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Are hormonal procedures in dairy cows' reproduction a remedy for feeding errors?

Dairy cows in questions – from science to practice
Reproduction of dairy cows – how much depends on nutrition?
Kraków 09-10.03.2023r

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Specialist in ruminant diseases

Are hormonal procedures in dairy cows' reproduction a remedy for feeding errors?

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RECORD-SETTER: Chris Kestell (left) and his father, Tom, are proud of Ever-Green-View My Gold-ET, a homebred registered Holstein cow that finished her 365-day lactation in November with 77,480 pounds of milk — a national record.

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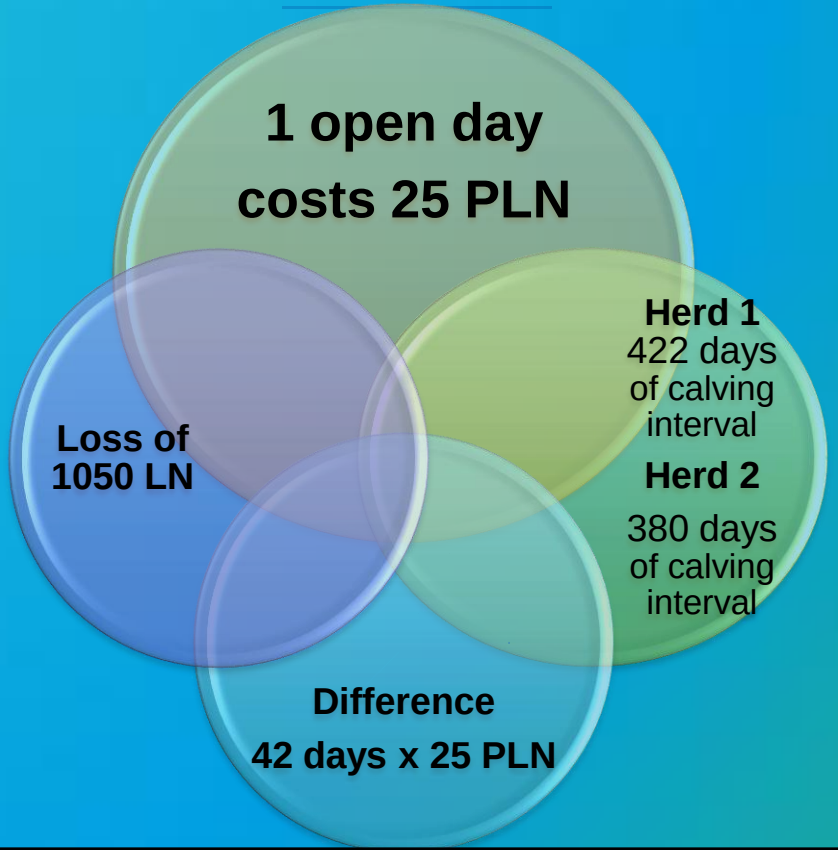

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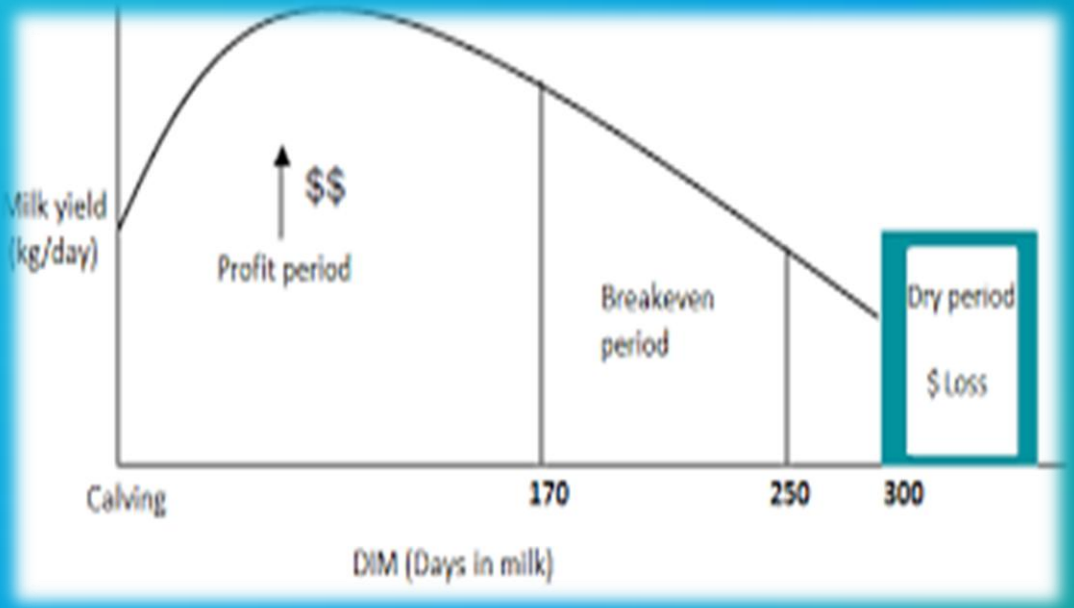

