MODELARE ȘI SIMULAREA STRATEGIEI DE DOZARE A MEDICAMENTELOR

STUDENT
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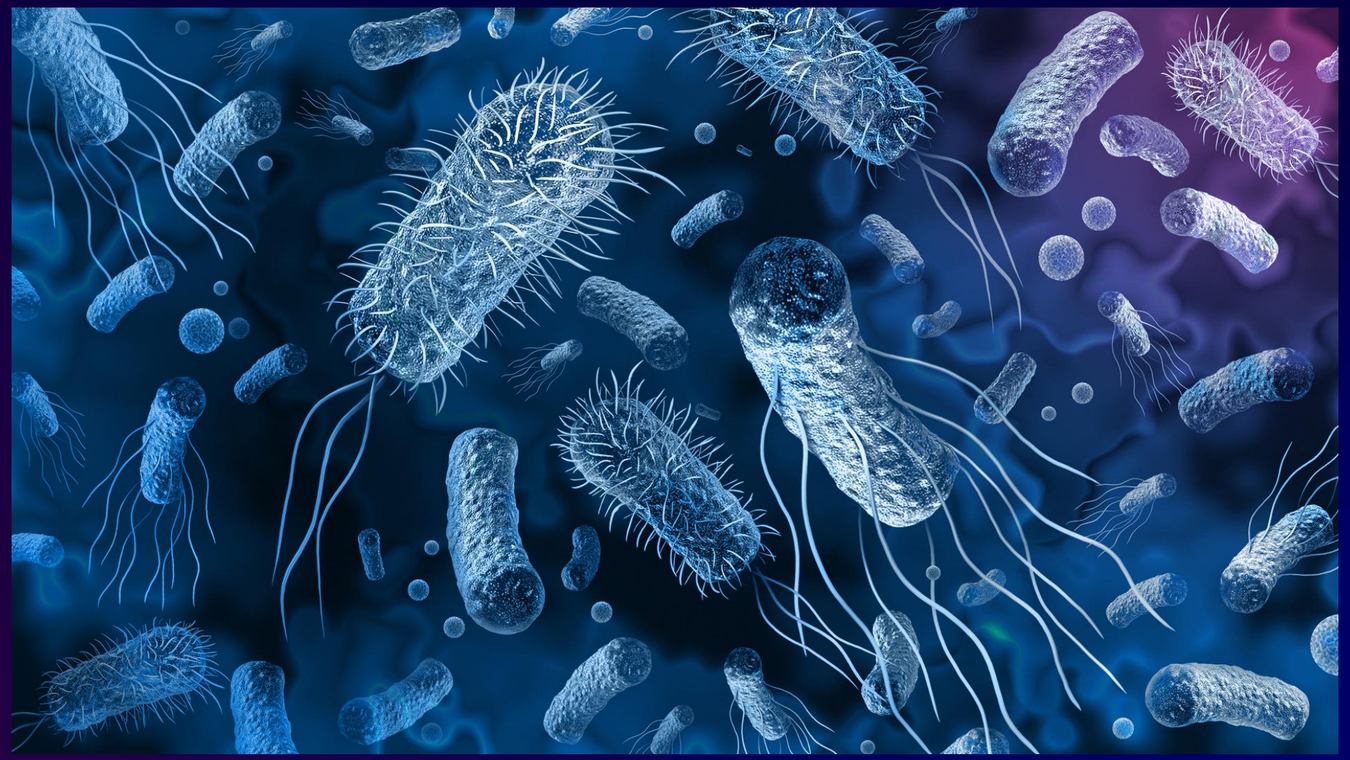
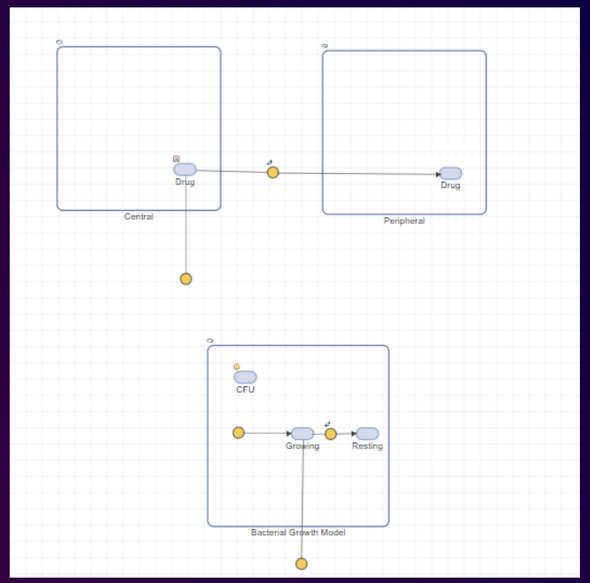
COORDONATOR
Conf. Dr. Ing. Coman Simona

