Analysis

ABB

2023-05-30

## Plan of analysis to be carried out

for simple diagrams,

for complex connections - sankey diagram - for the link between printing methods + printing model with a link to the bioink type (+ origin)?

first things first, to give numbers of studies that report e.g. A or B

# Printing Techniques

Give an overview of the different printing techniques, - method - printer model - printer source - forms - software

## Kind of Printer Method

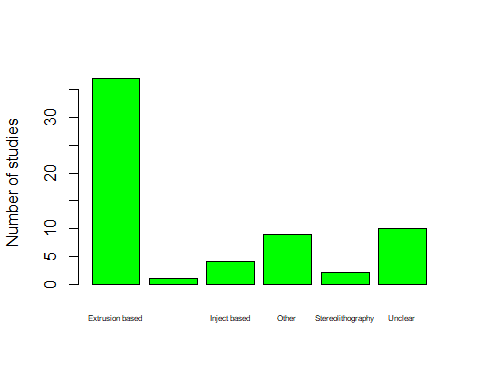
table(reconciled$`4.1 What kind of printing method is used?\_ae684e28-4f90-44ad-9de2-731d076de0b0\_Answer`)

##   
## Extrusion based Extrusion based|Unclear Inject based   
## 37 1 4   
## Other Stereolithography Unclear   
## 9 2 10

##  
 # Extrusion based Extrusion based|Unclear Inject based   
 # 37 1 4   
 # Other Stereolithography Unclear   
 # 9 2 10  
  
# proportions instead of absolute value of number of studies   
prop.table(table(reconciled$`4.1 What kind of printing method is used?\_ae684e28-4f90-44ad-9de2-731d076de0b0\_Answer`))

##   
## Extrusion based Extrusion based|Unclear Inject based   
## 0.58730159 0.01587302 0.06349206   
## Other Stereolithography Unclear   
## 0.14285714 0.03174603 0.15873016

barplot(table(reconciled$`4.1 What kind of printing method is used?\_ae684e28-4f90-44ad-9de2-731d076de0b0\_Answer`), ylab = "Number of studies", cex.names=.5 , col = "green")

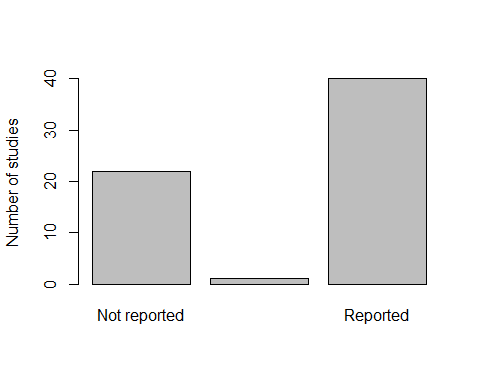


## Reporting of Printer Model

#### Reporting of Printer Model  
  
table(reconciled$`4.1.1 Do the authors report the printer model name/number?\_a3e72486-56d3-4154-a45f-9fb87b8612fc\_Answer`)

##   
## Not reported Not reported|Reported Reported   
## 22 1 40

# Not reported Not reported|Reported Reported   
 # 22 1 4  
  
both\_print <- reconciled %>% subset(`4.1.1 Do the authors report the printer model name/number?\_a3e72486-56d3-4154-a45f-9fb87b8612fc\_Answer` == "Not reported|Reported")  
  
barplot(table(reconciled$`4.1.1 Do the authors report the printer model name/number?\_a3e72486-56d3-4154-a45f-9fb87b8612fc\_Answer`), ylab = "Number of studies")

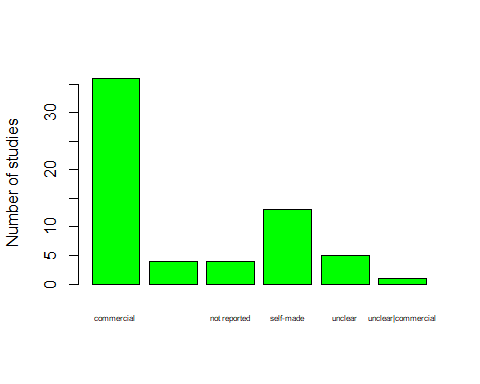


## Printer Source

#### Reporting of Printer Source  
  
table(reconciled$`4.1.2 What is the source of the printer?\_102ba965-5234-4b3e-8b23-bd70cf4e074d\_Answer`)

##   
## commercial modified commercial not reported self-made   
## 36 4 4 13   
## unclear unclear|commercial   
## 5 1

# commercial modified commercial not reported   
 # 36 4 4   
 # self-made unclear unclear|commercial   
 # 13 5 1  
  
barplot(table(reconciled$`4.1.2 What is the source of the printer?\_102ba965-5234-4b3e-8b23-bd70cf4e074d\_Answer`), ylab = "Number of studies", cex.names=.5, col = "green")

