Are You Gellin'?

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Collaborators:

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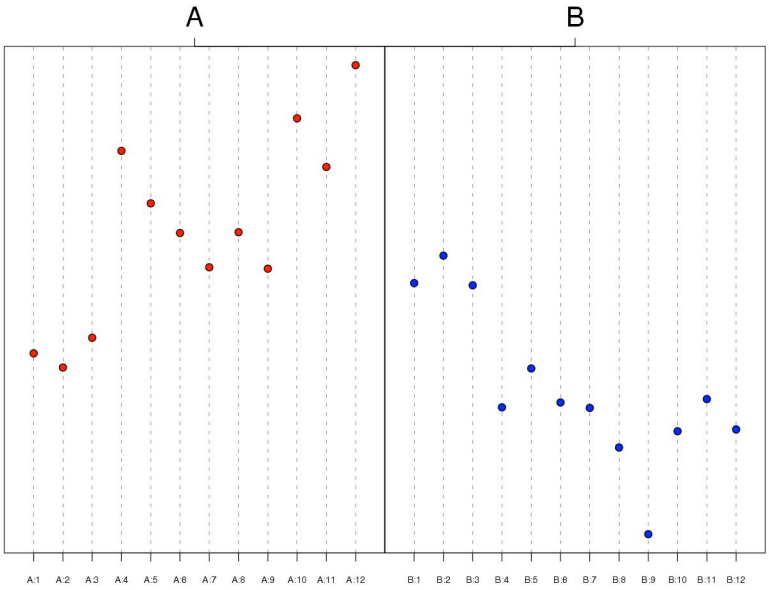
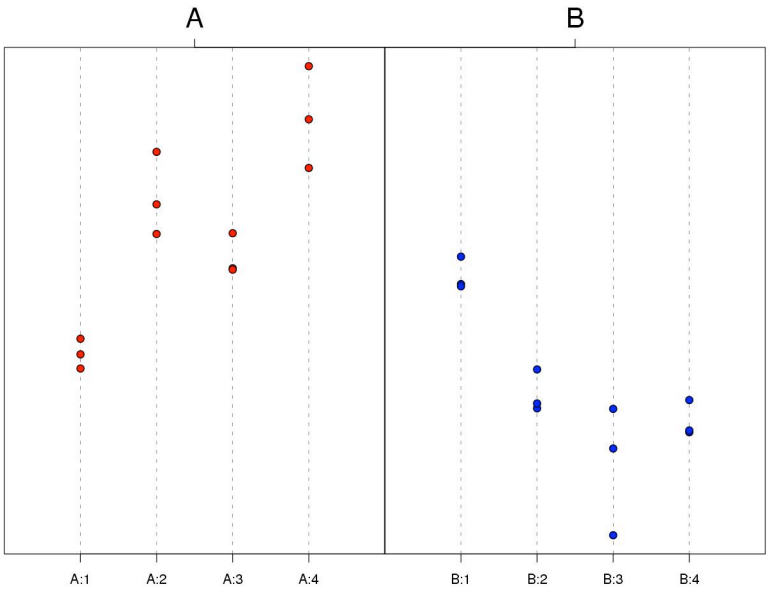




A mixed effects model is given by:

$$Y_{ijk} = \mu + \alpha_i + B_{ij} + \varepsilon_{ijk}.$$

For the indices in a balanced design we have:

$$i = 1, \ldots, a, \quad j = 1, \ldots, b, \quad k = 1, \ldots, r.$$

We assume that:

$$\sum \alpha_i = 0, \quad B_{ij} \sim_{\text{iid}} N(0, \sigma^2_{B|A}), \quad \varepsilon_{ijk} \sim_{\text{iid}} N(0, \sigma^2).$$

Hypothesis of interest are:

$$H_A: \ \alpha_1 = \cdots = \alpha_a = 0, \qquad H_B: \ \sigma^2_{B|A} = 0.$$

The ANOVA decomposition is given by

$$\text{SS}_{\text{TOTAL}} = \text{SS}_A + \text{SS}_{B|A} + \text{SS}_E$$

where

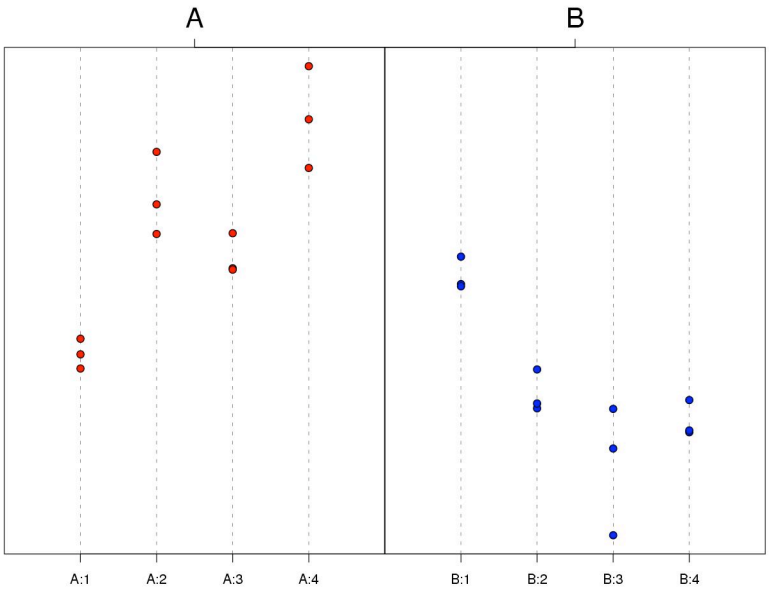
$$\begin{aligned}
\text{SS}_{\text{TOTAL}} &= \sum_i \sum_j \sum_k (Y_{ijk} - \bar{Y}_{...})^2, \\
\text{SS}_A &= \sum_i \sum_j \sum_k (\bar{Y}_{i..} - \bar{Y}_{...})^2 = rb \sum_i (\bar{Y}_{i..} - \bar{Y}_{...})^2, \\
\text{SS}_{B|A} &= \sum_i \sum_j \sum_k (\bar{Y}_{ij.} - \bar{Y}_{i..})^2 = r \sum_i \sum_j (\bar{Y}_{ij.} - \bar{Y}_{i..})^2, \\
\text{SS}_E &= \sum_i \sum_j \sum_k (Y_{ijk} - \bar{Y}_{ij.})^2.
\end{aligned}$$

