Effect of salmon oil and vitamin D in sow gestation diets on piglet vitality at birth and viability to weaning

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Introduction

- Additional fats are often used to increase energy density
- Soybean oil high conc. of n-6 FA e.g. Linoleic acid (LA)
  - Improve milk yield in sows resulted in an increase in piglet body weight (Lee et al, 2014; Cordero et al, 2011)
  - Improve immune capacity of piglets (Corino et al, 2009)
- Salmon oil high conc. of n-3 FA e.g. Docosahexanoic acid (DHA)

  - Increase piglet vitality at birth
  - Improve growth of nursing piglets
  - Increase n-3 serum conc. in sow and piglet immune cells (Rooke et al, 2001)

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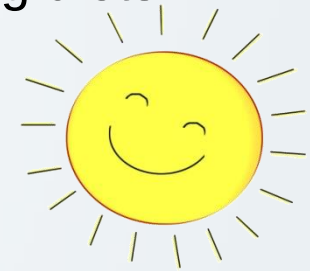
Introduction

- Vitamin D_3 (Cholecalciferol) is commonly added to pig diets



- Calcium homeostasis
- Bone health
- Innate and adaptive immunity

- Recommended inclusion rate for gestating and lactating sows is 800 IU/kg (NRC,2012)
- Up to 2000 IU/kg frequently added to pig diets on Irish farms

- Previously shown to:
- Increase milk, sow and piglet vitamin D levels (Flohr, et al 2014)
- Reduce stillbirths (Lauridsen, et al 2010; Weber, et al 2014)
- Prolong immune responses (Hines, et al 2013)
- Improve bone strength, mineral content and density (Witschi, et al 2011)

Aim of study

Investigate the use of salmon oil as well as the inclusion rate of vitamin D in sow gestation diets, as a solution to improve piglet vitality at birth and viability to weaning

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Materials & Methods

- 120 multiparous sows
- 2x2 factorial design
- Blocked by parity, c.s and weight on day 28

Prior to trial period

- 2.5 kg/day of control from service to day 29 of gestation

Experimental feeding

- Experimental diets were fed from day 30 of gestation until farrowing
- Sows were offered their respective experimental diet at 2.5kg/day to day 79 of gestation and 3.0kg/day from day 80 until parturition

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Materials & Methods

Table 1. Oil source and vitamin D content in sow gestation diets

Diet	n	Oil source	% Oil inclusion	Vitamin D_3
1	30	Soya	2.5	2000
2	30	Soya	2.5	800
3	30	Fish	2.5	2000
4	30	Fish	2.5	800

Diets were cereal soya based
(DE 12.9 MJ/kg, CP 14%, Fibre 7.67% and Lysine 0.7%)

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Materials & Methods

All sows

- Live-weight, back-fat depth, c.s and locomotion score
- Day 28, 107 and weaning

Blood samples (n=80)

- FAMEs and Vitamin D
- Day 28, 107 and weaning

- All sows were allowed to farrow naturally
- Performance measure e.g. TB, BA, BD etc

- Birth attended piglets were used for vitality scoring
- Birth unattended milk and tissue samples were collected