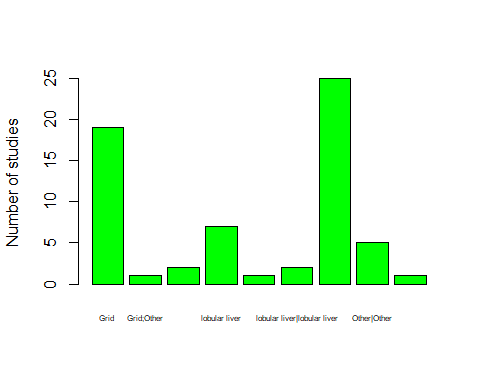


## Printer Forms

#### Reporting of Printer forms  
# split is based on the ink  
  
table(reconciled$`4.1.4 What kind of forms are printed with this ink?\_01d3ca37-1e2f-4087-8f39-c183f98f0c4e\_Answer`)

##   
## Grid Grid;Other   
## 19 1   
## Grid|Grid lobular liver   
## 2 7   
## lobular liver;Other lobular liver|lobular liver   
## 1 2   
## Other Other|Other   
## 25 5   
## Toroids   
## 1

# clean response  
# combo ;   
# pipe should be merged   
  
 # Grid Grid;Other   
 # 19 1   
 # Grid|Grid lobular liver   
 # 2 7   
 # lobular liver;Other lobular liver|lobular liver   
 # 1 2   
 # Other Other|Other   
 # 25 5   
 # Toroids   
 # 1  
  
barplot(table(reconciled$`4.1.4 What kind of forms are printed with this ink?\_01d3ca37-1e2f-4087-8f39-c183f98f0c4e\_Answer`), ylab = "Number of studies", cex.names=.5 , col = "green")

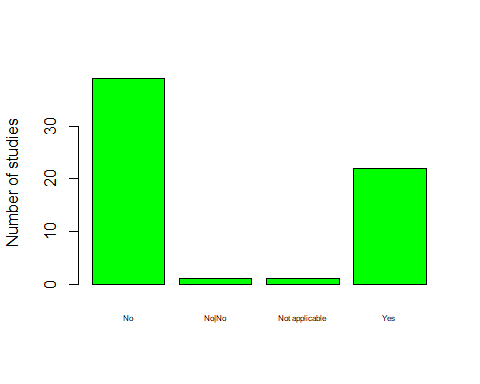


## Printer Software

#### Reporting of Printer software  
  
table(reconciled$`4.1.5 Do the authors report the name of the 3D modelling software?\_f88d82a9-410c-4118-ad6a-4535d12c4aca\_Answer`)

##   
## No No|No Not applicable Yes   
## 39 1 1 22

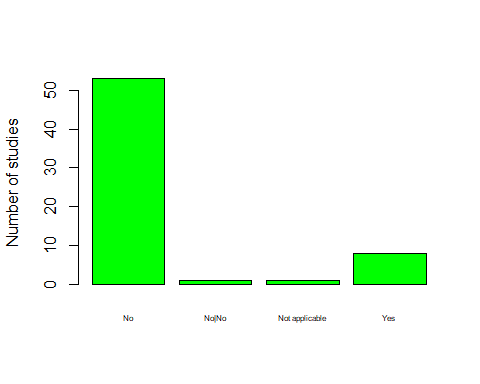
# No No|No Not applicable Yes   
 # 39 1 1 22  
  
barplot(table(reconciled$`4.1.5 Do the authors report the name of the 3D modelling software?\_f88d82a9-410c-4118-ad6a-4535d12c4aca\_Answer`), ylab = "Number of studies", cex.names=.5, col = "green")



## Slicing Software  
  
# - since the review started, many cases - not applicable   
# merge NA with No and merge No|No with NO  
table(reconciled$`4.1.6 Do the authors report the name of slicing software?\_bc07fc45-10aa-441f-9bdf-b32f5037389f\_Answer`)

##   
## No No|No Not applicable Yes   
## 53 1 1 8

# No No|No Not applicable Yes   
 # 53 1 1 8   
barplot(table(reconciled$`4.1.6 Do the authors report the name of slicing software?\_bc07fc45-10aa-441f-9bdf-b32f5037389f\_Answer`), ylab = "Number of studies", cex.names=.5, col = "green")



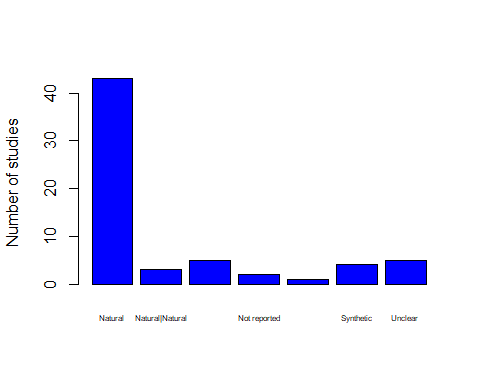
# BioInks

Give an overview of the different inks used with these techniques. - type - origin - additives - density