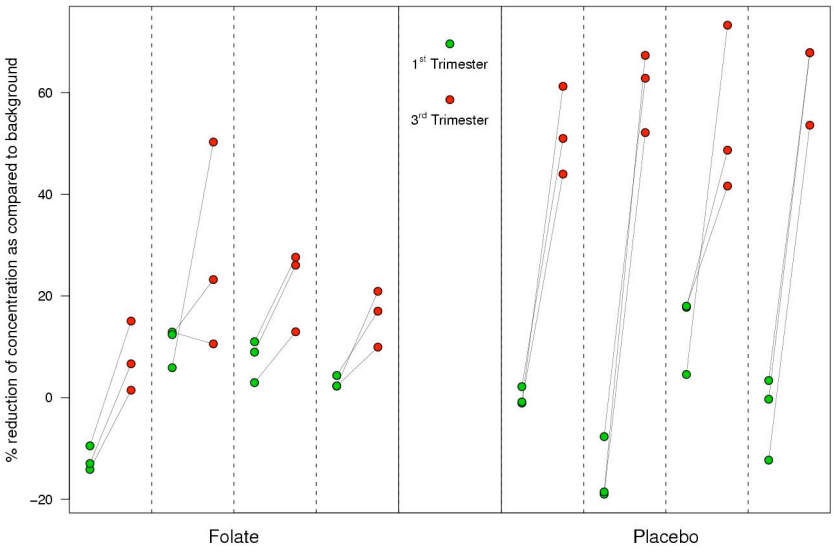
For the balanced mixed effects model we have:

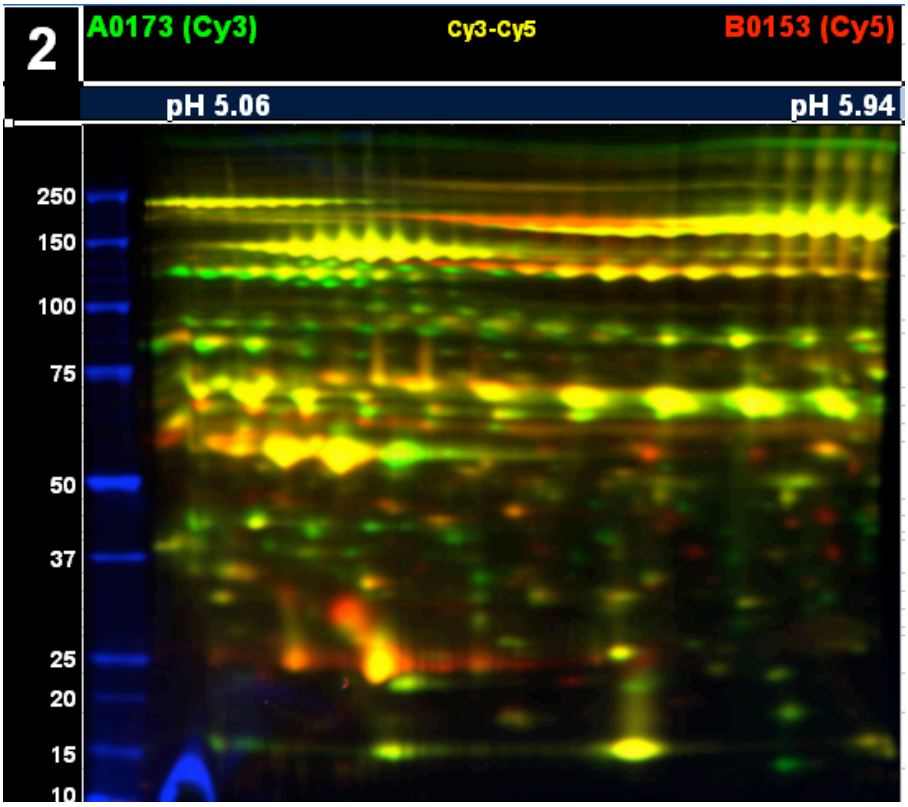
- $E[\text{MS}_A] = E[\text{SS}_A/(a-1)] = \sigma^2 + r\sigma^2_{B|A} + \frac{rb}{a-1}\sum_i \alpha_i^2$.
- $E[\text{MS}_{B|A}] = E[\text{SS}_{AB}/(a(b-1))] = \sigma^2 + r\sigma^2_{B|A}$.
- $E[\text{MS}_E] = E\left[\text{SS}_E/(ab(r-1))\right] = \sigma^2$.
- $\text{MS}_A/\text{MS}_{B|A} \sim F_{a-1,a(b-1)}$ if H_A is true.
- $\text{MS}_{B|A}/\text{MS}_E \sim F_{a(b-1),ab(r-1)}$ if $H_{B|A}$ is true.

