Digestive efficiency at two ages and according to weaning age : effects of the methods of calculation

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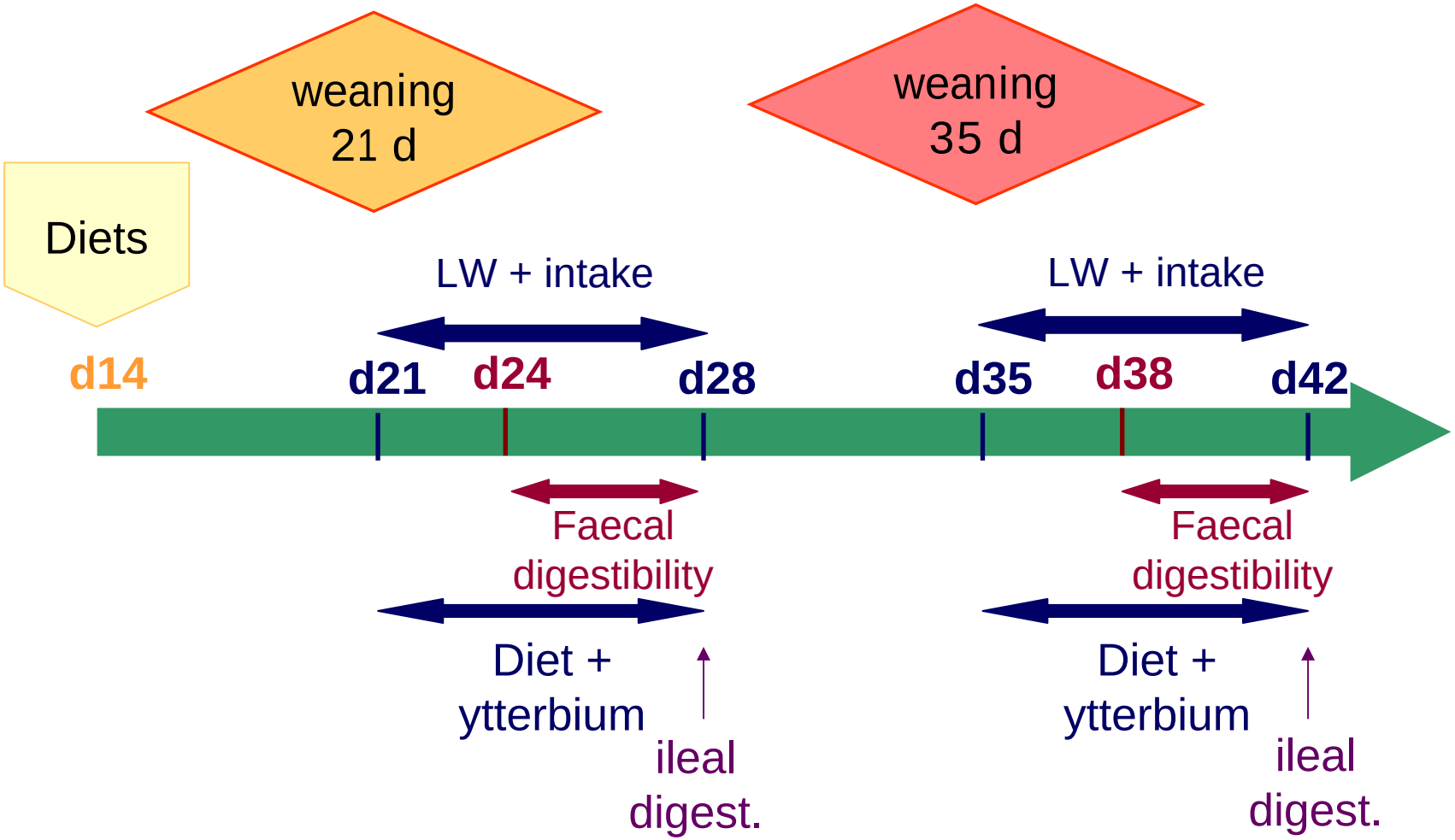
(part of the doctoral thesis of Mrs Gallois)

M&M

Objective : digestive efficiency at two ages and according to weaning age



Methods

Faecal digestibility on the 24-28 days period

- reference : aDC= $\frac{\text{intake - excreted}}{\text{intake}}$ (4d period)