## Type of BioInk  
table(reconciled$`4.1.3 What type of bioink was used?\_92421414-c597-4e9c-b720-9bb4318b5483\_Answer`)

##   
## Natural Natural|Natural Natural|Synthetic   
## 43 3 5   
## Not reported Not reported|Natural Synthetic   
## 2 1 4   
## Unclear   
## 5

# clean?   
  
 # Natural Natural|Natural Natural|Synthetic   
 # 43 3 5   
 # Not reported Not reported|Natural Synthetic   
 # 2 1 4   
 # Unclear   
 # 5   
  
barplot(table(reconciled$`4.1.3 What type of bioink was used?\_92421414-c597-4e9c-b720-9bb4318b5483\_Answer`), ylab = "Number of studies", cex.names=.5, col = "blue")



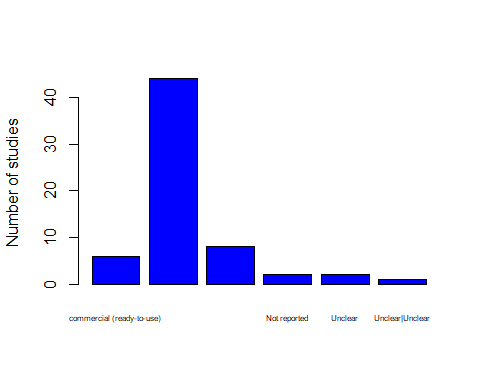
## If natural - type  
table(reconciled$`4.1.3.1.1 If natural bioink, please choose the type.\_66b761ad-6630-4323-b423-c848a717aae4\_Answer`)

##   
## Other   
## 1   
## Polysaccharide based   
## 10   
## Polysaccharide based;dECM based   
## 1   
## Protein based   
## 14   
## Protein based;dECM based   
## 8   
## Protein based;Polysaccharide based   
## 13   
## Protein based;Polysaccharide based;dECM based   
## 1   
## Protein based;Polysaccharide based;Other   
## 1   
## Protein based;Polysaccharide based|Protein based;Polysaccharide based   
## 1   
## Protein based|dECM based   
## 1   
## Protein based|Protein based   
## 1

# output needs cleaning   
  
  
  
## Origin of BioInk   
table(reconciled$`4.1.3.2.Â What is the origin of the bioink?\_34ef46b6-34ac-4ddb-a5de-07bc74272fca\_Answer`)

##   
## commercial (ready-to-use) custom formulated   
## 6 44   
## custom formulated|custom formulated Not reported   
## 8 2   
## Unclear Unclear|Unclear   
## 2 1

# needs cleaning  
  
# commercial (ready-to-use) custom formulated   
# 6 44   
# custom formulated|custom formulated Not reported   
# 8 2   
# Unclear Unclear|Unclear   
# 2 1   
  
barplot(table(reconciled$`4.1.3.2.Â What is the origin of the bioink?\_34ef46b6-34ac-4ddb-a5de-07bc74272fca\_Answer`), ylab = "Number of studies", cex.names=.5, col = "blue")



### Additives  
# -- needs cleaning   
table(reconciled$`4.1.3.3Â Which information is provided on the additives in the ink or culture?Â \_4c2b5908-9c3c-4ba8-91f2-dd9771ac2ad4\_Answer`)

##   
## Concentration   
## 9   
## Concentration;Manufacturer   
## 25   
## Concentration;Manufacturer;Order number   
## 8   
## Concentration;Manufacturer;Order number|Concentration;Manufacturer;Order number   
## 2   
## Concentration;Manufacturer|Concentration;Manufacturer   
## 4   
## Concentration|Concentration;Manufacturer   
## 1   
## Manufacturer   
## 1   
## None   
## 11   
## None|Concentration;Manufacturer   
## 1   
## None|None   
## 1

# needs cleaning  
  
  
  
## Cell density of bioInk  
table(reconciled$`4.1.3.4 Is the cell density of the bioinkÂ provided in the study?Â \_d03a497a-c8ab-49a6-8fa7-5eca0d168c94\_Answer`)

##   
## No No|No No|Yes Yes Yes|No Yes|Yes   
## 11 1 1 43 1 6

# needs cleaning   
  
 # No No|No No|Yes Yes Yes|No Yes|Yes   
 # 11 1 1 43 1 6

# Liver Cells

And then it is liver specific variables. - main type of liver cells - info about liver cells

AND - Main type of liver cells

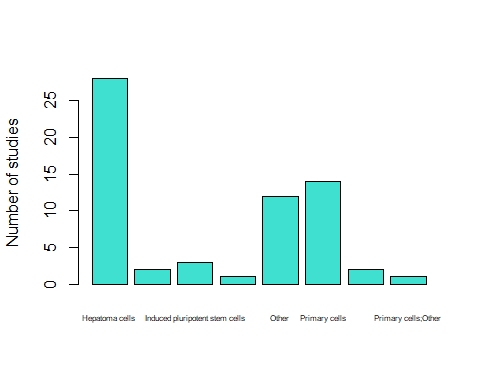
if comments from reconciled - print out for all to see.