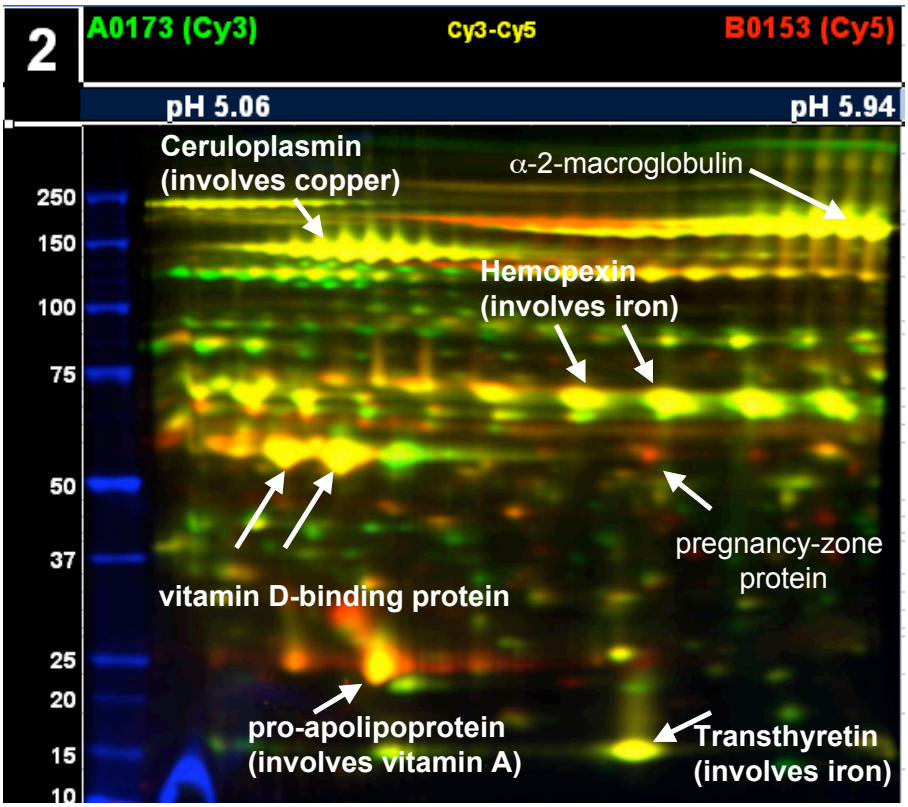
The above is usually summarized in an ANOVA table:

source	sum of squares	df	mean squares	test statistic
Factor A	SS_A	$a-1$	$\text{MS}_A = \text{SS}_A/(a-1)$	$\text{MS}_A/\text{MS}_{B\|A}$
Factor $B\|A$	$\text{SS}_{B\|A}$	$a(b-1)$	$\text{MS}_{B\|A} = \text{SS}_{B\|A}/(a(b-1))$	$\text{MS}_{B\|A}/\text{MS}_E$
Error	SS_E	$ab(r-1)$	$\text{MS}_E = \text{SS}_E/(ab(r-1))$	
Total	SS_{TOTAL}	$abr-1$		

