**Table** – Species differences in hepatic glucose metabolism

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Symbol** | | **Value** | **Human** | **Dog** | **Rat** | **Mouse** |
| **Body/liver architecture** |  |  | |  |  |  |  |
| **total body weight** |  |  | | **~70kg** |  | **200**±**7g** (male Wistar rats, 48h fasted) [[1](#_ENREF_1)]  **286±7g** (5h fasted) [[2](#_ENREF_2)]  **306-355g** (male Spraque-Dawley strain)[[3](#_ENREF_3)] | **24-42g** (Swiss albino laboratory mice) [Ulusoy2006]  **28-35g** (male C57BL/6J mice) [[4](#_ENREF_4)]  **12.1**±**1.9g** (4-week old female C57BL6J, 24h-fast) (Lean body mass: **10.6**±**1.7g ->88%** body weight)[[5](#_ENREF_5)]  **Mouse growth:**    (C57BL/6, wild-type black) [[6](#_ENREF_6)] |
| **total liver weight**  **(~3% body weight rule)** |  | **1500g** (human) | | **1500-1800g** (man), **1300-1500g** (woman) [[7](#_ENREF_7)]  **1697**±171g (±SD, n=6)[[8](#_ENREF_8)] | **556g** (400 – 800g) (dog) [[9](#_ENREF_9)] | **5.92**±**0.14g** (male Wistar rats, 48h fasted) [[1](#_ENREF_1)]  **6 up to 9-10g filled with glycogen** [[10](#_ENREF_10)]  **17.1±**2.2 ?(**±**SD. N=13, in situ perfused rat livers)[[11](#_ENREF_11)]  **2.4-3.7**( male Spraque-Dawley strain) [[3](#_ENREF_3)] | **0.7±0.1g** (4-week old female C57BL6J, 24h-fast) [[5](#_ENREF_5)] |
| **total liver volume**  **(~1g/ml)** |  | **1500ml** | | **1.5L** | ~**600ml** (calculated) | **~6ml** (calculated) | ~**1ml** |
| **Glucose metabolism** |  |  | |  |  |  |  |
| **Overnight fasting/basal blood glucose level**  **Postprandial blood glucose level** |  |  | |  |  | **4.6±1mmol/L** [[12](#_ENREF_12)]  Fasting 73-90mg/dl ?  Postprandial: 150-190mg/dl?  **7 – 9mmol/L** (stated as physiological concentrations in portal circulation) [[13](#_ENREF_13)] | **6.7±0.2mmol/L** (after 6h-fast) ???  **1.1±0.4**(4-week old female C57BL6J, 24h-fast) [[5](#_ENREF_5)] |
|  |  |  | |  |  |  | **100 – 200 mg/dl = 5.55 – 11.1mmol/L**  (C57BL/6, wild-type black) [[6](#_ENREF_6)]  Fed -> ad libitum  **Fed**: (C57BL/6, 6-10 weeks, male, SE) **139.8±4.5**= **7.8±0.25**  **Fed**: (C57BL/6, 6-10 weeks, female, SE)  **131.2±4.6**= **7.3±0.26**  **Fed**: (C57BL/6, 6 month, male, SE)  **127.9±7.4**= **7.1±0.41**  **Fed**: (C57BL/6, 6 month, female, SE)  **126.5±6.7**= **7.0±0.37**  **Fasted-> 6AM – 9PM (15h fast)**  **Fasted**: (C57BL/6, 6-10 weeks, male, SE)  **74.9±3.3**= **4.16±0.18**  **Fasted**: (C57BL/6, 6-10 weeks, female, SE)  **67.1±3.9**= **3.7±0.22**  **Fasted**: (C57BL/6, 6 month, male)  **72.2±5.7**= **4.0±0.32**  **Fasted**: (C57BL/6, 6 month, female)  **72.5±3.5**= **4.0±0.19** |
| **Hepatic glycogen** |  |  | | Total 500mmol/L -> 750 **mmol/gLW** = **90**(check ?) |  | **22-111**( male Spraque-Dawley strain, meal eating) [[3](#_ENREF_3)]  **4-65**( male Spraque-Dawley strain, nibbling) [[3](#_ENREF_3)]  Average fasting rat will over 16h store about **16% of the final liver weight** or **25% of initial weight**  **Maximal values: 16-18% fresh liver weight -> 170 mg/gLW (increase in liver weight from 6 up to 9/10g)**(repeated oral injections of glucose) [[10](#_ENREF_10)]  **~60****tissue** (early in light period)[[2](#_ENREF_2)]  **~7±2****tissue** (after 5h fasting)[[2](#_ENREF_2)]  **1.43±0.26 µmoles glycosyl units/g** (48h fasted rats)[[1](#_ENREF_1)] | **5.9±1.8****,3.8±1.3**(4-week old female C57BL6J, 24h-fast) [[5](#_ENREF_5)] |
