How to avoid data disaster

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Data Files

Format: .txt, .csv, .xls, …

Data?

λTables, lists, …

λNumbers, names, dates, …

λGraphs, images, ...

Always, always **RAW** data

NOT

- Processed
- Filtered
- Manipulated

either electronically or manually

Why? Because…

Maintain consistency

- Data format, codes (M,F)
- Separator: , ; tab

Reduce human errors

- Copy / Paste / Cut
- Delete
- Addition unwanted characters

Why? Because…

Reduce machine errors

- Cell formats
- Save file with a different extension

Example 1

Patient ID	**Sex**	**Date of birth**
1	M	01-01-2013
2	f	04-18-1998
3	Male	1st April 2004
4	Female	NA
5	F	2010/03/12
6	F	
7	M	10012012

Example 1

- Consistency: F, female, f, fem, 2, …
- Single common format for all dates

  YYYY-MM-DD or YYYYMMDD
- Consistency about missing values
- NA(not available), NULL,   , ...

Example 1 - modified

1	M	2013-01-01
2	F	1998-04-18
3	M	2004-04-01
4	F	NA
5	F	2010-03-12
6	F	NA
7	M	2012-01-10

A bit more about consistency

- Realistic and easy to understand Variable names
- File names
- Unique and consistent variable names

  Multiple tables

Blank spaces

Be careful about extra spaces within cells

- Blank cell is different then a cell that contains a single space
- “male” is different from “ male ”

These can be a headache later on!

Example 2

1	2015-06-14	123
2		76.5
3	2015-06-18	32
4		120.3
5		109
6	2015-06-20	105
7		143

Example 2

Fill in all cells

- –Problems when sorting

Empty cell

- –Missing value?
- –Value meant to be repeated multiple times?

Missing value -> NA

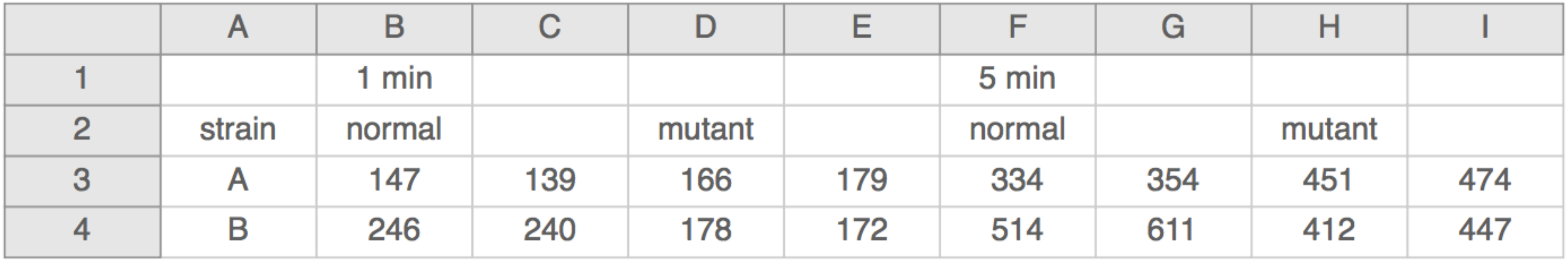
Example 2

Make sure it's clear that the data is **missing** and
not
unintentionally
left blank

