of doses and allocation rule.

Conditions of the Simulation

Figure 1 shows the hindlimb length data from phase 1 reported by Japan and Germany plotted on a log scale (except for treatment of the zero concentration control) and shows for each country that the dose-response is roughly linear with respect to log(dose). The simulations accordingly followed a linear dose-response and Figure 2 shows one such simulation. Other dose-response shapes are of course possible and these shapes do affect the power properties of the test statistics. Several other dose-response shapes are being simulated and will be reported at a later date.

To understand the tables, the following will be helpful. The maximum effect simulated is stated and does not vary across the simulations regardless of number of doses. Then a linear dose-response trend is simulated running from zero effect to the specified maximum effect, with the effect at dose D proportional to the logarithm of dose, with the maximum dose always the same. Thus, at the high dose (be that 4, 5, or 6), the simulated mean response is the maximum effect. The effect at smaller doses will depend on the number of doses simulated. These effects are printed in the header for each table.

Once the number of doses and number of replicates per dose is selected and the mean or median response at each dose is determined as indicated above, a random normal number generator is used to populate each replicate and spread the replicates around the simulated mean response that is based on the within- and between-replicate variance observed in the two studies from phase 1.

The phase 1 studies used 5 doses, four positive treatment groups and one control. The simulation considered experiments with 4, 5, or 6 doses (including control). The phase 1 studies used two replicates of 25 subjects each. The simulation explored 2-8 replicates of 10, 15, 20, or 25 subjects per replicate. The hindlimb length measurements were found to be approximately normally distributed and the simulations generated random normal responses within each replicate. An analysis of variance (ANOVA) found within- and between-replicate variance and the simulations were given these same variance components as found in the Japan study. Finally, the same maximum effect as observed in the Japan study was simulated.

It should be observed that one effect of decreasing the number of subjects per replicate is to increase the variability of the replicate means simulated. Since the data are analyzed in terms of replicate means, not individual subjects, decreasing the number of subjects per replicate has the effect of exploring increased variance. For example, cutting the number of replicates in half increases the standard deviation by roughly 40%. Subjects within the same replicate container in these endocrine disruption experiments are expected to be correlated rather than independent. It is for this reason that the statistical analysis treats the replicate mean (or median in the case of developmental stages) as the experimental unit rather than the individual.

An objective of the simulations was for the data from each simulated experiment to be analyzed by all seven tests. This would eliminate the remote chance that some simulation bias affects the comparisons. Since the two exact permutation tests require roughly 20 times the CPU time as the other five tests combined, in the interests of time. 1000-2000 experiments were simulated in which all seven tests were applied, while 5000-10000 experiments were simulated for the five other tests. In time, the number of experiments simulated with all seven tests applied will equal or exceed 5000. The standard error of the power estimates based on 5000 simulated experiments is expected to be no more than .5/sqrt(5000)=.007, or less than 1%.

It is well understood that the number of replicates will affect the power of a statistical test, with higher power (i.e., greater ability to distinguish statistically the changes in mean or median response) associated with increased numbers of replicates. This simulation study will quantify the relationship between the number of replicates and the power of each statistical test examined.

Statistical Tests Considered

Seven statistical tests are explored. These are the Dunnett, Dunn, Williams, Jonckheere (or Jonckheere-Terpstra), and Mann-Whitney (or Wilcoxon). For the Jonckheere and Mann-Whitney tests, both the standard "asymptotic" and exact permutation versions of the tests are explored. The reason for this is that when only small numbers of replicates are present, the asymptotic or large-sample test statistics may not be accurate. Experience and theory both suggest exact permutation methods maybe required, especially when there are fewer than four replicates per concentration.

Experimental Designs Considered

The optimum allocation depends on the statistical test to be used. A widely used allocation rule was given by Dunnett (1955), which states that for a total of N replicates and k treatments to be compared to a common control, if the same number, n, of replicates are allocated to every treatment group, then the number, n_0, to allocate to the control to optimize power is determined by the so-called square-root rule. By this rule, the value of n is (the integer part of) the solution of the equation $N = kn + n\sqrt{k}$, and $n_0 = N - kn$. [It is almost equivalent to say $n_0 = n\sqrt{k}$.] This has been shown to optimize power for Dunnett's test. It is used, often without formal justification, for other pairwise tests, such as the Mann-Whitney and Fisher exact test. Williams (1972) showed that the square-root rule may be somewhat sub-optimal for his test and optimum power is achieved when $\sqrt{k}$ in the above equation is replaced by something between $1.1\sqrt{k}$ and $1.4\sqrt{k}$. For simplicity, this minor modification is not followed in these simulations. The optimality of the square-root rule to other tests, such as Jonckheere-Terpstra and Cochran-Armitage has not been published in definitive form, but simulations (manuscript in preparation by J. W. Green) show that for the step-down Jonckheere-Terpstra test, power gains of up to 25% are possible under this rule compared to results from equal sample sizes. In all cases examined, the power is greater following this rule compared to equal sample sizes, where the total sample size is held constant. In the absence of definitive information on the Jonckheere-Terpstra and other tests, it is probably prudent to follow the square-root rule for pairwise and Jonckheere-Terpstra tests and either that or Williams' modification of the rule for other step-down procedures. The present simulation study does not show the square-root rule to be optimal, but it does demonstrate that this allocation rule improves the power properties of all tests considered (except under a few special circumstances, such as when the square-root rule puts only one replicate in each treatment group) and in every reasonable design.

Discussion of Tests

The Dunn, Mann-Whitney, and Jonckheere tests are non-parametric tests based on ranking the data by order of magnitude. Such tests are required when the data do not meet the requirements of the usual parametric procedures, which for the Dunnett and Williams tests are within-dose normality and variance homogeneity, plus independence of replicate means (or medians). Often, a simple transformation of the response will resolve a problem with normality or variance homogeneity. In other cases, no normalizing, variance stabilizing transformation can be found. Developmental stage is an inherently non-normal response and one of these non-parametric tests would be appropriate. It would not be appropriate, for example, to analyze developmental stage by use of a chi-square statistic based on a multinomial distribution, since such a test can be significant when the only difference between two dose groups is an increase or decrease in variation. The intent is to detect an increase in median developmental stage, not a change in spread of the stages.

A Comment on Parametric and Non-Parametric Tests

One often hears criticism of non-parametric tests on the grounds that they have lower power and one also hears claims that parametric tests are always to be preferred. This simulation study is an unbiased assessment of these claims in this specific context and for the specific tests considered. In fact, the non-parametric Jonckheere test has very good power properties in general and the Mann-Whitney does also provided there are four or more replicates per dose.

Pairwise versus Trend Tests

In addition to the division of tests between parametric and non-parametric, the Williams and Jonckheere tests are step-down trend tests, while the others are pairwise tests.

The hypothesis that is tested in determining the NOEC for a toxicological experiment reflects the risk assessment question and the assumptions that are made concerning the underlying characteristics, or statistical model, of the responses being analyzed (e.g., does the response increase in an orderly (i.e., monotone) way with increasing toxicant dose or concentration?). The statistical test that is used depends on the hypothesis tested (e.g., are responses in all groups equal?), the associated statistical model, and the distribution of the values (e.g., are data normally distributed?). Thus, it is necessary to understand the question to be answered and to translate this question into appropriate null and alternative hypotheses before selecting the test procedure.

The simplest statistical model generally used in hypothesis testing assumes only that the distributions of responses within these populations are identical except for a location parameter (e.g., the mean or median of the distribution of values from each group). Another statistical model that is often used assumes that there is a trend in the response that is associated with increasing exposure. Each of these models suggests a set of hypotheses that can be tested to determine whether the model is consistent with the data. These two types of hypotheses can further be expressed as 1-sided or 2-sided. The discussion below is developed in terms of population means, but applies equally to hypotheses concerning population medians. The most basic hypothesis (in 1-sided form) can be stated as follows:
$H_0 : \mu_0=\mu_1=\mu_2=\ldots=\mu_k$ vs. $H_1 : \mu_0>\mu_i$ for at least one i, (Model 1)
where μ_i, i=0, 1, 2, 3, ..., k denote the means of the control and test *populations*, respectively.

Thus, one tests the null hypothesis of no differences among the population means against the alternative that at least one population mean is smaller than the control mean. There is no investigation of differences among the treatment means, only whether treatment means differ from the control mean. The one-sided hypothesis is appropriate when an effect in only one direction is a concern. The direction of the inequality in the above alternative hypothesis (i.e. in $H_1 : \mu_0>\mu_i$) would be appropriate if a decrease in the endpoint was a concern but an increase was not (for instance, if an exposure was expected to induce infertility and reduce number of offspring). If an increase in the endpoint was the only concern, then the direction of the inequality would be reversed.

The conceptual difference between these two types of tests is as follows. Pairwise tests compare each treatment group to the control independent of all the other treatment groups. It is entirely possible, for example, for such a test to find a significant difference between dose 2 and the control but not find a significant difference between dose 3 or 4 and the control. A trend test cannot produce such a result. In comparing dose 4 to the control, all the doses between dose 4 and the control are taken into account. If no significant trend is found with all doses present, then no further testing is done and the high dose is the NOAEL. On the other hand, if the trend with all doses included is significant, then the high dose is an effects level. One then omits the high dose group and repeats the test with the remaining dose groups. If the trend test with the dose groups is significant, the test is repeated with the current high dose group omitted. This process continues until the first time the trend test is not significant. At that stage, testing stops and the NOAEL is the highest dose remaining. Such a procedure is justified on the grounds that biologically, one expects a toxic effect to manifest itself more strongly as the dose increases. That is, one expects a monotonic dose-response relationship. Should this not be expected biologically, then a trend test is not appropriate and pairwise methods should be used.

If no assumption is made about the relationships among the treatment groups and control (e.g., no trend is assumed), the test statistics will be based on comparing each treatment to the control, independent of the other treatments. Many tests have been developed for this approach, mostly for experiments in which treatments are qualitatively different, as, for example, in comparing various new therapies or drug formulations to a standard.

In toxicology, the treatment groups generally differ only in the exposure concentration (or dose) of a single chemical. It is further often true that biology suggests that if the chemical is toxic, then as the level of exposure is increased, the magnitude effect will tend to increase. Depending on what response is measured, the effect of increasing exposure may show up as an increase or as a decrease in the measured response, but not both. The statistical model underlying this biological expectation is what will be called a trend model or a model assuming monotonicity of the population means:
$\mu_0 \geq \mu_1 \geq \mu_2 \geq \mu_3 \geq \ldots \geq \mu_k$ (or with inequalities reversed)
The null and alternative hypotheses can then be stated as
$H_{02} : \mu_0 = \mu_1 = \mu_2 = \ldots = \mu_k$ vs $H_{12} : \mu_0 \geq \mu_1 \geq \mu_2 \geq \mu_3 \geq \ldots \geq \mu_k$, with $\mu_0 > \mu_k$.
Note that $\mu_0 > \mu_k$ is equivalent, under the alternative, to $\mu_0 > \mu_i$ for at least one *i*. If this monotone model is accepted as representing the true responses of test organisms to exposure to toxicants, it is not possible for, say, μ_3 to be smaller than μ_0 and μ_6 not to be smaller.

Under the trend model and tests designed for that model, if tests of hypotheses H_{02} vs. H_{12} reveal that μ_3 is different from μ_0, but μ_2 is not, the NOEC has been determined (i.e. it is the test concentration associated with μ_2), and there is no need to test whether μ_1 differs from μ_0. Also, finding that μ_3 differs from μ_0 implies that a significant trend exists across the span of doses including μ_0 and μ_3, the span including μ_0 and μ_4, and so on. For the majority of toxicological studies, a test of the trend hypothesis based on model (2) is consistent with the basic expectations for a model for dose-response. In addition, statistical tests for trend tend to be more powerful than alternative non-trend tests, and should be the preferred tests if they are applicable. Thus, a necessary early step in the analysis of results from a study is to consider each endpoint, decide whether a trend model is appropriate, and then choose the initial statistical test based on that decision. Only after it is concluded trend is not appropriate do specific pairwise comparisons make sense to illuminate sources of variability.

Adjustments to P-values for Multiple Tests
A common problem with doing several related statistical tests is that each tests carries with it a non-zero chance of declaring a difference between treatment and control to be significant when in fact there is no real treatment effect. Typically, one accepts a 5% chance of error of this type. If numerous tests are done, each with a 5% chance of incorrectly declaring an effect to be significant when no true difference exists, then the chance that at least one of these tests falsely declaring a significant effect is higher than 5%, sometimes much higher. As a consequence, some adjustment is usually made to

control the overall chance of at least one of the many tests being wrong. The Dunnett test has a built-in adjustment. The Williams and Jonckheere tests are applied in step-down fashion, with a significant result at one stage a requirement to proceed to the next stage. Consequently, each step in applying Williams or Jonckheere is done at the same 5% level and in this particular application, the overall false positive rate remains fixed at 5%. The Dunn and Mann-Whitney tests have no built-in multiplicity adjustment. There are several adjustment schemes. The Bonferroni- Holms adjustment is a considerable improvement over the older Bonferroni adjustment and is the method used in these simulations.

Pairwise comparison procedures amount to performing all possible comparisons of treatment groups to the control. Multiple comparisons to the control may be made, but there is no ordered set of hypotheses to test, and no use of the sequence of outcomes in deciding which comparisons to make. Examples of the single-step approach include the use of the Fisher's exact test, the Mann-Whitney, Dunnett and Dunn tests. Since many comparisons to the control are made, some adjustment must be made for the number of such comparisons to keep the family-wise error (FWE) rate at a fixed level, generally 0.05. With tests that are inherently single comparison tests, such as Fisher's exact and Mann-Whitney, a Bonferroni adjustment can be made: a study with k treatment levels would be analyzed by performing the pair-wise comparisons of each of the treatment groups to the control group, each performed at a significance level of α/k instead of α. (This is the Bonferroni adjustment.) Equivalently, the calculated p-value ignoring multiplicities is multiplied by k. That is, $p^b_i = k*p_i$ The Bonferroni adjustment is generally overly conservative, especially for large k. Modifications reduce the conservatism while preserving the FWE at 0.05 or less.

For the Holm modification of the Bonferroni adjustment, arrange the k unadjusted p-values for all comparisons of treatments to control in rank order, i.e., $p_{(1)} \leq p_{(2)} \leq p_{(3)} \leq \ldots \leq p_{(k)}$. Beginning with $p_{(1)}$, compare $p_{(i)}$ with $\alpha/(k-i+1)$, stopping at the first non-significant comparison. If the smallest i for which $p_{(i)}$ exceeds $\alpha/(k-i+1)$ is $i=j$, then all comparisons with $i>j$ are judged non-significant without further comparisons. It is helpful (Wright (1992)) to report adjusted p-values rather than the above comparisons. Thus, report $p^*_{(1)} = p_{(1)}*(k-i+1)$ and then compare each adjusted p-value to α. The table below illustrates the advantage of the Bonferroni-Holm method. In this hypothetical example, only the comparison of treatment 4 with the control would be significant if the Bonferroni adjustment is used, whereas all comparisons except the comparison of the Control with treatment 1 would be significant if the Bonferroni-Holm adjustment is used.

Comparison	Unadjusted p value	Bonferroni-Holm Adjusted p value $p^*_{(i)}$	Bonferroni Adjusted p-values P^b_i
Control – Treatment 4	$p_{(1)}$=0.002	0.002*4=0.008	0.002*4=0.008
Control – Treatment 2	$p_{(2)}$=0.013	0.013*3=0.039	0.013*4=0.052
Control – Treatment 3	$p_{(3)}$=0.020	0.020*2=0.040	0.02*4=0.08
Control – Treatment 1	$p_{(4)}$=0.310	0.310*1=0.310	0.310*4=1.

Step-down procedures are generally preferred where they are applicable. All step-down procedures discussed are based on a sequential process consisting of testing an ordered set of hypotheses concerning means, ranks, or trend. A step-down procedure based on trend (for example) works as follows: First, the hypothesis that there is no trend in response with increasing dose is tested when the control and all dose groups are included in the test. Then, if the test for trend is significant, the high dose group is dropped from the data set, and the hypothesis that there is no trend in the reduced data set is tested. This process of dropping treatment groups and testing is continued until the first time the trend test is non-significant. The highest dose in the reduced data set at that stage is then declared to be the NOEC. Distinguishing features of step-down procedures are that the tests of hypothesis must be performed in a given order, and that the outcome of each hypothesis test is evaluated before deciding whether to test the next hypothesis in the ordered sequence of hypotheses. It is these two aspects of these procedures that account for controlling the family-wise error (FWE) rate.