Iunie 2023

Descrierea problemei



Structura proiectului



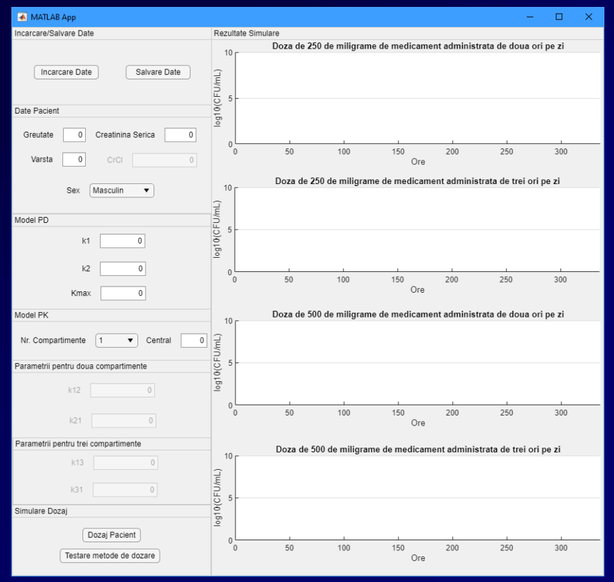
MODEL PK/PD

Simbiology

MATLAB

SIMULĂRI

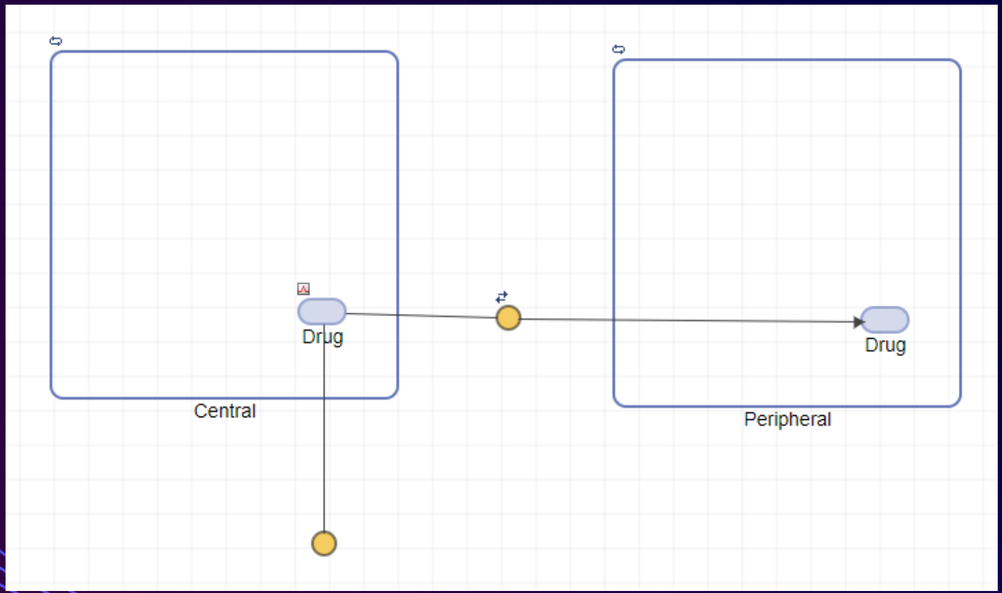
MATLAB

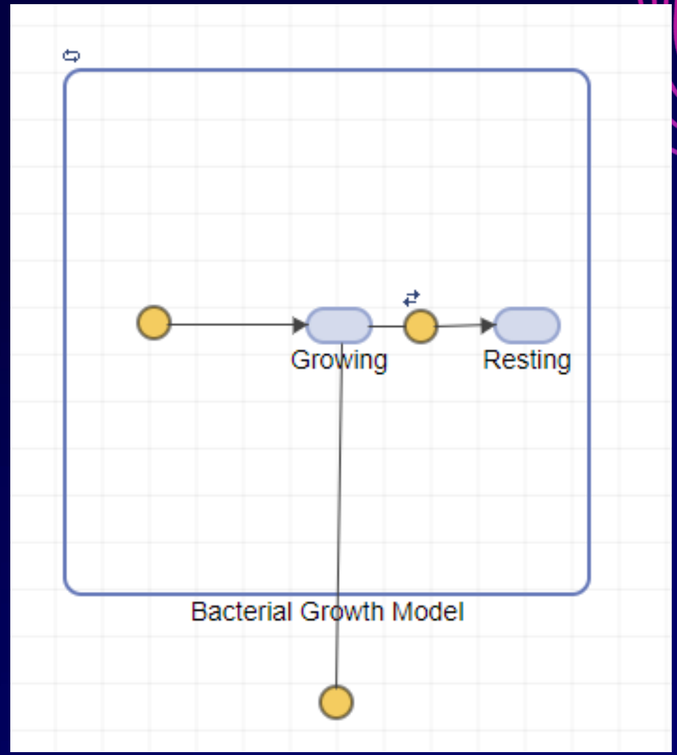


INTERFAȚA

AppDesigner

Modelul PK/PD





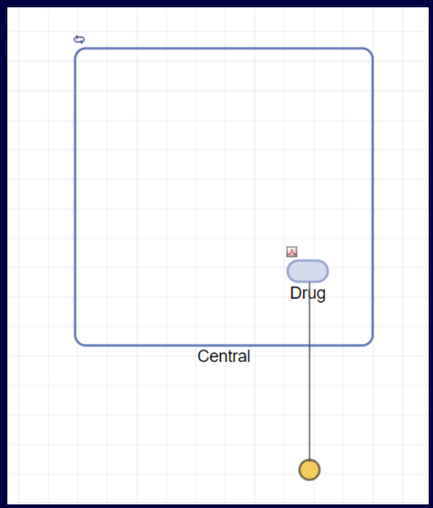
MODELUL PK

MODELUL PD

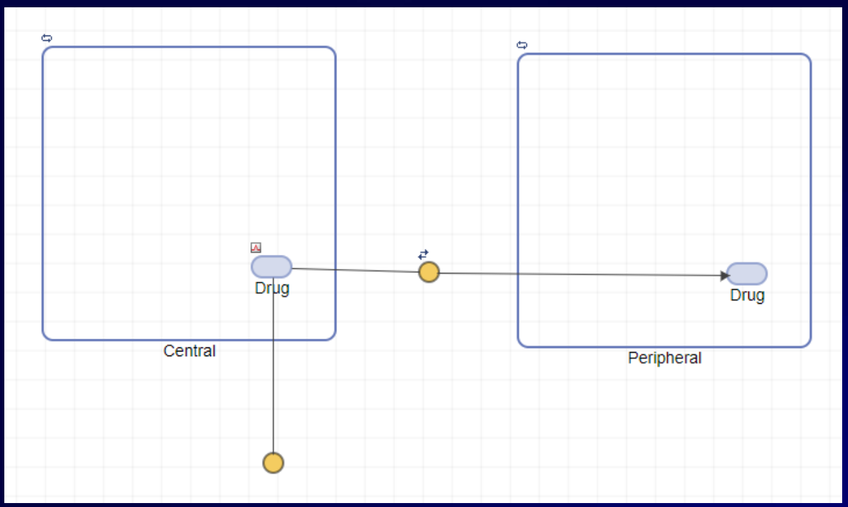
Modelul PK

Proiectul prezintă trei tipuri de modelele PK bazate pe numărul de compartimente:

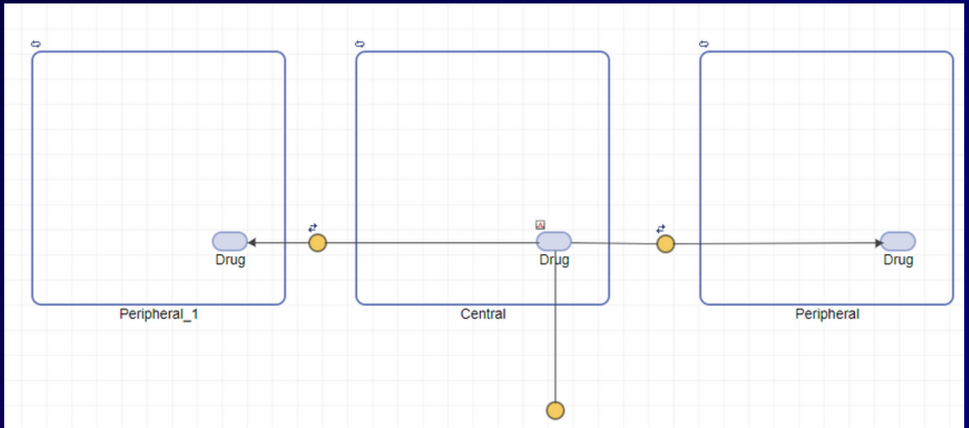
- Un compartiment;
- Două compartimente;
- Trei Compartimente.