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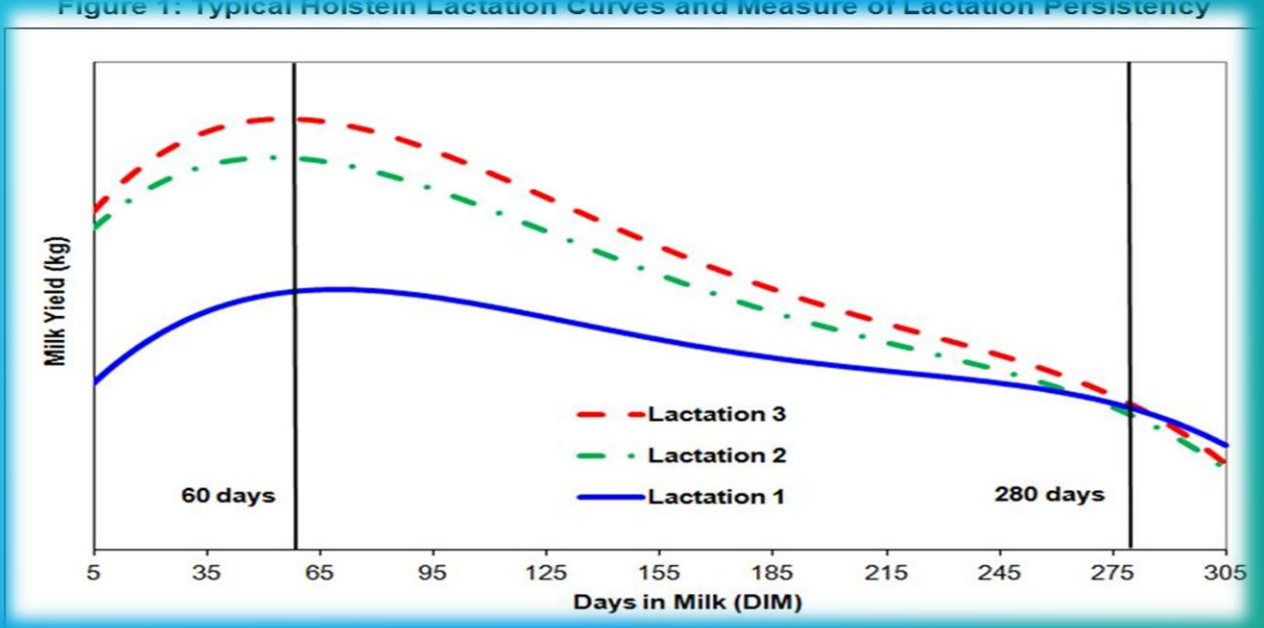
Figure 1: Typical Holstein Lactation Curves and Measure of Lactation Persistency



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Reproduction parameters

- Calving interval (intercalving period)
- Days open
- Insemination index
- Calving rate
- % of pregnant cows in the herd
- % pregnant by test

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$$PR = HDR \times CR$$

HDR – heat detection rate

CR – calving rate

PR – pregnancy rate

Each of these parameters is considered in a unit of time, which is the inter-heat period of 21 days

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PR = HDR x CR

Our aim:

≥ 25%

Are hormonal procedures in dairy cows' reproduction a remedy for feeding errors?

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PR = HDR x CR

25 = 100 x 25

25 = 62,5 x 40

25 = 50 x 50

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- 80% of cows pregnant up to 80 DIM
- 80% of cows pregnant up to 150 DIM

Wyniki ostatnich 12 próbnych dojów

Wyszczególnienie	09/30	10/27	11/25	12/23	01/21	02/24	03/24	04/28	05/26	07/29	08/30	09/30	
Krowy dojone	390	407	386	394	395	395	409	410	413	395	397	377	▼
Dzień laktacji (średnia)	144	143	148	147	151	165	177	183	188	149	148	142	▼
Mleko [kg/dzień]	41.5	41.3	42.5	44.4	45.9	45.7	45.6	46.5	46.9	46.9	44.5	47.3	▲
Tłuszcz [%]	3.76	4.01	3.84	3.90	3.67	3.76	3.61	3.70	3.55	3.36	3.49	3.52	
Białko [%]	3.19	3.33	3.22	3.25	3.29	3.26	3.22	3.31	3.28	3.13	3.14	3.25	
Kazeina [%]	2.51	2.63	2.54	2.57	2.60	2.57	2.56	2.56	2.56	2.42	2.46	2.56	▲
LKS [tys./ml]	304	241	231	196	201	230	235	183	200	189	178	151	▼
Mocznik [mg/l]	225	329	220	167	214	197	206	252	268	201	251	213	▼
Szacowane straty mleka, łącznie w całym stadzie [kg/dzień]													
- z powodu mastitis (wysoka LKS)	336												
- z powodu wydłużonych laktacji								181	521				

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How can good HDR be achieved?