A step-down method typically uses a critical level larger than that used in single-step procedures, and seeks to limit the number of comparisons that need to be made. Indeed, the special class of "fixed-sequence" tests described below fix the critical level at 0.05 for each comparison but bound the FWE rate at 0.05. Thus, step-down methods are generally preferable to the single-step methods as long as the response means are monotonic. Tests based on trend are logically consistent with the anticipated monotone pattern of responses in toxicity tests. Step-down procedures make use of this ordered alternative by ordering the tests of hypotheses. This minimizes the number of comparisons that need to be made, and in all the methods discussed here, a trend model is explicitly assumed (and tested) as a part of the procedure.

Procedures that employ step-down trend tests have more power than procedures that rely on multiple pairwise comparisons when there is a monotone dose-response because they make more use of the biology and experimental design being analyzed. When there is a monotone dose-response, procedures that compare single treatment means or medians against the control, independent of the results in other treatments (i.e. single-step procedures), ignore important and relevant information, and suffer power loss as a result. The trend models used in the step-down procedures do not assume a particular precise mathematical relationship between dose and response, but rather use only monotonicity of the dose-response relationship. The underlying statistical model assumes a monotone dose-response in the *population* means, not the *observed* means.

Rejection of the null hypothesis (i.e., rejecting the hypothesis that all group means, or medians, or distributions are equal) in favor of the stated alternative implies that the high dose is significantly different from the control. The same logic applies at each stage in the step-down application of the test to imply, whenever the test is significant, that the high dose remaining at that stage is significantly different from the control. These tests are all applied in a 1-sided manner with the direction of the alternative hypothesis always the same. Moreover, this methodology is general, and applies to any legitimate test of the stated hypotheses under the stated model. That is, one can use this fixed-sequence approach with the Cochran-Armitage test on quantal data, the Jonckheere-Terpstra or Williams or Brown-Forsythe tests of trend on continuous data. Other tests of trend can also be used in this manner.

The Power Concept

In addition to controlling the risk of a false positive, one must also be concerned with the risk of a false negative, that is, the chance of not declaring a difference between treatment and control to be significant when in fact there is a real difference of biological importance. It is convenient to refer to the chance of correctly declaring significant a treatment effect instead of the chance of not finding such an effect significant. These two chances are complementary, that is, they always add to 100%. The chance of correctly declaring significant a real treatment effect is the power of the test to detect that difference and varies with the size of the true effect.

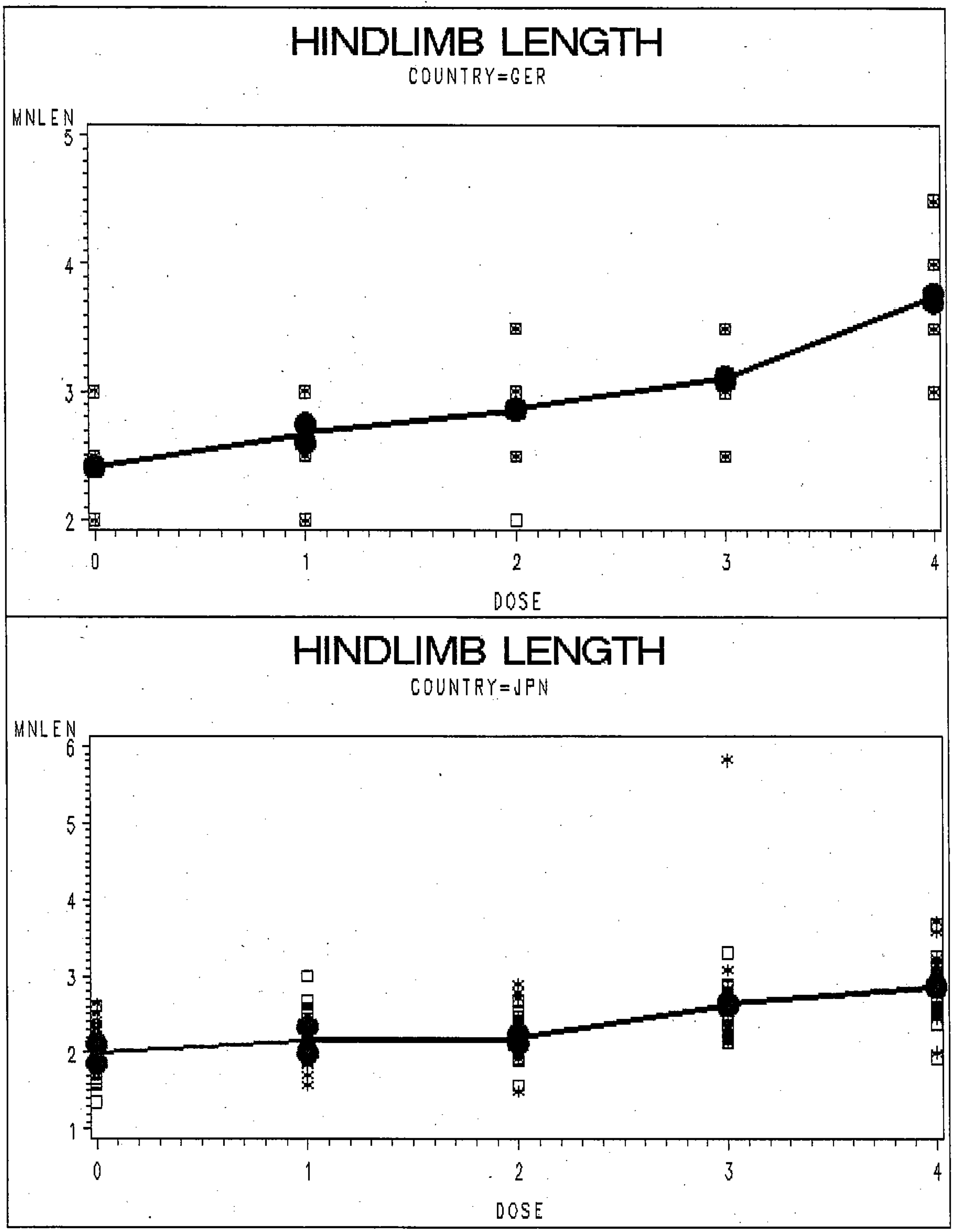

Figure 1

The red dots are replicate means and the line joins the treatment means.

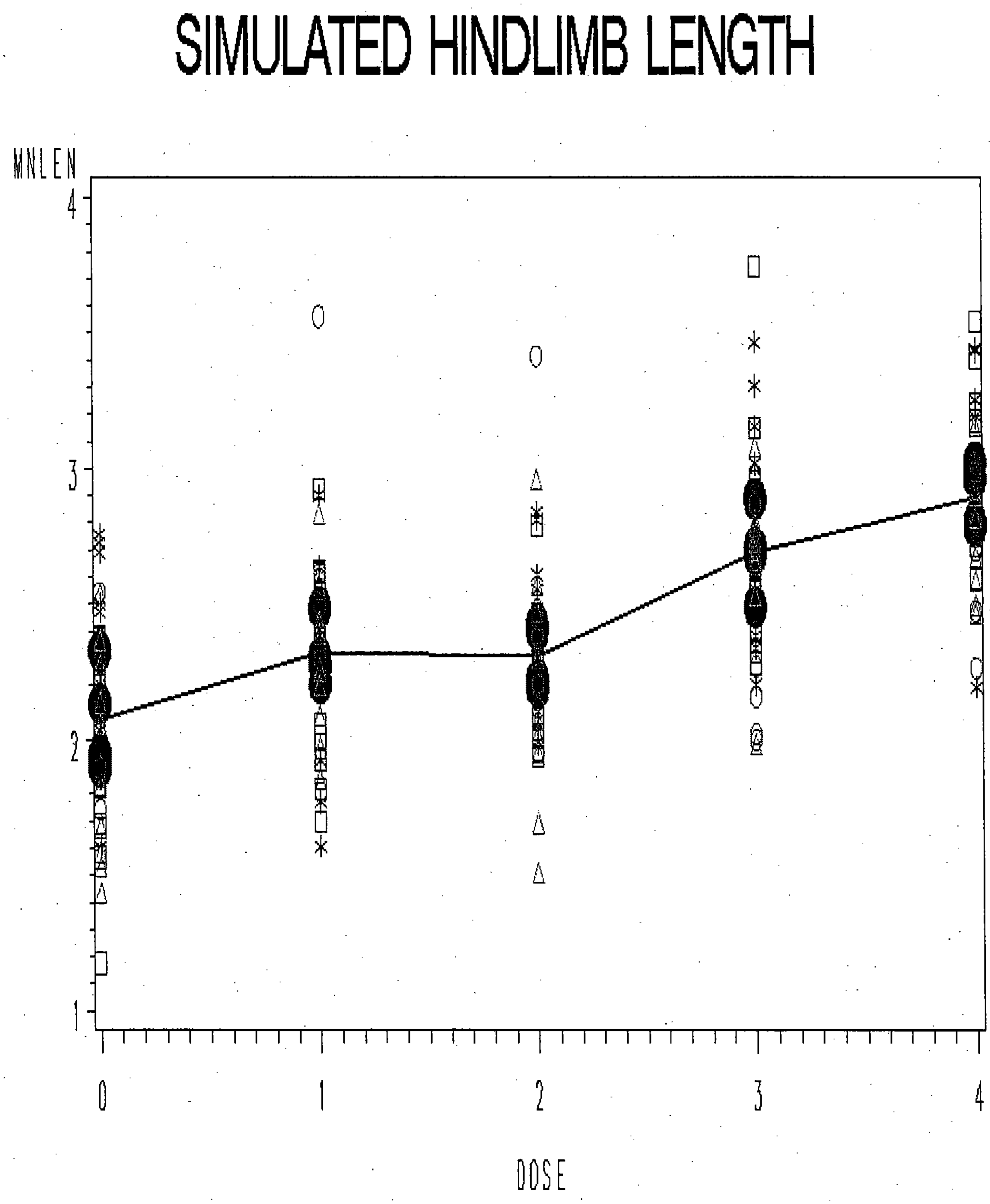

Figure 2
This simulates four replicates of 10 subjects each with standard allocate rule. Red dots are replicate means. The line joins the treatment means.

Table 1 Comparison of Tests for 4 Dose Experiments

POWER SIMULATIONS FOR 4 DOSES, LINEAR DOSE-RESPONSE
TREND RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.2918 0.5836 0.8754

				NOAEL			
				0	1	2	3
REPS	SAMPSIZE	SQRTRULE	TEST				
2	10	NO	DUNN			74	26
			DUNNETT	21	52	25	4
			JONCKH		75	25	1
			JONCKHX		75	25	1
			MW				100
			MWX				100
			WILLIAMS	34	52	14	1
		YES	DUNN				100
			DUNNETT	12	46	34	9
			JONCKH		86	12	3
			JONCKHX		62	31	7
			MW				100
			MWX				100
			WILLIAMS	30	51	18	2
	15	NO	DUNN			83	17
			DUNNETT	26	54	19	1
			JONCKH		82	17	0
			MW				100
			WILLIAMS	42	49	9	0
		YES	DUNN				100
			DUNNETT	19	49	27	4
			JONCKH		90	8	2
			MW				100
			WILLIAMS	38	47	14	0
	20	YES	DUNN				100
			DUNNETT	25	51	22	2
			JONCKH		91	7	2
			MW				100
			WILLIAMS	42	48	9	0
	25	NO	DUNN			87	14
			DUNNETT	33	54	12	1
			JONCKH		87	14	0
			JONCKHX		88	13	0
			MW				100
			MWX				100
			WILLIAMS	50	45	6	0
		YES	DUNN				100
			DUNNETT	25	51	21	3
			JONCKH		92	7	1
			JONCKHX		73	24	4
			MW				100
			MWX				100
			WILLIAMS	43	48	8	0
3	10	NO	DUNN		23	77	1
			DUNNETT	43	53	5	0
			JONCKH	56	43	2	
			JONCKHX	28	68	4	
			MW				100
			MWX			3	97
			WILLIAMS	59	40	2	
		YES	DUNN		17	82	2
			DUNNETT	41	55	5	
			JONCKH	66	31	4	
			JONCKHX	49	48	3	
			MW				100
			MWX			14	86
			WILLIAMS	59	40	1	

Table 1 Comparison of Tests for 4 Dose Experiments

POWER SIMULATIONS FOR 4 DOSES, LINEAR DOSE-RESPONSE
TREND RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.2918 0.5836 0.8754

				NOAEL			
				0	1	2	3
REPS	SAMPSIZE	SQRTRULE	TEST				
	15	NO	DUNN	20	80	0	
			DUNNETT	53	46	2	
			JONCKH	61	38	1	
			MW				100
			WILLIAMS	68	32	1	
		YES	DUNN		16	83	1
			DUNNETT	49	49	2	
			JONCKH	73	25	2	
			MW				100
			WILLIAMS	68	32	1	
	20	NO	DUNN		20	80	
			DUNNETT	55	44	1	
			JONCKH	63	36	1	
			MW				100
			WILLIAMS	71	29	0	
		YES	DUNN		14	85	1
			DUNNETT	52	46	2	
			JONCKH	76	22	2	
			MW				100
			WILLIAMS	70	30	1	
	25	NO	DUNN		21	79	0
			DUNNETT	60	40	0	
			JONCKH	68	32	0	
			JONCKHX	34	66	1	
			MW				100
			MWX			3	97
			WILLIAMS	75	25	0	
		YES	DUNN		13	87	0
			DUNNETT	57	42	1	
			JONCKH	78	20	2	
			JONCKHX	62	37	2	
			MW				100
			MWX			20	81
			WILLIAMS	74	26	0	
4	10	NO	DUNN		70	31	
			DUNNETT	59	42	1	
			JONCKH	72	28	0	
			JONCKHX	57	43	0	
			MW	55	38	7	0
			MWX	56	38	7	0
			WILLIAMS	72	29	0	
		YES	DUNN	0	84	16	
			DUNNETT	60	40	1	
			JONCKH	75	25	1	
			JONCKHX	65	35	1	
			MW	64	34	2	0
			MWX	64	34	2	0
			WILLIAMS	76	25	0	
	15	NO	DUNN		77	23	
			DUNNETT	67	33	0	
			JONCKH	78	22	0	
			MW	64	32	4	0
			WILLIAMS	79	21	0	
		YES	DUNN	0	87	13	
			DUNNETT	69	31	0	
			JONCKH	81	19	0	
			MW	71	27	1	0
			WILLIAMS	82	18	0	

Table 1 Comparison of Tests for 4 Dose Experiments

POWER SIMULATIONS FOR 4 DOSES, LINEAR DOSE-RESPONSE
TREND RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.2918 0.5836 0.8754

REPS	SAMPSIZE	SQRTRULE	TEST	NOAEL 0	1	2	3
4	20	NO	DUNN		81	19	
			DUNNETT	73	27	0	
			JONCKH	82	18	0	
			MW	68	30	2	
			WILLIAMS	84	16		
		YES	DUNN		91	9	
			DUNNETT	74	26	0	
			JONCKH	86	15		
			MW	76	23	1	
			WILLIAMS	86	14		
	25	NO	DUNN		84	16	
			DUNNETT	77	23	0	
			JONCKH	85	15		
			JONCKHX	73	28		
			MW	72	27	2	
			MWX	72	27	2	
			WILLIAMS	87	13		
		YES	DUNN		93	7	
			DUNNETT	76	24		
			JONCKH	86	14		
			JONCKHX	79	22	0	
			MW	78	22	0	0
			MWX	79	22	0	
			WILLIAMS	87	13		
5	10	NO	DUNN		92	8	
			DUNNETT	70	30	0	
			JONCKH	79	22		
			JONCKHX	76	24		
			MW	78	21	1	
			MWX	76	23	1	
			WILLIAMS	83	17		
		YES	DUNN	2	96	3	
			DUNNETT	74	26	0	
			JONCKH	85	16	0	
			JONCKHX	78	22	0	
			MW	78	22	1	
			MWX	78	22	0	
			WILLIAMS	86	14		
	15	NO	DUNN		97	3	
			DUNNETT	79	21		
			JONCKH	85	15		
			MW	85	15	0	
			WILLIAMS	88	12		
		YES	DUNN	1	98	1	
			DUNNETT	81	19	0	
			JONCKH	90	10		
			MW	84	15	0	
			WILLIAMS	90	10		
	20	NO	DUNN		98	2	
			DUNNETT	85	15		
			JONCKH	89	11		
			MW	89	11	0	
			WILLIAMS	92	8		
		YES	DUNN	1	99	1	
			DUNNETT	85	15	0	
			JONCKH	92	8		
			MW	87	13	0	
			WILLIAMS	93	7		