UN COMPARTIMENT

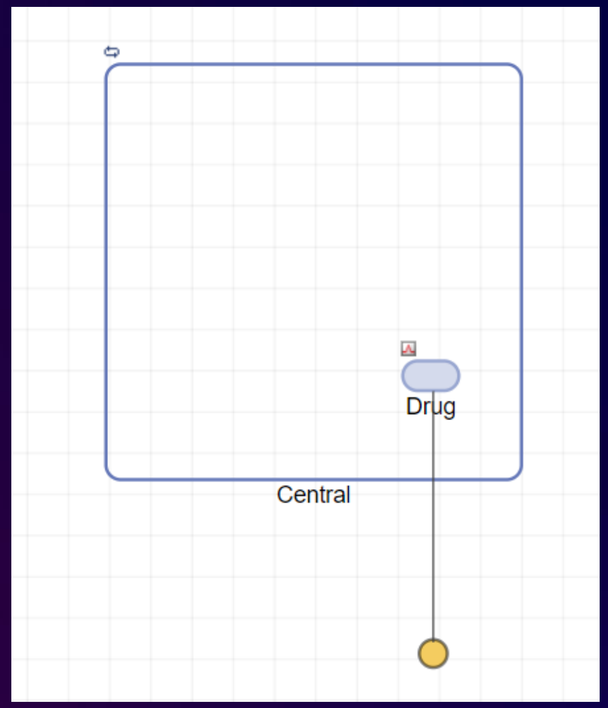


DOUĂ COMPARTIMENTE



TREI COMPARTIMENTE

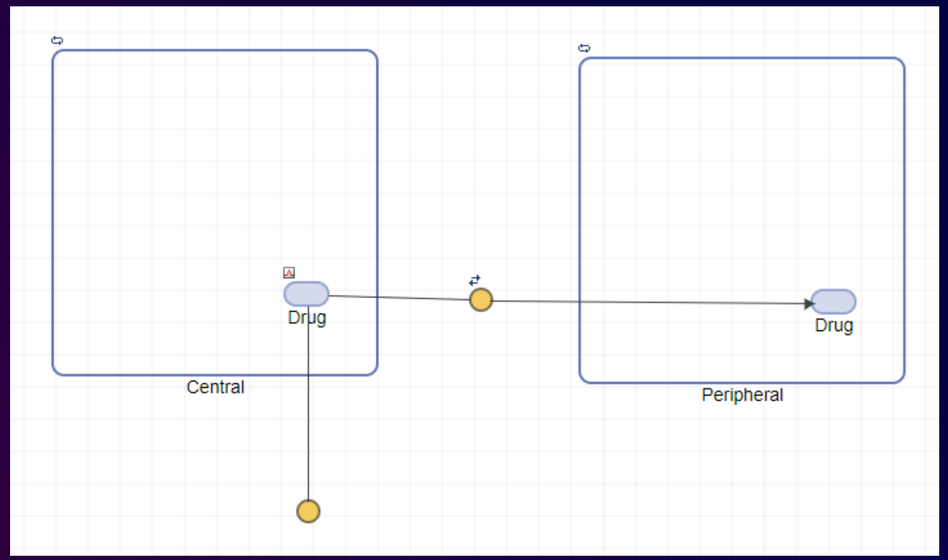
Modelele PK



MODELUL PK CU UN SINGUR COMPARTIMENT

- ⊕ SIMPLITATE
- ⊕ TIMP DE CALCUL SCURT
- ⊕ ESTIMAREA PARAMETRILOR
- ⊖ LIPSA DETALIILOR FIZIOLOGICE
- ⊖ CAPTAREA LIMITATĂ A FARMACOCINETICII COMPLEXE

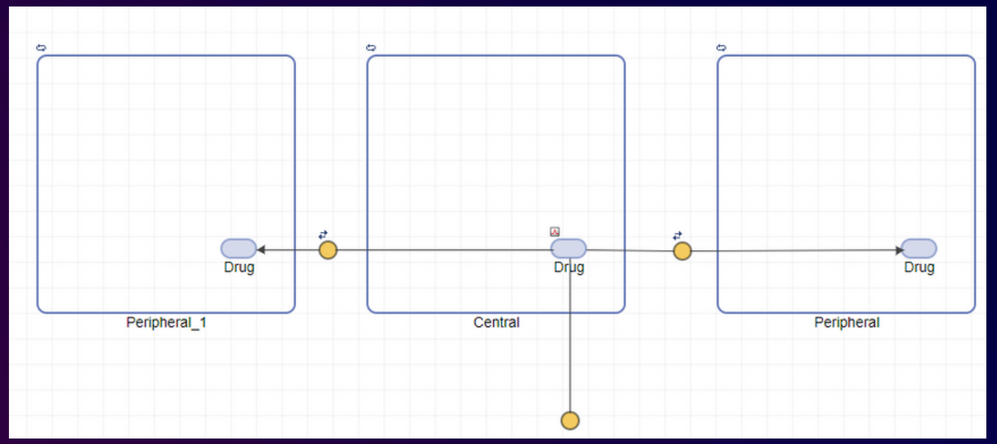
Modelele PK



MODELUL PK CU DOUĂ COMPARTIMENTE

- (+) REPREZENTARE ÎMBUNĂTĂȚITĂ A DISTRIBUȚIEI MEDICAMENTULU
- (+) CAPTAREA ELIMINĂRII ÎNTÂRZIATE
- (−) COMPLEXITATE MAI MARE
- (−) TIMP DE CALCUL MAI RIDICAT