if any of reviewer comments say HepG2

table(reconciled$`2.2Â What is the main type of liver cells included?\_9bea404f-a75c-401f-af5b-8fd020306538\_Answer`)

##   
## Hepatoma cells Hepatoma cells;Other   
## 28 2   
## Induced pluripotent stem cells Induced pluripotent stem cells;Other   
## 3 1   
## Other Primary cells   
## 12 14   
## Primary cells;Hepatoma cells Primary cells;Other   
## 2 1

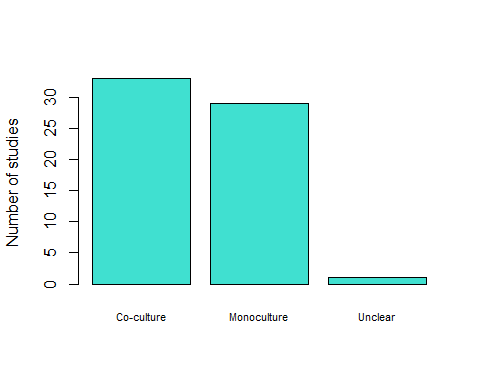
# clean?   
  
  
  
barplot(table(reconciled$`2.2Â What is the main type of liver cells included?\_9bea404f-a75c-401f-af5b-8fd020306538\_Answer`), ylab = "Number of studies", cex.names=.5, col = "turquoise")



table(reconciled$`2.2.1Â How is the presented liver model cultured?\_b6e561ab-c358-47fa-b9db-61e363b73223\_Answer`)

##   
## Co-culture Monoculture Unclear   
## 33 29 1

# Co-culture Monoculture Unclear   
 # 33 29 1   
  
  
barplot(table(reconciled$`2.2.1Â How is the presented liver model cultured?\_b6e561ab-c358-47fa-b9db-61e363b73223\_Answer`), ylab = "Number of studies", cex.names=.7, col = "turquoise")



# If co-culter - what type of non-parenchymal cells   
# - need to clean  
table(reconciled$`2.2.1.1 If co-cultured, what type of non-parenchymal cells are included?\_b729a62f-2dc7-47b6-ada7-e1ed8e363918\_Answer`)

##   
## Endothelial cells   
## 7   
## Endothelial cells;Hepatic stellate cells   
## 5   
## Endothelial cells;Other   
## 6   
## Hepatic stellate cells   
## 2   
## Immune cells;Endothelial cells;Hepatic stellate cells   
## 1   
## Immune cells;Hepatic stellate cells   
## 2   
## Other   
## 10

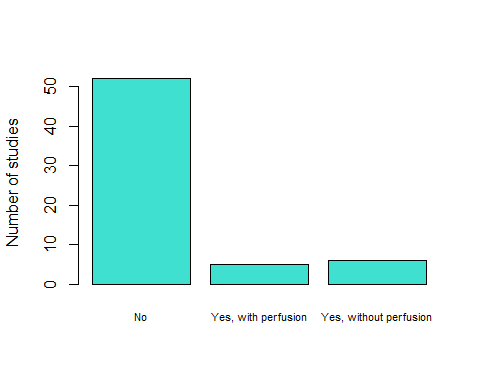
# Meta-data for Liver cells  
  
table(reconciled$`2.4 Which kind of meta data is available for the used liver cells?\_2868ee50-2c4c-47e8-a040-427e4f882632\_Answer`)

##   
## Age Common cell line Common cell line;None   
## 2 33 4   
## Health status None Sex;Age   
## 1 16 2   
## Sex;Age;Common cell line Sex;Age;Health status   
## 2 3

## common cell line; None should get merged with Common Cell line option   
# re-shape data to can number of bits of info?   
  
  
  
# LIVER Model  
  
table(reconciled$`3.1 Does the study present a vascularization of the model?\_3b31a6ff-4233-4f24-9e7e-2d2eb3c83420\_Answer`)

##   
## No Yes, with perfusion Yes, without perfusion   
## 52 5 6

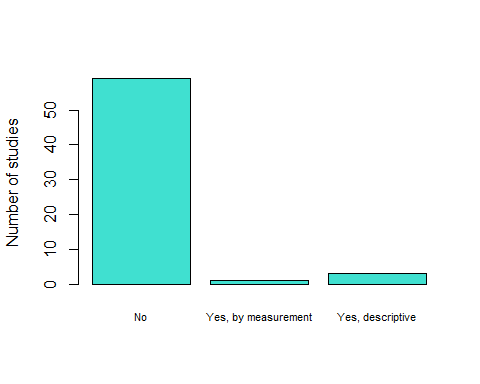
# No Yes, with perfusion Yes, without perfusion   
 # 52 5 6  
  
  
barplot(table(reconciled$`3.1 Does the study present a vascularization of the model?\_3b31a6ff-4233-4f24-9e7e-2d2eb3c83420\_Answer`), ylab = "Number of studies", cex.names=.7, col = "turquoise")