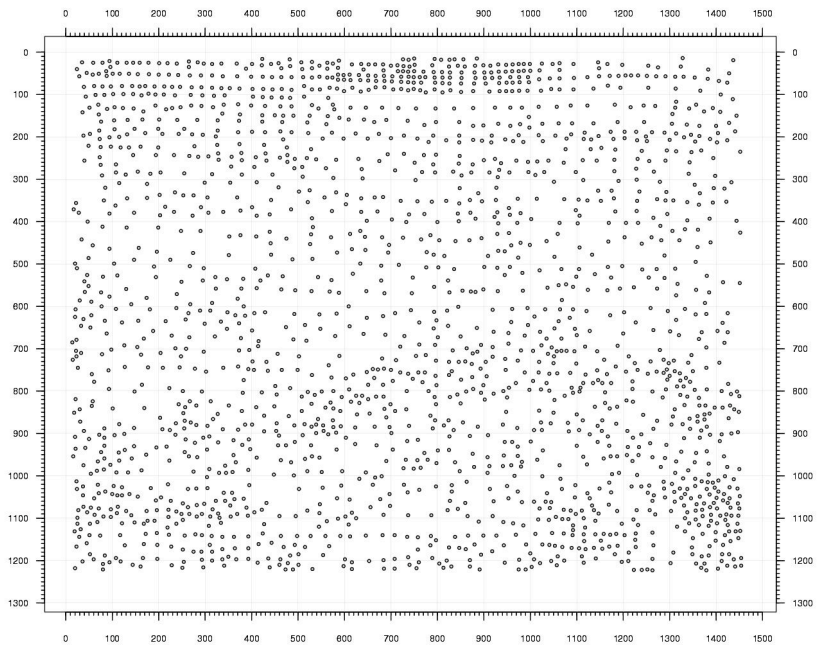

A
B
A:1
A:2
A:3
A:4
B:1
B:2
B:3
B:4

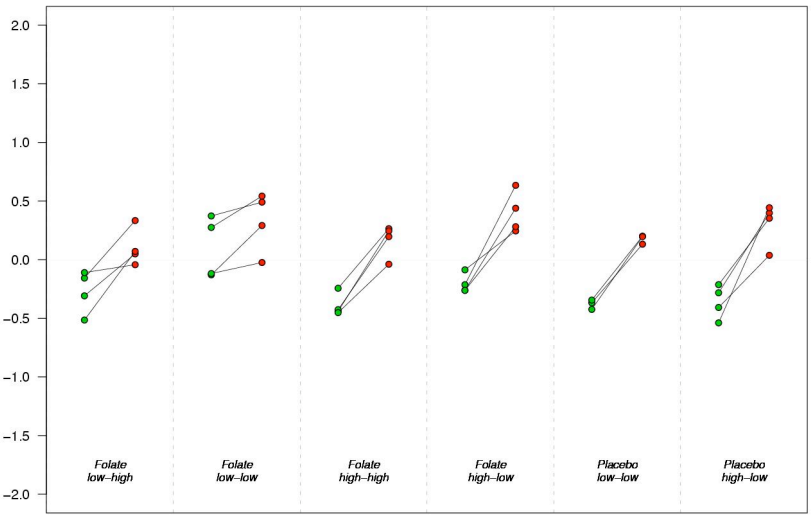

% reduction of concentration as compared to background
60
40
20
0
−20
1st Trimester
3rd Trimester
Folate
Placebo

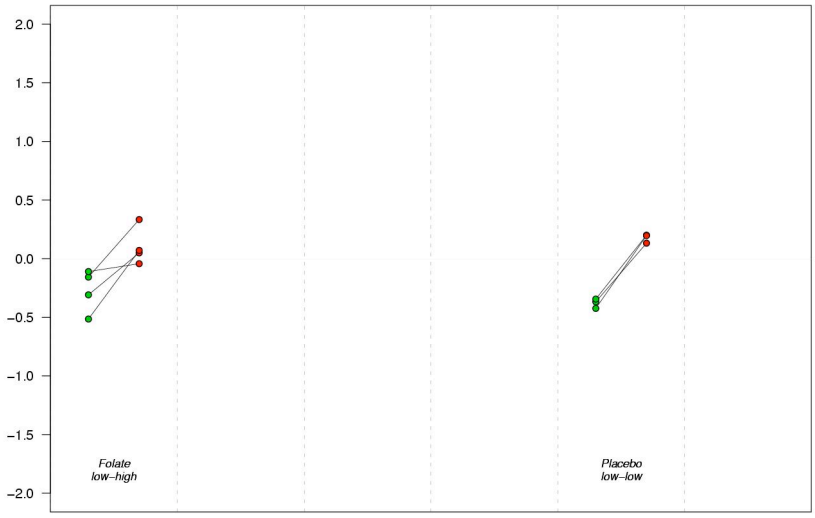


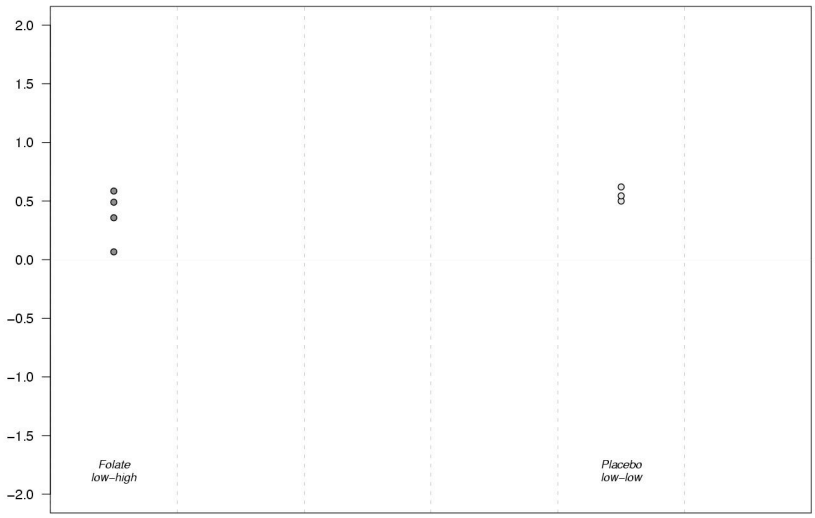


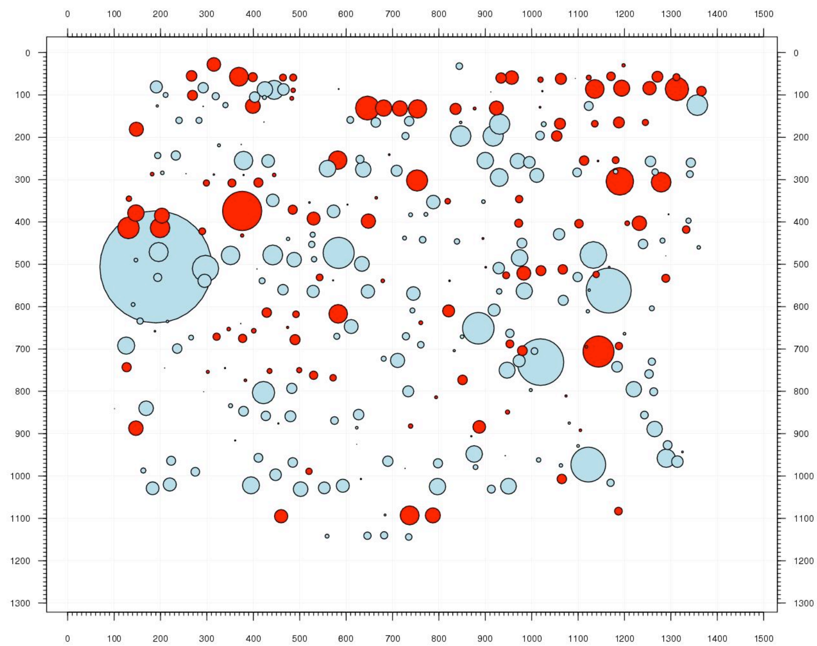
One Subject, Mid-pH Range Spots Identified