Example 2

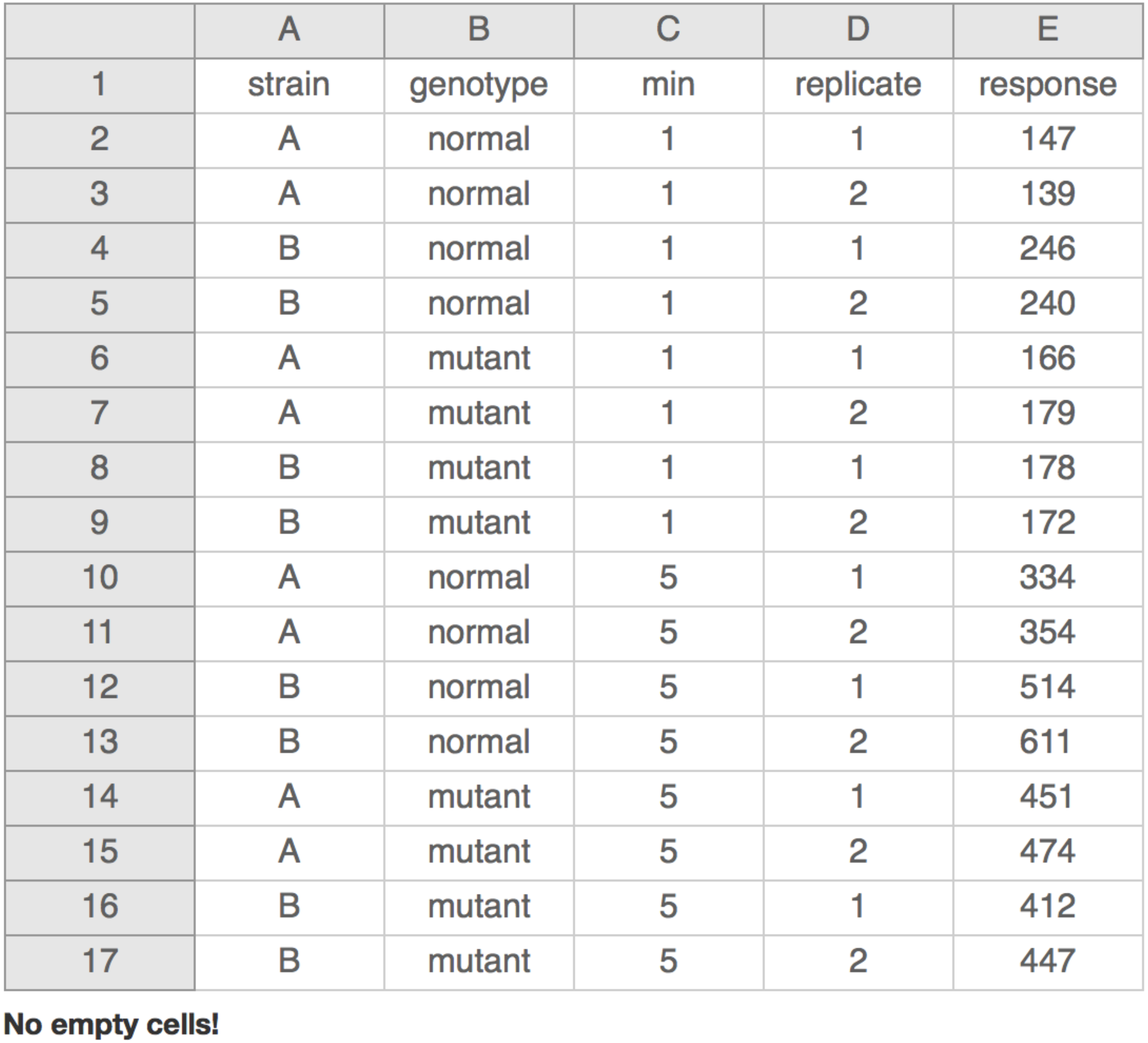
1	2015-06-14	123
2	2015-06-14	76.5
3	2015-06-18	32
4	2015-06-18	120.3
5	2015-06-18	109
6	2015-06-20	105
7	2015-06-20	143

Example 3



	A	B	C	D	E	F	G	H	I
1		1 min				5 min			
2	strain	normal		mutant		normal		mutant	
3	A	147	139	166	179	334	354	451	474
4	B	246	240	178	172	514	611	412	447

Example 3



	A	B	C	D	E
1	strain	genotype	min	replicate	response
2	A	normal	1	1	147
3	A	normal	1	2	139
4	B	normal	1	1	246
5	B	normal	1	2	240
6	A	mutant	1	1	166
7	A	mutant	1	2	179
8	B	mutant	1	1	178
9	B	mutant	1	2	172
10	A	normal	5	1	334
11	A	normal	5	2	354
12	B	normal	5	1	514
13	B	normal	5	2	611
14	A	mutant	5	1	451
15	A	mutant	5	2	474
16	B	mutant	5	1	412
17	B	mutant	5	2	447

No empty cells!