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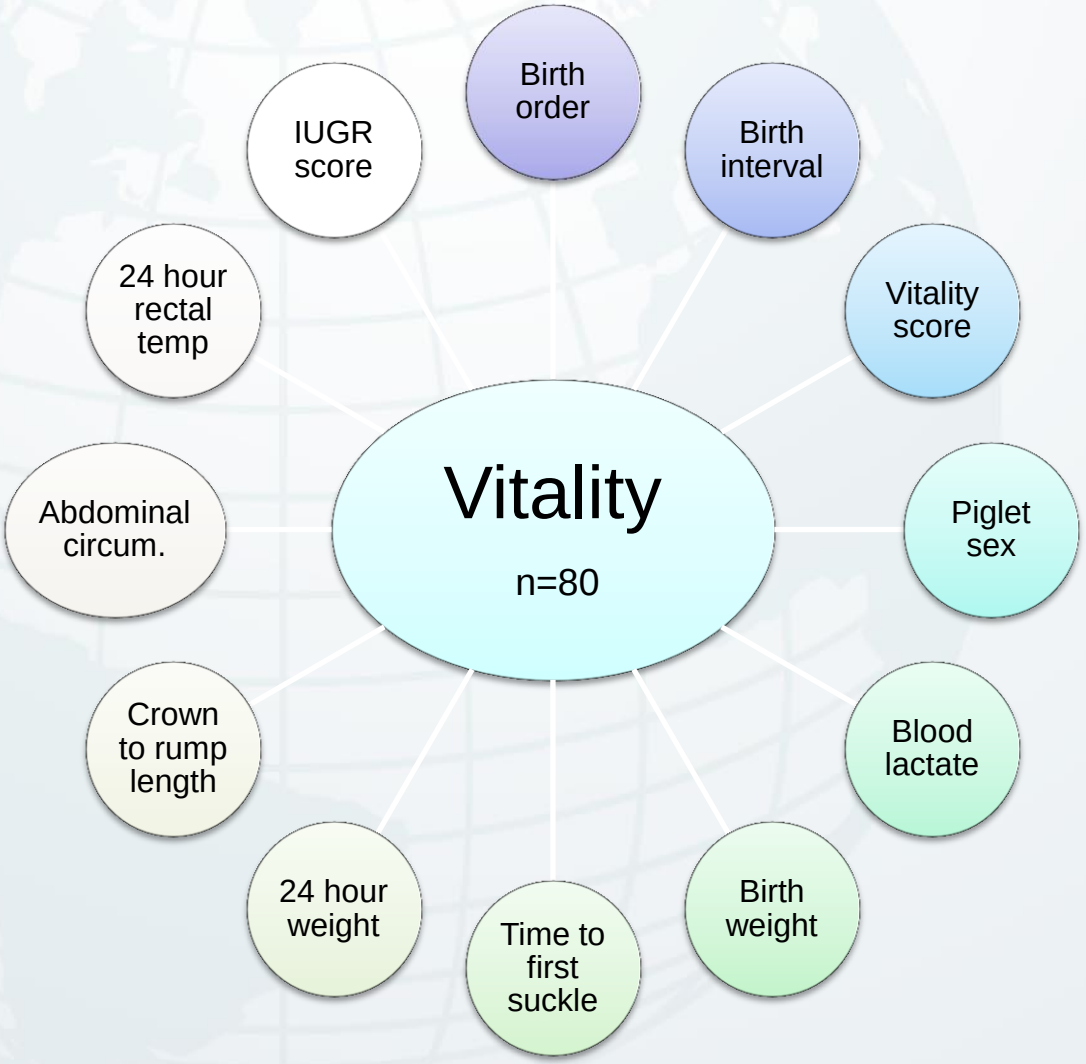
Materials & Methods



Vitality score (Baxter et al, 2008)

- First 15 secs after birth piglets were scored between 0-3:
- 0 no movement or breathing
- 3 good movement, attempts to stand and breathing

Blood lactate (Herpin et al, 1996)

- Measure of hypoxia
- Blood lactate meter (artic medical)

Ponderal index & BMI

(Baxter et al, 2008)
-Crown to rump
-Abdominal circumference

IUGR score (Hales et al, 2013)