Table 1 Comparison of Tests for 4 Dose Experiments

POWER SIMULATIONS FOR 4 DOSES, LINEAR DOSE-RESPONSE
TREND RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.2918 0.5836 0.8754

				NOAEL			
				0	1	2	3
REPS	SAMPSIZE	SQRTRULE	TEST				
	25	NO	DUNN		99	1	
			DUNNETT	87	13		
			JONCKH	91	9		
			JONCKHX	90	10		
			MW	91	9	0	
			MWX	90	10	0	
			WILLIAMS	94	6		
		YES	DUNN	0	99	0	
			DUNNETT	89	11		
			JONCKH	93	7		
			JONCKHX	90	10		
			MW	90	10	0	
			MWX	91	10		
			WILLIAMS	95	5		
6	10	NO	DUNN	0	98	2	
			DUNNETT	81	19		
			JONCKH	86	14		
			JONCKHX	86	15		
			MW	86	14	0	
			MWX	85	15	0	
			WILLIAMS	89	11		
		YES	DUNN	4	96	0	
			DUNNETT	82	18		
			JONCKH	91	9		
			MW	88	12	0	
			WILLIAMS	91	9		
	15	NO	DUNN	0	100	0	
			DUNNETT	88	12		
			JONCKH	91	9		
			MW	91	9		
			WILLIAMS	94	6		
		YES	DUNN	3	97	0	
			DUNNETT	90	10		
			JONCKH	95	5		
			MW	93	7		
			WILLIAMS	95	5		
	20	NO	DUNN	0	100	0	
			DUNNETT	91	9		
			JONCKH	93	7		
			MW	93	7		
			WILLIAMS	95	5		
		YES	DUNN	2	98	0	
			DUNNETT	93	7		
			JONCKH	96	4		
			MW	94	6		
			WILLIAMS	97	3		
	25	NO	DUNN	0	100	0	
			DUNNETT	93	7		
			JONCKH	95	5		
			JONCKHX	95	6		
			MW	95	5		
			MWX	95	6		
			WILLIAMS	97	3		
		YES	DUNN	2	98	0	
			DUNNETT	94	6		
			JONCKH	97	3		
			JONCKHX	96	5		
			MW	96	4		
			MWX	96	5		
			WILLIAMS	97	3		

Table 1 Comparison of Tests for 4 Dose Experiments

POWER SIMULATIONS FOR 4 DOSES, LINEAR DOSE-RESPONSE
TREND RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.2918 0.5836 0.8754

				NOAEL			
				0	1	2	3
REPS	SAMPSIZE	SQRTRULE	TEST				
7	10	NO	DUNN	1	99	0	
			DUNNETT	87	13		
			JONCKH	91	9		
			MW	91	9	0	
			WILLIAMS	93	7		
		YES	DUNN	17	83	0	
			DUNNETT	87	13		
			JONCKH	92	8		
			MW	92	8		
			WILLIAMS	95	6		
	15	NO	DUNN	0	100	0	
			DUNNETT	93	7		
			JONCKH	96	4		
			MW	96	4		
			WILLIAMS	97	3		
		YES	DUNN	17	83		
			DUNNETT	93	7		
			JONCKH	96	4		
			MW	96	4		
			WILLIAMS	97	3		
	20	NO	DUNN	0	100	0	
			DUNNETT	95	5		
			JONCKH	97	3		
			MW	97	3		
			WILLIAMS	98	2		
		YES	DUNN	16	84		
			DUNNETT	95	5		
			JONCKH	97	3		
			MW	97	3		
			WILLIAMS	98	2		
	25	NO	DUNN	0	100	0	
			DUNNETT	96	4		
			JONCKH	98	2		
			JONCKHX	98	3		
			MW	98	2		
			MWX	98	3		
			WILLIAMS	99	1		
		YES	DUNN	16	84		
			DUNNETT	97	3		
			JONCKH	98	2		
			JONCKHX	98	2		
			MW	98	2		
			MWX	98	2		
			WILLIAMS	99	1		
8	10	NO	DUNN	2	98	0	
			DUNNETT	92	8		
			JONCKH	94	6		
			MW	93	8		
			WILLIAMS	96	4		
		YES	DUNN	26	74		
			DUNNETT	92	8		
			JONCKH	96	4		
			MW	95	5		
			WILLIAMS	97	4		

Table 1 Comparison of Tests for 4 Dose Experiments

POWER SIMULATIONS FOR 4 DOSES, LINEAR DOSE-RESPONSE
TREND RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.2918 0.5836 0.8754

				NOAEL			
				0	1	2	3
REPS	SAMPSIZE	SQRTRULE	TEST				
8	15	NO	DUNN	2	98		
			DUNNETT	96	4		
			JONCKH	98	2		
			MW	97	3		
			WILLIAMS	99	1		
		YES	DUNN	30	70		
			DUNNETT	96	4		
			JONCKH	98	2		
			MW	97	3		
			WILLIAMS	98	2		
	20	NO	DUNN	1	99		
			DUNNETT	97	3		
			JONCKH	98	2		
			MW	97	3		
			WILLIAMS	99	1		
		YES	DUNN	35	65		
			DUNNETT	98	2		
			JONCKH	99	1		
			MW	98	2		
			WILLIAMS	99	1		
	25	NO	DUNN	1	99		
			DUNNETT	98	2		
			JONCKH	99	1		
			JONCKHX	99	2		
			MW	99	1		
			MWX	99	2		
			WILLIAMS	99	1		
		YES	DUNN	37	64		
			DUNNETT	98	2		
			JONCKH	99	1		
			JONCKHX	99	1		
			MW	99	1		
			MWX	99	1		
			WILLIAMS	100	1		

Table 2
Comparison of Allocation Rules for 4 Dose Experiments

POWER SIMULATIONS FOR 4 DOSES, LINEAR DOSE-RESPONSE TREND
RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.2918 0.5836 0.8754

				NOAEL			
				0	1	2	3
TEST	REPS	SAMPSIZE	SQRTRULE				
DUNN	2	10	NO			74	26
			YES			.	100
		15	NO			83	17
			YES				100
		20	YES				100
		25	NO			87	14
			YES				100
	3	10	NO		23	77	1
			YES		17	82	2
		15	NO		20	80	0
			YES		16	83	1
		20	NO		20	80	
			YES		14	85	1
		25	NO		21	79	0
			YES		13	87	0
	4	10	NO		70	31	
			YES	0	84	16	
		15	NO		77	23	
			YES	0	87	13	
		20	NO		81	19	
			YES		91	9	
		25	NO		84	16	
			YES		93	7	
	5	10	NO		92	8	
			YES	2	96	3	
		15	NO		97	3	
			YES	1	98	1	
		20	NO		98	2	
			YES	1	99	1	
		25	NO		99	1	
			YES	0	99	0	
	6	10	NO	0	98	2	
			YES	4	96	0	
		15	NO	0	100	0	
			YES	3	97	0	
		20	NO	0	100	0	
			YES	2	98	0	
		25	NO	0	100	0	
			YES	2	98	0	
	7	10	NO	1	99	0	
			YES	17	83	0	
		15	NO	0	100	0	
			YES	17	83		
		20	NO	0	100	0	
			YES	16	84		
		25	NO	0	100	0	
			YES	16	84		
	8	10	NO	2	98	0	
			YES	26	74		
		15	NO	2	98		
			YES	30	70		
		20	NO	1	99		
			YES	35	65		
		25	NO	1	99		
			YES	37	64		

Table 2
Comparison of Allocation Rules for 4 Dose Experiments

POWER SIMULATIONS FOR 4 DOSES, LINEAR DOSE-RESPONSE TREND
RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.2918 0.5836 0.8754

				NOAEL			
				0	1	2	3
TEST	REPS	SAMPSIZE	SQRTRULE				
DUNNETT	2	10	NO	21	52	25	4
			YES	12	46	34	9
		15	NO	26	54	19	1
			YES	19	49	27	4
		20	YES	25	51	22	2
		25	NO	33	54	12	1
			YES	25	51	21	3
	3	10	NO	43	53	5	0
			YES	41	55	5	
		15	NO	53	46	2	
			YES	49	49	2	
		20	NO	55	44	1	
			YES	52	46	2	
		25	NO	60	40	0	
			YES	57	42	1	
	4	10	NO	59	42	1	
			YES	60	40	1	
		15	NO	67	33	0	
			YES	69	31	0	
		20	NO	73	27	0	
			YES	74	26	0	
		25	NO	77	23	0	
			YES	76	24		
	5	10	NO	70	30	0	
			YES	74	26	0	
		15	NO	79	21		
			YES	81	19	0	
		20	NO	85	15		
			YES	85	15	0	
		25	NO	87	13		
			YES	89	11		
	6	10	NO	81	19		
			YES	82	18		
		15	NO	88	12		
			YES	90	10		
		20	NO	91	9		
			YES	93	7		
		25	NO	93	7		
			YES	94	6		
	7	10	NO	87	13		
			YES	87	13		
		15	NO	93	7		
			YES	93	7		
		20	NO	95	5		
			YES	95	5		
		25	NO	96	4		
			YES	97	3		
	8	10	NO	92	8		
			YES	92	8		
		15	NO	96	4		
			YES	96	4		
		20	NO	97	3		
			YES	98	2		
		25	NO	98	2		
			YES	98	2		

Table 2
Comparison of Allocation Rules for 4 Dose Experiments

POWER SIMULATIONS FOR 4 DOSES, LINEAR DOSE-RESPONSE TREND
RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.2918 0.5836 0.8754

				NOAEL			
				0	1	2	3
TEST	REPS	SAMPSIZE	SQRTRULE				
JONCKH	2	10	NO	75	25	1	
			YES	86	12	3	
		15	NO	82	17	0	
			YES	90	8	2	
		20	YES	91	7	2	
		25	NO	87	14	0	
			YES	92	7	1	
	3	10	NO	56	43	2	
			YES	66	31	4	
		15	NO	61	38	1	
			YES	73	25	2	
		20	NO	63	36	1	
			YES	76	22	2	
		25	NO	68	32	0	
			YES	78	20	2	
	4	10	NO	72	28	0	
			YES	75	25	1	
		15	NO	78	22	0	
			YES	81	19	0	
		20	NO	82	18	0	
			YES	86	15		
		25	NO	85	15		
			YES	86	14		
	5	10	NO	79	22		
			YES	85	16	0	
		15	NO	85	15		
			YES	90	10		
		20	NO	89	11		
			YES	92	8		
		25	NO	91	9		
			YES	93	7		
	6	10	NO	86	14		
			YES	91	9		
		15	NO	91	9		
			YES	95	5		
		20	NO	93	7		
			YES	96	4		
		25	NO	95	5		
			YES	97	3		
	7	10	NO	91	9		
			YES	92	8		
		15	NO	96	4		
			YES	96	4		
		20	NO	97	3		
			YES	97	3		
		25	NO	98	2		
			YES	98	2		
	8	10	NO	94	6		
			YES	96	4		
		15	NO	98	2		
			YES	98	2		
		20	NO	98	2		
			YES	99	1		
		25	NO	99	1		
			YES	99	1		

Table 2
Comparison of Allocation Rules for 4 Dose Experiments

POWER SIMULATIONS FOR 4 DOSES, LINEAR DOSE-RESPONSE TREND
RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.2918 0.5836 0.8754

				NOAEL			
				0	1	2	3
TEST	REPS	SAMPSIZE	SQRTRULE				
JONCKHX	2	10	NO	75	25	1	
			YES	62	31	7	
		25	NO	88	13	0	
			YES	73	24	4	
	3	10	NO	28	68	4	
			YES	49	48	3	
		25	NO	34	66	1	
			YES	62	37	2	
	4	10	NO	57	43	0	
			YES	65	35	1	
		25	NO	73	28		
			YES	79	22	0	
	5	10	NO	76	24		
			YES	78	22	0	
		25	NO	90	10		
			YES	90	10		
	6	10	NO	86	15		
		25	NO	95	6		
			YES	96	5		
	7	25	NO	98	3		
			YES	98	2		
	8	25	NO	99	2		
			YES	99	1		
MW	2	10	NO				100
			YES				100
		15	NO				100
			YES				100
		20	YES				100
		25	NO				100
			YES				100
	3	10	NO				100
			YES				100
		15	NO				100
			YES				100
		20	NO				100
			YES				100
		25	NO				100
			YES				100
	4	10	NO	55	38	7	0
			YES	64	34	2	0
		15	NO	64	32	4	0
			YES	71	27	1	0
		20	NO	68	30	2	
			YES	76	23	1	
		25	NO	72	27	2	
			YES	78	22	0	0
	5	10	NO	78	21	1	
			YES	78	22	1	
		15	NO	85	15	0	
			YES	84	15	0	
		20	NO	89	11	0	
			YES	87	13	0	
		25	NO	91	9	0	
			YES	90	10	0	

Table 2
Comparison of Allocation Rules for 4 Dose Experiments

POWER SIMULATIONS FOR 4 DOSES, LINEAR DOSE-RESPONSE TREND
RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.2918 0.5836 0.8754

				NOAEL			
				0	1	2	3
TEST	REPS	SAMPSIZE	SQRTRULE				
	6	10	NO	86	14	0	
			YES	88	12	0	
		15	NO	91	9		
			YES	93	7		
		20	NO	93	7		
			YES	94	6		
		25	NO	95	5		
			YES	96	4		
	7	10	NO	91	9	0	
			YES	92	8		
		15	NO	96	4		
			YES	96	4		
		20	NO	97	3		
			YES	97	3		
		25	NO	98	2		
			YES	98	2		
	8	10	NO	93	8		
			YES	95	5		
		15	NO	97	3		
			YES	97	3		
		20	NO	97	3		
			YES	98	2		
		25	NO	99	1		
			YES	99	1		
MWX	2	10	NO				100
			YES				100
		25	NO				100
			YES				100
	3	10	NO			3	97
			YES			14	86
		25	NO			3	97
			YES			20	81
	4	10	NO	56	38	7	0
			YES	64	34	2	0
		25	NO	72	27	2	
			YES	79	22	0	
	5	10	NO	76	23	1	
			YES	78	22	0	
		25	NO	90	10	0	
			YES	91	10		
	6	10	NO	85	15	0	
		25	NO	95	6		
			YES	96	5		
	7	25	NO	98	3		
			YES	98	2		
	8	25	NO	99	2		
			YES	99	1		
WILLIAMS	2	10	NO	34	52	14	1
			YES	30	51	18	2
		15	NO	42	49	9	0
			YES	38	47	14	0
		20	YES	42	48	9	0
		25	NO	50	45	6	0
			YES	43	48	8	0

Table 2
Comparison of Allocation Rules for 4 Dose Experiments

POWER SIMULATIONS FOR 4 DOSES, LINEAR DOSE-RESPONSE TREND
RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.2918 0.5836 0.8754

				NOAEL			
				0	1	2	3
TEST	REPS	SAMPSIZE	SQRTRULE				
	3	10	NO		59	40	2
			YES		59	40	1
		15	NO		68	32	1
			YES		68	32	1
		20	NO		71	29	0
			YES		70	30	1
		25	NO		75	25	0
			YES		74	26	0
	4	10	NO		72	29	0
			YES		76	25	0
		15	NO		79	21	0
			YES		82	18	0
		20	NO		84	16	
			YES		86	14	
WILLIAMS	4	25	NO		87	13	
			YES		87	13	
	5	10	NO		83	17	
			YES		86	14	
		15	NO		88	12	
			YES		90	10	
		20	NO		92	8	
			YES		93	7	
		25	NO		94	6	
			YES		95	5	
	6	10	NO		89	11	
			YES		91	9	
		15	NO		94	6	
			YES		95	5	
		20	NO		95	5	
			YES		97	3	
		25	NO		97	3	
			YES		97	3	
	7	10	NO		93	7	
			YES		95	6	
		15	NO		97	3	
			YES		97	3	
		20	NO		98	2	
			YES		98	2	
		25	NO		99	1	
			YES		99	1	
	8	10	NO		96	4	
			YES		97	4	
		15	NO		99	1	
			YES		98	2	
		20	NO		99	1	
			YES		99	1	
		25	NO		99	1	
			YES		100	1	

Table 3 Effect of Number of Replicates on Power

POWER SIMULATIONS FOR 4 DOSES, LINEAR DOSE-RESPONSE TREND RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.2918 0.5836 0.8754