⇒ **Problems :**

- intake and excretion are **unsteady** before 35d of age (at least) , verify that periods precisely corresponds for: intake and faecal excretion

- milk consumption from 24 to 28 d for un-weaned rabbits (w35)

Methods

ileal digestibility

- Sampling of ileal content, at 19:00
- 28 d : 3 rab. / litter, & 42 d. : 2 rab. / cage
- Ytterbium on fibre , in diet (150 mg/kg)
- $iADC_{starch} = 1 - \frac{[starch]_{ileum} * [ytterbium]_{feed}}{[starch]_{feed} * [ytterbium]_{ileum}}$

$\Rightarrow$ Problem : milk intake at 28 d for W35 rabbits

Methods

Solution = ?

Whole tract digestibility

for the unsteadiness in I/E:

• to move forward (-24h) the intake period, compared to the faecal sampling.

for the milk intake

• hypothesis on milk digestibility : 95-97-100%

for ileal digestibility

for the unsteadiness in I/E: no problem with Yb labelling

for the milk intake

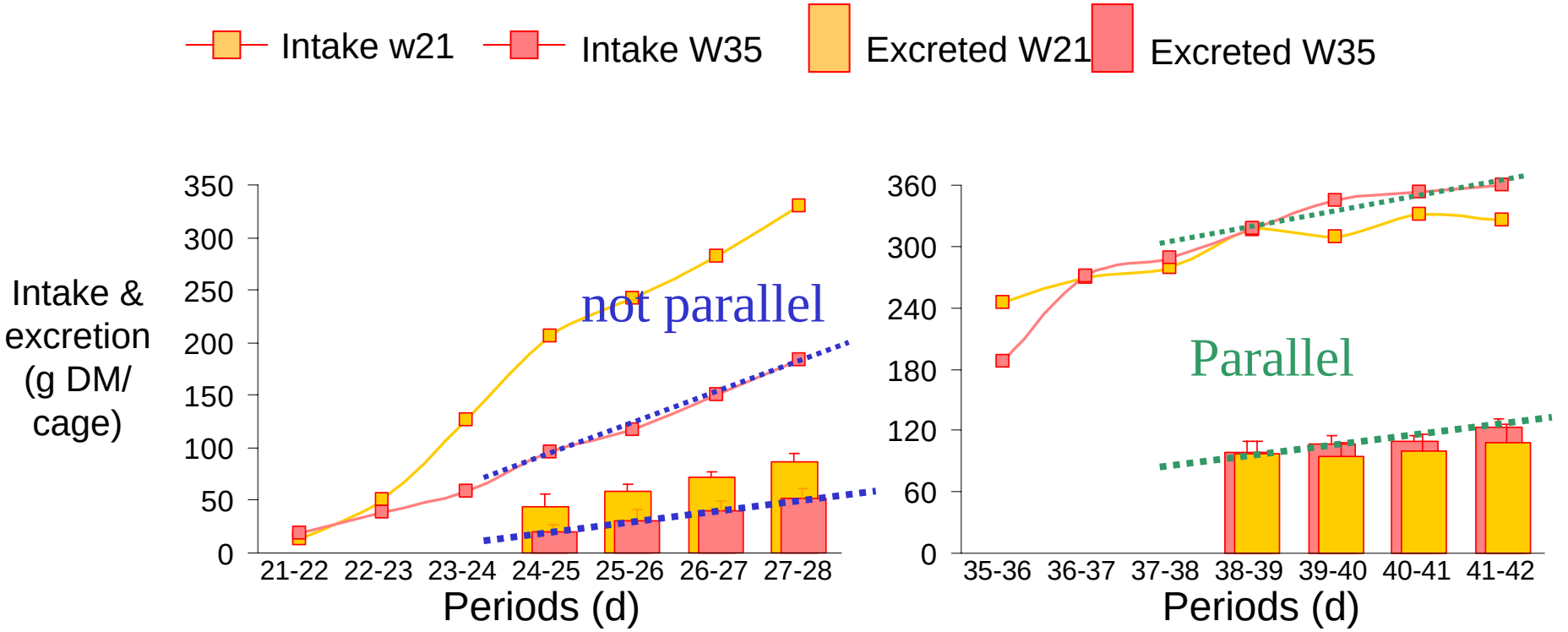
no solution

Experimental diet

Ingredients, g/kg	
Sugar beet pulp	130
Alfalfa meal	250
Soybean meal	50
Wheat	110
Extruded soybean seeds	40
Sunflower meal	138
Wheat bran	200
Sucrose	50
Minerals and vitamins[1]	22
Sunflower oil	10