-impact on colostrum intake and survivability

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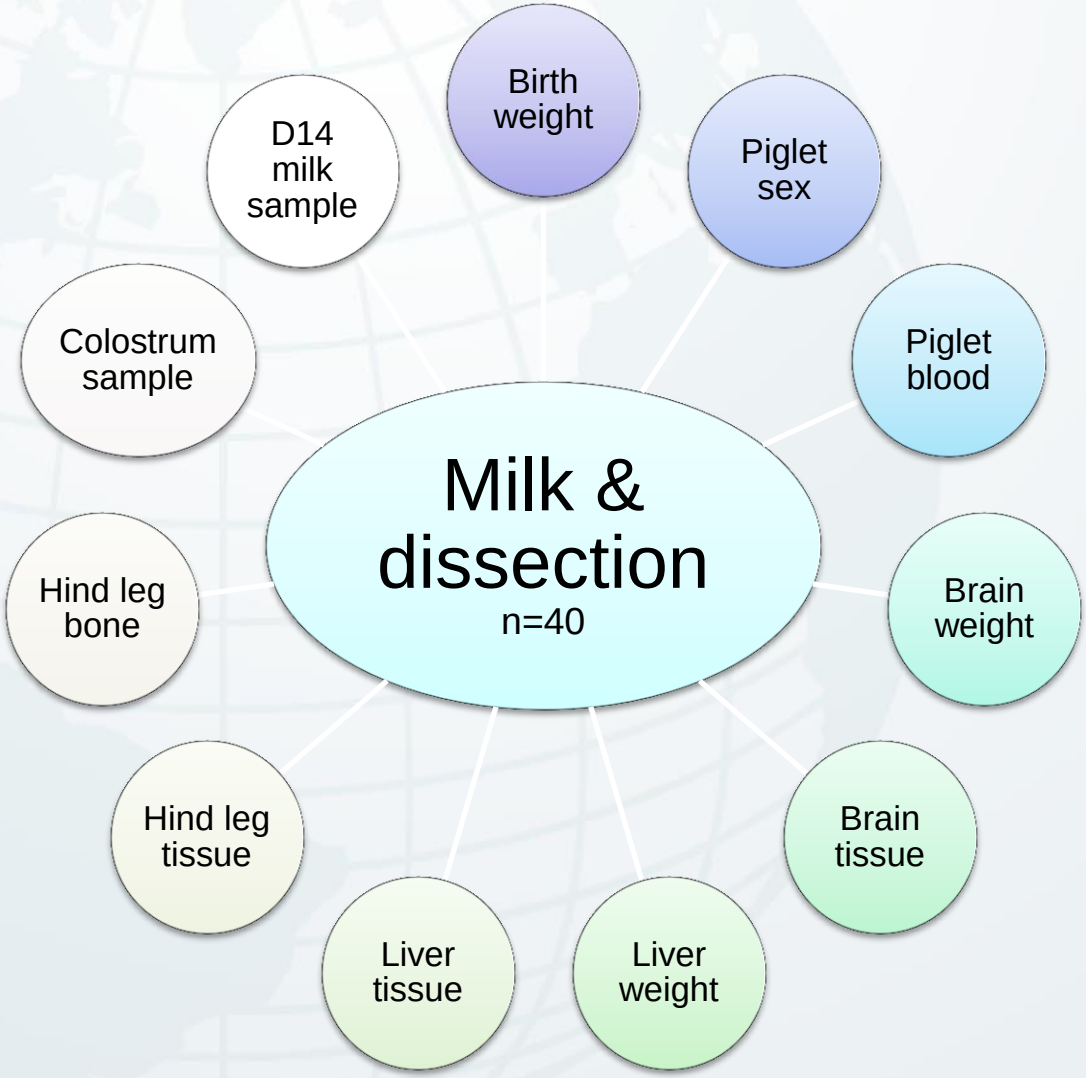
Materials & Methods



Piglet samples

- Piglet of mean birth weight euthanised

- Blood samples (FAMEs, Vit D and Immune cells)
- Tissues (FAMEs and Vit D)
- Hind legs (Bone mineral content and strength)

Milk samples

- Colostrum sample
- Milk sample at day 14 (FAMEs, Vit D, Immune cells)

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Materials & Methods

- Data was analysed using Genstat (release 18.1)

- REML linear mixed model
  - Vitality score
  - Sow and piglet weight

- Generalised linear mixed model
  - TB, BA, BD etc
  - Locomotion score

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Preliminary results

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Interaction between oil source and vitamin D level

	Soya		Fish			
Variable	**2000IU**	**800IU**	**2000IU**	**800IU**	**SEM**	**Sig**
Sow						
Gestation length (days)	116.2	117.0	117.0	116.6	0.28	*
Lactation length (days)	26.5	25.5	25.5	25.5	0.25	*
Lactation intake (kg)	175.1	158.4	153.3	156.5	4.11	*
Piglet						
24hr weight (all)	1.44	1.53	1.51	1.40	0.031	**
24hr weight (v)	1.50	1.58	1.52	1.41	0.037	*

P<0.05* P<0.01** P<0.001***

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Effect of oil source

Variable	Soya	Fish	SEM	Sig
Sow				
Lactation length (days)	26.0	25.5	0.18	*
Lactation intake (kg)	166.7	154.9	3.01	**
Live-weight weaning (kg)	262.8	258.7	1.17	*
Piglet				
Wean weight (kg)	8.15	7.83	0.123	*
Ponderal index	75.52	70.51	0.933	***
BMI	20.42	19.24	0.227	***
Time to first suckle (mins)	21.49	25.52	1.022	**

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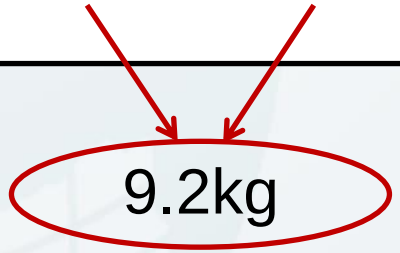
Effect of vitamin D level