				NOAEL			
				0	1	2	3
TEST	SQRTRULE	REPS	SAMPSIZE				
DUNN	NO	2	10			74	26
			15			83	17
			25			87	14
		3	10		23	77	1
			15		20	80	0
			20		20	80	
			25		21	79	0
		4	10		70	31	
			15		77	23	
			20		81	19	
			25		84	16	
		5	10		92	8	
			15		97	3	
			20		98	2	
			25		99	1	
		6	10	0	98	2	
			15	0	100	0	
			20	0	100	0	
			25	0	100	0	
		7	10	1	99	0	
			15	0	100	0	
			20	0	100	0	
			25	0	100	0	
		8	10	2	98	0	
			15	2	98		
			20	1	99		
			25	1	99		
	YES	2	10				100
			15				100
			20				100
			25				100
		3	10		17	82	2
			15		16	83	1
			20		14	85	1
			25		13	87	0
		4	10	0	84	16	
			15	0	87	13	
			20		91	9	
			25		93	7	
		5	10	2	96	3	
			15	1	98	1	
			20	1	99	1	
			25	0	99	0	
		6	10	4	96	0	
			15	3	97	0	
			20	2	98	0	
			25	2	98	0	
		7	10	17	83	0	
			15	17	83		
			20	16	84		
			25	16	84		
		8	10	26	74		
			15	30	70		
			20	35	65		
			25	37	64		

Table 3 Effect of Number of Replicates on Power

POWER SIMULATIONS FOR 4 DOSES, LINEAR DOSE-RESPONSE TREND RELATIVE TO LOG(DOSE)

MAX EFFECT=0.8754, EFFECTS=0 0.2918 0.5836 0.8754

TEST	SQRTRULE	REPS	SAMPSIZE	NOAEL 0	NOAEL 1	NOAEL 2	NOAEL 3
DUNNETT	NO	2	10	21	52	25	4
			15	26	54	19	1
			25	33	54	12	1
		3	10	43	53	5	0
			15	53	46	2	
			20	55	44	1	
			25	60	40	0	
		4	10	59	42	1	
			15	67	33	0	
			20	73	27	0	
			25	77	23	0	
		5	10	70	30	0	
			15	79	21		
			20	85	15		
			25	87	13		
		6	10	81	19		
			15	88	12		
			20	91	9		
			25	93	7		
		7	10	87	13		
			15	93	7		
			20	95	5		
			25	96	4		
		8	10	92	8		
			15	96	4		
			20	97	3		
			25	98	2		
	YES	2	10	12	46	34	9
			15	19	49	27	4
			20	25	51	22	2
			25	25	51	21	3
		3	10	41	55	5	
			15	49	49	2	
			20	52	46	2	
			25	57	42	1	
		4	10	60	40	1	
			15	69	31	0	
			20	74	26	0	
			25	76	24		
		5	10	74	26	0	
			15	81	19	0	
			20	85	15	0	
			25	89	11		
		6	10	82	18		
			15	90	10		
			20	93	7		
			25	94	6		
		7	10	87	13		
			15	93	7		
			20	95	5		
			25	97	3		
		8	10	92	8		
			15	96	4		
			20	98	2		
			25	98	2		

Table 3 Effect of Number of Replicates on Power

POWER SIMULATIONS FOR 4 DOSES, LINEAR DOSE-RESPONSE TREND
RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.2918 0.5836 0.8754

TEST	SQRTRULE	REPS	SAMPSIZE	NOAEL 0	NOAEL 1	NOAEL 2	NOAEL 3
JONCKH	NO	2	10		75	25	1
			15		82	17	0
			25		87	14	0
		3	10		56	43	2
			15		61	38	1
			20		63	36	1
			25		68	32	0
		4	10		72	28	0
			15		78	22	0
			20		82	18	0
			25		85	15	
		5	10		79	22	
			15		85	15	
			20		89	11	
			25		91	9	
		6	10		86	14	
			15		91	9	
			20		93	7	
			25		95	5	
		7	10		91	9	
			15		96	4	
			20		97	3	
			25		98	2	
		8	10		94	6	
			15		98	2	
			20		98	2	
			25		99	1	
	YES	2	10		86	12	3
			15		90	8	2
			20		91	7	2
			25		92	7	1
		3	10		66	31	4
			15		73	25	2
			20		76	22	2
			25		78	20	2
		4	10		75	25	1
			15		81	19	0
			20		86	15	
			25		86	14	
		5	10		85	16	0
			15		90	10	
			20		92	8	
			25		93	7	
		6	10		91	9	
			15		95	5	
			20		96	4	
			25		97	3	
		7	10		92	8	
			15		96	4	
			20		97	3	
			25		98	2	
		8	10		96	4	
			15		98	2	
			20		99	1	
			25		99	1	

Table 3 Effect of Number of Replicates on Power

POWER SIMULATIONS FOR 4 DOSES, LINEAR DOSE-RESPONSE TREND
RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.2918 0.5836 0.8754

TEST	SQRTRULE	REPS	SAMPSIZE	NOAEL 0	NOAEL 1	NOAEL 2	NOAEL 3
JONCKHX	NO	2	10		75	25	1
			25		88	13	0
		3	10	28	68	4	
			25	34	66	1	
		4	10	57	43	0	
			25	73	28		
		5	10	76	24		
			25	90	10		
		6	10	86	15		
			25	95	6		
		7	25	98	3		
		8	25	99	2		
	YES	2	10	62	31	7	
			25	73	24	4	
		3	10	49	48	3	
			25	62	37	2	
		4	10	65	35	1	
			25	79	22	0	
		5	10	78	22	0	
			25	90	10		
		6	25	96	5		
		7	25	98	2		
		8	25	99	1		
MW	NO	2	10				100
			15				100
			25				100
		3	10				100
			15				100
			20				100
			25				100
		4	10	55	38	7	0
			15	64	32	4	0
			20	68	30	2	
			25	72	27	2	
		5	10	78	21	1	
			15	85	15	0	
			20	89	11	0	
			25	91	9	0	
		6	10	86	14	0	
			15	91	9		
			20	93	7		
			25	95	5		
		7	10	91	9	0	
			15	96	4		
			20	97	3		
			25	98	2		
		8	10	93	8		
			15	97	3		
			20	97	3		
			25	99	1		

Table 3 Effect of Number of Replicates on Power

POWER SIMULATIONS FOR 4 DOSES, LINEAR DOSE-RESPONSE TREND
RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.2918 0.5836 0.8754

TEST	SQRTRULE	REPS	SAMPSIZE	NOAEL 0	1	2	3
	YES	2	10				100
			15				100
			20				100
			25				100
		3	10				100
			15				100
			20				100
			25				100
		4	10	64	34	2	0
			15	71	27	1	0
			20	76	23	1	
			25	78	22	0	0
		5	10	78	22	1	
			15	84	15	0	
			20	87	13	0	
			25	90	10	0	
		6	10	88	12	0	
			15	93	7		
			20	94	6		
			25	96	4		
		7	10	92	8		
			15	96	4		
			20	97	3		
			25	98	2		
		8	10	95	5		
			15	97	3		
			20	98	2		
			25	99	1		
MWX	NO	2	10				100
			25				100
		3	10			3	97
			25			3	97
		4	10	56	38	7	0
			25	72	27	2	
		5	10	76	23	1	
			25	90	10	0	
		6	10	85	15	0	
			25	95	6		
		7	25	98	3		
		8	25	99	2		
	YES	2	10				100
			25				100
		3	10			14	86
			25			20	81
		4	10	64	34	2	0
			25	79	22	0	
		5	10	78	22	0	
			25	91	10		
		6	25	96	5		
		7	25	98	2		
		8	25	99	1		

Table 3 Effect of Number of Replicates on Power

POWER SIMULATIONS FOR 4 DOSES, LINEAR DOSE-RESPONSE TREND
RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.2918 0.5836 0.8754

TEST	SQRTRULE	REPS	SAMPSIZE	NOAEL 0	NOAEL 1	NOAEL 2	NOAEL 3
WILLIAMS	NO	2	10	34	52	14	1
			15	42	49	9	0
			25	50	45	6	0
		3	10	59	40	2	
			15	68	32	1	
			20	71	29	0	
			25	75	25	0	
		4	10	72	29	0	
			15	79	21	0	
			20	84	16		
			25	87	13		
		5	10	83	17		
			15	88	12		
			20	92	8		
			25	94	6		
		6	10	89	11		
			15	94	6		
			20	95	5		
			25	97	3		
		7	10	93	7		
			15	97	3		
WILLIAMS	NO	7	20	98	2		
			25	99	1		
		8	10	96	4		
			15	99	1		
			20	99	1		
			25	99	1		
	YES	2	10	30	51	18	2
			15	38	47	14	0
			20	42	48	9	0
			25	43	48	8	0
		3	10	59	40	1	
			15	68	32	1	
			20	70	30	1	
			25	74	26	0	
		4	10	76	25	0	
			15	82	18	0	
			20	86	14		
			25	87	13		
		5	10	86	14		
			15	90	10		
			20	93	7		
			25	95	5		
		6	10	91	9		
			15	95	5		
			20	97	3		
			25	97	3		
		7	10	95	6		
			15	97	3		
			20	98	2		
			25	99	1		
		8	10	97	4		
			15	98	2		
			20	99	1		
			25	100	1		

Table 4 Comparison of Tests for 5 Dose Experiments

POWER SIMULATIONS FOR 5 DOSES, LINEAR DOSE-RESPONSE TREND
RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, DOSES=0 0.21885 0.4377 0.65655 0.8754

				NOAEL				
				0	1	2	3	4
REPS	SAMPSIZE	SQRTRULE	TEST					
2	10	NO	DUNN			6	69	26
			DUNNETT	11	35	37	15	3
			JONCKH		55	41	5	0
			JONCKHX		55	39	6	0
			MW					100
			MWX					100
			WILLIAMS	25	43	26	6	1
		YES	DUNN					100
			DUNNETT	5	26	40	23	7
			JONCKH		65	22	13	1
			JONCKHX		39	47	13	1
			MW					100
			MWX					100
			WILLIAMS	21	43	30	7	1
	15	NO	DUNN			6	76	19
			DUNNETT	14	42	33	9	1
			JONCKH		61	37	2	0
			MW					100
			WILLIAMS	29	47	20	3	0
		YES	DUNN					100
			DUNNETT	8	34	38	16	3
			JONCKH		71	19	9	1
			MW					100
			WILLIAMS	25	45	26	4	0
	20	YES	DUNN					100
			DUNNETT	10	37	37	14	2
			JONCKH		73	18	8	1
			MW					100
			WILLIAMS	27	48	22	3	0
	25	NO	DUNN			6	82	13
			DUNNETT	18	47	31	6	1
			JONCKH		68	31	1	0
			JONCKHX		68	30	2	
			MW					100
			MWX					100
			WILLIAMS	34	49	18	1	0
		YES	DUNN					100
			DUNNETT	13	39	37	11	2
			JONCKH		76	17	7	1
			JONCKHX		50	42	8	0
			MW					100
			MWX					100
			WILLIAMS	31	48	19	3	0
3	10	NO	DUNN		0	56	43	2
			DUNNETT	24	54	21	2	0
			JONCKH	37	51	12	0	
			JONCKHX	19	62	19	1	
			MW					100
			MWX				1	99
			WILLIAMS	42	49	10	0	
		YES	DUNN		0	49	49	3
			DUNNETT	20	56	24	2	0
			JONCKH	43	47	10	1	
			JONCKHX	28	56	16	1	
			MW					100
			MWX				6	94
			WILLIAMS	41	51	9	0	0

Table 4 Comparison of Tests for 5 Dose Experiments

POWER SIMULATIONS FOR 5 DOSES, LINEAR DOSE-RESPONSE TREND
RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, DOSES=0 0.21885 0.4377 0.65655 0.8754

REPS	SAMPSIZE	SQRTRULE	TEST	NOAEL 0	1	2	3	4
	15	NO	DUNN		0	63	36	1
			DUNNETT	30	56	14	0	
			JONCKH	42	51	6	0	
			MW					100
			WILLIAMS	49	46	6	0	
		YES	DUNN		0	54	44	1
			DUNNETT	27	57	15	1	
			JONCKH	50	44	6	0	
			MW					100
			WILLIAMS	49	47	4	0	
	20	NO	DUNN		0	67	33	0
			DUNNETT	31	57	11	0	
			JONCKH	44	51	4		
			MW					100
			WILLIAMS	50	46	4	0	
		YES	DUNN		0	59	41	1
			DUNNETT	29	59	12	0	
			JONCKH	53	43	4	0	
			MW					100
			WILLIAMS	52	45	3	0	
	25	NO	DUNN		0	69	32	1
			DUNNETT	35	57	9	0	
			JONCKH	48	49	4	0	
			JONCKHX	24	68	8		
			MW					100
			MWX				0	100
			WILLIAMS	54	43	3	0	
		YES	DUNN			61	39	1
			DUNNETT	34	57	10	0	
			JONCKH	56	41	4	0	
			JONCKHX	40	54	7		
			MW					100
			MWX				9	91
			WILLIAMS	56	43	2		
4	10	NO	DUNN		4	87	10	0
			DUNNETT	34	57	9	0	
			JONCKH	52	44	6	0	
			JONCKHX	37	58	5		
			MW					100
			MWX	7	11	20	29	33
			WILLIAMS	53	44	3		
		YES	DUNN		14	81	6	0
			DUNNETT	34	58	8	0	
			JONCKH	50	47	3		
			JONCKHX	50	46	5		
			MW	45	37	17	1	0
			MWX	47	41	11	0	
			WILLIAMS	57	42	2		
	15	NO	DUNN		3	90	7	
			DUNNETT	41	54	5		
			JONCKH	57	40	3		
			MW					100
			WILLIAMS	59	39	2		
		YES	DUNN		14	83	3	
			DUNNETT	41	55	4		
			JONCKH	56	43	1		
			MW	53	37	10	0	
			WILLIAMS	62	37	1		

Table 4 Comparison of Tests for 5 Dose Experiments

POWER SIMULATIONS FOR 5 DOSES, LINEAR DOSE-RESPONSE TREND
RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, DOSES=0 0.21885 0.4377 0.65655 0.8754

				NOAEL				
				0	1	2	3	4
REPS	SAMPSIZE	SQRTRULE	TEST					
	20	NO	DUNN		3	93	4	
			DUNNETT	45	52	3		
			JONCKH	63	35	2		
			MW					100
			WILLIAMS	65	35	1		
		YES	DUNN		13	85	2	
			DUNNETT	45	53	3		
			JONCKH	60	39	1		
			MW	57	35	7	0	
			WILLIAMS	67	32	1		
	25	NO	DUNN		3	93	4	
			DUNNETT	48	50	2		
			JONCKH	65	34	1		
			JONCKHX	47	51	1		
			MW					100
			MWX	10	15	23	24	27
			WILLIAMS	66	34	1		
		YES	DUNN		14	85	2	
			DUNNETT	49	49	2		
			JONCKH	63	36	1		
			JONCKHX	63	36	1		
			MW	61	34	6	0	
			MWX	62	35	3		
			WILLIAMS	70	30	0		
5	10	NO	DUNN		16	83	2	
			DUNNETT	43	54	4	0	
			JONCKH	57	42	2		
			JONCKHX	56	43	2		
			MW	56	36	9	1	0
			MWX	55	37	8	0	
			WILLIAMS	63	37	1		
		YES	DUNN		41	59	0	
			DUNNETT	46	51	3		
			JONCKH	65	34	1		
			MW	56	39	5	0	
			WILLIAMS	67	33	0		
	15	NO	DUNN		16	83	1	
			DUNNETT	51	48	1		
			JONCKH	65	35	1		
			MW	64	31	5	0	
			WILLIAMS	69	30	0		
		YES	DUNN		46	54	0	
			DUNNETT	54	46	1		
			JONCKH	72	28	0		
			MW	64	34	2	0	
			WILLIAMS	74	26	0		
	20	NO	DUNN		15	84	0	
			DUNNETT	57	43	1		
			JONCKH	69	30	0		
			MW	68	28	3	0	
			WILLIAMS	74	25	0		
		YES	DUNN		50	50	0	
			DUNNETT	58	42	0		
			JONCKH	76	24	0		
			MW	69	29	1		
			WILLIAMS	77	23	0		

Table 4 Comparison of Tests for 5 Dose Experiments

POWER SIMULATIONS FOR 5 DOSES, LINEAR DOSE-RESPONSE TREND RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, DOSES=0 0.21885 0.4377 0.65655 0.8754