More…

Don’t put too much information in 1 cell

1 cell = 1 information

Don’t include units such as “30 g”.

“g” in the column name

“0 (below threshold)”

write notes in a separate column

More…

Make it rectangle

Create a data dictionary – separate file

Avoid using “,” or “;” or tab

Do not manually modify values – copies

More..

No calculations

No font colour or highlighting

computer doesn’t recognize it

Good vs Bad Name

MaxTemp	max_temp	Maximum Temperature (C)
Quantity	Quantity_mg	Quamg
Sex		M/F
Weight	Weight_kg	w

Write-protect

Mac:

- –Right-click on the file in Finder
- –Select “Get Info”
- –Sharing and permission
- –Priviledge
- –Read only

Write-protect

Windows:

- –Right-click on the file in windows explorer
- –Properties
- –General tab
- –Attributes
- –Select the box for “read only” and click ok

Data validation

Excel data validation feature

- Select a column
- In the menu bar, choose Data
- Validation

Integer or decimal number - range

List of possible values

Limited length text

Save

Always keep a copy of your data files in a plain text format

-Tab delimited

-, or ; separated

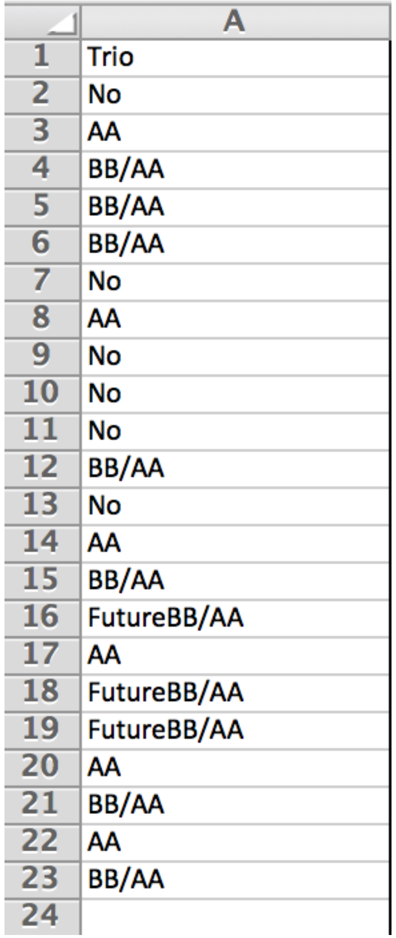
Such as .csv

Be careful

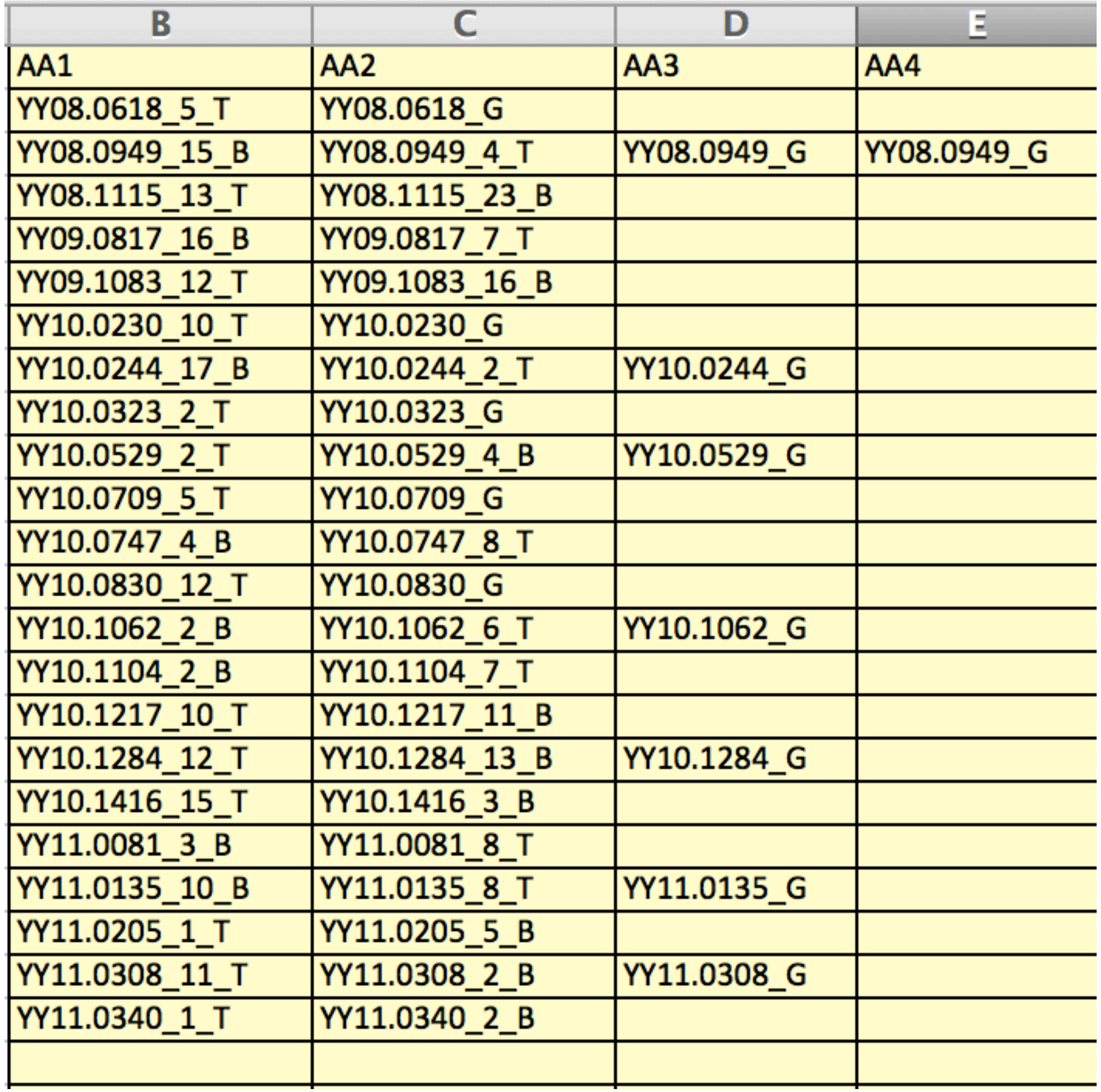
- When identifiers are long integers
  - 1000000 -> 1e06
- Do not fill blank cells with 0s
  - 0s are data!