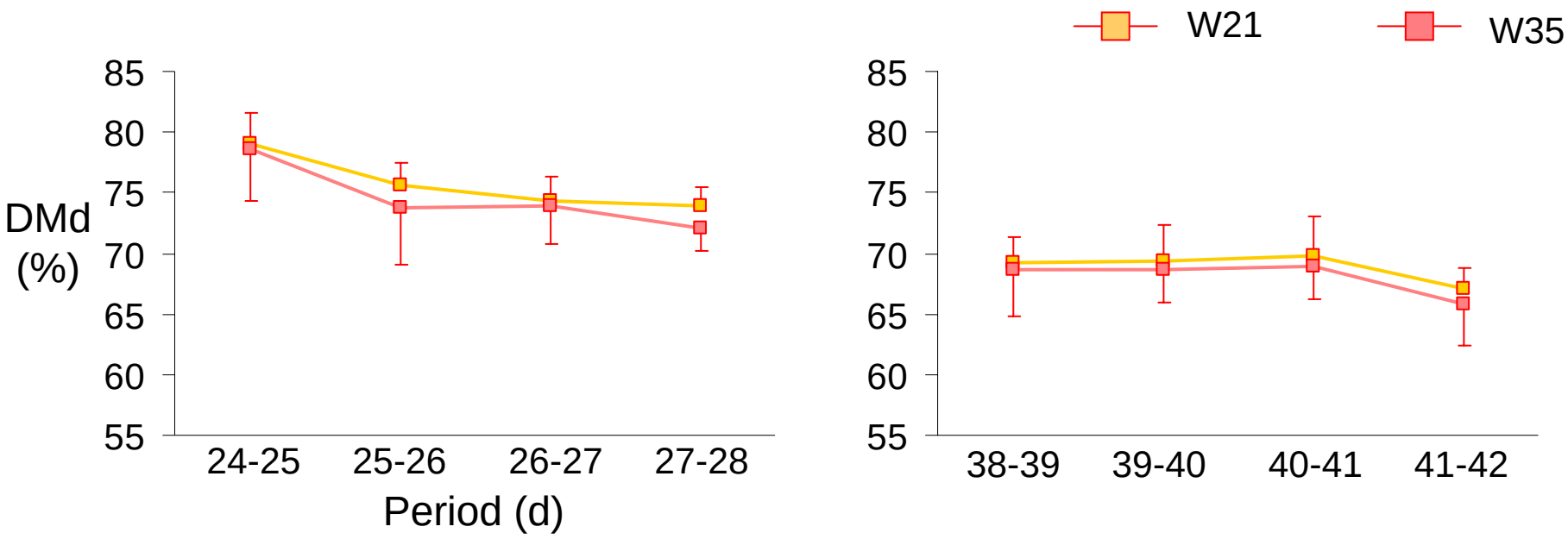
Nutrients, g/kg	
Dry matter	918
Crude protein	180
Crude fat	35
Starch	105
Acid Detergent Fibre	193
Hemicellulose[2]	147
Cellulose[3]	135
ADL	58
Ytterbium	150 mg/kg

