Lab Notebook for Theoph Model Development

CTSI

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1.1 Background

Theophylline is a medication used to treat asthma and chronic obstructive pulmonary disease as a second-line drug. It is a bronchodilator. This activity reviews the indications, action, and contraindications for theophylline as a potential agent in treating asthma and chronic obstructive pulmonary disease. This activity will highlight the mechanism of action, adverse

event profile, pharmacokinetics, and drug interactions pertinent for members of the interprofessional team in the treatment of patients with asthma and chronic obstructive pulmonary disease (Link). The chemical structure of Theoph is show below Figure 1.

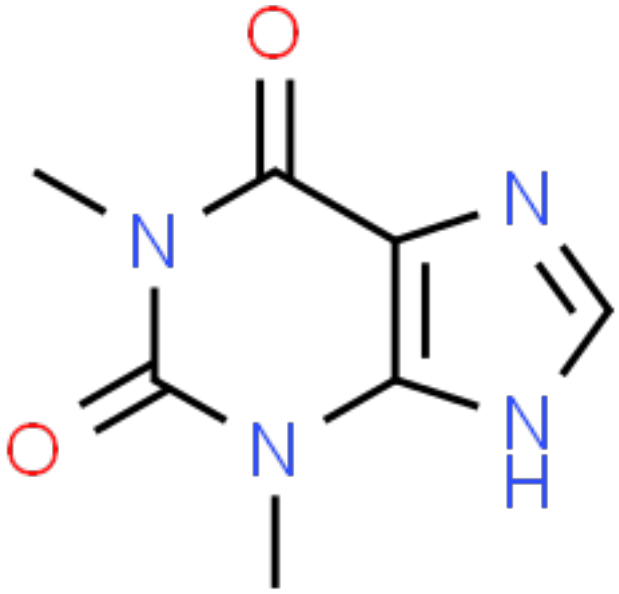


Figure 1: Chemical Structure

1.2 Methods

1.2.1 Data

```
#install.packages("ggplot2")
library(ggplot2)
library(gt)
library(tidyverse)
library(dplyr)
```

```
```{r}
#| label: fig-PK-profile
#| fig-cap: "Theoph PK Profiles"
#| fig-subcap:
#| - "PK Profile colored by Subject ID"
```
```

```
#| - "Individual PK profiles"
#| layout-ncol: 2

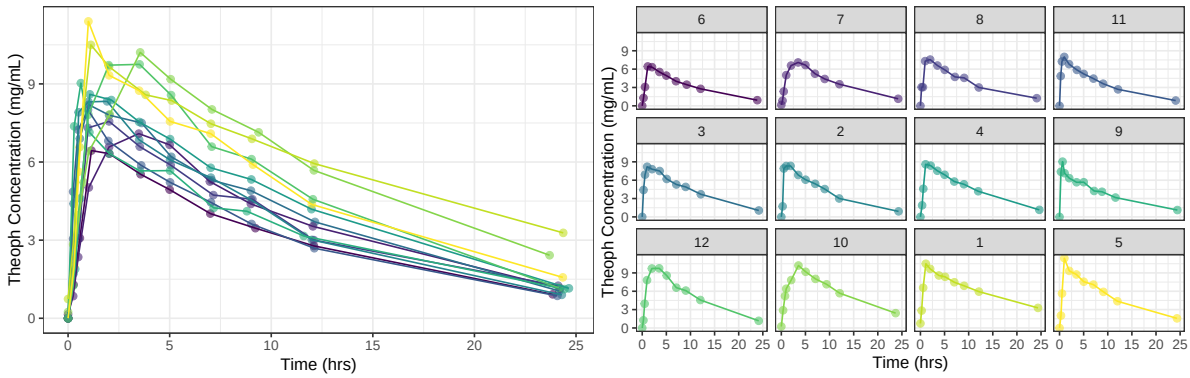
dataset<-Theoph

full<-ggplot(data=dataset, aes(x=Time, y=conc, group=Subject))+
  geom_point(aes(color=as.factor(Subject)),size=2, alpha=0.6)+
  geom_line(aes(color=as.factor(Subject)))+
  theme_bw()+
  guides(color="none")+
  labs(x="Time (hrs)", y="Theoph Concentration (mg/mL)")

full


idv<-ggplot(data=dataset, aes(x=Time, y=conc, group=Subject))+
  geom_point(aes(color=as.factor(Subject)),size=2, alpha=0.6)+
  geom_line(aes(color=as.factor(Subject)))+
  theme_bw()+
  guides(color="none")+
  labs(x="Time (hrs)", y="Theoph Concentration (mg/mL)")+
  facet_wrap(~Subject)

idv
```



(a) PK Profile colored by Subject ID

(b) Individual PK profiles

Figure 2: Theoph PK Profiles

Figure 2

Figure 2a and Figure 2b

```r
dataset%>%
  mutate(Time = round(Time, digits = 0))%>%
  group_by(Time)%>%
  summarise(N=n(),
            Mean = mean(conc),
            Median = median(conc))%>%
  gt()
```

Table 1: Summary of Theoph Concentrations

Time	N	Mean	Median
0	27	1.818889	1.250
1	21	7.006667	7.140
2	12	7.887500	7.815
3	1	7.090000	7.090
4	11	7.529091	7.500
5	12	6.766667	6.430
7	12	5.695000	5.350
9	12	5.080833	4.735
12	12	3.885000	3.615
24	11	1.426364	1.150
25	1	1.150000	1.150

Table 1

1.3 Results

As discussed in Section 1.1