## hypoxia   
table(reconciled$`3.2 Do the authors address hypoxia/normoxia/oxygenation of the liver model?\_5b050ea7-da29-4a47-bdea-23edda5877f2\_Answer`)

##   
## No Yes, by measurement Yes, descriptive   
## 59 1 3

# No Yes, by measurement Yes, descriptive   
 # 59 1 3  
barplot(table(reconciled$`3.2 Do the authors address hypoxia/normoxia/oxygenation of the liver model?\_5b050ea7-da29-4a47-bdea-23edda5877f2\_Answer`), ylab = "Number of studies", cex.names=.7, col = "turquoise")



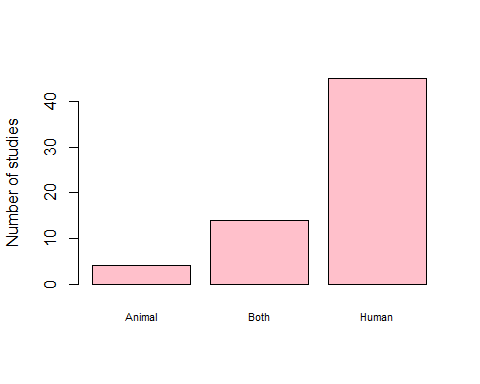
# Cells

What types of included cells? - human, animal, both

table(reconciled$`2.1 What is the origin of the cells in the liver model?\_d2a55b1d-f869-4fa4-83a1-94eeb126c6fb\_Answer`)

##   
## Animal Both Human   
## 4 14 45

#  
# Animal Both Human   
# 4 14 45   
  
barplot(table(reconciled$`2.1 What is the origin of the cells in the liver model?\_d2a55b1d-f869-4fa4-83a1-94eeb126c6fb\_Answer`), ylab = "Number of studies", cex.names=.7, col = "pink")

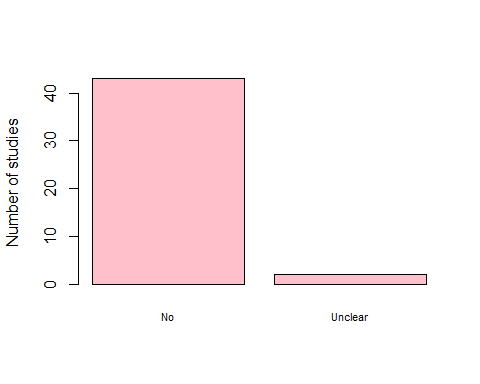


## If human, is it Xeno-free?

table(reconciled$`2.1.1 If human, is the described liver model xeno-free/animal-free?\_7b2396a2-218d-462b-b71f-0c68bc5e9911\_Answer`)

##   
## No Unclear   
## 43 2

barplot(table(reconciled$`2.1.1 If human, is the described liver model xeno-free/animal-free?\_7b2396a2-218d-462b-b71f-0c68bc5e9911\_Answer`)  
, ylab = "Number of studies", cex.names=.7, col = "pink")



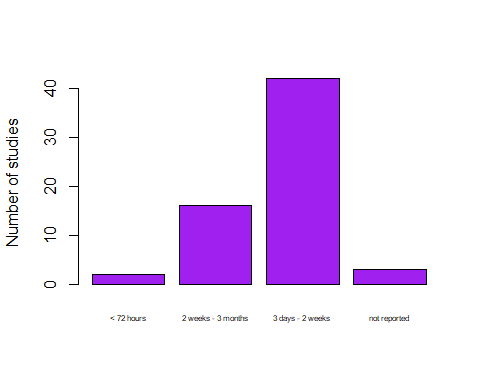
# Culture Conditions

What type of culture conditions? Liver Markers- what measurements?

table(reconciled$`5.2 How long were the liver models cultured after printing?\_1f136f0a-786b-4e17-a97d-e5cf32f47b26\_Answer`)

##   
## < 72 hours 2 weeks - 3 months 3 days - 2 weeks not reported   
## 2 16 42 3

# < 72 hours 2 weeks - 3 months 3 days - 2 weeks not reported   
 # 2 16 42 3   
barplot(table(reconciled$`5.2 How long were the liver models cultured after printing?\_1f136f0a-786b-4e17-a97d-e5cf32f47b26\_Answer`), ylab = "Number of studies", cex.names=.5, col = "purple")



# Liver Markers

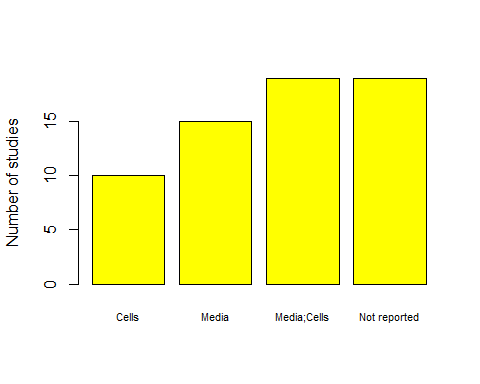
# WHICH  
table(reconciled$`6.1 Which liver markers were analysed in the presented model?\_1844378b-1400-4d7a-b9f5-5538df7c7b76\_Answer`)