				NOAEL				
				0	1	2	3	4
REPS	SAMPSIZE	SQRTRULE	TEST					
	25	NO	DUNN		15	86	0	
			DUNNETT	60	40	1		
			JONCKH	73	27	0		
			JONCKHX	72	28	0		
			MW	73	25	3	0	
			MWX	72	26	3		
			WILLIAMS	78	22	0		
		YES	DUNN		52	49	0	
			DUNNETT	64	36	0		
			JONCKH	80	20	0		
			JONCKHX	74	26			
			MW	73	27	1		
			MWX	74	26	1		
			WILLIAMS	82	18	0		
6	10	NO	DUNN		36	63	0	
			DUNNETT	51	48	1		
			JONCKH	63	36	1		
			MW	63	34	3	0	
			WILLIAMS	69	31	0		
		YES	DUNN	0	64	36	0	
			DUNNETT	55	44	1		
			JONCKH	71	29	0		
			MW	70	29	1		
			WILLIAMS	74	26	0		
	15	NO	DUNN		40	60	0	
			DUNNETT	61	39	0		
			JONCKH	72	28	0		
			MW	72	27	1		
			WILLIAMS	77	23	0		
		YES	DUNN		72	28	0	
			DUNNETT	64	36	0		
			JONCKH	78	22			
			MW	78	21	0		
			WILLIAMS	81	19			
	20	NO	DUNN		42	58	0	
			DUNNETT	66	34	0		
			JONCKH	77	23	0		
			MW	77	23	1		
			WILLIAMS	82	18	0		
		YES	DUNN	0	76	24		
			DUNNETT	69	31	0		
			JONCKH	82	18	0		
			MW	82	18	0		
			WILLIAMS	84	16			
	25	NO	DUNN		44	57		
			DUNNETT	70	30	0		
			JONCKH	80	21	0		
			JONCKHX	79	21	0		
			MW	80	20	0		
			MWX	79	21	0		
			WILLIAMS	84	17			
		YES	DUNN	0	80	21		
			DUNNETT	74	27	0		
			JONCKH	85	15	0		
			JONCKHX	83	17			
			MW	85	15	0		
			MWX	84	16			
			WILLIAMS	87	13			

Table 4 Comparison of Tests for 5 Dose Experiments

POWER SIMULATIONS FOR 5 DOSES, LINEAR DOSE-RESPONSE TREND RELATIVE TO LOG(DOSE)

MAX EFFECT=0.8754, DOSES=0 0.21885 0.4377 0.65655 0.8754

REPS	SAMPSIZE	SQRTRULE	TEST	NOAEL 0	1	2	3	4
7	10	NO	DUNN	0	60	40		
			DUNNETT	59	40	1		
			JONCKH	72	27	0		
			MW	72	27	1		
			WILLIAMS	76	24	0		
	15	NO	DUNN		66	34		
			DUNNETT	67	33	0		
			JONCKH	79	21	0		
			MW	79	21	0		
			WILLIAMS	82	18	0		
		YES	DUNN	1	91	8		
			DUNNETT	69	31	0		
			JONCKH	83	17	0		
			MW	83	17	0		
			WILLIAMS	85	15			
	20	NO	DUNN		71	29		
			DUNNETT	73	27			
			JONCKH	83	17			
			MW	83	17	0		
			WILLIAMS	86	14			
		YES	DUNN	1	94	5		
			DUNNETT	75	25	0		
			JONCKH	87	13			
			MW	87	13	0		
			WILLIAMS	89	11			
	25	NO	DUNN	0	74	27		
			DUNNETT	77	24	0		
			JONCKH	86	14			
			JONCKHX	84	16			
			MW	86	14	0		
			MWX	85	15	0		
			WILLIAMS	89	11			
		YES	DUNN	1	95	4		
			DUNNETT	79	21			
			JONCKH	90	11	0		
			JONCKHX	88	12			
			MW	90	11			
			MWX	88	12			
			WILLIAMS	91	9			
8	15	NO	DUNN		84	16		
			DUNNETT	76	24	0		
			JONCKH	86	14			
			MW	83	17	0		
			WILLIAMS	88	12			
		YES	DUNN	3	94	3		
			DUNNETT		77	23		
			JONCKH		89	11		
			MW		89	11		
			WILLIAMS		90	10		
	20	NO	DUNN			87	13	
			DUNNETT		80	20		
			JONCKH		89	11		
			MW		87	13		
			WILLIAMS		91	9		
		YES	DUNN		3	95	2	
			DUNNETT		82	18		
			JONCKH		91	9		
			MW		91	9		

Table 4 Comparison of Tests for 5 Dose Experiments

POWER SIMULATIONS FOR 5 DOSES, LINEAR DOSE-RESPONSE TREND RELATIVE TO LOG(DOSE)

MAX EFFECT=0.8754, DOSES=0 0.21885 0.4377 0.65655 0.8754

REPS	SAMPSIZE	SQRTRULE	TEST	NOAEL 0	1	2	3	4
8	20	YES	WILLIAMS		92	8		
	25	NO	DUNN			90	11	
			DUNNETT		84	17		
			JONCKH		91	9		
			JONCKHX		89	11		
			MW		89	11	0	
			MWX		89	11		
			WILLIAMS		93	8		
		YES	DUNN		2	97	1	
			DUNNETT		85	16	0	
			JONCKH		92	8		
			JONCKHX		93	7		
			MW		92	8		
			MWX		93	7		
			WILLIAMS		94	6		

Table 5 Comparison of Allocation Rules for 5 Dose Experiments

POWER COMPARISON OF ALLOCATION RULES FOR 5 DOSE EXPERIMENTS
LINEAR DOSE-RESPONSE TREND RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.21885 0.4377 0.65655 0.8754

				NOAEL				
				0	1	2	3	4
TEST	REPS	SAMPSIZE	SQRTRULE					
DUNN	2	10	NO			6	69	26
			YES					100
		15	NO			6	76	19
			YES					100
		20	YES					100
		25	NO			6	81	13
			YES					100
	3	10	NO		0	56	43	2
			YES		0	49	49	3
		15	NO		0	63	36	1
			YES		0	54	44	1
		20	NO		0	67	33	0
			YES		0	59	41	1
		25	NO		0	69	31	0
			YES		0	61	38	1
	4	10	NO		4	87	10	0
			YES		14	81	6	0
		15	NO		3	90	7	
			YES		14	83	3	
		20	NO		3	93	4	
			YES		13	85	2	
		25	NO		3	93	3	
			YES		14	85	1	
	5	10	NO		16	83	2	
			YES		41	59	0	
		15	NO		16	83	1	
			YES		46	54	0	
		20	NO		15	84	0	
			YES		50	50	0	
		25	NO		14	86	0	
			YES		51	49	0	
	6	10	NO		37	63	0	
			YES	0	65	36	0	
		15	NO		40	60	0	
			YES		72	28	0	
		20	NO		42	58	0	
			YES	0	76	24		
		25	NO		43	57		
			YES	0	80	20		
	7	10	NO	0	60	40		
			YES	3	83	14		
		15	NO		66	34		
			YES	1	91	8		
		20	NO		71	29		
			YES	1	94	5		
		25	NO	0	73	27		
			YES	1	95	4		
	8	10	NO		75	25		
			YES	4	89	7		
		15	NO		84	16		
			YES	3	94	3		
		20	NO		87	13		
			YES	3	95	2		
		25	NO		89	11		
			YES	2	97	1		

Table 5 Comparison of Allocation Rules for 5 Dose Experiments

POWER COMPARISON OF ALLOCATION RULES FOR 5 DOSE EXPERIMENTS
LINEAR DOSE-RESPONSE TREND RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.21885 0.4377 0.65655 0.8754

				NOAEL				
				0	1	2	3	4
TEST	REPS	SAMPSIZE	SQRTRULE					
DUNNETT	2	10	NO	11	35	37	15	3
			YES	5	26	40	23	7
		15	NO	14	42	33	9	1
			YES	8	34	38	16	3
		20	YES	11	37	37	14	2
		25	NO	18	46	30	6	0
			YES	12	39	36	11	1
	3	10	NO	24	54	21	2	0
			YES	20	56	24	2	0
		15	NO	30	56	14	0	
			YES	27	57	15	1	
		20	NO	31	57	11	0	
			YES	29	59	12	0	
		25	NO	35	56	9	0	
			YES	33	57	10	0	
	4	10	NO	34	57	9	0	
			YES	34	58	8	0	
		15	NO	41	54	5		
			YES	41	55	4		
		20	NO	45	52	3		
			YES	45	53	3		
		25	NO	48	49	2		
			YES	49	49	2	0	
	5	10	NO	43	54	4	0	
			YES	45	53	3		
		15	NO	51	48	1		
			YES	54	46	1		
		20	NO	57	43	1		
			YES	58	42	0		
		25	NO	60	39	0		
			YES	64	36	0		
	6	10	NO	52	47	1		
			YES	55	45	1		
		15	NO	61	39	0		
			YES	64	36	0		
		20	NO	66	34	0		
			YES	69	31	0		
		25	NO	70	30	0		
			YES	73	27	0		
	7	10	NO	59	41	1		
			YES	61	39	0		
		15	NO	67	33	0		
			YES	69	31	0		
		20	NO	73	27			
			YES	75	25	0		
		25	NO	76	24	0		
			YES	79	21			
	8	10	NO	66	34	0		
			YES	69	31	0		
		15	NO	76	24	0		
			YES	77	23			
		20	NO	80	20			
			YES	82	18			
		25	NO	83	17			
			YES	85	15	0		

Table 5 Comparison of Allocation Rules for 5 Dose Experiments

POWER COMPARISON OF ALLOCATION RULES FOR 5 DOSE EXPERIMENTS
LINEAR DOSE-RESPONSE TREND RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.21885 0.4377 0.65655 0.8754

				NOAEL				
				0	1	2	3	4
TEST	REPS	SAMPSIZE	SQRTRULE					
JONCKH	2	10	NO		55	41	5	0
			YES		65	22	13	1
		15	NO		61	37	2	0
			YES		71	19	9	1
		20	YES		74	18	8	1
		25	NO		68	31	1	0
			YES		76	17	7	0
	3	10	NO	37	51	12	0	
			YES	43	47	10	1	
		15	NO	42	51	6	0	
			YES	50	44	6	0	
		20	NO	44	51	4		
			YES	53	43	4	0	
		25	NO	48	48	4	0	
			YES	56	41	4	0	
	4	10	NO	52	44	6	0	
			YES	50	47	3		
		15	NO	57	40	3		
			YES	56	43	1		
		20	NO	63	35	2		
			YES	60	39	1		
		25	NO	65	34	1		
			YES	63	36	0		
	5	10	NO	57	42	2		
			YES	65	35	1		
		15	NO	65	35	1		
			YES	72	28	0		
		20	NO	69	30	0		
			YES	76	24	0		
		25	NO	73	27	0		
			YES	80	20	0		
	6	10	NO	66	34	1		
			YES	71	29	0		
		15	NO	72	28	0		
			YES	78	22			
		20	NO	77	23	0		
			YES	82	18	0		
		25	NO	79	21	0		
			YES	85	15	0		
	7	10	NO	72	27	0		
			YES	77	23	0		
		15	NO	79	21	0		
			YES	83	17	0		
		20	NO	83	17			
			YES	87	13			
		25	NO	86	14	0		
			YES	89	11	0		
	8	10	NO	80	20	0		
			YES	83	17			
		15	NO	86	14			
			YES	89	11			
		20	NO	89	11			
			YES	91	9			
		25	NO	91	9			
			YES	92	8			

Table 5 Comparison of Allocation Rules for 5 Dose Experiments

POWER COMPARISON OF ALLOCATION RULES FOR 5 DOSE EXPERIMENTS
LINEAR DOSE-RESPONSE TREND RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.21885 0.4377 0.65655 0.8754

				NOAEL				
				0	1	2	3	4
TEST	REPS	SAMPSIZE	SQRTRULE					
JONCKHX	2	10	NO		55	39	6	0
			YES		39	47	13	1
		25	NO		68	30	2	
			YES		50	42	8	0
	3	10	NO	19	62	19	1	
			YES	28	56	16	1	
		25	NO	24	68	8		
			YES	40	54	7		
	4	10	NO	37	58	5		
			YES	50	46	5		
		25	NO	47	51	1		
			YES	63	36	1		
	5	10	NO	56	43	2		
			YES	58	41	1		
		25	NO	72	28	0		
			YES	74	26			
	6	10	NO	68	31	1		
			YES	68	32	0		
		25	NO	79	21	0		
			YES	83	17			
	7	10	NO	69	31	0		
			YES	76	24	0		
		25	NO	84	16			
			YES	88	12			
	8	10	NO	77	23	0		
			YES	82	18			
		25	NO	89	11			
			YES	93	7			
MW	2	10	NO					100
			YES					100
		15	NO					100
			YES					100
		20	YES					100
		25	NO					100
			YES					100
	3	10	NO					100
			YES					100
		15	NO					100
			YES					100
		20	NO					100
			YES					100
		25	NO					100
			YES					100
	4	10	NO					100
			YES	45	37	17	1	0
		15	NO					100
			YES	53	37	10	0	
		20	NO					100
			YES	57	35	7	0	
		25	NO					100
			YES	61	33	6	0	
	5	10	NO	56	36	9	1	0
			YES	56	40	5	0	
		15	NO	64	31	5	0	
			YES	64	34	2	0	
		20	NO	68	28	3	0	
			YES	69	29	1		
		25	NO	72	25	2	0	
			YES	73	26	1		

Table 5 Comparison of Allocation Rules for 5 Dose Experiments

POWER COMPARISON OF ALLOCATION RULES FOR 5 DOSE EXPERIMENTS
LINEAR DOSE-RESPONSE TREND RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.21885 0.4377 0.65655 0.8754

				NOAEL				
				0	1	2	3	4
TEST	REPS	SAMPSIZE	SQRTRULE					
MW	6	10	NO	66	32	3	0	
			YES	71	29	1		
		15	NO	72	27	1		
			YES	78	21	0		
		20	NO	77	23	1		
			YES	82	18	0		
		25	NO	79	20	0		
			YES	85	15	0		
	7	10	NO	72	27	1		
			YES	77	23	1		
		15	NO	79	21	0		
			YES	83	17	0		
		20	NO	83	17	0		
			YES	87	13	0		
		25	NO	86	14	0		
			YES	89	11	0		
	8	10	NO	77	23	0		
			YES	83	17			
		15	NO	83	17	0		
			YES	89	11			
		20	NO	87	13			
			YES	91	9			
		25	NO	89	11	0		
			YES	92	8			
MWX	2	10	NO					100
			YES					100
		25	NO					100
			YES					100
	3	10	NO				1	99
			YES				6	94
		25	NO				0	100
			YES				9	91
	4	10	NO	7	11	20	29	33
			YES	47	41	11	0	
		25	NO	10	15	23	24	27
			YES	62	35	3		
	5	10	NO	55	37	8	0	
			YES	56	41	4		
		25	NO	72	26	3		
			YES	74	26	1		
	6	10	NO	68	30	2		
			YES	68	31	1		
		25	NO	79	21	0		
			YES	84	16			
	7	10	NO	69	30	1		
			YES	76	23	1		
		25	NO	85	15	0		
			YES	88	12			
	8	10	NO	77	23	0		
			YES	83	17			
		25	NO	89	11			
			YES	93	7			

Table 5 Comparison of Allocation Rules for 5 Dose Experiments

POWER COMPARISON OF ALLOCATION RULES FOR 5 DOSE EXPERIMENTS
LINEAR DOSE-RESPONSE TREND RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.21885 0.4377 0.65655 0.8754

				NOAEL				
				0	1	2	3	4
TEST	REPS	SAMPSIZE	SQRTRULE					
WILLIAMS	2	10	NO	25	43	26	6	1
			YES	21	43	30	7	1
		15	NO	29	47	20	3	0
			YES	25	45	26	4	0
		20	YES	28	48	22	3	0
		25	NO	34	49	17	1	0
			YES	31	48	19	2	0
	3	10	NO	42	49	10	0	
			YES	41	51	9	0	0
		15	NO	49	46	6	0	
			YES	49	47	4	0	
WILLIAMS	3	20	NO	50	46	4	0	
			YES	52	45	3	0	
		25	NO	54	43	3	0	
			YES	55	42	2		
	4	10	NO	53	44	3		
			YES	57	42	2		
		15	NO	59	39	2		
			YES	62	37	1		
		20	NO	65	35	1		
			YES	67	32	1		
		25	NO	66	33	0		
			YES	70	29	0		
	5	10	NO	63	37	1		
			YES	67	33	0		
		15	NO	69	30	0		
			YES	74	26	0		
		20	NO	74	25	0		
			YES	77	23	0		
		25	NO	78	22	0		
			YES	82	18	0		
	6	10	NO	72	29	0		
			YES	74	26	0		
		15	NO	77	23	0		
			YES	81	19			
		20	NO	82	18	0		
			YES	84	16			
		25	NO	84	16			
			YES	87	13			
	7	10	NO	75	25	0		
			YES	80	20			
		15	NO	82	18	0		
			YES	85	15			
		20	NO	86	14			
			YES	89	11			
		25	NO	89	11			
			YES	91	9			
	8	10	NO	82	18			
			YES	84	16			
		15	NO	88	12			
			YES	90	10			
		20	NO	91	9			
			YES	92	8			
		25	NO	93	7			
			YES	94	6			

