肉牛难产主要因素分析

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摘　要:难产(dystocia)是母畜分娩时胎儿娩出缓慢或难以娩出,需要助产帮助胎儿娩出的过程。难产既会导致母牛出现生殖道疾病而影响其后的发情和繁殖,也会危及犊牛和母牛的生命,严重损害养牛经济效益。引起肉牛难产的因素很多,有遗传因素和非遗传因素,包括母牛因素、胎儿因素、公牛因素、营养因素与环境因素等。犊牛出生重、母体骨盆结构和妊娠时长是 3 个最主要的因素。多种因素的交叉互作,使难产成为极其复杂的生理与病理现象。国际牛业发达国家非常重视母牛繁殖与生产环节,开展了大量卓有成效的研究与分析。在对几十年来有关肉牛繁殖与生产方面的报道较为细致分析基础上,文章重点对普通肉牛繁殖与生产过程中出现的主要难产问题进行综述,供国内同行借鉴。

关键词: 难产; 出生重; 骨盆; 孕期; 繁殖
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难产(dystocia)是指母畜分娩时,胎儿娩出缓慢或难以娩出,需要通过助产手段帮助胎儿娩出的过程。关于牛的分娩难度的分级并无统一标准。Nix 等[1]把分娩难度分为 4 级:1 级为无需助产;2 级为轻微拉拽助产(mild traction);3 级为重度助产,需借助机械拉拽(heavy traction requiring a mechanical calf puller);4 级为剖腹产(cesarean section)。Bellows 和 Lammoglia 分为 4 级,即 1 级无助产;2 级手动轻微助产;3 级机械拉拽助产;4 级剖腹产[2]。大部分研究者将分娩难度也分为类似的 4 级;也有学者将其分为 2 级或 3 级[3-5]。在我们的研究与实践中,也将分娩分为类似的 4 级,1 级无需助产,2 级为手动助产,3 级为利用产绳或机械拉拽,4 级为剖腹产。Zaborski 等将影响牛难产的因素分为四类:1)直接因素,包括胎位不正(malpresentations)与子宫扭曲(uterine torsion);2)母牛因素,包括体重、体况、年龄、分娩次数、骨盆面积、犊牛出生重、妊娠时长;3)遗传因素,有公牛与犊牛、同种(近亲)、胎儿发育速度及骨骼肌肉发育程度等;4)非遗传性因素,包括分娩年份、季节、地域等环境因素[6]。难产既会导致母牛出现生殖道疾病,对今后的发情和繁殖产生影响,有时还会危及胎儿和母牛的生命,严重损害养牛经济效益。

我国是肉牛养殖与牛肉生产大国,存栏与出栏量均居世界前列。然而,肉牛繁殖关键技术指标如配种率、妊娠到期率、犊牛存活率等均不及国际先进水平,母牛流产率、难产率与犊牛死亡率等居高不下,严重影响了肉牛养殖效益。笔者对几十年来国际上,尤其是肉牛发达国家有关肉牛繁殖与生产方面的报道做了较为细致阅读与系统分析,本文重点对普通肉牛繁殖与生产过程中出现的难产问题进行分析阐述,供国内同行借鉴。

1　母牛因素

1.1　骨盆因素

研究表明,胎儿—骨盆不相适应是初产母牛犊牛死亡的最重要因素[7-8]。正常的骨盆,如产力及胎儿无异常,胎儿很容易娩出。难产主要发生在骨盆中腔处,当胎儿的体型大小超过母牛的骨盆中腔时,胎儿头部或肩部无法通过中腔而被卡在骨盆内,造成难产。初产母牛的骨盆面积被认为是影响难产程度最大的母牛特征。初产母牛自身尚处于身体发育与成熟阶段,骨盆发育尚未完成,分娩时容易难产。尤其是当配种年龄较小,或母牛的品种类型与公牛的品种类型相差较大,胎儿体重较大时,母牛的骨盆中腔面积容纳不了过大的胎儿,由此造成难产[6,9]。

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在实际操作中,母牛骨盆面积常用来判断是否存在难产的依据[10]。Micke 等研究表明,无难产现象的自然分娩母牛的孕前骨盆面积大于难产母牛;对于青年母牛,测量骨盆面积可预测难产风险,骨盆面积每增加 1 cm^2,可显著降低难产风险[11]。Holm 等利用多种分析方法分析了 484 头母牛的骨盆面积与胎儿出生重及难产的关系,认为对于骨盆面积的判断可以成为淘汰有难产风险母牛的一个依据[8]。