##   
## Alanine aminotransferase (ALT);Aspartate aminotransferase (AST);Alkaline phosphatase (ALP);Gamma-glutamyl transferase (GGT);Other   
## 1   
## Alanine aminotransferase (ALT);Lactate dehydrogenase (LDH);Other   
## 1   
## Lactate dehydrogenase (LDH)   
## 4   
## Lactate dehydrogenase (LDH);Other   
## 4   
## None   
## 19   
## Other   
## 34

# clean?   
  
  
# WHERE  
table(reconciled$`6.1.1 Where were the liver markers measured?\_a70225ae-f529-4b91-bcc9-8081d7efc6e2\_Answer`)

##   
## Cells Media Media;Cells Not reported   
## 10 15 19 19

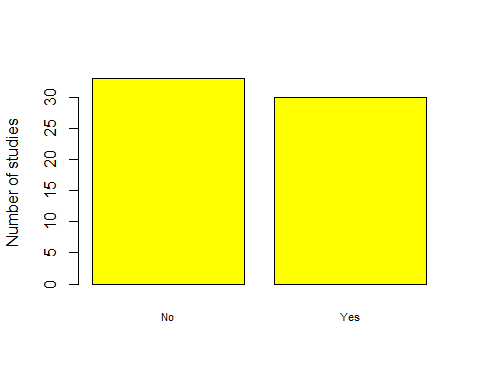
# Cells Media Media;Cells Not reported   
 # 10 15 19 19   
barplot(table(reconciled$`6.1.1 Where were the liver markers measured?\_a70225ae-f529-4b91-bcc9-8081d7efc6e2\_Answer`), ylab = "Number of studies", cex.names=.7, col = "yellow")



# CYP450   
table(reconciled$`6.2 Does the study analyse the Cytochrome P450 CYP450 level in the print?\_3c21cc1f-1431-49c7-ad8f-bda83956828a\_Answer`)

##   
## No Yes   
## 33 30

# No Yes   
 # 33 30   
  
barplot(table(reconciled$`6.2 Does the study analyse the Cytochrome P450 CYP450 level in the print?\_3c21cc1f-1431-49c7-ad8f-bda83956828a\_Answer`), ylab = "Number of studies", cex.names=.7, col = "yellow")



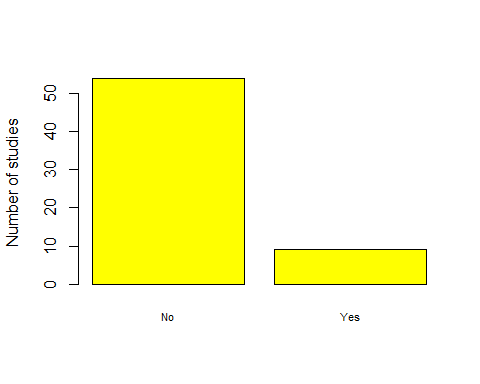
table(reconciled$`6.2.1 If yes, which cytochrome isoforms were analysed?\_62bdffd7-d9c7-4646-9f66-9510f5bf2649\_Answer`)

##   
## Cytochrome P450 1A2 (CYP1A)   
## 4   
## Cytochrome P450 1A2 (CYP1A);Cytochrome P450 2E1 (CYP2E)   
## 1   
## Cytochrome P450 1A2 (CYP1A);Cytochrome P450 3A4 (CYP3A)   
## 1   
## Cytochrome P450 1A2 (CYP1A);Cytochrome P450 3A4 (CYP3A);Cytochrome P450 2B6 (CYP2B)   
## 1   
## Cytochrome P450 1A2 (CYP1A);Cytochrome P450 3A4 (CYP3A);Cytochrome P450 2B6 (CYP2B);Cytochrome P450 2C9 (CYP2C)   
## 1   
## Cytochrome P450 1A2 (CYP1A);Cytochrome P450 3A4 (CYP3A);Cytochrome P450 2B6 (CYP2B);Cytochrome P450 2C9 (CYP2C);Cytochrome P450 2D6 (CYP2D)   
## 2   
## Cytochrome P450 1A2 (CYP1A);Cytochrome P450 3A4 (CYP3A);Cytochrome P450 2B6 (CYP2B);Cytochrome P450 2C9 (CYP2C);Cytochrome P450 2E1 (CYP2E)   
## 1   
## Cytochrome P450 1A2 (CYP1A);Cytochrome P450 3A4 (CYP3A);Cytochrome P450 2C9 (CYP2C);Cytochrome P450 2D6 (CYP2D)   
## 1   
## Cytochrome P450 1A2 (CYP1A);Cytochrome P450 3A4 (CYP3A);Other   
## 3   
## Cytochrome P450 2C9 (CYP2C)   
## 1   
## Cytochrome P450 2E1 (CYP2E)   
## 1   
## Cytochrome P450 3A4 (CYP3A)   
## 9   
## Cytochrome P450 3A4 (CYP3A);Cytochrome P450 2D6 (CYP2D)   
## 1   
## Cytochrome P450 3A4 (CYP3A);Cytochrome P450 2D6 (CYP2D);Cytochrome P450 2E1 (CYP2E)   
## 1   
## Not reported   
## 2