Practise 1

IDs



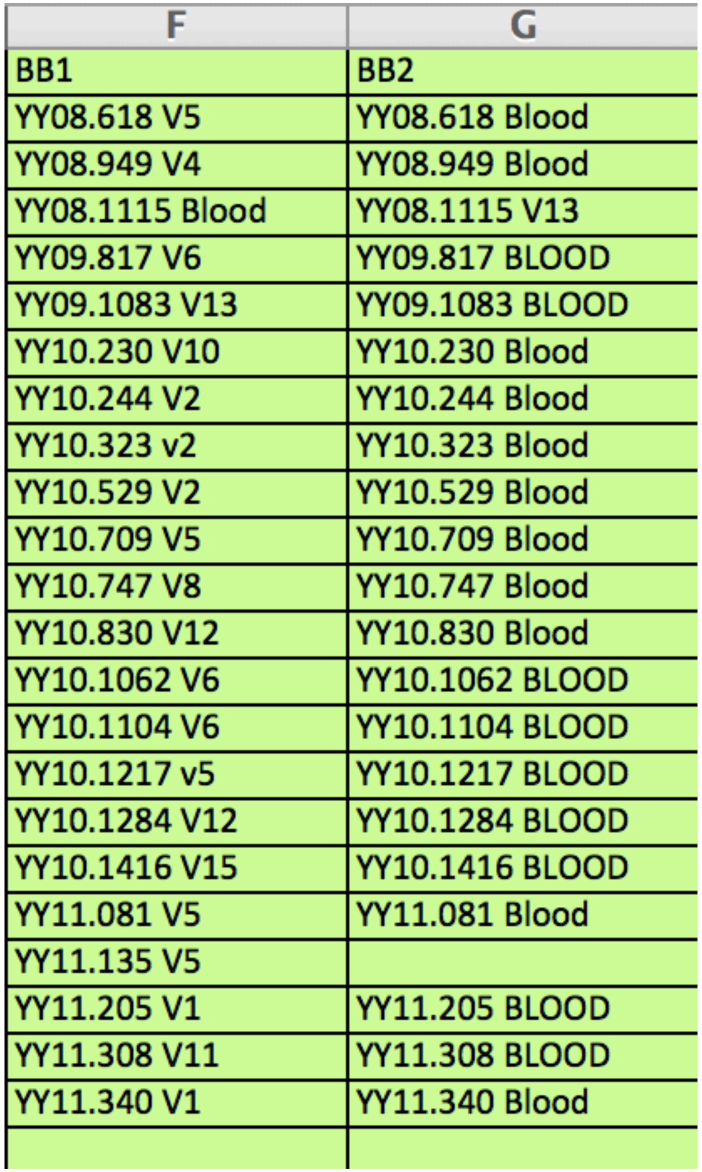
	A
1	Trio
2	No
3	AA
4	BB/AA
5	BB/AA
6	BB/AA
7	No
8	AA
9	No
10	No
11	No
12	BB/AA
13	No
14	AA
15	BB/AA
16	FutureBB/AA
17	AA
18	FutureBB/AA
19	FutureBB/AA
20	AA
21	BB/AA
22	AA
23	BB/AA
24	