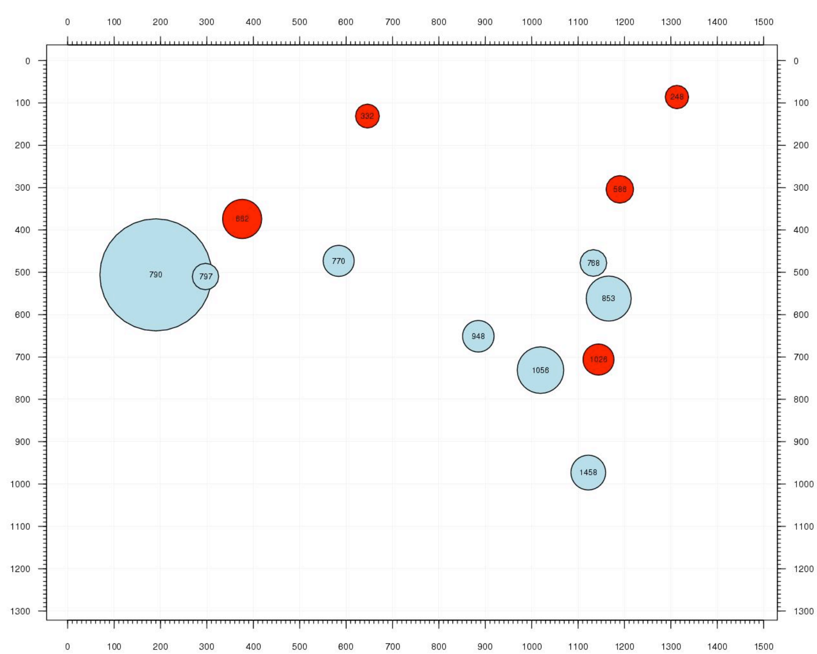

0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500


2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
Folate low–high
Folate low–low
Folate high–high
Folate high–low
Placebo low–low
Placebo high–low


2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
Folate
low−high
Placebo
low−low

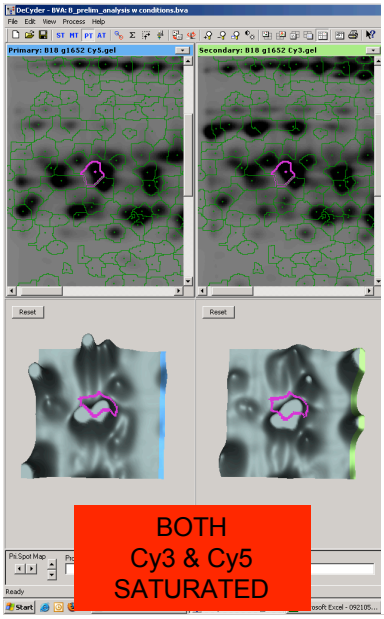

2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
Folate
low−high
Placebo
low−low