- Extraordinary oestrus observation
- Electronic heat detection systems
- Hormone protocols

> 80%

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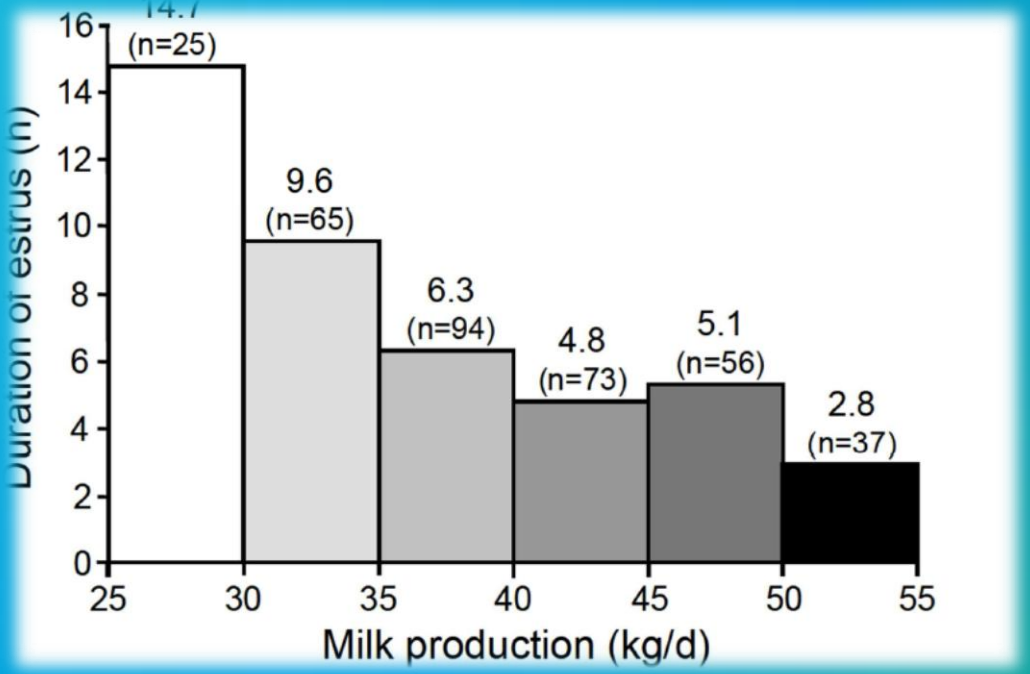

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	% of cows with detected heat Time of observation in min		
Multiplicity of observations	5	10	20
1	26	52	63
2	36	72	86
3	39	79	95
4	49	82	98

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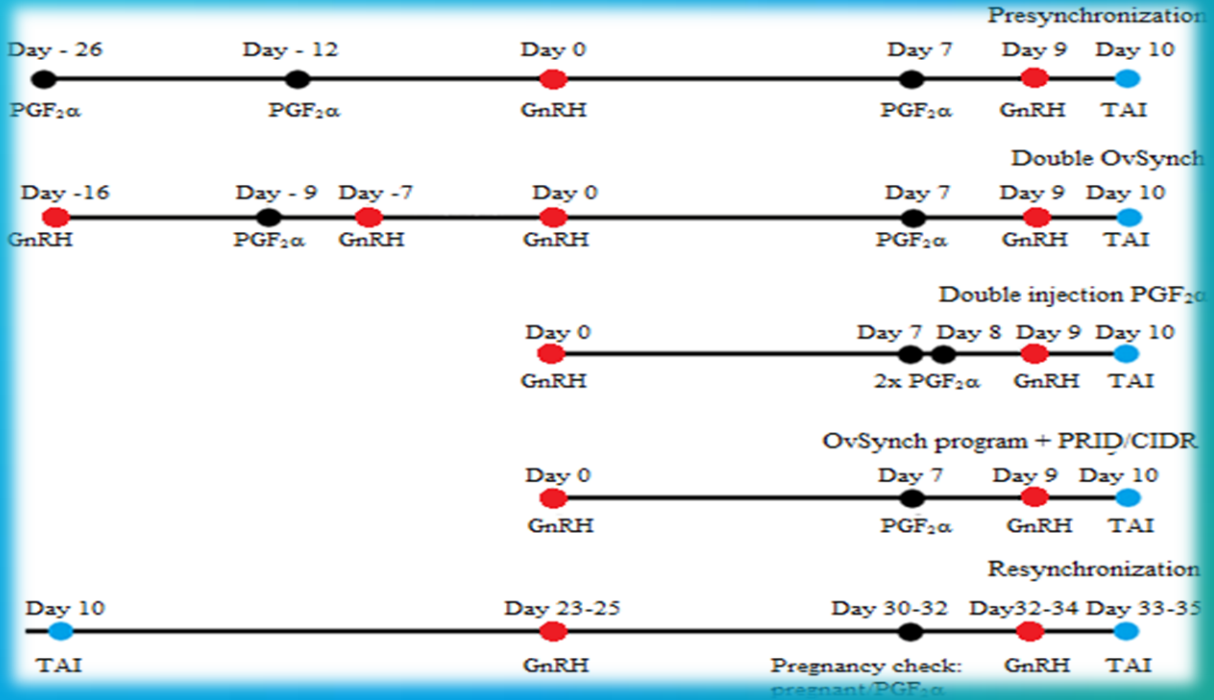
Are hormonal procedures in dairy cows' reproduction a remedy for feeding errors?