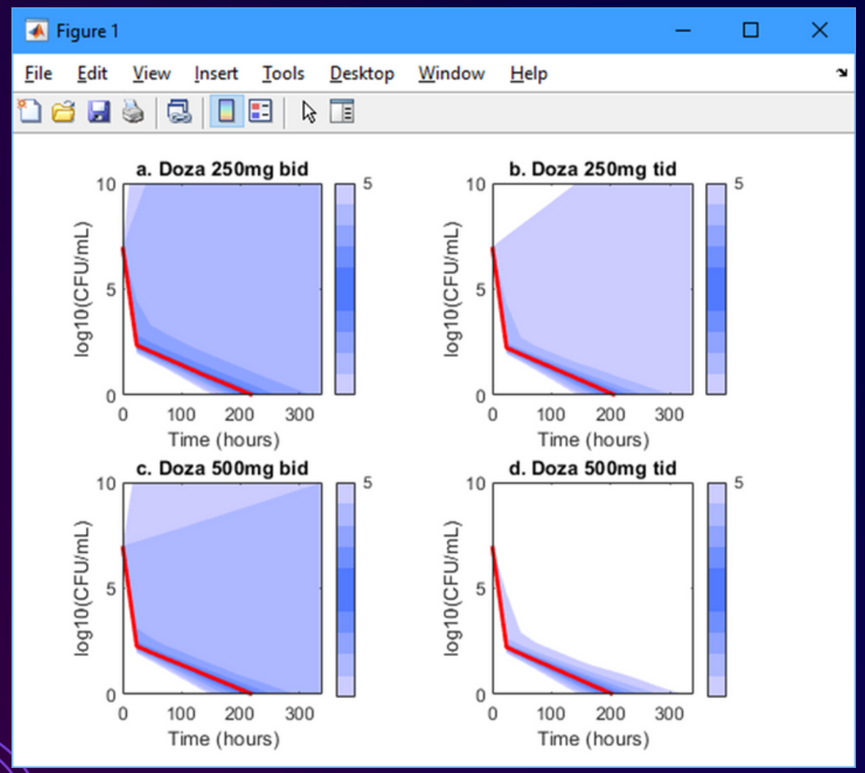
Modelele PK



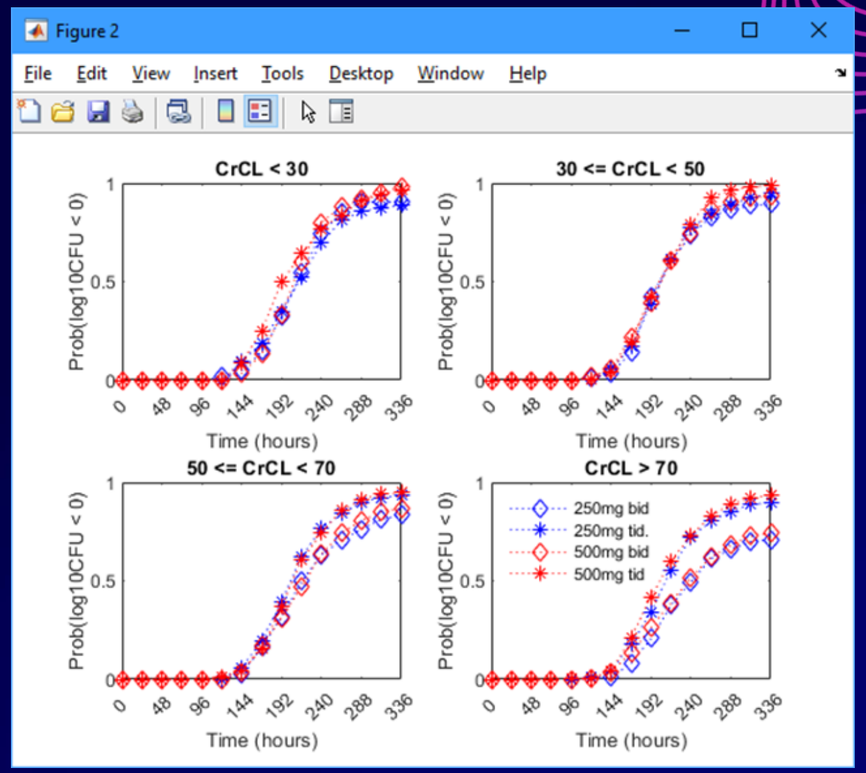
MODELUL PK CU TREI COMPARTIMENTE

- (+) REPREZENTAREA PRECISA A FARMACOCINETICII
- (+) EVALUAREA MAI DETALIATA A PARAMETRILOR
- (+) FLEXIBILITATE MAI MARE
- (−) CEA MAI MARE COMPLEXITATE
- (−) CEL MAI RIDICAT TIMP DE CALCUL
- (−) NECESITAREA A UNOR DATE MAI DETALIATE