| **HGP/HGU** |  |  | | Total liver:  Basal **12**? |  | Total liver: **60±10** ??? (State) | Basal hepatic glucose production (HGP) averaged **~170**(N=14 male C57BL/6J mice)[[4](#_ENREF_4)]  **164.4±30.0**(Euglycemia) [[4](#_ENREF_4)]  **172.2±31.0**(Hyperglycemia) [[4](#_ENREF_4)]  **25.8±6.0** **(22.6±5.3****)** (4-week old female C57BL6J, 24h-fast) [[5](#_ENREF_5)]  rate of de novo glucose-6-phosphate synthesis:  **~143±17**(9h-fasted mice) **79.0±5.2%** ofrate of de novo glucose-6-phosphate synthesis to plasma glucose:  **~112**[[14](#_ENREF_14)] |
| **GLY Glycogen time courses**  **rates glycogen synthesis/glycogenolysis** |  |  | |  |  | * liver weight was observed to **increase** in meal-fed and nibbling rats **for up to 8h** after initiation of meal ingestion (also increase in glycogen) [other studies showed up to 5h] * for **12-22h** there was a decrease in liver weight & glycogen [[3](#_ENREF_3)]   rate of glycogen change:  **0-8h**: **+12.5** (meal eating)/ **+9.7** (nibbling) [[3](#_ENREF_3)]  **8-14h**: **-3.4** (meal eating)/ **-2.3** (nibbling) [[3](#_ENREF_3)]  **12-22h**: **-6.6** (meal eating)/ **-2.6** (nibbling) [[3](#_ENREF_3)] | Direct & indirect pathways estimated [[4](#_ENREF_4)]  Absolute glycogen flux into plasma glucose: **4.1±1.0** **(3.6±0.87****)**  (4-week old female C57BL6J, 24h-fast) [[5](#_ENREF_5)]  Sources of hepatic glycogen:  direct pathway: **12±4%**  indirect pathway: **61±6%**  pre-existing: **25.8±6%**  absolute direct pathway: **0.27±0.1**  absolute indirect pathway: **2.3±0.4**  (4-week old female C57BL6J, 24h-fast) [[5](#_ENREF_5)] |
| **Gluconeogenesis (GNG)** |  |  | |  |  |  | Rate of de novo glucose-6-phosphate synthesis:  **143±17.0**(9h-fasted mice) [[14](#_ENREF_14)]  Absolute GNG: **21.7±5.8** **(19,7±5.1****)** Fractional GNG: **84±4% (HGP)**  (4-week old female C57BL6J, 24h-fast) [[5](#_ENREF_5)] |
| **Hormonal dose response curves** |  |  | |  |  |  |  |
| **Overnight fasting/basal plasma insulin** |  |  | |  |  | **34±5** [[12](#_ENREF_12)] | **0.3±0.1**(4-week old female C57BL6J, 24h-fast) [[5](#_ENREF_5)]  **26±3**(Euglycemia) [[4](#_ENREF_4)]  **25±4** (Hyperglycemia) [[4](#_ENREF_4)]  Fed -> ad libitum  **Fed**: (C57BL/6, 6-10 weeks, male, SE) **0.81±0.04**  **Fed**: (C57BL/6, 6-10 weeks, female, SE)  **0.41±0.02**  **Fed**: (C57BL/6, 6 month, male, SE)  **1.23±0.11**  **Fed**: (C57BL/6, 6 month, female, SE)  **0.41±0.05**  Fasted: **6AM – 9PM (15h fast)**  **Fasted**: (C57BL/6, 6-10 weeks, male, SE)  **0.19±0.03**  **Fasted**: (C57BL/6, 6-10 weeks, female, SE)  **0.14±0.01**  **Fasted**: (C57BL/6, 6 month, male)  **0.17±0.02**  **Fasted**: (C57BL/6, 6 month, female)  **0.16±0.03** |
| **Overnight fasting/basal plasma epinephrine** |  |  | |  |  | **1.0±0.2 nmol/L** [[12](#_ENREF_12)] |  |
|  |  |  | |  |  |  |  |

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