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How can good CR be achieved?

Risk factors:

- Nutrition
- Welfare and zoohygiene
- Management
- Infectious diseases

> 40%

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Risk factors in cattle reproduction – nutrition

A broken scale reduces the advantages of the TMT system to a minimum

Diet „on paper"

Diet of tractor driver

Diet consumed by cow

Diet used by cow

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Risk factors in cattle reproduction – nutrition

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Are hormonal procedures in dairy cows' reproduction a remedy for feeding errors?

Risk factors in cattle reproduction – nutrition

Change in BCS, points	Efficiency of 1st AI (%)
1,0	61,7
0,5	55,9
0,0	50,0
-0,5	44,1
-1,0	38,3
More than -1,0	17,0

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Risk factors in cattle reproduction – nutrition

Are hormonal procedures in dairy cows' reproduction a remedy for feeding errors?

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Risk factors in cattle reproduction – Welfare and zoohygiene

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Risk factors in cattle reproduction – Welfare and zoohygiene

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Risk factors in cattle reproduction – Welfare and zoohygiene

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Risk factors in cattle reproduction – Welfare and zoohygiene

Are hormonal procedures in dairy cows' reproduction a remedy for feeding errors?

Heat stress and fertility

Temperature Humidity Index (THI) Relative Humidity %									
C	20	30	40	50	60	70	80	90	100
22	66	66	67	68	69	69	70	71	72
24	68	69	70	70	71	72	73	74	75
26	70	71	72	73	74	75	77	78	79
28	72	73	74	76	77	78	80	81	82
30	74	75	77	78	80	81	83	84	86
32	76	77	79	81	83	84	86	88	90
34	78	80	82	84	85	87	89	91	93
36	80	82	84	86	88	90	93	95	97
38	82	84	86	89	91	93	96	98	100
40	84	86	89	91	94	96	99	101	104

No heat stress
Moderate heat stress
Severe heat stress
Dead cows

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Consequences of heat stress in dairy cows:

- **Immediate:** decrease in DM intake, decrease in milk production, changes in milk composition, increases in SCC
- **Distant in time:** fertility disorders, immunodeficiency.

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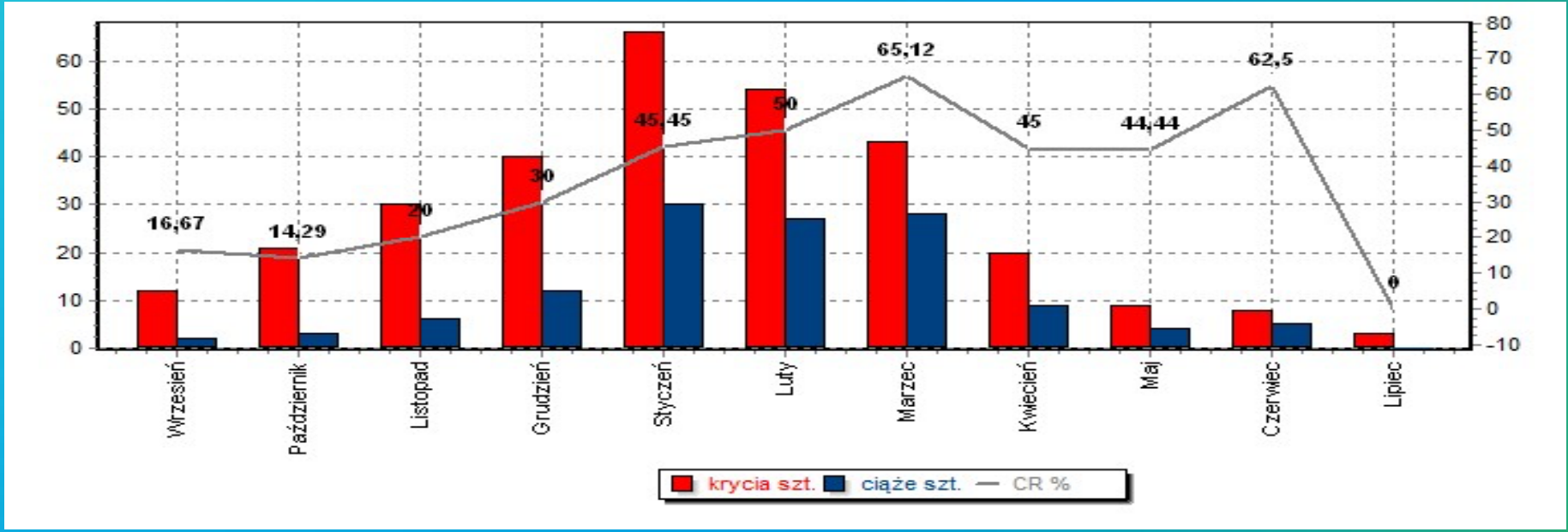
Heat stress and fertility