Simulări

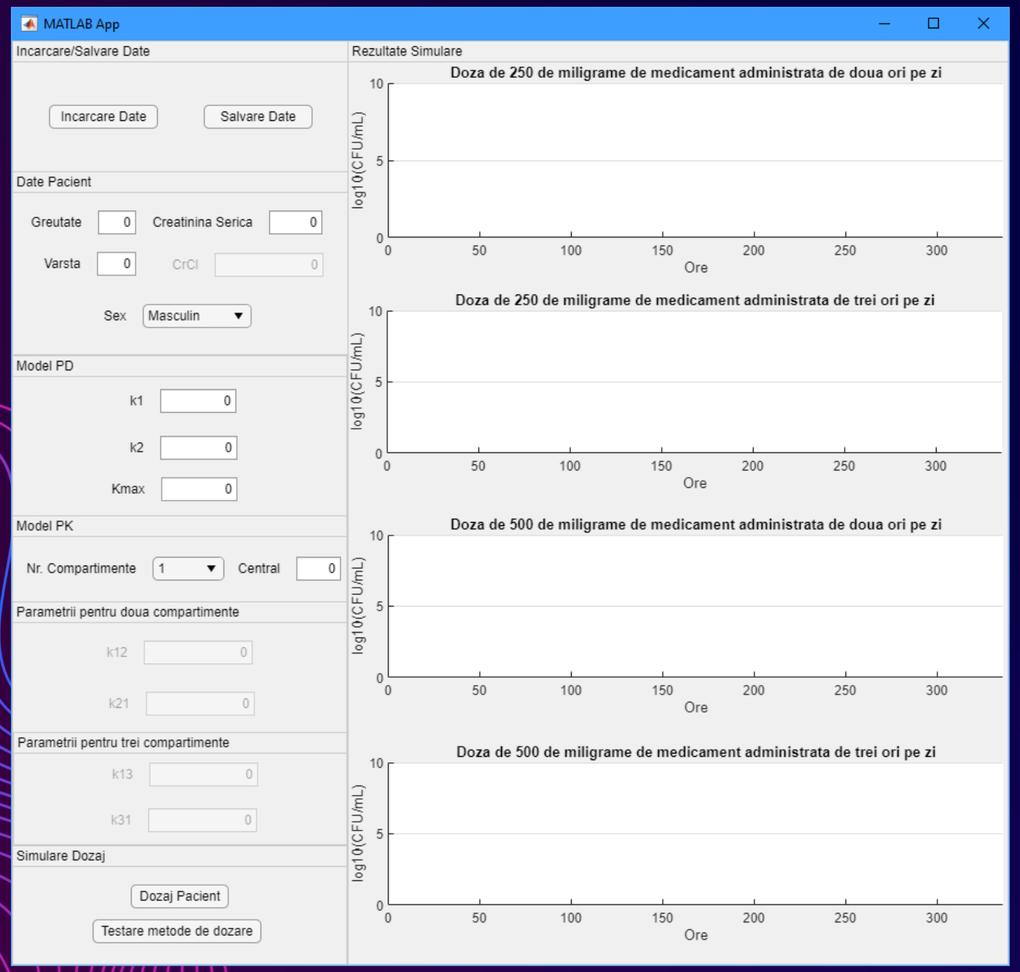


SIMULARE NIVELE DE CFU ALE PACIENȚILOR



SIMULARE EFECT FUNCȚIEI RENALE

Interfața



DATE PACIENT

- Greutate
- Vârstă
- Sex
- Creatinină Serică
- Rata de eliminare a creatininei(CrCl)

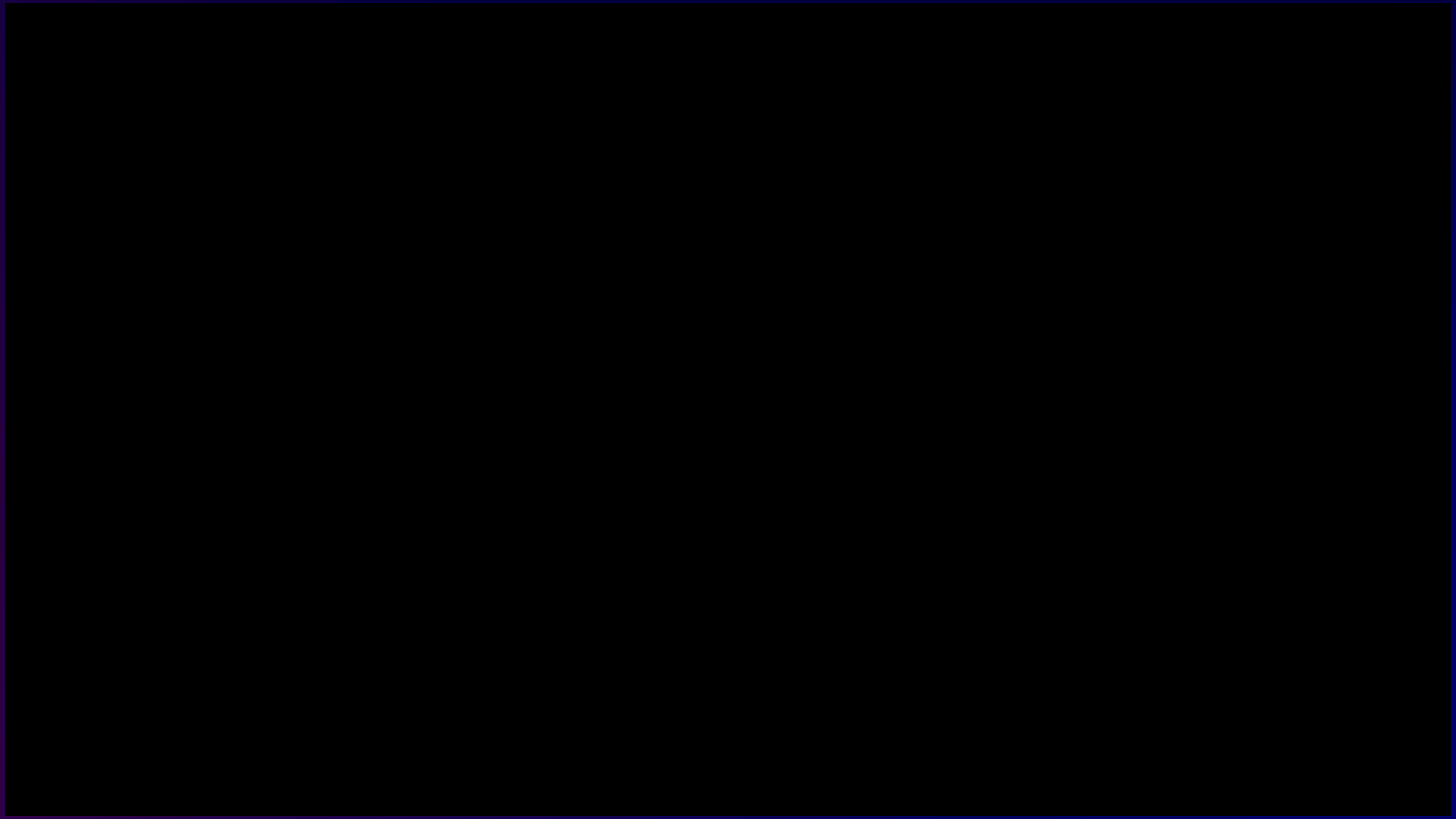
PARAMETRII MODEL PD

- Ratele de transformare biochimică (k1,k2)
- Constanta de rată maximă de ucidere(Kmax)