1.2　母牛的年龄与体重

通常情况下,难产与母牛的初配年龄密切相关,年龄小的母牛分娩更困难。Carnier 等[12]认为青年母牛在分娩时,尚未达到体成熟期,头胎难产是由于母牛体型小所致;随着母牛年龄增加,难产率降低,3 ~5 岁牛的难产率为 7.4%,11 ~13 岁龄的难产率为 4.6%。Eriksson 等报道夏洛莱牛与海福特牛的初产难产率为 6%,经产牛的难产率为 1% ~2%[13]。然而,如果把母牛的年龄与体重因素综合考虑,对于发育快的母牛,年龄虽小,但体重已经接近成年水平。因而,对于初产牛而言,如果母牛达到性成熟而体成熟延迟,其分娩难产的比率会上升[14]。在配种时,青年母牛的体重应该达到成年母牛的 65%,分娩时的体重要达到成年母牛的 85%,而且所用配种的公牛的后代是易产,那么难产率将是可接受的[9]。随着母牛体重增加,难产率下降,600 ~650 kg 母牛的难产率为 5.3%,而 350 ~400 kg 的难产率为 8.3%[15]。初产年龄在 26 月龄之前的难产率、犊牛死亡率与母牛死亡率均高于 30 月龄以上母牛[16]。不同品种牛的性成熟与体成熟年龄有差异。中小型品种如安格斯牛、海福特牛和短角牛等多为早熟品种,母牛的适配年龄在 16 ~18 月龄;大型品种如夏洛莱牛、西门塔尔牛、利木赞牛、皮尔蒙特牛、德国黄牛、南德温牛、婆罗门牛等多为晚熟型品种,母牛的适配年龄稍晚,可在 18 月龄以后。

1.3　母牛的胎次与多胎

一般情况下,青年母牛的生产要比成年母牛更困难,头胎比二胎的难产率高,但在二胎与随后的胎次之间无明显的难产差异[17]。Rutter 等对 476 例夏洛莱牛进行分析,初产母牛与经产牛的难产率分别为 31.3% 和 15.0%[18]。Berger 等[19]分析了 1972—1985 年美国纯系安格斯牛场的 965 417 的生产记录,初产母牛的难产率是经产牛的 11.58 倍。Carnier 等发现皮尔蒙特初产母牛的难产率为 28.4%,而成年母牛的难产率为 13.2%;初产母牛的剖腹产率比经产牛高 3 倍;随着分娩次数增多,难产率显著下降[12]。在皮尔蒙特牛中,难产遗传力在头胎、二胎与多胎的影响分别为 19%,10.0% 和 8.0%[12],表明分娩次数与难产之间存在直接关联。

在肉牛中,双胎的难产发生率为 35.0% ~42.2%,而单胎为 20.4% ~23.0%[20]。荷斯坦牛双胞胎的难产程度比单胎生产高 10.5 倍[21]。双胎的难产水平为 2.19,而单胎为 1.57;双胞胎出现胎位不正的比率为 7.2% ~78.9%,而单胎的发生率为 2.7% ~21.8%[3]。Echternkamp 等[22]观察到双侧卵巢排卵的双胞胎的难产率比单侧排卵的双胞胎难产率低 14%;三胞胎的难产率进一步提高,主要是因为胎位不正所致;而胎儿是位于左侧子宫角还是右侧子宫角,对难产并无影响[23]。

1.4　孕期时长

牛妊娠期的长短,依品种、年龄、季节、饲养管理和胎儿性别等因素有所差异。牛妊娠期一般为 275 ~285 d,平均为 283 d,最短为 260 d,最长可达 315 d。早熟品种的妊娠期短,乳牛比肉牛短,怀母犊比怀公犊短;青年母牛比成年母牛短约 1 d,怀双胎比怀单胎短 3 ~6 d;冬春分娩母牛比夏秋季分娩长 2 ~3 d;饲养管理条件差的母牛妊娠期长。Meyer 等[24]认为妊娠时长是继胎儿体重与母牛胎盘之后的影响经产母牛难产的第三大重要因素;在需要 3 级助产的犊牛中,孕期短于正常 280 d 的犊牛出生后死亡率最高;孕期在 265 ~268 d 的死亡率为 55.3%,269 ~271 d 的死亡率为 45.5%,272 ~275 d 的死亡率为 33.7%,276 ~293 d 的死亡率为 23.8%,而 294 ~295 d 的死亡率为 35.4%。在分析了 9 个纯种肉牛和 3 个杂种的犊牛生产情况后,发现因孕期延长使胎儿发育过大,致使难产率升高[14,25]。Uematsu 等认为妊娠期超过 301 d 与低于 270 d 的母牛难产率显著高于妊娠期为 281 ~290 d[26]。牛的孕期长短具有中等程度的遗传力,通过遗传选择可以改变孕期长度。Purfield 等分析了安格斯、夏洛莱、利木赞牛等肉牛的孕期调控基因的遗传定位,发现了 25 个 SNPs 与荷斯坦牛的孕期极显著相关,其中位于 BTA18 的 58.06 ~58.19 Mb 区间的 rs381577268 位点,对孕期贡献率最大,为 1.37%[27]。掌握不同品种牛的孕期,可以预测同品种及杂种牛的预产期,对于犊牛生产非常重要。