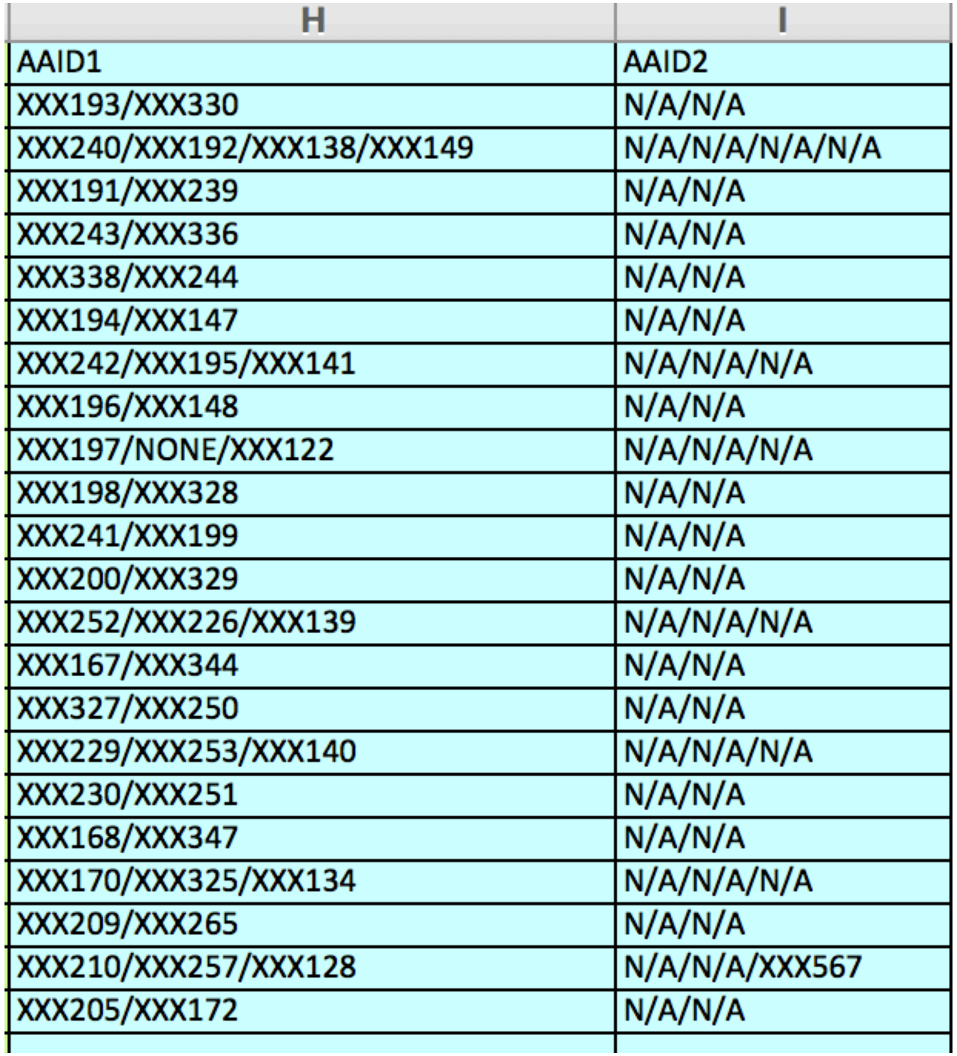
B	C	D	E
AA1	AA2	AA3	AA4
YY08.0618_5_T	YY08.0618_G		
YY08.0949_15_B	YY08.0949_4_T	YY08.0949_G	YY08.0949_G
YY08.1115_13_T	YY08.1115_23_B		
YY09.0817_16_B	YY09.0817_7_T		
YY09.1083_12_T	YY09.1083_16_B		
YY10.0230_10_T	YY10.0230_G		
YY10.0244_17_B	YY10.0244_2_T	YY10.0244_G	
YY10.0323_2_T	YY10.0323_G		
YY10.0529_2_T	YY10.0529_4_B	YY10.0529_G	
YY10.0709_5_T	YY10.0709_G		
YY10.0747_4_B	YY10.0747_8_T		
YY10.0830_12_T	YY10.0830_G		
YY10.1062_2_B	YY10.1062_6_T	YY10.1062_G	
YY10.1104_2_B	YY10.1104_7_T		
YY10.1217_10_T	YY10.1217_11_B		
YY10.1284_12_T	YY10.1284_13_B	YY10.1284_G	
YY10.1416_15_T	YY10.1416_3_B		
YY11.0081_3_B	YY11.0081_8_T		
YY11.0135_10_B	YY11.0135_8_T	YY11.0135_G	
YY11.0205_1_T	YY11.0205_5_B		
YY11.0308_11_T	YY11.0308_2_B	YY11.0308_G	
YY11.0340_1_T	YY11.0340_2_B		