	Vitamin D			
Variable	**2000 IU**	**800 IU**	**SEM**	**Sig**
Live-weight weaning (kg)	265.4	256.2	1.12	***

P<0.05* P<0.01** P<0.001***



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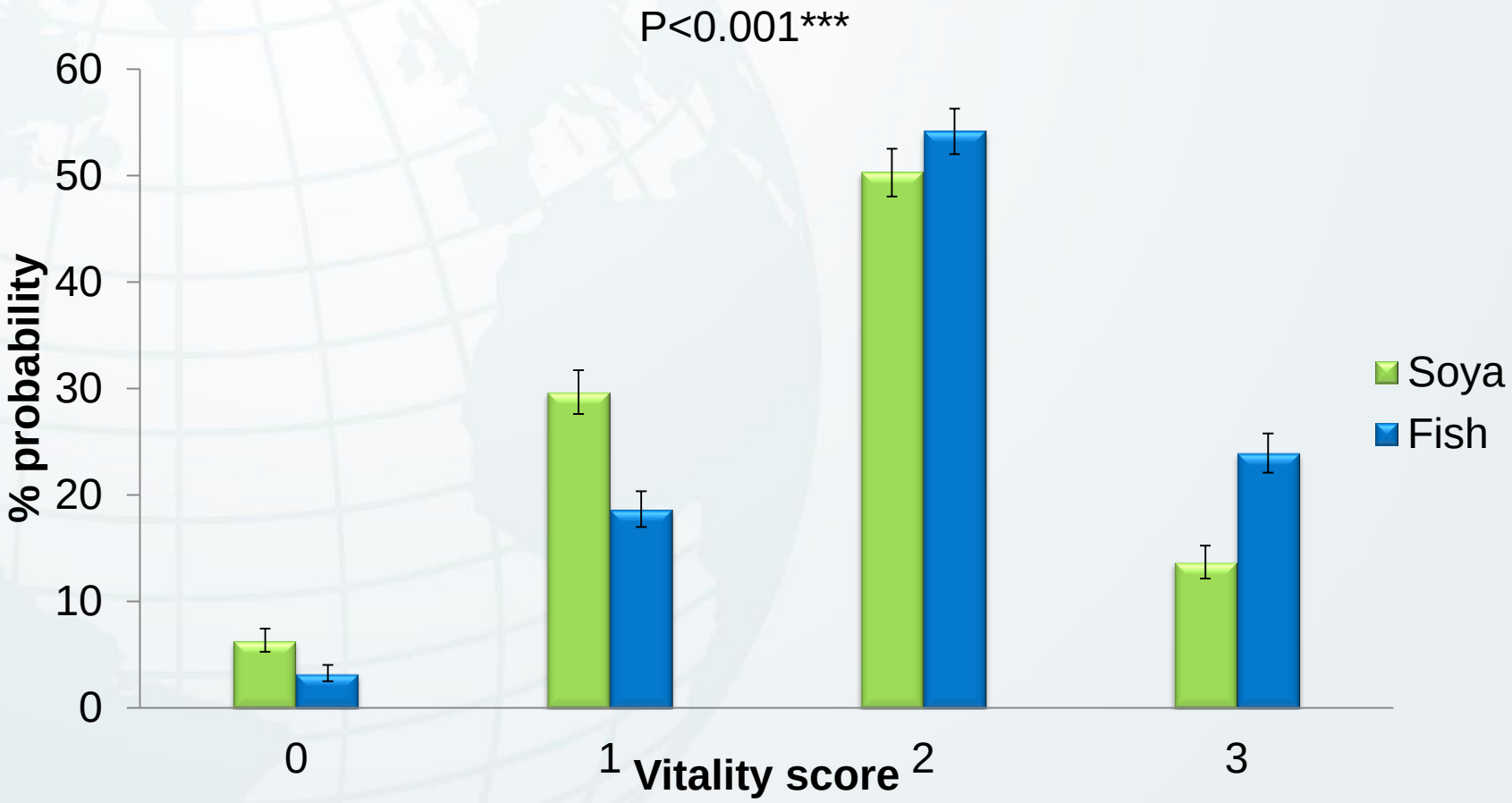
%Probability of piglets born to soya and fish oil sows having vitality score between 0-3