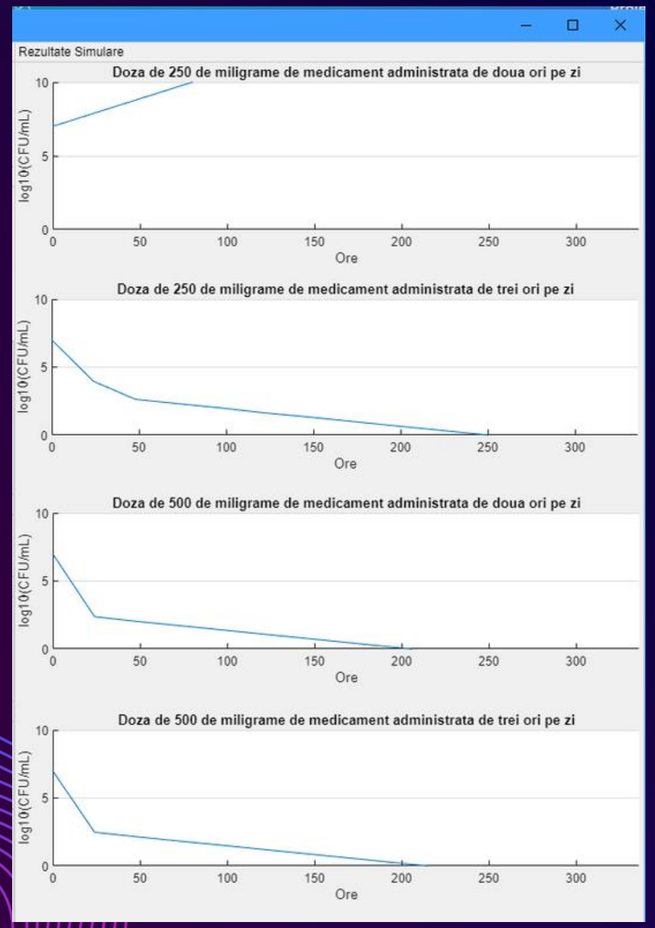
PARAMETRII MODEL PK

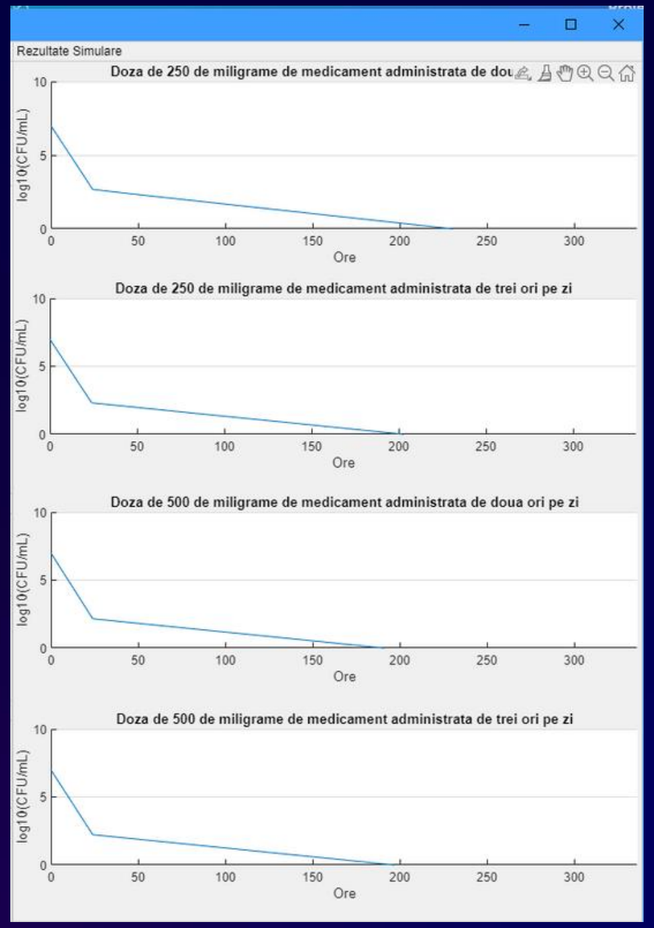
- Numărul de comparimente al modelului
- Compartimentul principal de distribuție al medicamentului în organism (Central)
- Ratele de transfer între compartimente (k12,k21,k13,k31)