## output needs cleaning  
  
  
## agonists  
table(reconciled$`6.3 Have agonists of the receptors for the inducibility of CYPs been applied?\_ac9f38a8-8fe2-44de-a180-24fddd78fb59\_Answer`)

##   
## No Yes   
## 54 9

# No Yes   
 # 54 9   
barplot(table(reconciled$`6.3 Have agonists of the receptors for the inducibility of CYPs been applied?\_ac9f38a8-8fe2-44de-a180-24fddd78fb59\_Answer`), ylab = "Number of studies", cex.names=.7, col = "yellow")



# Quality

* Quality Assays
* storage conditions
* application
* time

## Does the study describe quality assurance?

table(reconciled$`5.3 Does the study describe quality-assuring assays for the printed model?\_09745b80-9723-4e5c-8a47-dfc8a9c71a6d\_Answer`)

##   
## Yes   
## 63

# Yes   
# 63

## Which assays were performed?

### messy - needs cleaning  
table(reconciled$`5.3.1 Which assays were performed to assure the quality of the liver model?\_8a415412-28c6-48ff-840a-538ea69a068f\_Answer`)

##   
## Histological characterization   
## 1   
## Histological characterization;Enzyme linked immunosorbent Assay (ELISA) of liver markers   
## 1   
## Live/Dead Cell Staining   
## 1   
## Live/Dead Cell Staining;Histological characterization   
## 1   
## Live/Dead Cell Staining;Real-time quantitative PCR of liver markers;Histological characterization;Enzyme linked immunosorbent Assay (ELISA) of liver markers   
## 2   
## Live/Dead Cell Staining;Real-time quantitative PCR of liver markers;Rheological test;Histological characterization   
## 1   
## Live/Dead Cell Staining;Rheological test;Mechanical stiffness;Size measurement;Biocompatibility   
## 1   
## Live/Dead Cell Staining;Size measurement   
## 1   
## Live/Dead Cell Staining;Size measurement;Histological characterization   
## 1   
## Live/Dead Cell Staining;Viability test   
## 2   
## Live/Dead Cell Staining;Viability test;Biodegradation;Mechanical stiffness   
## 1   
## Live/Dead Cell Staining;Viability test;Enzyme linked immunosorbent Assay (ELISA) of liver markers   
## 1   
## Live/Dead Cell Staining;Viability test;Histological characterization   
## 1   
## Live/Dead Cell Staining;Viability test;Real-time quantitative PCR of liver markers;Biocompatibility ;Enzyme linked immunosorbent Assay (ELISA) of liver markers   
## 1   
## Live/Dead Cell Staining;Viability test;Real-time quantitative PCR of liver markers;Enzyme linked immunosorbent Assay (ELISA) of liver markers   
## 2   
## Live/Dead Cell Staining;Viability test;Real-time quantitative PCR of liver markers;Histological characterization;Enzyme linked immunosorbent Assay (ELISA) of liver markers   
## 2   
## Live/Dead Cell Staining;Viability test;Real-time quantitative PCR of liver markers;Mechanical stiffness;Histological characterization   
## 1   
## Live/Dead Cell Staining;Viability test;Real-time quantitative PCR of liver markers;Mechanical stiffness;Histological characterization;Enzyme linked immunosorbent Assay (ELISA) of liver markers   
## 1   
## Live/Dead Cell Staining;Viability test;Real-time quantitative PCR of liver markers;Mechanical stiffness;Size measurement;Histological characterization   
## 1   
## Live/Dead Cell Staining;Viability test;Real-time quantitative PCR of liver markers;Rheological test;Biodegradation;Histological characterization   
## 1   
## Live/Dead Cell Staining;Viability test;Real-time quantitative PCR of liver markers;Rheological test;Histological characterization   
## 1   
## Live/Dead Cell Staining;Viability test;Real-time quantitative PCR of liver markers;Rheological test;Histological characterization;Enzyme linked immunosorbent Assay (ELISA) of liver markers   
## 1   
## Live/Dead Cell Staining;Viability test;Real-time quantitative PCR of liver markers;Rheological test;Mechanical stiffness;Size measurement;Histological characterization   
## 1   
## Live/Dead Cell Staining;Viability test;Real-time quantitative PCR of liver markers;Size measurement;Histological characterization   
## 2   
## Live/Dead Cell Staining;Viability test;Rheological test;Biodegradation;Mechanical stiffness;Enzyme linked immunosorbent Assay (ELISA) of liver markers   
## 1   
## Live/Dead Cell Staining;Viability test;Rheological test;Biodegradation;Mechanical stiffness;Histological characterization;Enzyme linked immunosorbent Assay (ELISA) of liver markers   
## 1   
## Live/Dead Cell Staining;Viability test;Rheological test;Histological characterization   
## 3   
## Live/Dead Cell Staining;Viability test;Rheological test;Histological characterization;Enzyme linked immunosorbent Assay (ELISA) of liver markers   
## 2   
## Live/Dead Cell Staining;Viability test;Rheological test;Mechanical stiffness   
## 1   
## Live/Dead Cell Staining;Viability test;Rheological test;Mechanical stiffness;Enzyme linked immunosorbent Assay (ELISA) of liver markers   
## 1   
## Live/Dead Cell Staining;Viability test;Rheological test;Mechanical stiffness;Histological characterization   
## 1   
## Live/Dead Cell Staining;Viability test;Rheological test;Mechanical stiffness;Histological characterization;Enzyme linked immunosorbent Assay (ELISA) of liver markers   
## 2   
## Live/Dead Cell Staining;Viability test;Rheological test;Mechanical stiffness;Size measurement;Enzyme linked immunosorbent Assay (ELISA) of liver markers   
## 1   
## Live/Dead Cell Staining;Viability test;Rheological test;Size measurement   
## 1   
## Live/Dead Cell Staining;Viability test;Size measurement;Histological characterization   
## 1   
## Live/Dead Cell Staining;Viability test;Size measurement;Histological characterization;Enzyme linked immunosorbent Assay (ELISA) of liver markers   
## 2   
## Real-time quantitative PCR of liver markers;Histological characterization   
## 3   
## Real-time quantitative PCR of liver markers;Histological characterization;Enzyme linked immunosorbent Assay (ELISA) of liver markers   
## 1   
## Real-time quantitative PCR of liver markers;Rheological test;Histological characterization;Enzyme linked immunosorbent Assay (ELISA) of liver markers   
## 1   
## Rheological test;Histological characterization   
## 1   
## Viability test   
## 2   
## Viability test;Histological characterization;Enzyme linked immunosorbent Assay (ELISA) of liver markers   
## 2   
## Viability test;Mechanical stiffness   
## 1   
## Viability test;Real-time quantitative PCR of liver markers;Histological characterization;Biocompatibility ;Enzyme linked immunosorbent Assay (ELISA) of liver markers   
## 1   
## Viability test;Real-time quantitative PCR of liver markers;Histological characterization;Enzyme linked immunosorbent Assay (ELISA) of liver markers   
## 3   
## Viability test;Real-time quantitative PCR of liver markers;Rheological test;Histological characterization;Enzyme linked immunosorbent Assay (ELISA) of liver markers   
## 1   
## Viability test;Real-time quantitative PCR of liver markers;Size measurement;Histological characterization   
## 1