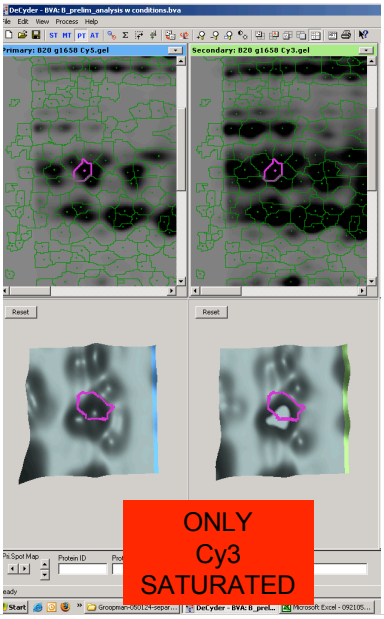



248
332
882
588
790
797
770
788
853
948
1026
1056
1458

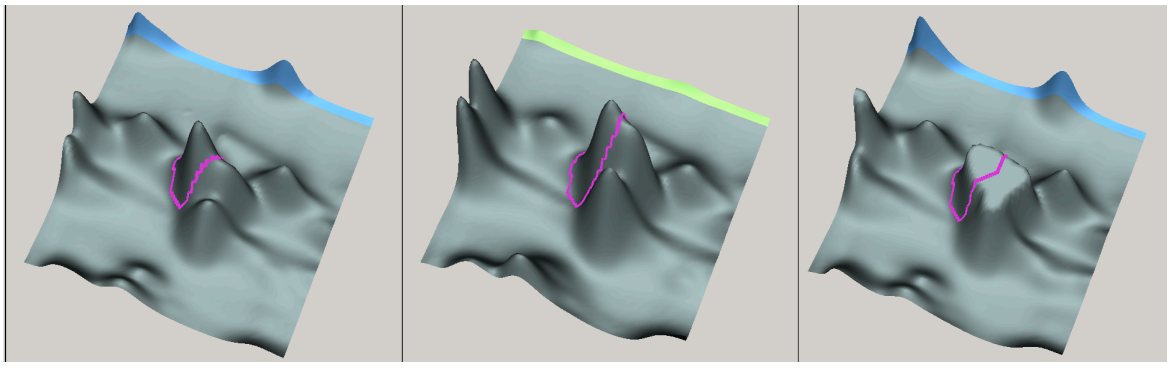
Spot 790

Saturation and Resolution Problems
Gels 1652 and 1658

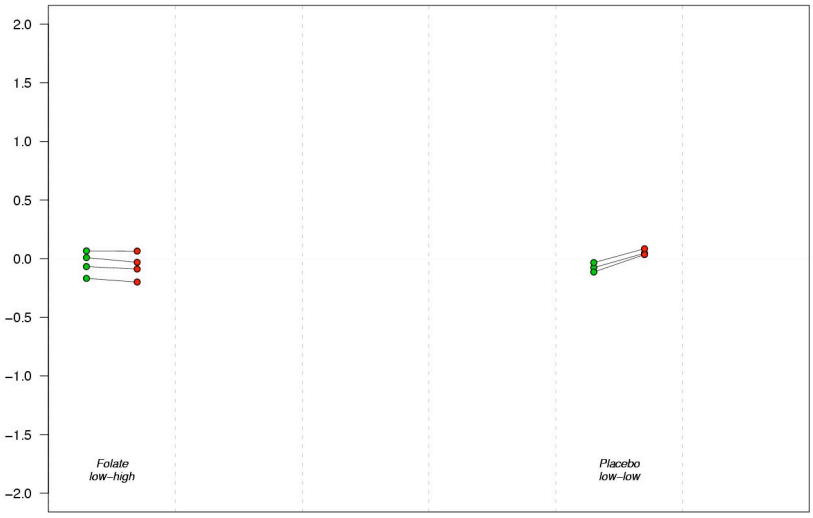


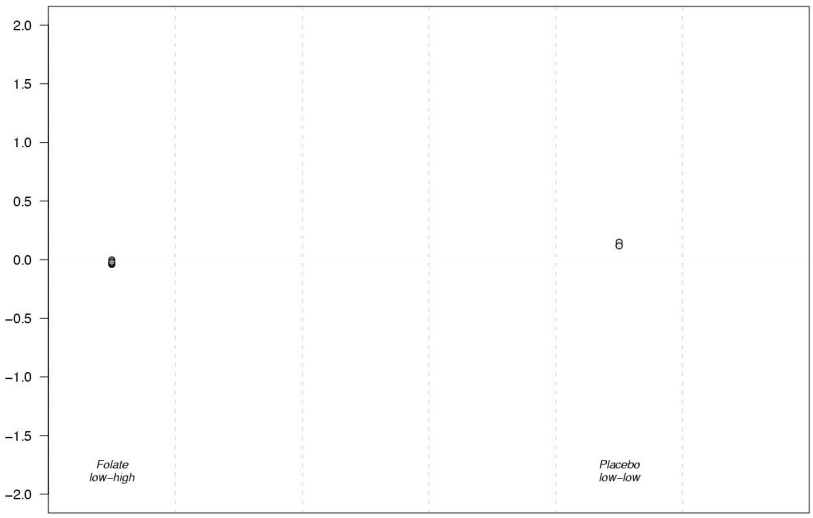


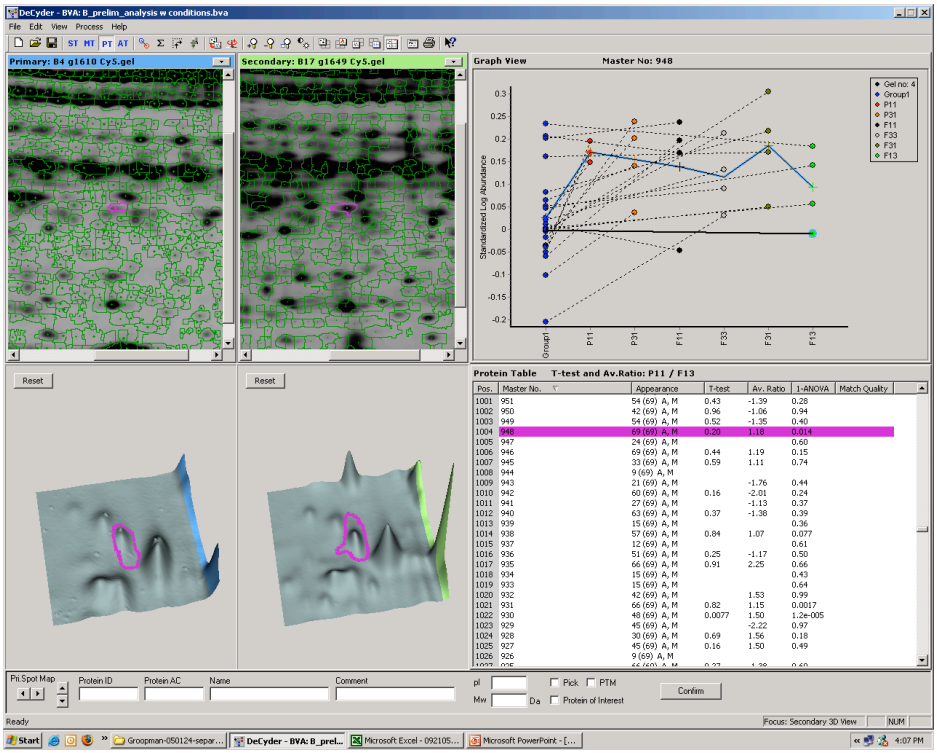
Spot 790

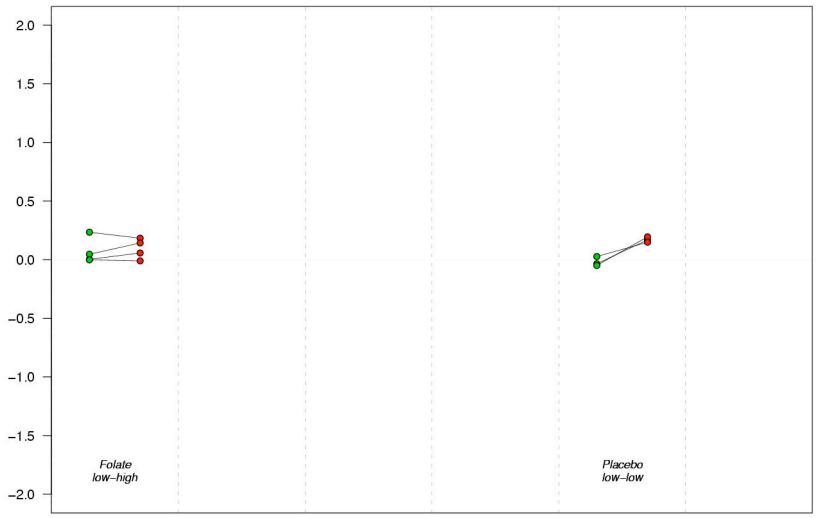


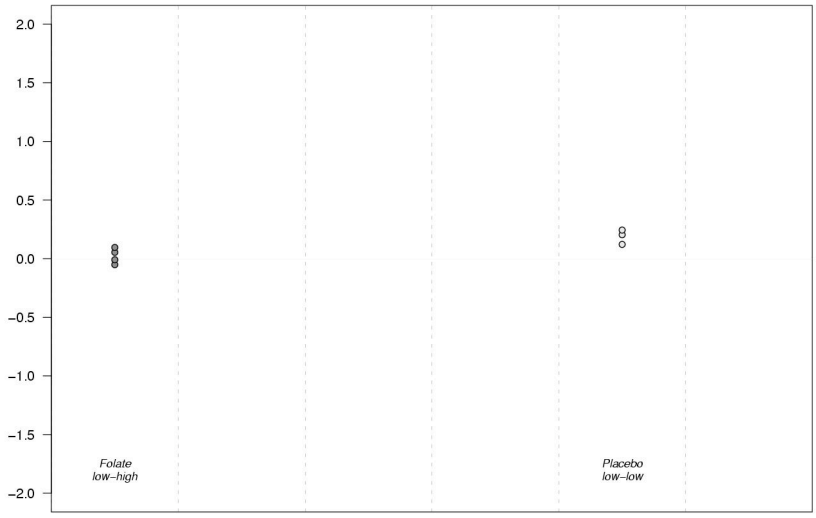
Cy2 Cy5 Cy3


2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
Folate
low−high
Placebo
low−low


2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
Folate
low−high
Placebo
low−low


DeCyder - BVA: B_prelim_analysis w conditions.bva
File Edit View Process Help
Primary: B4 g1610 Cy5.gel
Secondary: B17 g1649 Cy5.gel
Graph View
Master No: 948
