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Lecture title: **Animal nutrition: Total digestible nutrients (TDN)**

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Summary:

Total digestible nutrients (TDN)

Evaluation systems based on the digestible nutrient content:

%TDN = %dig. crude prot. + %dig.crude fibre + %dig.N-free extr. + 2,25 x %dig. crude fat

The calculation of TDN is based on the energy content of the different nutrients:

crude fibre, N-free extract: 17,5 KJ/g
crude protein: 24,0 KJ/g
crude fat: 39,5 KJ/g

Nutrients	**g/kg d.m.**	**Digestibility coefficient**	**Factor**	
crude protein	127,5	0,60		= 76,5
crude fat	50,1	0,60	2,25	= 67,6
crude fibre	319,3	0,65		= 207,5
N-free extract	396,1	0,55		= 217,8
			TDN	**= 569,4 g/kg d.m.**

Fat on oxidation provides 2.25 time more energy as compared to CHO and the protein is included because of the fact that excess of protein eaten by the animals serves as a source of energy to the body

Homework

After approximate feed analysis of yellow corn, the following results were
Obtained , calculate the TDN in this feedstuff?

Components.	**%**	**Digestibility %**
Crude protein	20	75
Ether extract	3	80
Crude fiber	8	35
NFE	51	80

Limitations of the TDN system:

1- It is over estimate the value of roughages because more energy spent in chewing of such feeds remains unaccounted
2- Only the loss in faeces is accounted
3- If the feed is high in fat content will sometimes exceed100 in percentage of TDN

Factors affect the TDN value of the feed:

1- The percentage of dry matter
The more moisture in feed the lower TDN values
2- The digestibility of dry matter
Unless the dry matter of a feed is digestible, it can have no TDN value . Lignin has a high energy value but it cannot be digested by the animals so has no digestible energy or TDN values
3- The amount of minerals in the digestible of dry matter
Mineral contribute no energy to animal though mineral compounds are digestible but have no TDN values
4- The amount of fat in the digestible dry matter
A fat which have a coefficients of digestibility of 100% would have a TDN value of 225% (100*2.25)

The starch equivalent:

the fat-producing capacity of an animal feed or ration expressed as the amount of starch required to produce the same amount of fat

Starch equivalent is the number of kilograms of starch that would be required to produce the same amount of fat as that of 100 kg of feed.

Calculation of Starch equivalent

Kellner has given starch equivalent factor for one kg of digestible nutrients.

1 kg of digestible nutrient	Starch equivalent factor
Carbohydrate	1
Fiber	1
Protein	0.94
Fat from roughages	1.91
Fat from cereals	2.12

The correction factor for concentrate is known as Value number or Golden number and it is 0.98 and the correction factor for roughages is known as crude fibre correction factor.

Example:

Calculate the S.E of Barley with following digestible nutrients.

Digestible protein 5.6
Digestible ether extractive. 1.2
Digestible fibre 2.5
Digestible NFE 60.5

Multiply the digestible nutrients by respective starch equivalent factor. Totaling of this will give the starch equivalent of Barley as shown here**.**

Digestible protein. 5.6x0.94= 5.26
Digestible ether extract 1.2x 2.12= 2.4
Digestible crude fiber 2.5x1= 2.5
Digestible NFE 60.5x1= 60.5
70.80

Scandinavian feed unit system:

The Scandinavian feed unit (SFU) originates from Denmark about 1880 where 1 kg concentrates was called a feed unit. The concentrate at that time was a mixture of cereals (oats and barley) but later some countries agreed to use 1 kg barley as basis for the unit. Today the Scandinavian feed unit is estimated in the same way as Fattening feed unit (FFU).

Nitrogen balance: it is used for determination of biological protein value in feed intake , there are three types of nitrogen balance :

1- Positive nitrogen balance
2- Negative nitrogen balance
3- Neutral nitrogen balance

Positive nitrogen balance:
When the amount of nitrogen feed intake for protein synthesis is large than the amount of nitrogen in feces and urine

Negative nitrogen balance
When the amount of nitrogen feed intake is less than the amount of nitrogen in feces and urine , this means there is catabolic reaction to proteins in the body
Due to :

1. Decrease of protein in forages
2. Bad quality of protein in forages
3. Decrease in organic matter intake
4. Decrease digestible coefficient

Neutral nitrogen balance

When the amount of nitrogen feed intake is equal to the amount of nitrogen in feces and urine for maintenance of protein.