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BREDSUM: 21 day pregnancy risk
Waiting time 62

Data	Ht Elig	Heat	Pct	Pg Elig	Preg	Pct	Poronienia
1/01/20	180	136	76	174	64	37	9
22/01/20	180	121	67	175	61	35	7
12/02/20	183	118	64	175	55	31	9
4/03/20	164	106	65	159	47	30	6
25/03/20	169	120	71	165	50	30	5
15/04/20	173	122	71	171	66	39	6
6/05/20	146	94	64	141	42	30	8
27/05/20	136	94	69	131	41	31	7
17/06/20	142	91	64	140	38	27	5
8/07/20	147	89	61	136	29	21	4
29/07/20	176	126	72	164	38	23	6
19/08/20	198	139	70	194	53	27	4
9/09/20	193	135	70	187	43	23	5
30/09/20	190	107	56	189	39	21	4
21/10/20	202	137	68	193	52	27	8
11/11/20	199	137	69	183	55	30	6
2/12/20	182	123	68	174	51	29	8
Razem	2960	1995	67	2851	824	29	107

Czas oczekiwania62

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Infectious diseases

- Brucella abortus,
- Campylobacter fetus,
- Listeria monocytogenes
- Leptospira interrogans,
- Arcanobacterium pyogenes,
- Sallmonella,
- Trichomonas foetus,
- Neospora caninum,
- BVD-MD,
- IBR-IPV,
- BTV,
- SV,
- Chlamydiophila abortus,
- Coxiella (Gorączka Q)

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Types of hormonal procedures:

Heat synchronization, e.g. prostaglandins

Ovulation synchronization: ovsynch protocol and modifications

Hormonal procedures may be used in:

- treatment of problematic cows,
- synchronization of entire groups of animals as a part of reproduction management

Are hormonal procedures in dairy cows' reproduction a remedy for feeding errors?

Hormonal procedures

Advantages	Disadvantages
Applicable to all cows	Możliwość wystąpienia AI u krów z zaburzeniami rozrodu
Reduced need for heat detection and gynecological examinations	The highest effectiveness is limited to the start of the protocol between the 5th and 9th day of the cycle
Shortening of calving intervals and voluntary grace periods	Increased embryo mortality
Herd work synchronization	Cost of hormones
Possible therapeutic/treatment effects	Various responses to hormonal treatment
Fertility comparable to other methods	Poor heifer fertility

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Reproduction analysis

Lactation	VWP	Mean
All:	48	73
1st Lact.	50	76
2nd Lact.	46	69
3rd & later Lact.	47	71

Lactation	VWP	Mean
All:	62	67
1st Lact.	63	67
2nd Lact.	63	66
3rd & later Lact.	63	67

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Are hormonal procedures in dairy cows' reproduction a remedy for feeding errors?

Reproduction analysis

All Lactations	HDR	61,6%	CR	30,8	PR	21,2%
1st Lactation	HDR	60,7%	CR	33,1	PR	21,7%
2nd Lactation	HDR	64,7%	CR	30,9	PR	23,6%
3rd+ Lactations	HDR	61,9%	CR	28,0	PR	19,7%

All Lactations	HDR	97,2%	CR	40,7	PR	32,1%
1st Lactation	HDR	97,2%	CR	49,0	PR	40,4%
2nd Lactation	HDR	98,8%	CR	43,0	PR	35,3%
3rd+ Lactations	HDR	98,7%	CR	35,9	PR	27,3%

Are hormonal procedures in dairy cows' reproduction a remedy for feeding errors?