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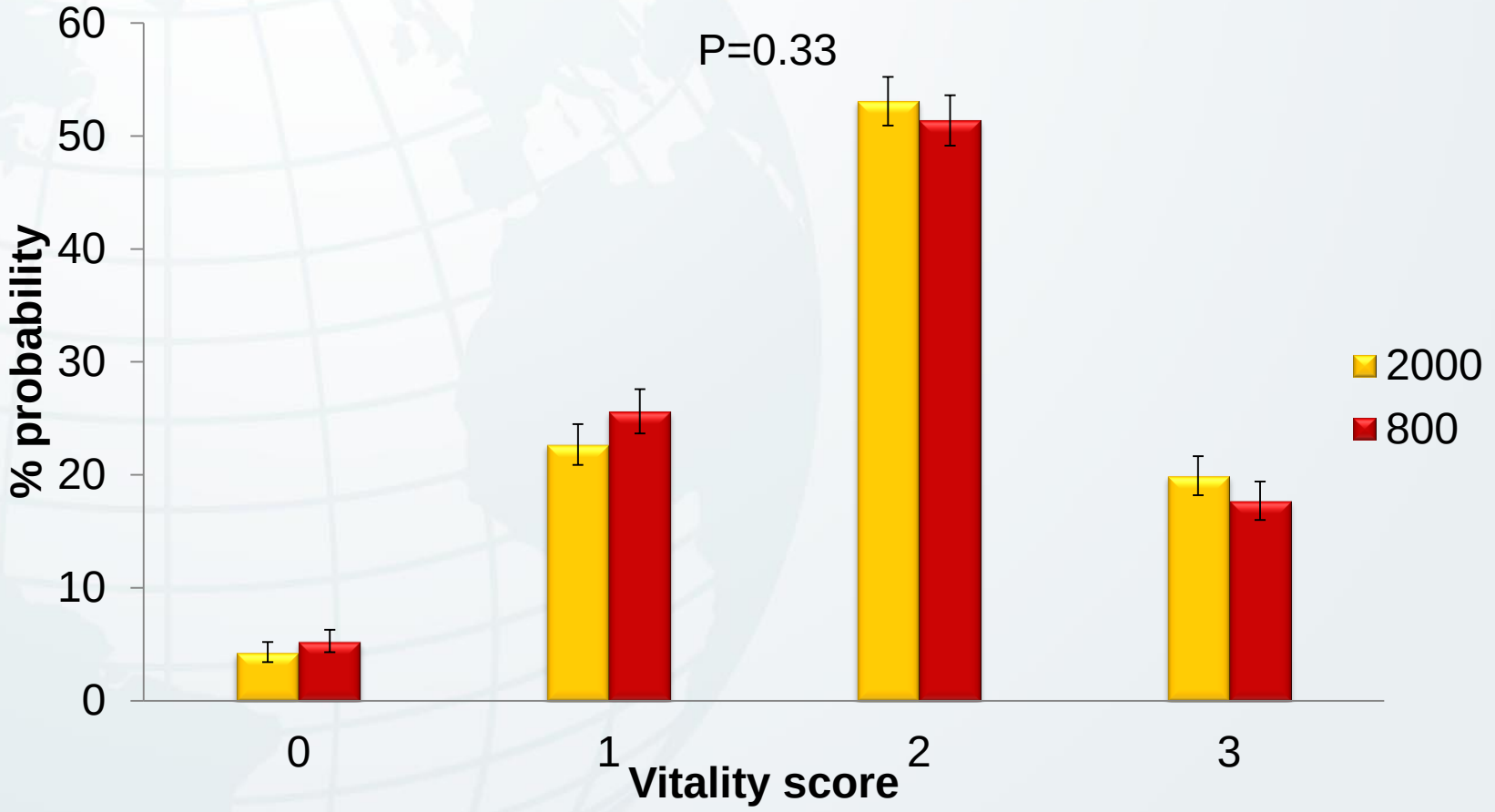
%Probability of piglets born to 2000IU and 800IU vitamin D sows having vitality score between 0-3



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Discussion

- DHA essential for cognitive and visual development of fetus

- In previous trials n-6 FA were found in high conc. in colostrum and milk samples

- Ponderal Index and BMI indicators of survivability greatest for piglet born to soya oil sows- inc. no. weaned

- Interactions between oil and vitamin D

-Sow -soya 2000 & fish 800

-Piglet -soya 800 & fish 2000

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Conclusion

- Preliminary results
- Blood, milk, tissue and bone analysis
- Salmon oil improved piglet vitality immediately at birth
- Soya oil improved piglet growth to weaning

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Thank you for listening

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