- Column titles
- Missing values

Name consistency

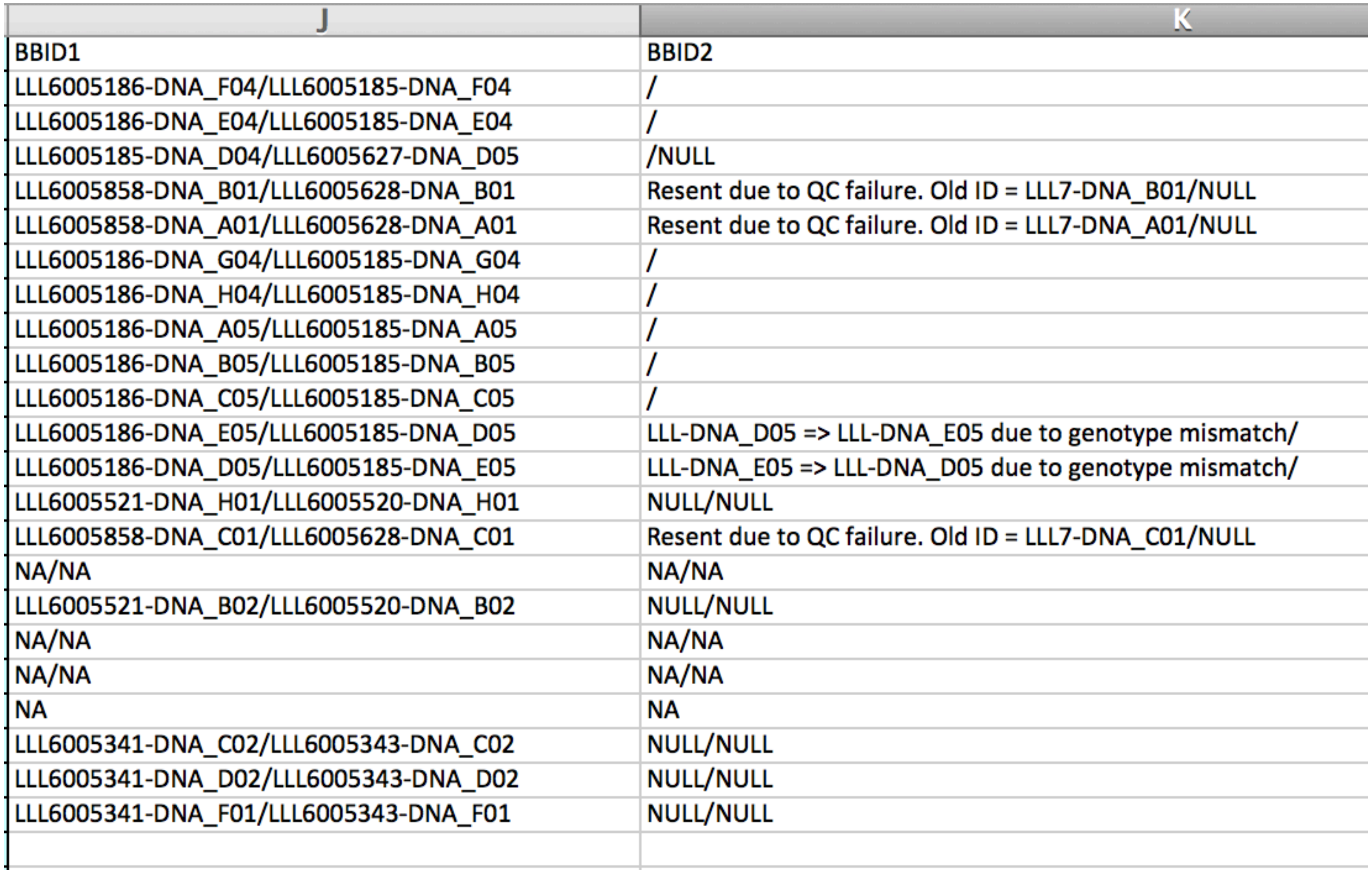


F	G
BB1	BB2
YY08.618 V5	YY08.618 Blood
YY08.949 V4	YY08.949 Blood
YY08.1115 Blood	YY08.1115 V13
YY09.817 V6	YY09.817 BLOOD
YY09.1083 V13	YY09.1083 BLOOD
YY10.230 V10	YY10.230 Blood
YY10.244 V2	YY10.244 Blood
YY10.323 v2	YY10.323 Blood
YY10.529 V2	YY10.529 Blood
YY10.709 V5	YY10.709 Blood
YY10.747 V8	YY10.747 Blood
YY10.830 V12	YY10.830 Blood
YY10.1062 V6	YY10.1062 BLOOD
YY10.1104 V6	YY10.1104 BLOOD
YY10.1217 v5	YY10.1217 BLOOD
YY10.1284 V12	YY10.1284 BLOOD
YY10.1416 V15	YY10.1416 BLOOD
YY11.081 V5	YY11.081 Blood
YY11.135 V5	
YY11.205 V1	YY11.205 BLOOD
YY11.308 V11	YY11.308 BLOOD
YY11.340 V1	YY11.340 Blood