Reproduction analysis

PROGRAM	EFFECTIVENESS
PRESYNCH	51%
OVSYNCH	40%
RESYNCH	46%
NATURAL	37%
PGF2L	-----

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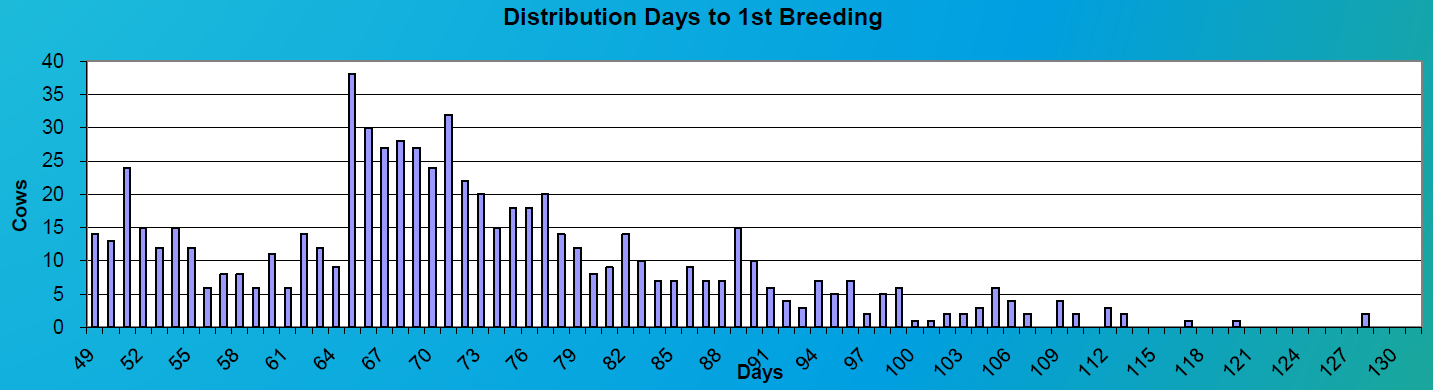
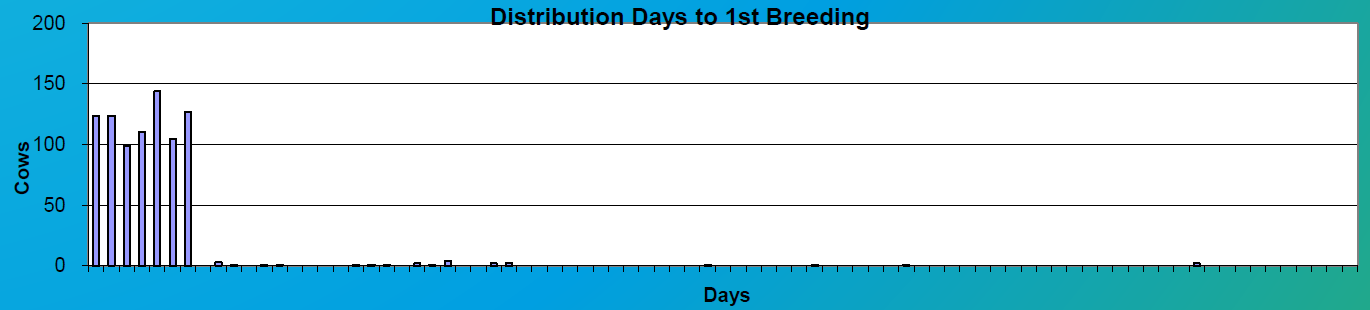
Are hormonal procedures in dairy cows' reproduction a remedy for feeding errors?

Reproduction analysis





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Reproduction analysis

Lactation	PR All	MEANDO	MPD loss	CPY	CPY Loss	Milk Calf Losses	Diff DO	Replacement Losses	Total
All Lactations	21,2%	137,1	-0,8	0,88	-0,04	($24)	-14,8	($32)	($55)
1st Lactation	21,7%	136,9	-0,7	0,88	-0,03	($20)	-12,6	($27)	($48)
2nd Lactation	23,6%	125,2	-0,3	0,91	-0,01	($8)	-4,9	($11)	($19)
3rd+ Lactations	19,7%	143,7	-1,2	0,86	-0,06	($36)	-22,4	($47)	($83)

Lactation	PR All	MEANDO	MPD loss	CPY	CPY Loss	Milk Calf Losses	Diff DO	Replacement Losses	Total
All Lactations	32,1%	117,6	1,0	0,94	0,05	$51	18,7	$77	$128
1st Lactation	40,4%	105,0	1,7	0,97	0,08	$88	32,2	$116	$204
2nd Lactation	35,3%	112,6	1,3	0,95	0,07	$68	24,7	$95	$162
3rd+ Lactations	27,3%	130,3	0,4	0,90	0,02	$19	7,0	$41	$60