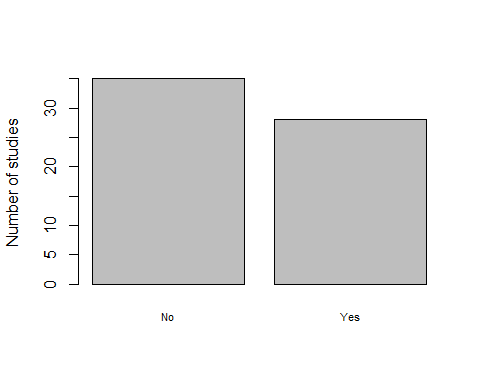
# needs cleaning   
  
  
## heat map of which assay were performed - will be more than 63   
## also how many assay were performed? 1, 2, 3, 4, 5, or more.

## Applications in the paper

# Application   
table(reconciled$`7.1 Do the authors apply the model in the study?\_a6895d38-a9ed-4605-a092-4f06ebbd9e2b\_Answer`)

##   
## No Yes   
## 35 28

# No Yes   
 # 35 28   
  
barplot(table(reconciled$`7.1 Do the authors apply the model in the study?\_a6895d38-a9ed-4605-a092-4f06ebbd9e2b\_Answer`), ylab = "Number of studies", cex.names=.7, col = "gray")



# field of application   
table(reconciled$`7.1.1 please select the field of application. \_d332c2ee-9864-434f-8595-90305808e32d\_Answer`)

##   
## Disease modeling   
## 3   
## Drug dosage testing   
## 2   
## Drug dosage testing;Disease modeling   
## 1   
## Drug dosage testing;Xenograft (implantation into animal);Disease modeling   
## 1   
## Implant / Medical surgery   
## 1   
## Other   
## 3   
## Toxicity testing   
## 10   
## Toxicity testing;Drug dosage testing   
## 4   
## Toxicity testing;Drug dosage testing;Other   
## 1   
## Xenograft (implantation into animal)   
## 2