PROBLEM-7:
AUC values of penicillin up on i.v administration of 50 mg and oral administration of 100 mg tablet were found to be 70 and 90 respectively. Calculate:

a. Absolute Bioavailability of penicillin.
b. Relatively Bioavailability of penicillin from tablet based on penicillin suspension whose dose is 100 mg and AUC is 95.

SOLUTION-7:

a. Calculate Absolute Bioavailability of penicillin.
Given,

i.v. dose of penicillin, $D_{iv} = 50$ mg
Oral dose of penicillin tablet, $D_{oral} = 100$ mg
AUC of iv administered penicillin, $[AUC]_{iv} = 70$ mg. hr/lt
AUC of oral administered penicillin, $[AUC]_{oral} = 90$ mg. hr/lt

Absolute Bioavailability, $F = ?$

Formula:

$$F = \frac{[AUC]_{oral} D_{iv}}{[AUC]_{iv} D_{oral}} \times 100$$

$$F = \frac{90 \times 50}{70 \times 100} = \frac{4500}{7000} = 0.64 \times 100 = 64\%$$

b. Calculate Relatively Bioavailability of penicillin from tablet based on penicillin suspension whose dose is 100 mg and AUC is 95.

Dose of penicillin tablet, $D_{test} = 100$ mg
Dose of penicillin suspension, $D_{std} = 100$ mg
AUC of penicillin tablet, $[AUC]_{test} = 90$ mg. hr/lt
AUC of penicillin suspension, $[AUC]_{std} = 95$ mg. hr/lt

Relative Bioavailability, $F_t = ?$

Formula:

$$F_t = \frac{[AUC]_{test} D_{std}}{[AUC]_{std} D_{test}} \times 100$$

$$F_t = \frac{90 \times 100}{95 \times 100} = \frac{9000}{9500} = 0.95 \times 100 = 95\%$$
PROBLEM-8:
Following data is obtained for 4 formulations of pentoxyifylline in volunteers of average weight 50 kg.

<table>
<thead>
<tr>
<th>Drug Product</th>
<th>Dose (mg/kg)</th>
<th>AUC (mg. hr/lt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>i.v. solution</td>
<td>1.2</td>
<td>450</td>
</tr>
<tr>
<td>oral solution</td>
<td>4.0</td>
<td>822</td>
</tr>
<tr>
<td>oral capsule</td>
<td>4.0</td>
<td>736</td>
</tr>
<tr>
<td>oral S.R. tablet</td>
<td>8.0</td>
<td>1040</td>
</tr>
</tbody>
</table>

SOLUTION-8:
Given data:

<table>
<thead>
<tr>
<th>Drug Product</th>
<th>Dose (mg/kg)</th>
<th>Dose in mg/50 kg</th>
<th>AUC (mg. hr/lt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>i.v. solution</td>
<td>1.2</td>
<td>60</td>
<td>AUC_i.v. = 450</td>
</tr>
<tr>
<td>oral solution</td>
<td>4.0</td>
<td>200</td>
<td>AUC_sol = 822</td>
</tr>
<tr>
<td>oral capsule</td>
<td>4.0</td>
<td>200</td>
<td>AUC_cap = 736</td>
</tr>
<tr>
<td>oral S.R. tablet</td>
<td>8.0</td>
<td>400</td>
<td>AUC_S.R. = 1040</td>
</tr>
</tbody>
</table>

a. What is the absolute bioavailability of the drug from capsule?

\[
F = \frac{[AUC]_\text{cap} \cdot D_{i.v.}}{[AUC]_{i.v.} \cdot D_{\text{cap}}} = \frac{736 \times 60}{450 \times 200} = \frac{44,160}{90,000} = 0.49 \times 100 = 49\%
\]

b. What is the absolute bioavailability of the drug from S.R. tablet?

\[
F = \frac{[AUC]_{\text{S.R}} \cdot D_{i.v.}}{[AUC]_{i.v.} \cdot D_{\text{S.R.}}} = \frac{1040 \times 60}{450 \times 400} = \frac{62,400}{180,000} = 0.346 \times 100 = 34.6\%
\]

c. What is the relative bioavailability of capsule against oral solution?

\[
F_r = \frac{[AUC]_\text{cap} \cdot D_{\text{sol}}}{[AUC]_{\text{sol}} \cdot D_{\text{cap}}} = \frac{736 \times 200}{822 \times 200} = \frac{1,47,200}{1,64,400} = 0.895 \times 100 = 89.5\%
\]

d. What is the relative bioavailability of S.R. tablet against oral solution?

\[
F_r = \frac{[AUC]_{\text{S.R}} \cdot D_{\text{sol}}}{[AUC]_{\text{sol}} \cdot D_{\text{S.R.}}} = \frac{1040 \times 200}{822 \times 400} = \frac{2,08,000}{3,28,800} = 0.632 \times 100 = 63.2\%
\]

e. Which solid formulation shows better bioavailability?

Bioavailability of capsule (49%) is more than S.R. tablet (34.6%).

Reference: Bio-Pharmaceutics and Pharmacokinetics by: Brahmankar : V. Venkateswarlu