BREDSUM: 21 day pregnancy risk
Waiting time62

PR 2021

Data	Ht Elig	Heat	Pct	Pg Elig	Preg	Pct	Poronienia
1/01/21	160	116	72	158	57	36	5
22/01/21	167	102	61	161	52	32	4
12/02/21	156	101	65	143	48	34	3
5/03/21	152	98	64	148	52	35	4
26/03/21	141	99	70	139	46	33	5
16/04/21	138	88	64	136	54	40	3
7/05/21	119	89	75	114	39	34	5
28/05/21	98	52	53	96	26	27	4
18/06/21	109	60	55	106	34	32	3
9/07/21	105	73	70	104	29	28	2
30/07/21	115	78	68	110	43	39	3
20/08/21	107	76	71	105	27	26	4
10/09/21	118	76	64	114	34	30	7
1/10/21	140	95	68	140	53	38	4
22/10/21	127	89	70	119	38	32	2
12/11/21	129	86	67	125	31	25	6
3/12/21	154	108	70	153	59	39	4
Razem	2235	1486	66	2171	722	33	68

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Summary by mating code from 1/1/21 through 31/12/21

Mating code 2021

Mating code	95% CI	%Calv	#Calv	#Otw	Other	Abort	Total	%Tot	SPC
resynch	49-59	54	218	183	45	19	446	19	1,8
GGPGI	32-50	41	44	64	12	4	120	5	2,5
natural	41-53	47	122	136	14	15	272	12	2,1
Ovsynch	43-57	50	103	102	17	9	222	10	2,0
Ovsynch2	57-63	60	688	459	115	53	1262	54	1,7
TOTALS	53-58	55	1175	944	203	100	2322	100	1,8

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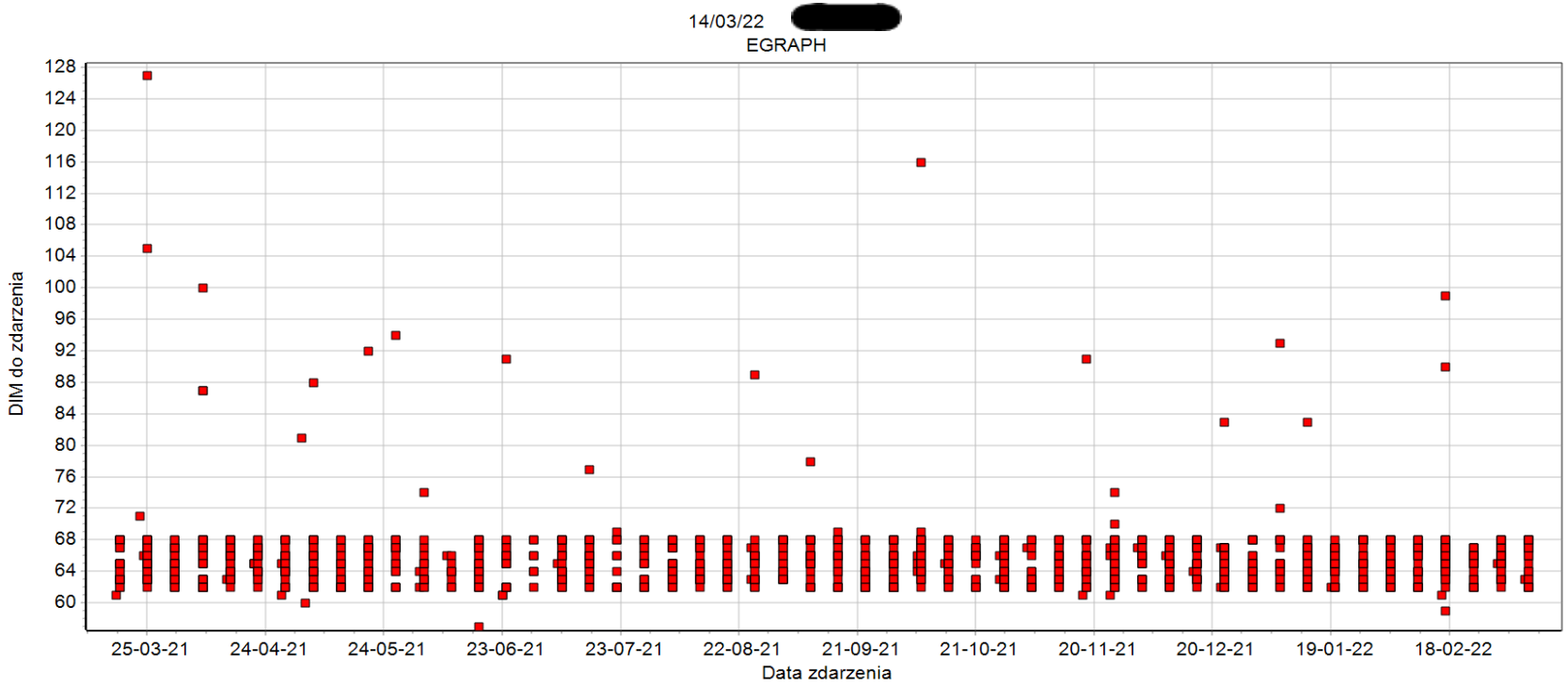
EGRAPH

