1. How should I model the gills compartment? Vidal considers that the blood inflow of the compartment is just a part of the Q\_total.
2. Excretion pathways (gills, urine, feces)
   * 1. Urinary excretion.  
        In general the reabsorption of PFAS from urine back to organism is a possible process in fish. We can consider a ratio of Renal elimination to reabsorption (K\_renal) specific for each PFAS substance. The values of K\_renal can be given from Ng et al., (2013) who has estimated both renal elimination and reabsorption rate. Using these ratios makes it easier to fit a Cl\_urine (urinary elimination rate) and then calculate reabsorption rate of pfas. Also, the K\_renal ratio seems to decrease with the increase of chain length of PFAS. (Sun et al. 2022 also approached it this way).   
          
        Ng et al., 2013  
        A picture containing text, font, screenshot, number

        Description automatically generated  
          
        Sun et al., 2022  
        A screenshot of a calculator

        Description automatically generated with low confidence

For the modeling of these processes, we will need a flow rate of urine and the volume of urine existing in the gallbladder of rainbow trout. We can take these values from Curtis et al., 1981. To calculate V\_urine we use the mean maximum volume of the urinary bladder which is 2.20 ml/kg. To calculate Q\_urine we use the mean of urinary flow rates given in Table 2, so

(kg)

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1. Vidal and Grech, based on Nichols, considers that a big part of outflow from muscle and skin compartments goes to kidney compartment.
2. About Enterohepatic circulation

* Cao et al.2022 supports that PFAS are recirculated via the reabsorption from bile back to blood. They estimated the F\_reab parameters for various PFAS substances.

Table

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* Martin et al., 2013 (dietary) supports that enterohepatic circulation plays important role in fish.
* Rainbow trout Bile flow rate = 75 μL/kg/h by Grosell et al., 2000 (<https://doi.org/10.1152/ajpregu.2000.278.6.R1674>)

1. Urine excretion

Check NG et al., 2013 about how they calculated the urine elimination and reabsorption parameters.

1. In the paper of Falk et al.2015 it seems that the blood concentrations are calculated considering the whole blood volume, not only the plasma volume.
2. “*PFOA and PFOS are >90% bound to plasma proteins such as albumin in the rat, monkey, and human [35–38]. Because PFAAs are so highly bound in plasma, this will affect distribution and partitioning into tissues, and the free fraction of chemical must be accounted for in the model.*” (Loccisano et al., 2012)
3. About the ratio of plasma to total blood volume. This ratio seems to be around 70% (plasma volume/total blood volume) in fish and specifically in rainbow trout.
   1. Stevens et al., (1968): The hematocrit seems to be between 25% and 30% (so the plasma is between 70% and 75%) – Table 1.  
      A picture containing text, font, number, screenshot

      Description automatically generated
   2. Brill et al., (1998): Reported that the hematocrit is the 30% of the total blood volume – Table 1.  
        
      A picture containing text, screenshot, font

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   3. Gingerich et al., (1990): Measured the plasma volume per 100 g of fish for two rainbow trout strains. The two plasma/total blood ratios are 3.74/5.27=0.70 and 3.24/4.63=0.70 – Table 2.  
      A picture containing text, font, screenshot, white

      Description automatically generated