intake and excretion profiles



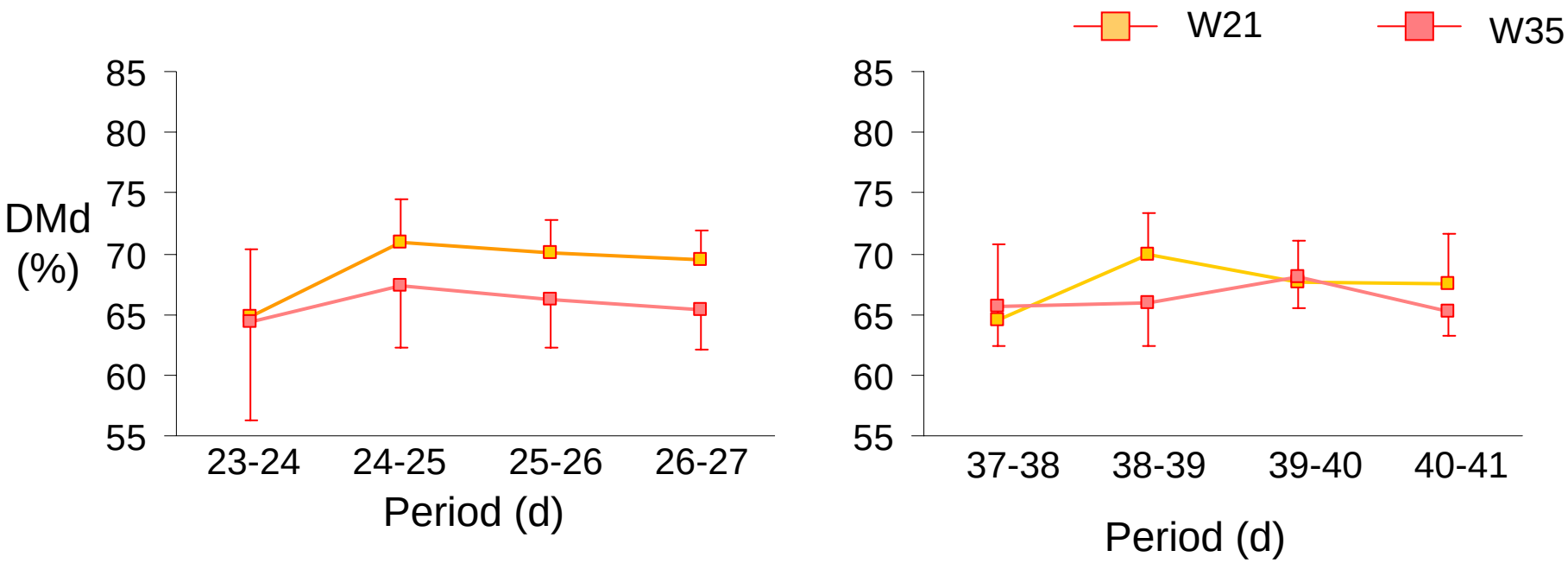
⇒ Increase in feed intake and faecal excretion ,
specially **for 24-28 d period**

DM digestibility according to "reference" method



⇒ Values for DM: high and decreasing

DM digestibility according to "-24h" method



⇒ Values : between 65 and 70% , and not decreasing

Complementary methods

for the faecal digestibility

- to use an inert marker, for abstraction of intake and excreted
- to take into account the milk intake

Faecal digestibility from 24 to 28 d.

Hypothesis : milk digested at 100%

	Reference		
	W21		W35
dOM	75,1	≈	73,9
dCP	83,1	≈	81,7
dCF	88,4	>	82,1
dStarch	98,5	=	98,5
dNDF	48,6	=	47,5
dEnergy	74,2	>	72,7

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Faecal digestibility from 24 to 28 d.

Hypothesis : milk digested at 100%

	Reference			- 24 h		
	W21		W35	W21		W35
dOM	75,1	≈	73,9	69,0	>	66,0
dCP	83,1	≈	81,7	79,0	>	76,1
dCF	88,4	>	82,1	85,5	>	76,6
dStarch	98,5	=	98,5	98,1	=	98,0
dNDF	48,6	=	47,5	36,2	>	31,5
dEnergy	74,2	>	72,7	68,0	>	64,4

Faecal digestibility from 24 to 28 d.

Hypothesis : milk digested at 100%

	Reference			- 24H			Ytterbium		
	S21		S35	S21		S35	**S21**		**S35**
dOM	75,1	≈	73,9	69,0	>	66,0	**68,3**	=	**67,0**
dCP	83,1	≈	81,7	79,0	>	76,1	**78,5**	=	**76,8**
dCF	88,4	>	82,1	85,5	>	76,6	**85,2**	>	**77,2**
dStarch	98,5	=	98,5	98,1	=	98,0	**98,1**	=	**98,1**
dNDF	48,6	=	47,5	36,2	>	31,5	**34,8**	=	**33,6**
dEnergy	74,2	>	72,7	68,0	>	64,4	**67,3**	=	**65,5**

No interaction methode*age at weaning
Effect of method sign. for all nutrients
Effect of age at weaning sign. for all nutrients except starch