H	I
AAID1	AAID2
XXX193/XXX330	N/A/N/A
XXX240/XXX192/XXX138/XXX149	N/A/N/A/N/A/N/A
XXX191/XXX239	N/A/N/A
XXX243/XXX336	N/A/N/A
XXX338/XXX244	N/A/N/A
XXX194/XXX147	N/A/N/A
XXX242/XXX195/XXX141	N/A/N/A/N/A
XXX196/XXX148	N/A/N/A
XXX197/NONE/XXX122	N/A/N/A/N/A
XXX198/XXX328	N/A/N/A
XXX241/XXX199	N/A/N/A
XXX200/XXX329	N/A/N/A
XXX252/XXX226/XXX139	N/A/N/A/N/A
XXX167/XXX344	N/A/N/A
XXX327/XXX250	N/A/N/A
XXX229/XXX253/XXX140	N/A/N/A/N/A
XXX230/XXX251	N/A/N/A
XXX168/XXX347	N/A/N/A
XXX170/XXX325/XXX134	N/A/N/A/N/A
XXX209/XXX265	N/A/N/A
XXX210/XXX257/XXX128	N/A/N/A/XXX567
XXX205/XXX172	N/A/N/A

- ID1/ID2
  - –Separate columns
- N/A/N/A
  - –NA/NA
  - –Separate columns



J	K
BBID1	BBID2
LLL6005186-DNA_F04/LLL6005185-DNA_F04	/
LLL6005186-DNA_E04/LLL6005185-DNA_E04	/
LLL6005185-DNA_D04/LLL6005627-DNA_D05	/NULL
LLL6005858-DNA_B01/LLL6005628-DNA_B01	Resent due to QC failure. Old ID = LLL7-DNA_B01/NULL
LLL6005858-DNA_A01/LLL6005628-DNA_A01	Resent due to QC failure. Old ID = LLL7-DNA_A01/NULL
LLL6005186-DNA_G04/LLL6005185-DNA_G04	/
LLL6005186-DNA_H04/LLL6005185-DNA_H04	/
LLL6005186-DNA_A05/LLL6005185-DNA_A05	/
LLL6005186-DNA_B05/LLL6005185-DNA_B05	/
LLL6005186-DNA_C05/LLL6005185-DNA_C05	/
LLL6005186-DNA_E05/LLL6005185-DNA_D05	LLL-DNA_D05 => LLL-DNA_E05 due to genotype mismatch/
LLL6005186-DNA_D05/LLL6005185-DNA_E05	LLL-DNA_E05 => LLL-DNA_D05 due to genotype mismatch/
LLL6005521-DNA_H01/LLL6005520-DNA_H01	NULL/NULL
LLL6005858-DNA_C01/LLL6005628-DNA_C01	Resent due to QC failure. Old ID = LLL7-DNA_C01/NULL
NA/NA	NA/NA
LLL6005521-DNA_B02/LLL6005520-DNA_B02	NULL/NULL
NA/NA	NA/NA
NA/NA	NA/NA
NA	NA
LLL6005341-DNA_C02/LLL6005343-DNA_C02	NULL/NULL
LLL6005341-DNA_D02/LLL6005343-DNA_D02	NULL/NULL
LLL6005341-DNA_F01/LLL6005343-DNA_F01	NULL/NULL

“/” or “N/A” or “NULL”?

Practise 2