1.5　母牛品种作用

遗传与环境因素共同决定了母牛的生产能力,母体供给胎儿营养的能力,不受胎儿基因型的影响[28]。在利用大型南德温(South Devon)牛与小型 Dexter 牛进行交互杂交发现,小型母本所生犊牛重为 27 kg,而大型母本的犊牛重为 33 kg;母本大小对胎儿体重的影响取决于母牛与公牛大小的差异,胎儿大小的最大差异出现在妊娠后期[28]。不同品种

肉牛,如安格斯、海福特、利木赞、夏洛莱、西门塔尔、婆罗门、瑞士黄牛等,发生难产的程度不一样。Gregory 等[29]比较了海福特、安格斯、西门塔尔、利木赞、夏洛莱、德国黄牛等品种肉牛的分娩、出生重与存活率发现,对于不同品种的初产母牛,犊牛的出生重、分娩难度和出生后 24 h 的存活率均有显著差异;初产母牛难产的犊牛出生重为 39.6 kg,72 h 存活率为 87.1%,显著低于经产母牛的犊牛 35.4 kg 出生重和 92.2% 的存活率;安格斯初产母牛与经产牛的难产率均最低,而 Braunvieh 初产母牛和 Pinzgauer 经产母牛的难产率最高。Kriese 等报道 2 周岁龄的利木赞成年母牛难产率最低,Pinzgaue 初产母牛的难产率最高[30]。挪威红牛(Norwegian Red)的难产率约为 2.5%[31]。

2 胎儿或犊牛因素

2.1 犊牛出生重

犊牛出生重的大小直接关乎难产发生的概率。就犊牛的体尺而言,头周长、肩宽与胸围是影响分娩的关键因素。虽然安格斯和海福特牛的难产率低,但如果出生重大于 30 kg,发生难产的概率也提高[19]。安格斯牛的出生重在 20 ~ 40 kg 之间时,无需助产或轻微助产率;出生重大于 40 kg 时,有 17.9% 的母牛需人工强力助产[19]。夏洛莱牛也有类似的现象,头胎的平均出生重为 39.0 kg,二胎的平均出生重平均为 44.3 kg;头胎的助产率显著高于二胎的助产率[18]。Gaafar 等[15]分析了 1997—2004 年间 3 ~ 13 岁的 585 头奶牛的 1 243 头次产犊记录,认为当出生重分别为 <20 kg、21 ~ 25 kg、26 ~ 30 kg、31 ~ 35 kg、36 ~ 40 kg 及 >40 kg 时,难产率分别为 4.6%,5.7%,6.1%,7.2%,8.1% 和 8.5%。Nix 等[1]收集了 2 191 例安格斯、Brangus、无角海福特等纯种与杂种犊牛的分娩记录,认为出生重每增加 1 kg,难产率提高 0.23%。Gregory 等在安格斯、海福特、利木赞、西门塔尔、德国黄和夏洛莱牛研究中发现,出生重每增加 1 kg,难产率提高 4.2%[29]。海福特母牛的难产程度高于安格斯母牛[(34.78 ± 3.19)% vs (27.02 ± 3.13)%];在纯种与杂种犊牛之间,难产率无明显差异,但杂种犊牛的出生重比纯种的高(1.55 ± 0.26) kg。夏洛莱犊牛与 Maine-Anjou 犊牛的难产率很高,有 3.0% 需剖腹产,而只有 57% 完全顺产;阿奎坦犊牛与利木赞犊牛的难产率低,分别只有 1.6% 和 0.2%[5]。Berry 等报道,当犊牛出生重是母牛体重的 7.5% 时,难产率为 12.5%;当体重之比为 10% 时,难产率加倍,达到 25%[32]。Dhakal 等对 1 231 头犊牛的出生重进行分析后,认为品种对出生重的影响力极为显著[33]。