-24H and "Yb" methods = similar

Faecal digestibility from 24 to 28 d., when milk digestion in accounted

Hypothesis : milk digested

	at 100%			**97%**			**95%**		
	S21		S35	S21		S35	S21		S35
dOM	69,0	>	66,0	69,0	=	67,9	69,0	=	69,2
dCP	79,0	>	76,1	79,0	≈	81,1	79,0	<	84,4
dCF	85,5	>	76,6	85,5	<	94,3	85,5	<	106,0
dEnergy	68,0	>	64,4	68,0	=	67,1	68,0	<	69,0

For each nutrient, 3 to 5% of "matter" from non-digested is substracted to excretion

Faecal digestibility from 38-42 d

	Reference		
	W21		W35
dOM	68,5	=	67,8
dCP	78,8	≈	77,5
dCF	83,8	<	85,7
dStarch	98,4	=	98,3
dNDF	37,1	=	35,7
dEnergy	67,5	=	66,8

Faecal digestibility from 38-42 d

	Reference			- 24H		
	W21		W35	W21		W35
dOM	68,5	=	67,8	67,3	=	66,0
dCP	78,8	≈	77,5	78,0	>	76,3
dCF	83,8	<	85,7	83,2	<	84,9
dStarch	98,4	=	98,3	98,4	=	98,3
dNDF	37,1	=	35,7	34,7	=	32,2
dEnergy	67,5	=	66,8	66,2	=	65,0

Faecal digestibility from 38-42 d

	Reference		- 24 H		Ytterbium	
	W21	W35	W21	W35	**W21**	**W35**
dOM	68,5 =	67,8	67,3 =	66,0	**68,3 <**	**71,4**
dCP	78,8 ≈	77,5	78,0 >	76,3	**78,7 =**	**80,0**
dCF	83,8 <	85,7	83,2 <	84,9	**83,8 <**	**87,3**
dStarch	98,4 =	98,3	98,4 =	98,3	**98,4 =**	**98,5**
dNDF	37,1 =	35,7	34,7 =	32,2	**36,8 <**	**43,0**
dEnergy	67,5 =	66,8	66,2 =	65,0	**67,3 <**	**70,5**

Interaction signif. for method X age at weaning
(except for CF and Starch)
Effect of method **sign**. for CF and Starch
Effet of age at weaning sign. for CF

Faecal digestibility from 38-42 d

	Reference			- 24 H			Ytterbium		
	W21		W35	W21		W35	*W21*		**W35**
dOM	*68,5*	=	67,8	*67,3*	=	66,0	*68,3*	<	**71,4**
dCP	*78,8*	≈	77,5	*78,0*	>	76,3	*78,7*	=	**80,0**
dCF	*83,8*	<	85,7	*83,2*	<	84,9	*83,8*	<	**87,3**
dStarch	*98,4*	=	98,3	*98,4*	=	98,3	*98,4*	=	**98,5**
dNDF	*37,1*	=	35,7	*34,7*	=	32,2	*36,8*	<	**43,0**
dEnergy	*67,5*	=	66,8	*66,2*	=	65,0	*67,3*	<	**70,5**

Interaction signif. for method X age at weaning

Weaning at 21d : the three methods not significantly different , since rabbits have a stable intake and excretion

Weaning at 35d : Yb method no similar to -24H (possible retention of Yb, since intake not stable 3 days after weaning)