Table 6 Effect of Number of Replicates on Power

POWER COMPARISON OF REPLICATE COUNT FOR 5 DOSE EXPERIMENTS
LINEAR DOSE-RESPONSE TREND RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.21885 0.4377 0.65655 0.8754

				NOAEL				
				0	1	2	3	4
TEST	SQRTRULE	REPS	SAMPSIZE					
DUNN	NO	2	10			6	69	26
			15			6	76	19
			25			6	81	13
		3	10		0	56	43	2
			15		0	63	36	1
			20		0	67	33	0
			25		0	69	31	0
		4	10		4	87	10	0
			15		3	90	7	
			20		3	93	4	
			25		3	93	3	
		5	10		16	83	2	
			15		16	83	1	
			20		15	84	0	
			25		14	86	0	
		6	10		37	63	0	
			15		40	60	0	
			20		42	58	0	
			25		43	57		
		7	10	0	60	40		
			15		66	34		
			20		71	29		
			25	0	73	27		
		8	10		75	25		
			15		84	16		
			20		87	13		
			25		89	11		
	YES	2	10					100
			15					100
			20					100
			25					100
		3	10		0	49	49	3
			15		0	54	44	1
			20		0	59	41	1
			25		0	61	38	1
		4	10		14	81	6	0
			15		14	83	3	
			20		13	85	2	
			25		14	85	1	
		5	10		41	59	0	
			15		46	54	0	
			20		50	50	0	
			25		51	49	0	
		6	10	0	65	36	0	
			15		72	28	0	
			20	0	76	24		
			25	0	80	20		
		7	10	3	83	14		
			15	1	91	8		
			20	1	94	5		
			25	1	95	4		
		8	10	4	89	7		
			15	3	94	3		
			20	3	95	2		
			25	2	97	1		

Table 6 Effect of Number of Replicates on Power

POWER COMPARISON OF REPLICATE COUNT FOR 5 DOSE EXPERIMENTS
LINEAR DOSE-RESPONSE TREND RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.21885 0.4377 0.65655 0.8754

				NOAEL				
				0	1	2	3	4
TEST	SQRTRULE	REPS	SAMPSIZE					
DUNNETT	NO	2	10	11	35	37	15	3
			15	14	42	33	9	1
			25	18	46	30	6	0
		3	10	24	54	21	2	0
			15	30	56	14	0	
			20	31	57	11	0	
			25	35	56	9	0	
		4	10	34	57	9	0	
			15	41	54	5		
			20	45	52	3		
			25	48	49	2		
		5	10	43	54	4	0	
			15	51	48	1		
			20	57	43	1		
			25	60	39	0		
		6	10	52	47	1		
			15	61	39	0		
			20	66	34	0		
			25	70	30	0		
		7	10	59	41	1		
			15	67	33	0		
			20	73	27			
			25	76	24	0		
		8	10	66	34	0		
			15	76	24	0		
			20	80	20			
			25	83	17			
	YES	2	10	5	26	40	23	7
			15	8	34	38	16	3
			20	11	37	37	14	2
			25	12	39	36	11	1
		3	10	20	56	24	2	0
			15	27	57	15	1	
			20	29	59	12	0	
			25	33	57	10	0	
		4	10	34	58	8	0	
			15	41	55	4		
			20	45	53	3		
			25	49	49	2	0	
		5	10	45	53	3		
			15	54	46	1		
			20	58	42	0		
			25	64	36	0		
		6	10	55	45	1		
			15	64	36	0		
			20	69	31	0		
			25	73	27	0		
		7	10	61	39	0		
			15	69	31	0		
			20	75	25	0		
			25	79	21			
		8	10	69	31	0		
			15	77	23			
			20	82	18			
			25	85	15	0		

Table 6 Effect of Number of Replicates on Power

POWER COMPARISON OF REPLICATE COUNT FOR 5 DOSE EXPERIMENTS
LINEAR DOSE-RESPONSE TREND RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.21885 0.4377 0.65655 0.8754

				NOAEL				
TEST	SQRTRULE	REPS	SAMPSIZE	0	1	2	3	4
JONCKH	NO	2	10		55	41	5	0
			15		61	37	2	0
			25		68	31	1	0
		3	10	37	51	12	0	
			15	42	51	6	0	
			20	44	51	4		
			25	48	48	4	0	
		4	10	52	44	6	0	
			15	57	40	3		
			20	63	35	2		
			25	65	34	1		
		5	10	57	42	2		
			15	65	35	1		
			20	69	30	0		
			25	73	27	0		
		6	10	66	34	1		
			15	72	28	0		
			20	77	23	0		
			25	79	21	0		
		7	10	72	27	0		
			15	79	21	0		
			20	83	17			
			25	86	14	0		
		8	10	80	20	0		
			15	86	14			
			20	89	11			
			25	91	9			
	YES	2	10		65	22	13	1
			15		71	19	9	1
			20		74	18	8	1
			25		76	17	7	0
		3	10	43	47	10	1	
			15	50	44	6	0	
			20	53	43	4	0	
			25	56	41	4	0	
		4	10	50	47	3		
			15	56	43	1		
			20	60	39	1		
			25	63	36	0		
		5	10	65	35	1		
			15	72	28	0		
			20	76	24	0		
			25	80	20	0		
		6	10	71	29	0		
			15	78	22			
			20	82	18	0		
			25	85	15	0		
		7	10	77	23	0		
			15	83	17	0		
			20	87	13			
			25	89	11	0		
		8	10	83	17			
			15	89	11			
			20	91	9			
			25	92	8			

Table 6 Effect of Number of Replicates on Power

POWER COMPARISON OF REPLICATE COUNT FOR 5 DOSE EXPERIMENTS
LINEAR DOSE-RESPONSE TREND RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.21885 0.4377 0.65655 0.8754

				NOAEL				
TEST	SQRTRULE	REPS	SAMPSIZE	0	1	2	3	4
JONCKHX	NO	2	10		55	39	6	0
			25		68	30	2	
		3	10	19	62	19	1	
			25	24	68	8		
		4	10	37	58	5		
			25	47	51	1		
		5	10	56	43	2		
			25	72	28	0		
		6	10	68	31	1		
			25	79	21	0		
		7	10	69	31	0		
			25	84	16			
		8	10	77	23	0		
			25	89	11			
	YES	2	10		39	47	13	1
			25		50	42	8	0
		3	10	28	56	16	1	
			25	40	54	7		
		4	10	50	46	5		
			25	63	36	1		
		5	10	58	41	1		
			25	74	26			
		6	10	68	32	0		
			25	83	17			
		7	10	76	24	0		
			25	88	12			
		8	10	82	18			
			25	93	7			
MW	NO	2	10					100
			15					100
			25					100
		3	10					100
			15					100
			20					100
			25					100
		4	10					100
			15					100
			20					100
			25					100
		5	10	56	36	9	1	0
			15	64	31	5	0	
			20	68	28	3	0	
			25	72	25	2	0	
		6	10	66	32	3	0	
			15	72	27	1		
			20	77	23	1		
			25	79	20	0		
		7	10	72	27	1		
			15	79	21	0		
			20	83	17	0		
			25	86	14	0		
		8	10	77	23	0		
			15	83	17	0		
			20	87	13			
			25	89	11	0		

Table 6 Effect of Number of Replicates on Power

POWER COMPARISON OF REPLICATE COUNT FOR 5 DOSE EXPERIMENTS
LINEAR DOSE-RESPONSE TREND RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.21885 0.4377 0.65655 0.8754

				NOAEL				
				0	1	2	3	4
TEST	SQRTRULE	REPS	SAMPSIZE					
MW	YES	2	10					100
			15					100
			20					100
			25					100
		3	10					100
			15					100
			20					100
			25					100
		4	10	45	37	17	1	0
			15	53	37	10	0	
			20	57	35	7	0	
			25	61	33	6	0	
		5	10	56	40	5	0	
			15	64	34	2	0	
			20	69	29	1		
			25	73	26	1		
		6	10	71	29	1		
			15	78	21	0		
			20	82	18	0		
			25	85	15	0		
		7	10	77	23	1		
			15	83	17	0		
			20	87	13	0		
			25	89	11	0		
		8	10	83	17			
			15	89	11			
			20	91	9			
			25	92	8			
MWX	NO	2	10					100
			25					100
		3	10				1	99
			25				0	100
		4	10	7	11	20	29	33
			25	10	15	23	24	27
		5	10	55	37	8	0	
			25	72	26	3		
		6	10	68	30	2		
			25	79	21	0		
		7	10	69	30	1		
			25	85	15	0		
		8	10	77	23	0		
			25	89	11			
	YES	2	10					100
			25					100
		3	10				6	94
			25				9	91
		4	10	47	41	11	0	
			25	62	35	3		
		5	10	56	41	4		
			25	74	26	1		
		6	10	68	31	1		
			25	84	16			
		7	10	76	23	1		
			25	88	12			
		8	10	83	17			
			25	93	7			

Table 6 Effect of Number of Replicates on Power

POWER COMPARISON OF REPLICATE COUNT FOR 5 DOSE EXPERIMENTS
LINEAR DOSE-RESPONSE TREND RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.21885 0.4377 0.65655 0.8754

TEST	SQRTRULE	REPS	SAMPSIZE	NOAEL 0	1	2	3	4
WILLIAMS	NO	2	10	25	43	26	6	1
			15	29	47	20	3	0
			25	34	49	17	1	0
		3	10	42	49	10	0	
			15	49	46	6	0	
			20	50	46	4	0	
			25	54	43	3	0	
		4	10	53	44	3		
			15	59	39	2		
			20	65	35	1		
			25	66	33	0		
WILLIAMS	NO	5	10	63	37	1		
			15	69	30	0		
			20	74	25	0		
			25	78	22	0		
		6	10	72	29	0		
			15	77	23	0		
			20	82	18	0		
			25	84	16			
		7	10	75	25	0		
			15	82	18	0		
			20	86	14			
			25	89	11			
		8	10	82	18			
			15	88	12			
			20	91	9			
			25	93	7			
	YES	2	10	21	43	30	7	1
			15	25	45	26	4	0
			20	28	48	22	3	0
			25	31	48	19	2	0
		3	10	41	51	9	0	0
			15	49	47	4	0	
			20	52	45	3	0	
			25	55	42	2		
		4	10	57	42	2		
			15	62	37	1		
			20	67	32	1		
			25	70	29	0		
		5	10	67	33	0		
			15	74	26	0		
			20	77	23	0		
			25	82	18	0		
		6	10	74	26	0		
			15	81	19			
			20	84	16			
			25	87	13			
		7	10	80	20			
			15	85	15			
			20	89	11			
			25	91	9			
		8	10	84	16			
			15	90	10			
			20	92	8			
			25	94	6			

Table 7 Comparison of Tests for 6 Dose Experiments

POWER COMPARISON OF TESTS FOR 6 DOSE EXPERIMENTS
LINEAR DOSE-RESPONSE TREND RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.17508 0.35016 0.52524 0.70032 0.8754

				NOAEL					
				0	1	2	3	4	5
REPS	SAMPSIZE	SQRTRULE	TEST						
2	10	NO	DUNN				15	59	27
			DUNNETT	6	22	35	27	9	2
			JONCKH		39	47	13	2	0
			JONCKHX		39	43	17	1	
			MW						100
			WILLIAMS	59	33	33	13	2	0
		YES	DUNN						100
			DUNNETT	2	14	32	29	18	6
			JONCKH		47	33	16	4	0
			JONCKHX		46	30	19	4	0
			MW						100
			WILLIAMS	57	33	35	15	3	0
	15	NO	DUNN				16	64	21
			DUNNETT	8	29	35	22	6	1
			JONCKH		46	45	10	1	
			JONCKHX		48	40	12	1	
			MW						100
			WILLIAMS	61	40	30	8	1	0
		YES	DUNN						100
			DUNNETT	3	19	36	28	12	3
			JONCKH		53	33	12	3	0
			JONCKHX		52	31	14	3	0
			MW						100
			WILLIAMS	59	39	32	11	1	0
	20	NO	DUNN				17	66	16
			DUNNETT	10	30	37	20	4	1
			JONCKH		50	44	6	0	
			JONCKHX		50	41	9	0	
			WILLIAMS	100					
		YES	DUNN						100
			DUNNETT	5	24	36	26	8	2
			JONCKH		57	31	11	2	0
			JONCKHX		58	28	13	2	
			MW						100
			WILLIAMS	60	41	30	8	1	0
	25	NO	DUNN				17	70	14
			DUNNETT	12	33	37	17	3	0
			JONCKH		52	43	6	0	
			JONCKHX		51	41	8	0	
			MW						100
			MWX						100
			WILLIAMS	26	44	26	6	0	
		YES	DUNN						100
			DUNNETT	6	26	38	23	7	1
			JONCKH		60	30	10	2	0
			JONCKHX		60	28	11	1	
			MW						100
			MWX						100
			WILLIAMS	22	42	30	7	0	
3	10	NO	DUNN			5	64	30	2
			DUNNETT	13	42	36	9	1	0
			JONCKH	26	50	23	2	0	
			JONCKHX	12	53	33	3		
			MW						100
			WILLIAMS	65	48	21	2	0	
		YES	DUNN			5	60	33	3
			DUNNETT	10	43	38	10	1	
			JONCKH	30	50	19	2	0	
			JONCKHX	30	43	26	2		
			MW						100
			WILLIAMS	65	50	19	1	0	

Table 7 Comparison of Tests for 6 Dose Experiments

POWER COMPARISON OF TESTS FOR 6 DOSE EXPERIMENTS
LINEAR DOSE-RESPONSE TREND RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.17508 0.35016 0.52524 0.70032 0.8754

				NOAEL					
				0	1	2	3	4	5
REPS	SAMPSIZE	SQRTRULE	TEST						
	15	NO	DUNN			5	72	23	1
			DUNNETT	17	47	32	5	0	
			JONCKH	30	53	17	1		
			JONCKHX	13	59	27	2		
			MW						100
			WILLIAMS	67	49	16	1		
		YES	DUNN			6	67	27	2
			DUNNETT	14	50	33	4	0	
			JONCKH	36	50	14	1	0	
			JONCKHX	38	43	19	1		
			MW						100
			WILLIAMS	68	51	13	1		
	20	NO	DUNN			4	76	20	0
			DUNNETT	18	51	28	3	0	
			JONCKH	31	53	15	1		
			MW						100
			WILLIAMS	37	50	13	0		
		YES	DUNN			5	69	25	1
			DUNNETT	16	54	28	3		
			JONCKH	37	51	11	0		
			MW						100
			WILLIAMS	39	50	10	0		
	25	NO	DUNN			5	78	18	0
			DUNNETT	22	52	25	2		
			JONCKH	37	51	12	0		
			JONCKHX	18	61	20	1		
			MW						100
			MWX						100
			WILLIAMS	41	49	11	0		
		YES	DUNN			6	73	21	1
			DUNNETT	19	55	26	2	0	
			JONCKH	38	52	10	0		
			JONCKHX	38	47	15	0		
			MW						100
			MWX				2	18	80
			WILLIAMS	42	51	8	0		
4	10	NO	DUNN		0	29	65	6	0
			DUNNETT	19	53	27	3	0	
			JONCKH	37	48	16	1		
			JONCKHX	23	62	14	1		
			MW						100
			WILLIAMS	70	48	13	0		
		YES	DUNN		1	51	46	3	0
			DUNNETT	19	55	24	2	0	
			JONCKH	41	50	9	0		
			JONCKHX	38	51	11	0		
			MW	34	37	21	5	2	0
			WILLIAMS	71	50	9	0		
	15	NO	DUNN		0	33	65	3	
			DUNNETT	25	57	18	1		
			JONCKH	45	45	11	0		
			JONCKHX	29	60	11			
			MW						100
			WILLIAMS	73	48	7	0		
		YES	DUNN		0	56	44	1	
			DUNNETT	24	60	16	0		
			JONCKH	47	49	6	0		
			JONCKHX	41	51	8			
			MW	41	40	16	3	0	0
			WILLIAMS	74	48	5	0		

Table 7 Comparison of Tests for 6 Dose Experiments

POWER COMPARISON OF TESTS FOR 6 DOSE EXPERIMENTS
LINEAR DOSE-RESPONSE TREND RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.17508 0.35016 0.52524 0.70032 0.8754