Standardized Log Abundance
Group1
P11
P31
F11
F33
F31
F13
Reset
Reset
Protein Table
T-test and Av.Ratio: P11 / F13
Pos. Master No. Appearance T-test Av. Ratio 1-ANOVA Match Quality
Pri.Spot Map
Protein ID
Protein AC
Name
Comment
pI
Mw
Da
Pick
PTM
Protein of Interest
Confirm
Ready
Focus: Secondary 3D View
NUM


2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
Folate
low–high
Placebo
low–low



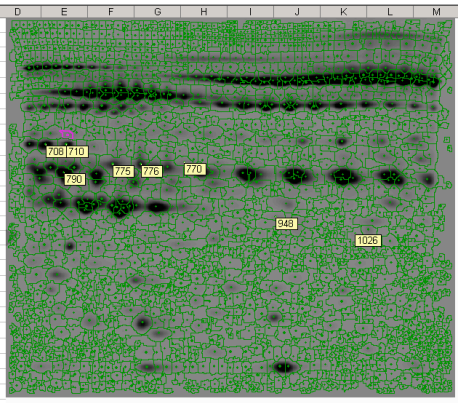
spot 790 Bubble Test 1 (9-13-05 results)

Group	Gel #	Spot # 790 Comments
LL	1649	cy3 staturation, incomplete spot resolution
	1652	cy3 & cy 5 staturation, incomplete spot resolution
	1658	" " " "
	missing	
LH	1601	cy3 & cy 5 staturation, incomplete spot resolution
	1604	unresolved spot pair
	1607*	cy3 staturation, incomplete spot resolution
	1610	ok