Conclusions for methods

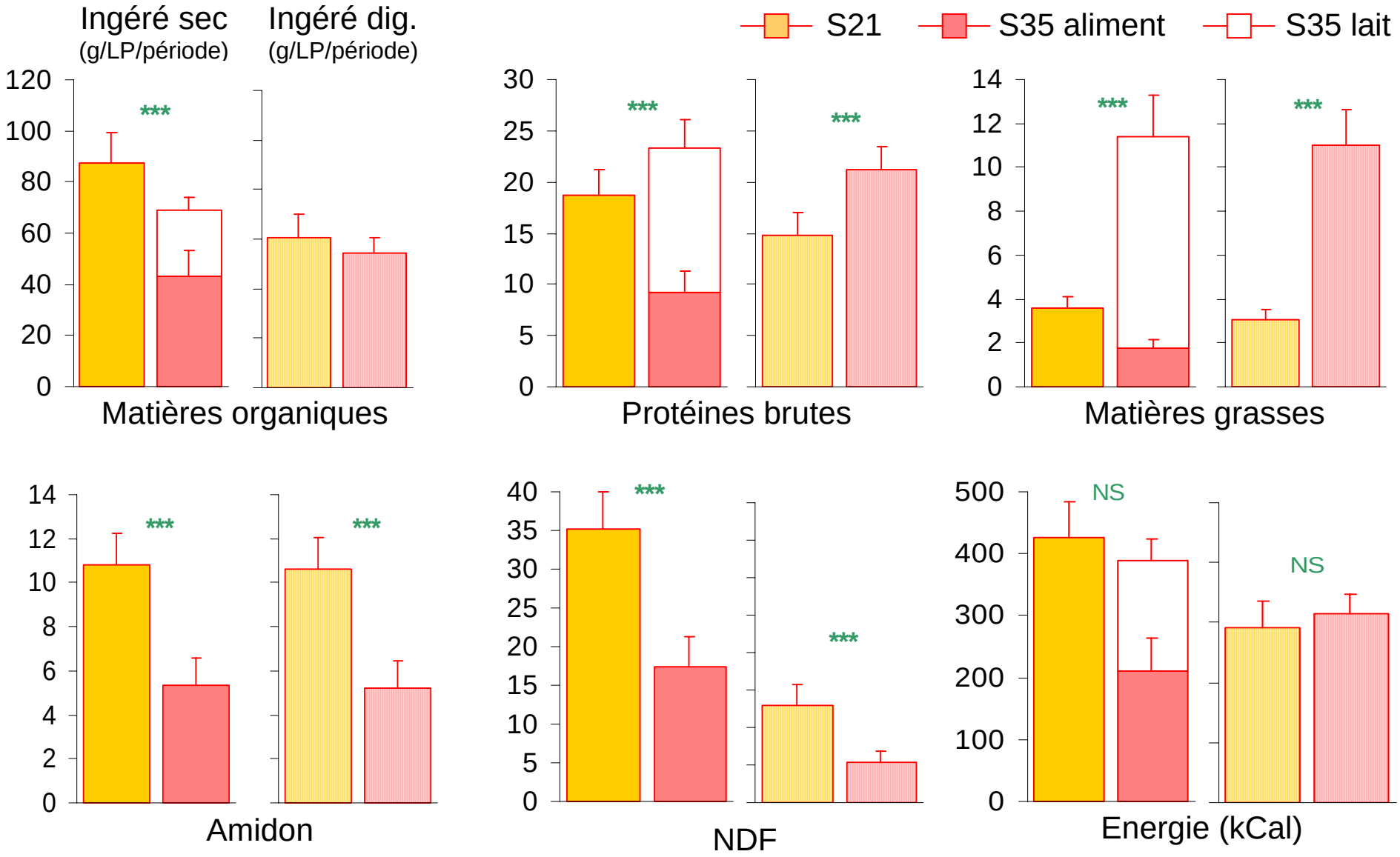
- reference "EGRAN" method not adapted before 35 d

  - **-24H** : seems good for the **period 24-28 d** , **since similar to "Yb" method**

  - period 38-42 d : reference = "-24H" BUT different to Yb, for rabbits weaned at 35d (no problems with early weaned rabbits)

  - **Be carefull with intake and excretion stability !!**

Bilan ingéré digestible 23-27 jours



Bilan ingéré digestible 37-41 jours

Ingéré sec aliment

- tend à être supérieur pour les S35

Ingéré digestible

- dépend de la méthode employée

- décalée : ingéré de MG digestibles supérieur pour les S35

- ytterbium appliquée à ingéré 37-41 : ingéré digestible des ≠ nutriments supérieur pour les S35