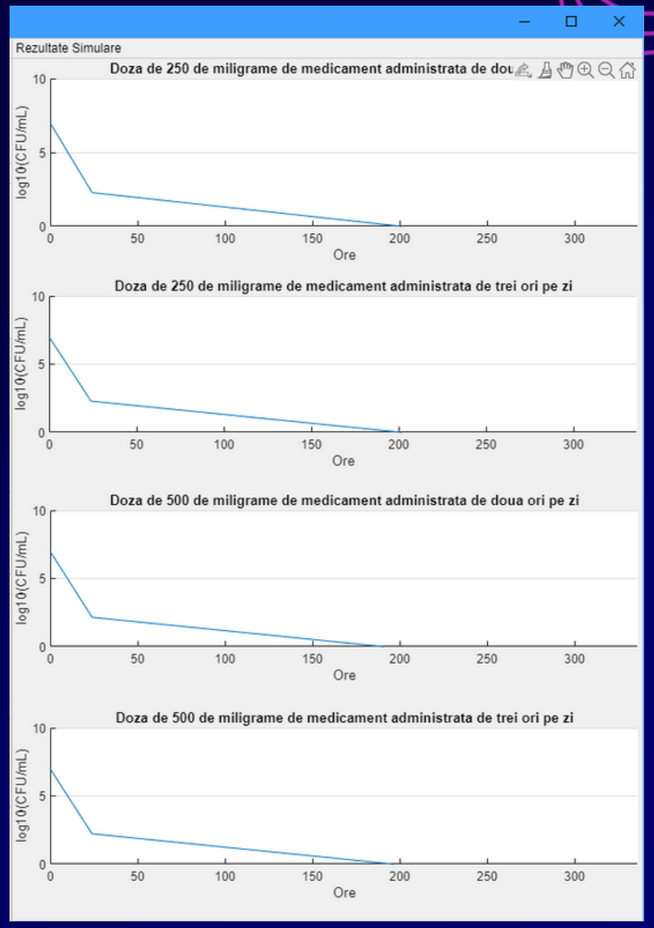
Demo



Interpretare rezultate







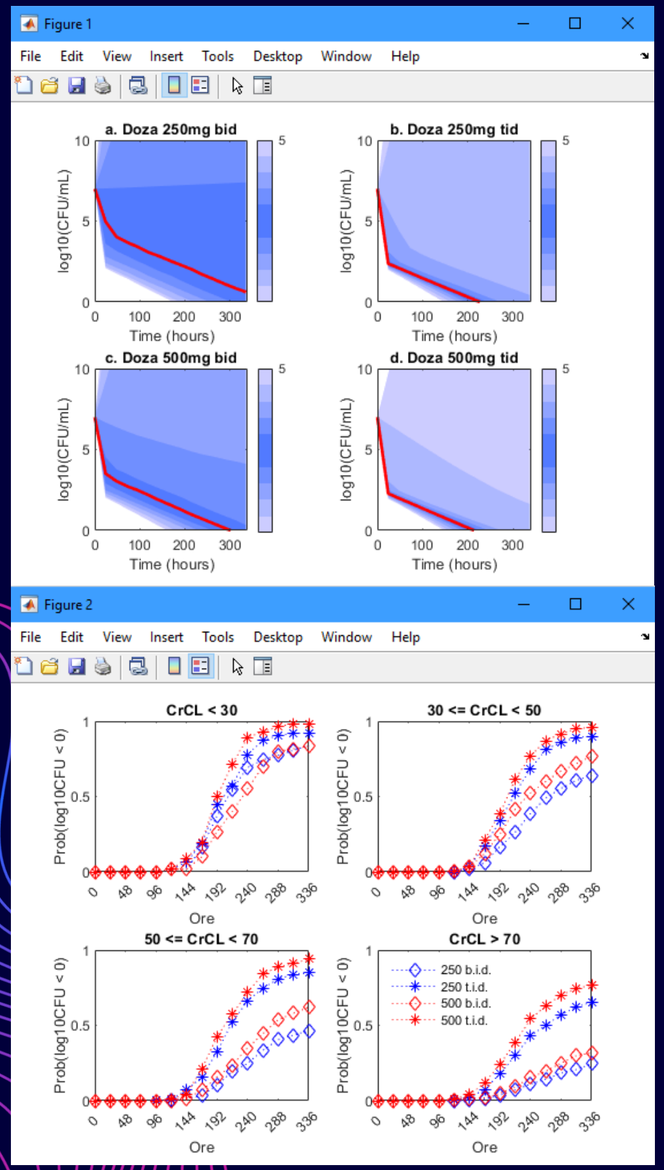
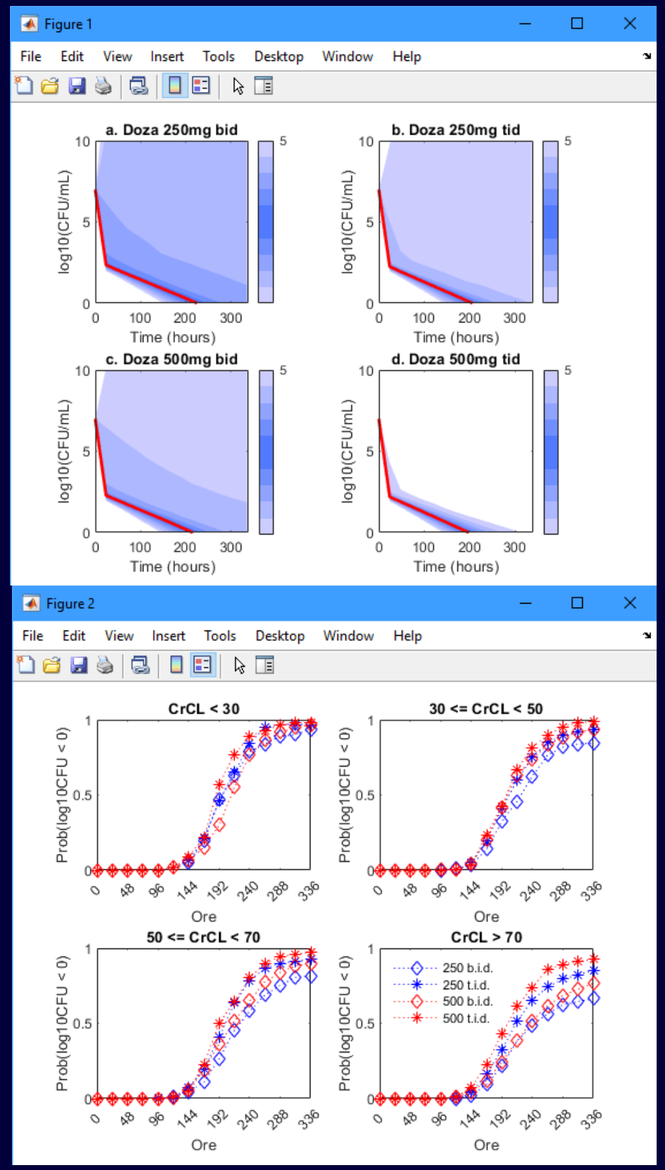