				NOAEL					
				0	1	2	3	4	5
REPS	SAMPSIZE	SQRTRULE	TEST						
	20	NO	DUNN			35	63	2	0
			DUNNETT	28	57	14	0		
			JONCKH	48	45	8	0		
			MW						100
			WILLIAMS	50	45	5	0		
		YES	DUNN		0	60	38	1	
			DUNNETT	27	60	13	0		
			JONCKH	50	46	4			
			MW	46	39	13	1	0	
			WILLIAMS	52	45	3			
	25	NO	DUNN			37	62	2	
			DUNNETT	30	58	12	0		
			JONCKH	49	45	7	0		
			JONCKHX	33	61	7			
			MW						100
			MWX						100
			WILLIAMS	50	46	4	0		
		YES	DUNN		0	64	36	0	
			DUNNETT	32	60	9	0		
			JONCKH	54	44	3	0		
			JONCKHX	48	48	4			
			MW	51	39	10	1	0	
			MWX	47	44	9	1		
			WILLIAMS	56	43	2			
5	10	NO	DUNN		1	61	38	1	
			DUNNETT	26	60	15	0		
			JONCKH	43	50	8	0		
			JONCKHX	42	50	8			
			MW	39	35	19	6	1	0
			WILLIAMS	74	48	5	0		
		YES	DUNN		7	76	18	0	
			DUNNETT	29	59	13	0		
			JONCKH	51	45	5			
			JONCKHX	42	52	6			
			MW	42	44	14	1	0	
			WILLIAMS	76	45	3			
	15	NO	DUNN		0	67	33	0	
			DUNNETT	32	59	10	0		
			JONCKH	48	47	6	0		
			JONCKHX	47	47	6	0		
			MW	45	36	16	3	0	
			WILLIAMS	77	44	3	0		
		YES	DUNN		6	82	12	0	
			DUNNETT	34	60	7	0		
			JONCKH	57	41	3			
			JONCKHX	52	45	3			
			MW	47	44	9	0	0	
			WILLIAMS	79	41	2	0		
	20	NO	DUNN		0	71	29		
			DUNNETT	36	57	7			
			JONCKH	52	45	3			
			MW	50	36	13	2	0	
			WILLIAMS	57	41	2			
		YES	DUNN		6	85	10	0	
			DUNNETT	37	58	4	0		
			JONCKH	60	38	1			
			MW	52	43	5	0		
			WILLIAMS	62	37	1			

Table 7 Comparison of Tests for 6 Dose Experiments

POWER COMPARISON OF TESTS FOR 6 DOSE EXPERIMENTS
LINEAR DOSE-RESPONSE TREND RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.17508 0.35016 0.52524 0.70032 0.8754

				NOAEL					
				0	1	2	3	4	5
REPS	SAMPSIZE	SQRTRULE	TEST						
	25	NO	DUNN		0	75	25	0	
			DUNNETT	40	56	5	0		
			JONCKH	55	42	3			
			JONCKHX	53	44	3			
			MW	54	35	10	1	0	100
			MWX						100
			WILLIAMS	61	39	2			
		YES	DUNN		5	88	7		
			DUNNETT	42	55	3	0		
			JONCKH	64	35	1			
			JONCKHX	58	41	1			
			MW	56	40	4	0		
			MWX	57	39	4	0		
			WILLIAMS	66	34	1			
6	10	NO	DUNN		3	80	17	0	
			DUNNETT	32	58	10	0		
			JONCKH	48	48	5	0		
			JONCKHX	46	50	4			
			MW	47	41	12	1	0	
			WILLIAMS	77	44	3	0		
		YES	DUNN	0	22	72	7	0	
			DUNNETT	32	61	8	0		
			JONCKH	56	42	3			
			JONCKHX	54	44	2			
			MW	52	40	8	0		
			WILLIAMS	78	42	2			
	15	NO	DUNN		2	87	12	0	
			DUNNETT	39	57	5	0		
			JONCKH	55	44	2			
			JONCKHX	56	43	2			
			MW	54	40	7	0	0	
			WILLIAMS	79	40	1			
		YES	DUNN		25	72	4		
			DUNNETT	38	58	5			
			JONCKH	62	38	1			
			JONCKHX	61	38	1			
			MW	59	36	4	0		
			WILLIAMS	81	38	1			
	20	NO	DUNN		2	89	8		
			DUNNETT	43	54	3			
			JONCKH	59	39	1			
			MW	59	36	4	0		
			WILLIAMS	64	36	1			
		YES	DUNN		27	71	2		
			DUNNETT	42	55	2			
			JONCKH	65	35	1			
			MW	64	34	2	0		
			WILLIAMS	68	32	0			
	25	NO	DUNN		2	91	7		
			DUNNETT	45	53	2			
			JONCKH	62	38	1			
			JONCKHX	62	37	1			
			MW	61	36	3	0		100
			MWX						100
			WILLIAMS	67	34	0			
		YES	DUNN		28	71	1		
			DUNNETT	47	51	2			
			JONCKH	69	31	0			
			JONCKHX	66	33	0			
			MW	68	31	2			
			MWX	65	33	2			
			WILLIAMS	72	28	0			

Table 7 Comparison of Tests for 6 Dose Experiments

POWER COMPARISON OF TESTS FOR 6 DOSE EXPERIMENTS
LINEAR DOSE-RESPONSE TREND RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.17508 0.35016 0.52524 0.70032 0.8754

				NOAEL					
				0	1	2	3	4	5
REPS	SAMPSIZE	SQRTRULE	TEST						
7	10	NO	DUNN		8	85	8	0	
			DUNNETT	38	57	6	0		
			JONCKH	56	42	3			
			JONCKHX	53	44	3			
			MW	56	38	6	0		
			WILLIAMS	80	39	2			
		YES	DUNN	0	40	59	2		
			DUNNETT	38	59	4			
			JONCKH	61	39	1			
			JONCKHX	56	44	1			
			MW	60	36	4			
			WILLIAMS	81	37	1			
	15	NO	DUNN		8	89	4		
			DUNNETT	45	53	2	0		
			JONCKH	63	37	1			
			JONCKHX	61	38	1			
			MW	62	34	4	0		
			WILLIAMS	84	33	0			
		YES	DUNN	0	46	54	1		
			DUNNETT	47	52	2			
			JONCKH	69	31	0			
			JONCKHX	67	33	0			
			MW	69	30	1			
			WILLIAMS	85	30	0			
	20	NO	DUNN		7	90	2		
			DUNNETT	51	48	1			
			JONCKH	68	32	0			
			MW	67	30	2			
			WILLIAMS	72	28	0			
		YES	DUNN	0	51	49	0		
			DUNNETT	53	46	1			
			JONCKH	73	26	0			
			MW	73	26	1			
			WILLIAMS	75	25	0			
	25	NO	DUNN		7	92	1		
			DUNNETT	53	46	1			
			JONCKH	69	30	0			
			MW	69	30	2	0		
			WILLIAMS	73	27	0			
		YES	DUNN	0	53	47	0		
			DUNNETT	55	44	1			
			JONCKH	76	24	0			
			MW	76	24	1			
			WILLIAMS	77	23	0			
8	10	NO	DUNN		15	83	3		
			DUNNETT	42	56	3			
			JONCKH	63	36	1			
			JONCKHX	59	40	1			
			MW	58	39	4	0		
			WILLIAMS	83	35	1			
		YES	DUNN	0	28	64	9	0	
			DUNNETT	38	56	7	0		
			JONCKH	59	39	2			
			JONCKHX	47	49	5			
			MW	67	32	1	0		
			WILLIAMS	85	29	0			

Table 7 Comparison of Tests for 6 Dose Experiments

POWER COMPARISON OF TESTS FOR 6 DOSE EXPERIMENTS
LINEAR DOSE-RESPONSE TREND RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.17508 0.35016 0.52524 0.70032 0.8754

				NOAEL					
				0	1	2	3	4	5
REPS	SAMPSIZE	SQRTRULE	TEST						
	15	NO	DUNN		16	83	1		
			DUNNETT	53	47	1			
			JONCKH	70	30	0			
			JONCKHX	67	33	0			
			MW	65	33	2			
			WILLIAMS	86	28	0			
		YES	DUNN	0	63	38	0		
			DUNNETT	54	46	1			
			JONCKH	75	26	0			
			JONCKHX	73	27				
			MW	73	27	0			
			WILLIAMS	88	24	0			
	20	NO	DUNN		15	84	1		
			DUNNETT	58	41	1			
			JONCKH	75	24	0			
			MW	71	28	1			
			WILLIAMS	77	23	0			
		YES	DUNN	0	66	33	0		
			DUNNETT	60	40	0			
			JONCKH	79	21	0			
			MW	77	23	0			
			WILLIAMS	80	20	0			
	25	NO	DUNN		15	84	0		
			DUNNETT	61	38	0			
			JONCKH	78	22	0			
			MW	74	25	1			
			WILLIAMS	80	20	0			
		YES	DUNN	0	71	29			
			DUNNETT	63	37	0			
			JONCKH	82	18	0			
			MW	80	20	0			
			WILLIAMS	83	17	0			

Table 8 Comparison of Allocation Rules for 6 Dose Experiments

POWER COMPARISON OF ALLOCATION RULES FOR 6 DOSE EXPERIMENTS
LINEAR DOSE-RESPONSE TREND RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.17508 0.35016 0.52524 0.70032 0.8754

				NOAEL					
				0	1	2	3	4	5
TEST	REPS	SAMPSIZE	SQRTRULE						
DUNN	2	10	NO				15	59	27
			YES						100
		15	NO				16	64	21
			YES						100
		20	NO				17	66	16
			YES						100
		25	NO				17	70	14
			YES						100
	3	10	NO			5	64	30	2
			YES			5	60	33	3
		15	NO			5	72	23	1
			YES			6	67	27	2
		20	NO			4	76	20	0
			YES			5	69	25	1
		25	NO			5	78	18	0
			YES			6	73	21	1
	4	10	NO		0	29	65	6	0
			YES		1	51	46	3	0
		15	NO		0	33	65	3	
			YES		0	56	44	1	
		20	NO			35	63	2	0
			YES		0	60	38	1	
		25	NO			37	62	2	
			YES		0	64	36	0	
	5	10	NO		1	61	38	1	
			YES		7	76	18	0	
		15	NO		0	67	33	0	
			YES		6	82	12	0	
		20	NO		0	71	29		
			YES		6	85	10	0	
		25	NO		0	75	25	0	
			YES		5	88	7		
	6	10	NO		3	80	17	0	
			YES	0	22	72	7	0	
		15	NO		2	87	12	0	
			YES		25	72	4		
		20	NO		2	89	8		
			YES		27	71	2		
		25	NO		2	91	7		
			YES		28	71	1		
	7	10	NO		8	85	8	0	
			YES	0	40	59	2		
		15	NO		8	89	4		
			YES	0	46	54	1		
		20	NO		7	90	2		
			YES	0	51	49	0		
		25	NO		7	92	1		
			YES	0	53	47	0		
	8	10	NO		15	83	3		
			YES	0	28	64	9	0	
		15	NO		16	83	1		
			YES	0	63	38	0		
		20	NO		15	84	1		
			YES	0	66	33	0		
		25	NO		15	84	0		
			YES	0	71	29			

Table 8 Comparison of Allocation Rules for 6 Dose Experiments

POWER COMPARISON OF ALLOCATION RULES FOR 6 DOSE EXPERIMENTS
LINEAR DOSE-RESPONSE TREND RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.17508 0.35016 0.52524 0.70032 0.8754

				NOAEL					
				0	1	2	3	4	5
TEST	REPS	SAMPSIZE	SQRTRULE						
DUNNETT	2	10	NO	6	22	35	27	9	2
			YES	2	14	32	29	18	6
		15	NO	8	29	35	22	6	1
			YES	3	19	36	28	12	3
		20	NO	10	30	37	20	4	1
			YES	5	24	36	26	8	2
		25	NO	12	33	37	17	3	0
			YES	6	26	38	23	7	1
	3	10	NO	13	42	36	9	1	0
			YES	10	43	38	10	1	
		15	NO	17	47	32	5	0	
			YES	14	50	33	4	0	
		20	NO	18	51	28	3	0	
			YES	16	54	28	3		
		25	NO	22	52	25	2		
			YES	19	55	26	2	0	
	4	10	NO	19	53	27	3	0	
			YES	19	55	24	2	0	
		15	NO	25	57	18	1		
			YES	24	60	16	0		
		20	NO	28	57	14	0		
			YES	27	60	13	0		
		25	NO	30	58	12	0		
			YES	32	60	9	0		
	5	10	NO	26	60	15	0		
			YES	29	59	13	0		
		15	NO	32	59	10	0		
			YES	34	60	7	0		
		20	NO	36	57	7			
			YES	37	58	4	0		
		25	NO	40	56	5	0		
			YES	42	55	3	0		
	6	10	NO	32	58	10	0		
			YES	32	61	8	0		
		15	NO	39	57	5	0		
			YES	38	58	5			
		20	NO	43	54	3			
			YES	42	55	2			
		25	NO	45	53	2			
			YES	47	51	2			
	7	10	NO	38	57	6	0		
			YES	38	59	4			
		15	NO	45	53	2	0		
			YES	47	52	2			
		20	NO	51	48	1			
			YES	53	46	1			
		25	NO	53	46	1			
			YES	55	44	1			
	8	10	NO	42	56	3			
			YES	38	56	7	0		
		15	NO	53	47	1			
			YES	54	46	1			
		20	NO	58	41	1			
			YES	60	40	0			
		25	NO	61	38	0			
			YES	63	37	0			

Table 8 Comparison of Allocation Rules for 6 Dose Experiments

POWER COMPARISON OF ALLOCATION RULES FOR 6 DOSE EXPERIMENTS
LINEAR DOSE-RESPONSE TREND RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.17508 0.35016 0.52524 0.70032 0.8754

				NOAEL					
				0	1	2	3	4	5
TEST	REPS	SAMPSIZE	SQRTRULE						
JONCKH	2	10	NO		39	47	13	2	0
			YES		47	33	16	4	0
		15	NO		46	45	10	1	
			YES		53	33	12	3	0
		20	NO		50	44	6	0	
			YES		57	31	11	2	0
		25	NO		52	43	6	0	
			YES		60	30	10	2	0
	3	10	NO	26	50	23	2	0	
			YES	30	50	19	2	0	
		15	NO	30	53	17	1		
			YES	36	50	14	1	0	
		20	NO	31	53	15	1		
			YES	37	51	11	0		
		25	NO	37	51	12	0		
			YES	38	52	10	0		
	4	10	NO	37	48	16	1		
			YES	41	50	9	0		
		15	NO	45	45	11	0		
			YES	47	49	6	0		
		20	NO	48	45	8	0		
			YES	50	46	4			
		25	NO	49	45	7	0		
			YES	54	44	3	0		
	5	10	NO	43	50	8	0		
			YES	51	45	5			
		15	NO	48	47	6	0		
			YES	57	41	3			
		20	NO	52	45	3			
			YES	60	38	1			
		25	NO	55	42	3			
			YES	64	35	1			
	6	10	NO	48	48	5	0		
			YES	56	42	3			
		15	NO	55	44	2			
			YES	62	38	1			
		20	NO	59	39	1			
			YES	65	35	1			
		25	NO	62	38	1			
			YES	69	31	0			
	7	10	NO	56	42	3			
			YES	61	39	1			
		15	NO	63	37	1			
			YES	69	31	0			
		20	NO	68	32	0			
			YES	73	26	0			
		25	NO	69	30	0			
			YES	76	24	0			
	8	10	NO	63	36	1			
			YES	59	39	2			
		15	NO	70	30	0			
			YES	75	26	0			
		20	NO	75	24	0			
			YES	79	21	0			
		25	NO	78	22	0			
			YES	82	18	0			

Table 8 Comparison of Allocation Rules for 6 Dose Experiments

POWER COMPARISON OF ALLOCATION RULES FOR 6 DOSE EXPERIMENTS
LINEAR DOSE-RESPONSE TREND RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.17508 0.35016 0.52524 0.70032 0.8754