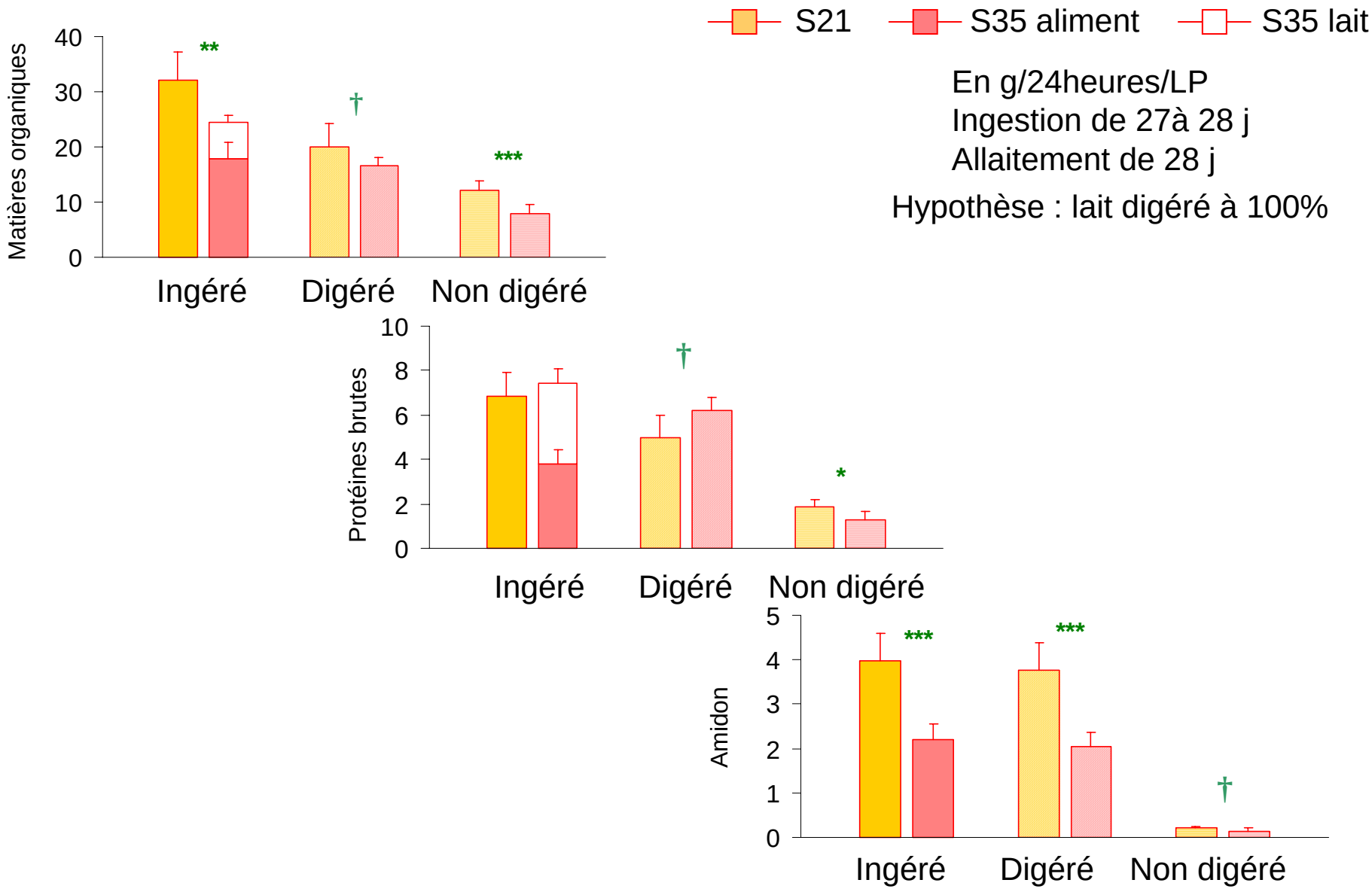
Digestibilités iléales

		28 jours		
		S21		S35
mg.g^{-1}	[ytterbium]i	0,43	=	0,37
g.100g^{-1}	[Amidon]i	1,53	=	1,64
	[PB]i	13,79	=	14,89
%	dMO	61,8	=	55,9
	dAmidon	94,8	=	93,4
	dPB	72,6	≈	65,6

Digestibilités iléales

		28 jours		42 jours	
		S21	S35	S21	S35
mg.g^{-1}	[ytterbium]i	0,43 =	0,37	0,41 =	0,48
g.100g^{-1}	[Amidon]i	1,53 =	1,64	1,32 =	1,38
g.100g^{-1}	[PB]i	13,79 =	14,89	16,54 =	15,92
%	dMO	61,8 =	55,9	60,4 ≈	65,9
%	dAmidon	94,8 =	93,4	95,2 =	95,6
%	dPB	72,6 ≈	65,6	65,3 =	70,9

Bilan digestion iléale de l'aliment : 28 jours



En g/24heures/LP
Ingestion de 27à 28 j
Allaitement de 28 j

Hypothèse : lait digéré à 100%

Bilan digestion iléale de l'aliment : 42 jours