* gel 1607 ran "faster" than all other gels in this series

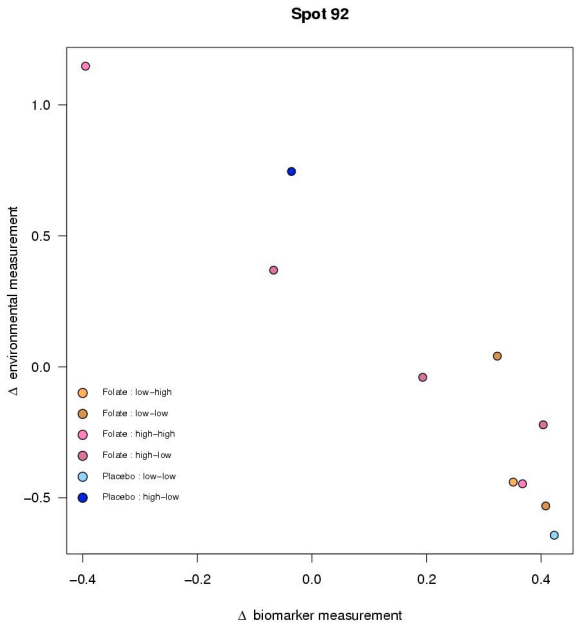
Group	Gel #	Spot # 948 Comments
LL	1649	real spot, weak intensity
	1652	" " " "
	1658	" " " "
	missing	
LH	1601	real spot, weak intensity
	1604	" " " "
	1607*	" " " "
	1610	" " " "

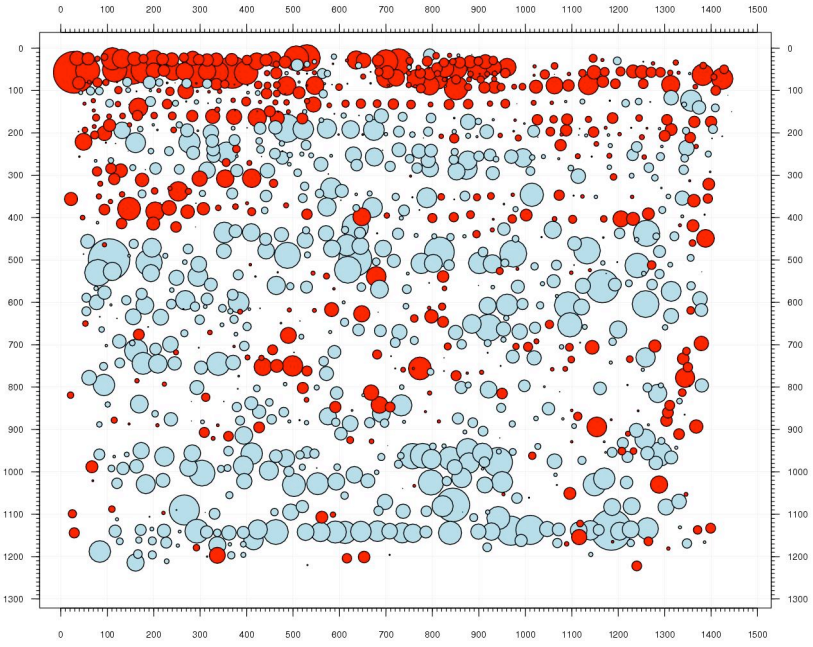
* gel 1607 ran "faster" than all other gels in this series



g1664 cy2 master image

thoughts | old test | T1 spots 790&948 | T2 spots 790&948 | t1 | t1 keepers | T1 & II | t2


Spot 92
1.0
0.5
0.0
−0.5
Δ environmental measurement
Folate : low−high
Folate : low−low
Folate : high−high
Folate : high−low
Placebo : low−low
Placebo : high−low
−0.4
−0.2
0.0
0.2
0.4
Δ biomarker measurement


0
100
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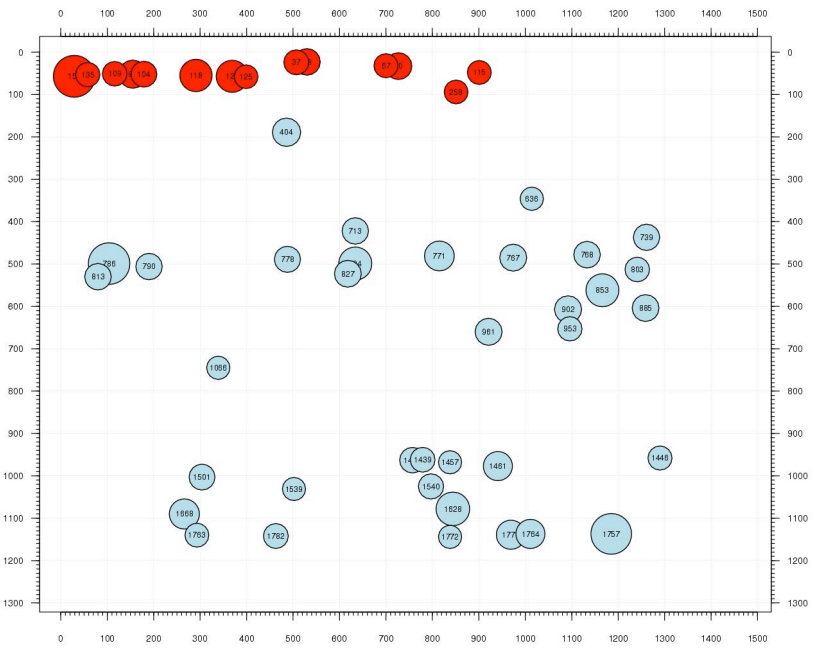
0
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300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
404
636
713
739
778
771
767
768
803
786
790
813
827
853
902
885
953
961
1066
1439
1457
1481
1448
1501
1538
1540
1628
1668
1763
1782
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1771
1764
1757