				NOAEL					
				0	1	2	3	4	5
TEST	REPS	SAMPSIZE	SQRTRULE						
JONCKHX	2	10	NO		39	43	17	1	
			YES		46	30	19	4	0
		15	NO		48	40	12	1	
			YES		52	31	14	3	0
		20	NO		50	41	9	0	
			YES		58	28	13	2	
		25	NO		51	41	8	0	
			YES		60	28	11	1	
	3	10	NO	12	53	33	3		
			YES	30	43	26	2		
		15	NO	13	59	27	2		
			YES	38	43	19	1		
		25	NO	18	61	20	1		
			YES	38	47	15	0		
	4	10	NO	23	62	14	1		
			YES	38	51	11	0		
		15	NO	29	60	11			
			YES	41	51	8			
		25	NO	33	61	7			
			YES	48	48	4			
	5	10	NO	42	50	8			
			YES	42	52	6			
		15	NO	47	47	6	0		
			YES	52	45	3			
		25	NO	53	44	3			
			YES	58	41	1			
	6	10	NO	46	50	4			
			YES	54	44	2			
		15	NO	56	43	2			
			YES	61	38	1			
		25	NO	62	37	1			
			YES	66	33	0			
	7	10	NO	53	44	3			
			YES	56	44	1			
		15	NO	61	38	1			
			YES	67	33	0			
	8	10	NO	59	40	1			
			YES	47	49	5			
		15	NO	67	33	0			
			YES	73	27				
MW	2	10	NO						100
			YES						100
		15	NO						100
			YES						100
		20	YES						100
		25	NO						100
			YES						100
	3	10	NO						100
			YES						100
		15	NO						100
			YES						100
		20	NO						100
			YES						100
		25	NO						100
			YES						100
	4	10	NO						100
			YES	34	37	21	5	2	0
		15	NO						100
			YES	41	40	16	3	0	0
		20	NO						100
			YES	46	39	13	1	0	
		25	NO						100
			YES	51	39	10	1	0	

Table 8 Comparison of Allocation Rules for 6 Dose Experiments

POWER COMPARISON OF ALLOCATION RULES FOR 6 DOSE EXPERIMENTS
LINEAR DOSE-RESPONSE TREND RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.17508 0.35016 0.52524 0.70032 0.8754

				NOAEL					
				0	1	2	3	4	5
TEST	REPS	SAMPSIZE	SQRTRULE						
	5	10	NO	39	35	19	6	1	0
			YES	42	44	14	1	0	
		15	NO	45	36	16	3	0	
			YES	47	44	9	0	0	
		20	NO	50	36	13	2	0	
			YES	52	43	5	0		
		25	NO	54	35	10	1	0	100
			YES	56	40	4	0		
	6	10	NO	47	41	12	1	0	
			YES	52	40	8	0		
		15	NO	54	40	7	0	0	
			YES	59	36	4	0		
		20	NO	59	36	4	0		
			YES	64	34	2	0		
		25	NO	61	36	3	0		100
			YES	68	31	2			
	7	10	NO	56	38	6	0		
			YES	60	36	4			
		15	NO	62	34	4	0		
			YES	69	30	1			
		20	NO	67	30	2			
			YES	73	26	1			
		25	NO	69	30	2	0		
			YES	76	24	1			
	8	10	NO	58	39	4	0		
			YES	67	32	1	0		
		15	NO	65	33	2			
			YES	73	27	0			
		20	NO	71	28	1			
			YES	77	23	0			
		25	NO	74	25	1			
			YES	80	20	0			
MWX	2	25	NO						100
			YES						100
	3	25	NO						100
			YES				2	18	80
	4	25	NO						100
			YES	47	44	9	1		
	5	25	NO						100
			YES	57	39	4	0		
	6	25	NO						100
			YES	65	33	2			
WILLIAMS	2	10	NO	59	33	33	13	2	0
			YES	57	33	35	15	3	0
		15	NO	61	40	30	8	1	0
			YES	59	39	32	11	1	0
		20	NO	100					
			YES	60	41	30	8	1	0
		25	NO	26	44	26	6	0	
			YES	22	42	30	7	0	
	3	10	NO	65	48	21	2	0	
			YES	65	50	19	1	0	
		15	NO	67	49	16	1		
			YES	68	51	13	1		
		20	NO	37	50	13	0		
			YES	39	50	10	0		

Table 8 Comparison of Allocation Rules for 6 Dose Experiments

POWER COMPARISON OF ALLOCATION RULES FOR 6 DOSE EXPERIMENTS
LINEAR DOSE-RESPONSE TREND RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.17508 0.35016 0.52524 0.70032 0.8754

				NOAEL					
				0	1	2	3	4	5
TEST	REPS	SAMPSIZE	SQRTRULE						
WILLIAMS	3	25	NO	41	49	11	0		
			YES	42	51	8	0		
	4	10	NO	70	48	13	0		
			YES	71	50	9	0		
		15	NO	73	48	7	0		
			YES	74	48	5	0		
		20	NO	50	45	5	0		
			YES	52	45	3			
		25	NO	50	46	4	0		
			YES	56	43	2			
	5	10	NO	74	48	5	0		
			YES	76	45	3			
		15	NO	77	44	3	0		
			YES	79	41	2	0		
		20	NO	57	41	2			
			YES	62	37	1			
		25	NO	61	39	2			
			YES	66	34	1			
	6	10	NO	77	44	3	0		
			YES	78	42	2			
		15	NO	79	40	1			
			YES	81	38	1			
		20	NO	64	36	1			
			YES	68	32	0			
		25	NO	67	34	0			
			YES	72	28	0			
	7	10	NO	80	39	2			
			YES	81	37	1			
		15	NO	84	33	0			
			YES	85	30	0			
		20	NO	72	28	0			
			YES	75	25	0			
		25	NO	73	27	0			
			YES	77	23	0			
	8	10	NO	83	35	1			
			YES	85	29	0			
		15	NO	86	28	0			
			YES	88	24	0			
		20	NO	77	23	0			
			YES	80	20	0			
		25	NO	80	20	0			
			YES	83	17	0			

Table 9 Effect of Number of Replicates on Power

EFFECT OF NUMBER OF REPLICATES ON POWER FOR 6 DOSE EXPERIMENTS
LINEAR DOSE-RESPONSE TREND RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.17508 0.35016 0.52524 0.70032 0.8754

				NOAEL					
				0	1	2	3	4	5
TEST	SQRTRULE	REPS	SAMPSIZE						
DUNN	NO	2	10				15	59	27
			15				16	64	21
			20				17	66	16
			25				17	70	14
		3	10			5	64	30	2
			15			5	72	23	1
			20			4	76	20	0
			25			5	78	18	0
		4	10		0	29	65	6	0
			15		0	33	65	3	
			20			35	63	2	0
			25			37	62	2	
		5	10		1	61	38	1	
			15		0	67	33	0	
			20		0	71	29		
			25		0	75	25	0	
		6	10		3	80	17	0	
			15		2	87	12	0	
			20		2	89	8		
			25		2	91	7		
		7	10		8	85	8	0	
			15		8	89	4		
			20		7	90	2		
			25		7	92	1		
		8	10		15	83	3		
			15		16	83	1		
			20		15	84	1		
			25		15	84	0		
	YES	2	10						100
			15						100
			20						100
			25						100
		3	10			5	60	33	3
			15			6	67	27	2
			20			5	69	25	1
			25			6	73	21	1
		4	10		1	51	46	3	0
			15		0	56	44	1	
			20		0	60	38	1	
			25		0	64	36	0	
		5	10		7	76	18	0	
			15		6	82	12	0	
			20		6	85	10	0	
			25		5	88	7		
		6	10	0	22	72	7	0	
			15		25	72	4		
			20		27	71	2		
			25		28	71	1		
		7	10	0	40	59	2		
			15	0	46	54	1		
			20	0	51	49	0		
			25	0	53	47	0		
		8	10	0	28	64	9	0	
			15	0	63	38	0		
			20	0	66	33	0		
			25	0	71	29			

Table 9 Effect of Number of Replicates on Power

EFFECT OF NUMBER OF REPLICATES ON POWER FOR 6 DOSE EXPERIMENTS
LINEAR DOSE-RESPONSE TREND RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.17508 0.35016 0.52524 0.70032 0.8754

				NOAEL					
				0	1	2	3	4	5
TEST	SQRTRULE	REPS	SAMPSIZE						
DUNNETT	NO	2	10	6	22	35	27	9	2
			15	8	29	35	22	6	1
			20	10	30	37	20	4	1
			25	12	33	37	17	3	0
		3	10	13	42	36	9	1	0
			15	17	47	32	5	0	
			20	18	51	28	3	0	
			25	22	52	25	2		
		4	10	19	53	27	3	0	
			15	25	57	18	1		
			20	28	57	14	0		
			25	30	58	12	0		
		5	10	26	60	15	0		
			15	32	59	10	0		
			20	36	57	7			
			25	40	56	5	0		
		6	10	32	58	10	0		
			15	39	57	5	0		
			20	43	54	3			
			25	45	53	2			
		7	10	38	57	6	0		
			15	45	53	2	0		
			20	51	48	1			
			25	53	46	1			
		8	10	42	56	3			
			15	53	47	1			
			20	58	41	1			
			25	61	38	0			
	YES	2	10	2	14	32	29	18	6
			15	3	19	36	28	12	3
			20	5	24	36	26	8	2
			25	6	26	38	23	7	1
		3	10	10	43	38	10	1	
			15	14	50	33	4	0	
			20	16	54	28	3		
			25	19	55	26	2	0	
		4	10	19	55	24	2	0	
			15	24	60	16	0		
			20	27	60	13	0		
			25	32	60	9	0		
		5	10	29	59	13	0		
			15	34	60	7	0		
			20	37	58	4	0		
			25	42	55	3	0		
		6	10	32	61	8	0		
			15	38	58	5			
			20	42	55	2			
			25	47	51	2			
		7	10	38	59	4			
			15	47	52	2			
			20	53	46	1			
			25	55	44	1			
		8	10	38	56	7	0		
			15	54	46	1			
			20	60	40	0			
			25	63	37	0			

Table 9 Effect of Number of Replicates on Power

EFFECT OF NUMBER OF REPLICATES ON POWER FOR 6 DOSE EXPERIMENTS
LINEAR DOSE-RESPONSE TREND RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.17508 0.35016 0.52524 0.70032 0.8754

				NOAEL					
				0	1	2	3	4	5
TEST	SQRTRULE	REPS	SAMPSIZE						
JONCKH	NO	2	10		39	47	13	2	0
			15		46	45	10	1	
			20		50	44	6	0	
			25		52	43	6	0	
		3	10	26	50	23	2	0	
			15	30	53	17	1		
			20	31	53	15	1		
			25	37	51	12	0		
		4	10	37	48	16	1		
			15	45	45	11	0		
			20	48	45	8	0		
			25	49	45	7	0		
		5	10	43	50	8	0		
			15	48	47	6	0		
			20	52	45	3			
			25	55	42	3			
		6	10	48	48	5	0		
			15	55	44	2			
			20	59	39	1			
			25	62	38	1			
		7	10	56	42	3			
			15	63	37	1			
			20	68	32	0			
			25	69	30	0			
		8	10	63	36	1			
			15	70	30	0			
			20	75	24	0			
			25	78	22	0			
	YES	2	10		47	33	16	4	0
			15		53	33	12	3	0
			20		57	31	11	2	0
			25		60	30	10	2	0
		3	10	30	50	19	2	0	
			15	36	50	14	1	0	
			20	37	51	11	0		
			25	38	52	10	0		
		4	10	41	50	9	0		
			15	47	49	6	0		
			20	50	46	4			
			25	54	44	3	0		
		5	10	51	45	5			
			15	57	41	3			
			20	60	38	1			
			25	64	35	1			
		6	10	56	42	3			
			15	62	38	1			
			20	65	35	1			
			25	69	31	0			
		7	10	61	39	1			
			15	69	31	0			
			20	73	26	0			
			25	76	24	0			
		8	10	59	39	2			
			15	75	26	0			
			20	79	21	0			
			25	82	18	0			

Table 9 Effect of Number of Replicates on Power

EFFECT OF NUMBER OF REPLICATES ON POWER FOR 6 DOSE EXPERIMENTS
LINEAR DOSE-RESPONSE TREND RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.17508 0.35016 0.52524 0.70032 0.8754

				NOAEL					
				0	1	2	3	4	5
TEST	SQRTRULE	REPS	SAMPSIZE						
JONCKHX	NO	2	10		39	43	17	1	
			15		48	40	12	1	
			20		50	41	9	0	
			25		51	41	8	0	
		3	10	12	53	33	3		
			15	13	59	27	2		
			25	18	61	20	1		
		4	10	23	62	14	1		
			15	29	60	11			
			25	33	61	7			
		5	10	42	50	8			
			15	47	47	6	0		
			25	53	44	3			
		6	10	46	50	4			
			15	56	43	2			
			25	62	37	1			
		7	10	53	44	3			
			15	61	38	1			
		8	10	59	40	1			
			15	67	33	0			
	YES	2	10		46	30	19	4	0
			15		52	31	14	3	0
			20		58	28	13	2	
			25		60	28	11	1	
		3	10	30	43	26	2		
			15	38	43	19	1		
			25	38	47	15	0		
		4	10	38	51	11	0		
			15	41	51	8			
			25	48	48	4			
		5	10	42	52	6			
			15	52	45	3			
			25	58	41	1			
		6	10	54	44	2			
			15	61	38	1			
			25	66	33	0			
		7	10	56	44	1			
			15	67	33	0			
		8	10	47	49	5			
			15	73	27				
MW	NO	2	10						100
			15						100
			25						100
		3	10						100
			15						100
			20						100
			25						100
		4	10						100
			15						100
			20						100
			25						100
		5	10	39	35	19	6	1	0
			15	45	36	16	3	0	
			20	50	36	13	2	0	
			25	54	35	10	1	0	100
		6	10	47	41	12	1	0	
			15	54	40	7	0	0	
			20	59	36	4	0		
			25	61	36	3	0		100
		7	10	56	38	6	0		
			15	62	34	4	0		
			20	67	30	2			
			25	69	30	2	0		

		8	10	58	39	4	0		
			15	65	33	2			
			20	71	28	1			
			25	74	25	1			
	YES	2	10						100
			15						100
			20						100
			25						100
		3	10						100
			15						100
			20						100
			25						100
		4	10	34	37	21	5	2	0
			15	41	40	16	3	0	0
			20	46	39	13	1	0	
			25	51	39	10	1	0	
		5	10	42	44	14	1	0	
			15	47	44	9	0	0	
			20	52	43	5	0		
			25	56	40	4	0		
		6	10	52	40	8	0		
			15	59	36	4	0		
			20	64	34	2	0		
			25	68	31	2			
		7	10	60	36	4			
			15	69	30	1			
			20	73	26	1			
			25	76	24	1			
		8	10	67	32	1	0		
			15	73	27	0			
			20	77	23	0			
			25	80	20	0			
MWX	NO	2	25						100
		3	25						100
		4	25						100
		5	25						100
		6	25						100
	YES	2	25						100
		3	25				2	18	80
		4	25	47	44	9	1		
		5	25	57	39	4	0		
		6	25	65	33	2			
WILLIAMS	NO	2	10	59	33	33	13	2	0
			15	61	40	30	8	1	0
			20	100					
			25	26	44	26	6	0	
		3	10	65	48	21	2	0	
			15	67	49	16	1		
			20	37	50	13	0		
			25	41	49	11	0		
		4	10	70	48	13	0		
			15	73	48	7	0		
			20	50	45	5	0		
			25	50	46	4	0		
		5	10	74	48	5	0		
			15	77	44	3	0		
WILLIAMS	NO	5	20	57	41	2			
			25	61	39	2			
		6	10	77	44	3	0		
			15	79	40	1			
			20	64	36	1			
			25	67	34	0			
		7	10	80	39	2			
			15	84	33	0			
			20	72	28	0			
			25	73	27	0			
		8	10	83	35	1			
			15	86	28	0			
			20	77	23	0			
			25	80	20	0			

Table 9 Effect of Number of Replicates on Power

EFFECT OF NUMBER OF REPLICATES ON POWER FOR 6 DOSE EXPERIMENTS
LINEAR DOSE-RESPONSE TREND RELATIVE TO LOG(DOSE)
MAX EFFECT=0.8754, EFFECTS=0 0.17508 0.35016 0.52524 0.70032 0.8754

				NOAEL					
				0	1	2	3	4	5
TEST	SQRTRULE	REPS	SAMPSIZE						
	YES	2	10	57	33	35	15	3	0
			15	59	39	32	11	1	0
			20	60	41	30	8	1	0
			25	22	42	30	7	0	
		3	10	65	50	19	1	0	
			15	68	51	13	1		
			20	39	50	10	0		
			25	42	51	8	0		
		4	10	71	50	9	0		
			15	74	48	5	0		
			20	52	45	3			
			25	56	43	2			
		5	10	76	45	3			
			15	79	41	2	0		
			20	62	37	1			
			25	66	34	1			
		6	10	78	42	2			
			15	81	38	1			
			20	68	32	0			
			25	72	28	0			
		7	10	81	37	1			
			15	85	30	0			
			20	75	25	0			
			25	77	23	0			
		8	10	85	29	0			
			15	88	24	0			
			20	80	20	0			
			25	83	17	0			