First insemination Graph



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Lactation	VWP	Mean	Median	Bred	VWP+20	Efficiency
All:	41	67	67,0	77	62,0%	67,1%
1st Lact.	41	64	63,0	74	54,1%	68,3%
2nd Lact.	40	65	66,0	74	65,0%	71,3%
3rd & later Lact.	41	70	70,0	79	68,5%	64,9%
Unknown:	0	0	0,0	0	0,0%	0,0%

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Lactation	VWP	Mean	Median	Bred	VWP+20	Efficiency
All:	65	73	71,0	77	7,1%	92,5%
1st Lact.	66	71	70,0	74	3,3%	96,7%
2nd Lact.	66	75	72,0	79	9,8%	90,3%
3rd & later Lact.	67	74	72,0	79	6,3%	91,4%
Unknown:	0	0	0,0	0	0,0%	0,0%

Lactation	VWP	Mean	Median	Bred	VWP+20	Efficiency
All:	66	76	75,0	81	9,5%	90,5%
1st Lact.	57	75	74,5	80	34,1%	89,5%
2nd Lact.	52	76	74,0	82	64,7%	91,7%
3rd & later Lact.	69	77	75,0	82	6,2%	91,4%
Unknown:	0	0	0,0	0	0,0%	0,0%

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Lactation	Services/Conception			services
All Lactations	2,94	C/R:	34,0	17,3%
1st Lactation	2,64	C/R:	37,8	18,9%
2nd Lactation	2,55	C/R:	39,2	12,5%
3rd+ Lactations	3,42	C/R:	29,3	19,2%
Lact. # unknown	-	C/R:	-	0,0%

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Lactation	Services/Conception			services
All Lactations	2,17	C/R:	46,2	9,5%
1st Lactation	2,17	C/R:	46,2	5,5%
2nd Lactation	1,68	C/R:	59,6	5,9%
3rd+ Lactations	2,41	C/R:	41,5	16,9%
Lact. # unknown	-	C/R:	-	0,0%

Lactation	Services/Conception			services
All Lactations	2,48	C/R:	40,3	17,3%
1st Lactation	2,56	C/R:	39,1	20,9%
2nd Lactation	2,49	C/R:	40,2	17,9%
3rd+ Lactations	2,38	C/R:	42,1	12,5%
Lact. # unknown	-	C/R:	-	0,0%

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Lactation	Mean Pregnancy Rate All	95% CL	First
All Lactations	18,4%	6,5%	15,8%
1st Lactation	21,0%	13,5%	23,1%
2nd Lactation	21,9%	13,3%	14,6%
3rd+ Lactations	15,6%	8,7%	12,5%
Lact. # unknown	0,0%	0,0%	0,0%

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Lactation	Mean Pregnancy Rate All	95% CL	Min	Max
All Lactations	36,5%	6,6%	29,9%	43,1%
1st Lactation	37,5%	10,0%	27,5%	47,5%
2nd Lactation	49,1%	16,3%	32,7%	65,4%
3rd+ Lactations	33,2%	10,4%	22,8%	43,6%
Lact. # unknown	0,0%	0,0%	0,0%	0,0%

Lactation	Mean Pregnancy Rate All	95% CL	First
All Lactations	27,7%	5,0%	39,7%
1st Lactation	28,9%	8,6%	42,5%
2nd Lactation	26,1%	8,2%	41,4%
3rd+ Lactations	28,3%	9,6%	33,8%
Lact. # unknown	0,0%	0,0%	0,0%

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Risk factors in cattle reproduction - Management

Hormones work better when administered !!!

Served to the right cows, at the right time!!!

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Risk factors in cattle reproduction - Management

0.95 x 0.95 x 0.95 x 0.95 x 0.95 = 77%

0.9 x 0.9 x 0.9 x 0.9 x. 0.9 = 59%

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Hormonal procedures and twin pregnancy

Proceedings protocols	Number of births	Number of twin pregnancies	% of twin pregnancies
Herd 1 Natural estrus	404	24	6
Herd 2 Presynch/Ovsynch	1435	88	6,10
Herd 3 Ovsynch	376	10	2,7
Herd 4 DoubleOvsynch/Ovsynch	208	6	2,9

Are hormonal procedures in dairy cows' reproduction a remedy for feeding errors?

Summary:

- The use of hormonal procedures in the reproduction of dairy cattle is not a remedy for nutritional errors !
- The use of hormonal procedures allows to achieve better reproductive parameters by increasing HDR/SR
- The use of hormonal procedures does not significantly affect the increase in CR
- Data analysis

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Thank you for your attention!