Figure 1
File Edit View Insert Tools Desktop Window Help
a. Doza 250mg bid
b. Doza 250mg tid
c. Doza 500mg bid
d. Doza 500mg tid
log10(CFU/mL)
Time (hours)
Figure 2
File Edit View Insert Tools Desktop Window Help
CrCL < 30
30 <= CrCL < 50
50 <= CrCL < 70
CrCL > 70
Prob(log10CFU < 0)
Ore
250 b.i.d.
250 t.i.d.
500 b.i.d.
500 t.i.d.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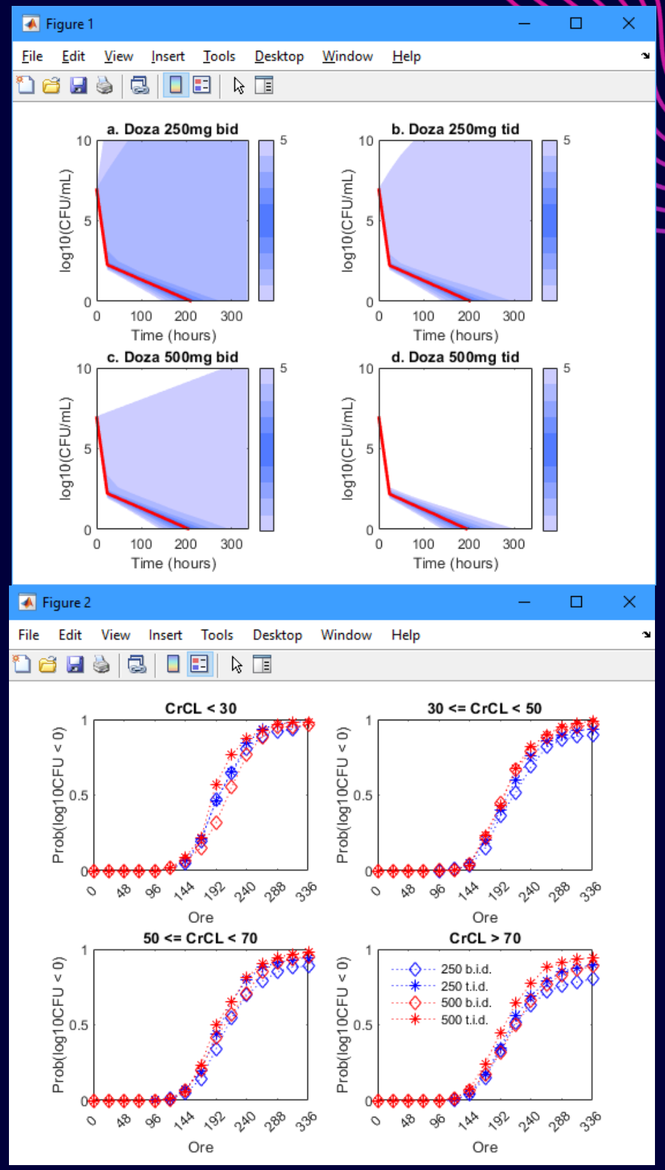
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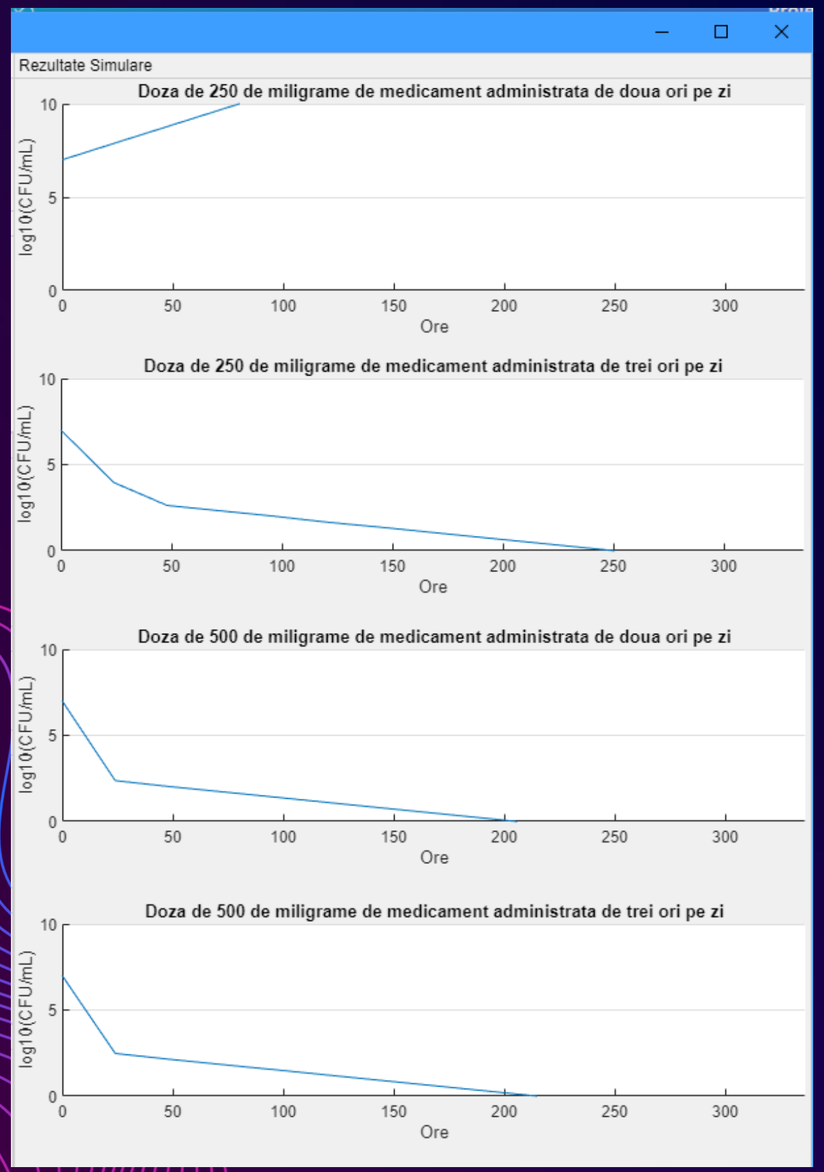
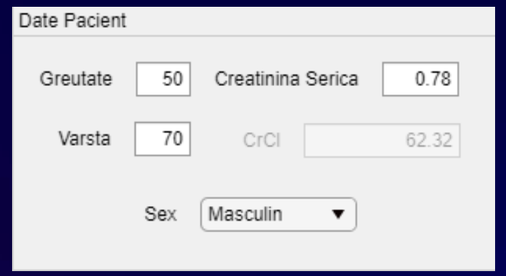
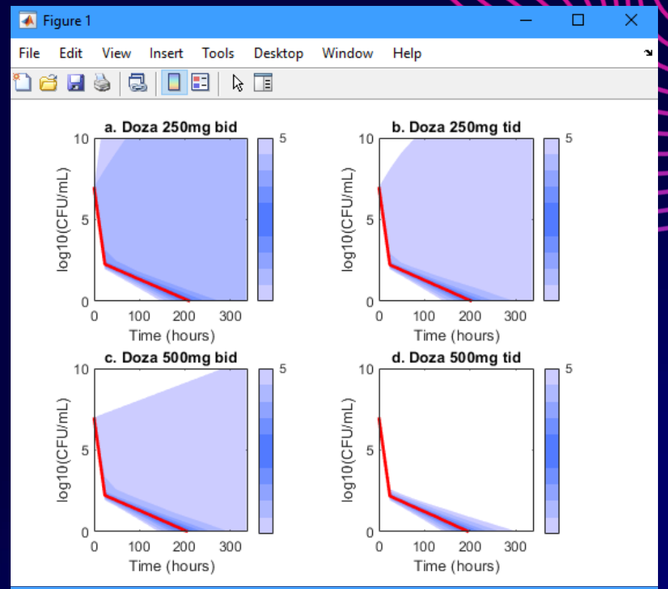

Rezultate Simulare
Doza de 250 de miligrame de medicament administrata de doua ori pe zi
Doza de 250 de miligrame de medicament administrata de trei ori pe zi
Doza de 500 de miligrame de medicament administrata de doua ori pe zi
Doza de 500 de miligrame de medicament administrata de trei ori pe zi
log10(CFU/mL)
Ore


Date Pacient
Greutate
50
Creatinina Serica
0.78
Varsta
70
CrCl
62.32
Sex
Masculin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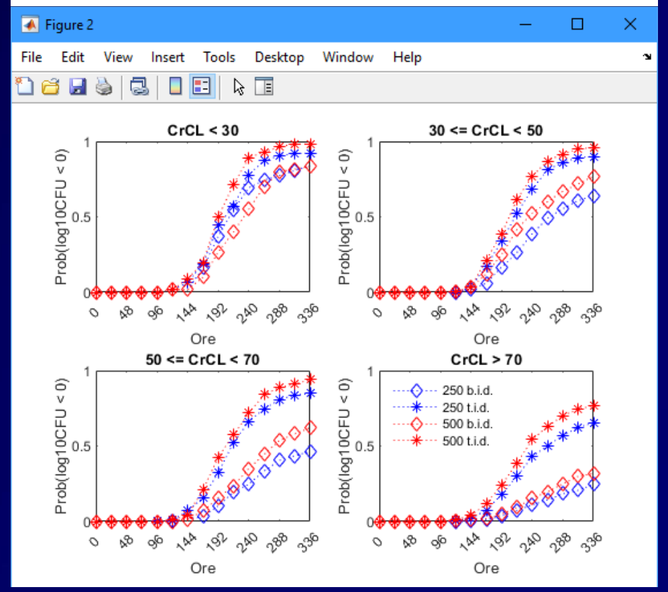
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Direcții viitoare de dezvoltare

1. OPTIMIZAREA PROGRAMULUI
2. SALVAREA ISTORICULUI PACIENTULUI
3. AUTOMATIZAREA MODELULUI PK/PD

Vă mulțumesc