**Fish Nutrition/ Practical**

Lecture: Three

Date: Feb. 2nd 2023

**Digestibility**

**Digestion:**

It is the process of braking down food into simple chemical compounds that can be absorbed and used for energy, growth, and cell repair.

There are **two** kinds of digestion: mechanical and chemical. **Mechanical digestion**involves physically breaking the food into smaller pieces. Mechanical digestion begins in the mouth as the food is chewed. **Chemical digestion** involves analyses food particles into simpler nutrients using chemical solutions and enzymes that can be used by the cells.

**Metabolism:**

Is the set of [life](https://en.wikipedia.org/wiki/Life)-sustaining [chemical transformations](https://en.wikipedia.org/wiki/Chemical_reactions) within the [cells](https://en.wikipedia.org/wiki/Cell_%28biology%29) of [organisms](https://en.wikipedia.org/wiki/Organisms)which are essential to life.

Metabolism is usually divided in to two categories:

1. [**Catabolism**](https://en.wikipedia.org/wiki/Catabolism): is breaking down of organic matter for example, the breaking down of glucose to pyruvate, by [cellular respiration](https://en.wikipedia.org/wiki/Cellular_respiration). Its releases [energy](https://en.wikipedia.org/wiki/Energy).
2. [**Anabolism**](https://en.wikipedia.org/wiki/Anabolism): is building up of components of cells such as [proteins](https://en.wikipedia.org/wiki/Protein) and [nucleic acids](https://en.wikipedia.org/wiki/Nucleic_acid). This process is consumes energy.

**Digestibility:**is the ability of the animal to breakdown and utilize **feed** which it provides the necessary nutrients required for the animal growth.

**Importance of Digestibility:**

1. To evaluate the nutritional and chemical composition of feed.
2. To determine the amount of digested feed actually absorbed by an animal.
3. To enable formulation a diets that maximize the growth of fish by providing appropriate amounts of nutrients.
4. To limit the wastes produced by the fish.

The nutritional value of a feedstuff depends not only on its chemical composition but also on the digestibility of its nutrients and energy. Therefore, knowledge of the Apparent Digestibility Coefficients (ADC) of nutrients of feedstuffs is essential for a correct diet formulation.

**Quantification of the digestive process:**

Relative measure of how much of ingested food and its nutrient components have been digested and absorbed by the animal.

**Apparent Digestibility:**

It is the percentage of feed retained by an animal. This can be calculated by measuring amount of feed intake and amount of fecal excretions.

**How to determine digestibility?**

1. **Direct (balance) method:**

The direct method of measuring digestibility is based on the total amount of nutrients ingested by test animals and excreted as feces.

Apparent digestibility coefficient (ADC)

**ADC = 100x (Xingested-Xegested)/ Xingested**

Total ADC (dry matter), ADC for protein, carbohydrate and lipid

**Drawbacks of direct method:**

1. Necessity to estimate total amount of food consumed
2. Necessity to collect all feces egested
3. Leaching of nutrients from food and from feces
4. Needs automatic feces collection device

**Examples of calculation:**
**Eg 1**: Fife fish were feed during six months in a test plastic tank, the consumed feed was 2750 g and the collected faces during the period was 330 g, calculate the digestibility of this feed?

**Eg 2**: We have common carp fingerlings cultured in a recirculated tank, their average weight is 300 g and fish were fed on % 3 of their body weight and the average weight of feces is 2 g for each fish. Calculate feed digestibility?

**Eg 3**:

Three fish reared in the plastic tank in a lab, their average weight is 2.5 kg and fed % 4 of their weight daily, calculate the digestibility of feed if you know that the amount of collected feces is 20 g for each day?

**Eg 4**:
There is a feed its fat content is 15%. If a fish eats 2 kg of this feed since a production season and the estimated amount of excreted feces is 300 g with fat content 18 %, find out the digestibility of fat in this feed?

**Eg 5**:
On a label of feed bag wrote the Nitrogen content is 30% and gave to Rain bow trout fingerlings average weight 150 g on % 3 of the body weight daily.The amount of excreted feces was 1.5 g daily with nitrogen content 35 %.

If you did know that the endogenous portion in the example above was 0.5% N (in the 1.5 g of feces). Calculate both ADC and true DC of Protein in the feed?