2.2 犊牛性别

性别是影响分娩的第二个最主要因素。因公犊的体型与体重都比母犊大,而且公犊的妊娠期一般比母犊长,因而公犊更易难产。Dhakal 等[33]报道母犊的出生重(27.57 ± 0.54) kg 显著小于公犊出生重(29.53 ± 0.53) kg。安格斯公犊的出生重为(34.13 ± 2.28) kg,难产率为 24.74%;母犊的出生重为(30.96 ± 2.55) kg,难产率为 12.64%;海福特公犊出生重为(36.11 ± 2.67) kg,难产率为 32.05%;母犊的出生重为(33.24 ± 2.45) kg,难产率为21.32%。安格斯初产母牛的公犊出生重为 33 kg,母犊出生重为 30 kg;安格斯经产母牛的公犊出生重为 36 kg,母犊出生重为 33 kg[19];夏洛莱牛公犊的出生重大于 45.4 kg 时,难产率大幅升高[18]。Bellows 等发现安格斯与海福特的杂种公犊的难产率高出母犊 40.2%;初产公犊牛的难产率为 65.8%,而经产母牛的公犊难产率为 11.1%;初产母犊的难产率为 39.2%,经产母牛的母犊难产率为 5.2%[34]。

2.3 胎位异常

胎位不正或异常(malpresentation)是临产母牛最困难的难产现象。在异常胎位中,72.8% 是后背位,之后为腕关节或肩部扭曲(11.4%)、臀位(8.2%)、头侧仰(2.5%)、肘部曲张(1.9%)、臀位(1.3%)、横位(1.3%)及斜侧位(0.6%)[35]。肉牛胎位异常的发生率在总的分娩牛中为 0.91% ~4% 之间,占所有难产中的 13% ~22.4%;胎位异常是经产牛常发的难产现象,占难产率的 20% ~40%[36]。De Amicis 等[37]对 11 年间 14 575 例意大利奶牛与肉牛的难产现象作了分析,平均难产率为 5.6%,犊牛因素显著高于母牛因素($P < 0.000\ 1$);初产母牛的难产率为 10.7%,经产母牛为 3.75%;犊牛死亡率为 24.9%,母牛死亡率为 11.1%,其中母牛与犊牛同时死亡的占 5.1%。在所有引起难产的因素中,胎位异常与胎儿巨大是主要因素占 70%;子宫扭曲在欧洲的发生率占难产率的 3.0% ~4.0%,北美占 3.0% ~7.0%,与管理与营养有关;子宫扭转与子宫乏力占 13%[37]。以精料饲喂的舍饲母牛更容易造成胎儿在子宫内的扭曲,出现各种不同的异常体位[8]。

3 公牛因素

大型品种公牛的体重与体型因素易引起犊牛的体重与体尺变大,从而引发难产。夏洛莱公牛后代的难产率为(30.90 ± 2.41)%,西门塔尔牛为

(32.66 ±3.09)%,利木赞牛为(30.78 ±3.19)%和南德温牛为(32.34 ±5.19)%,难产程度均显著高于海福特(15.78 ±2.27)%和安格斯(9.90 ±2.55)%公牛的后代[6]。公牛因素影响胎儿头的周长大小,影响犊牛的产程,周长大则难产率高。在公牛的直接效应因素中,体高、骨骼大小、骨盆面积与难产均存在一定的关系,而阴囊的环周长与难产呈正相关[14]。Casas 等认为婆罗门公牛后代的生产难度最大,显著高于安格斯、海福特、Boran、Tuli 等公牛的后代[38]。Ahlberg 等也认为海福特、安格斯、德国黄公牛后代的难产率低,而夏洛莱、利木赞和 Chiangus 公牛后代的难产率高;西门塔尔与夏洛莱母牛对分娩难度的遗传影响最小,红安格斯和 Chiangus 母牛的遗传影响最大[39]。

4　营养因素

Anthony 等分别用低蛋白(0.56 kg/d)和高蛋白(0.98 kg/d)饲喂妊娠母牛,结果产后母牛的体重分别为 418 kg 和 444 kg;犊牛出生重分别为 35.3 kg 和 36.1 kg;分娩难度分别为 1.6 和 1.6;助产率为 35.5%和 35.7%,上述指标说明孕期的蛋白质差异补充并不影响犊牛出生重与分娩难度[40]。Micke 等[11]对 3 岁龄妊娠母牛分成 2 组,一组在受精至 90 d 饲喂高能量饲料,一组饲喂低能量饲料;在 90 ~ 180 d,两组的饲喂策略互换;180 d 之后,两组采用同样的饲料。结果表明,在第二阶段饲喂高能饲料组,犊牛出生重显著增加,难产率显著提高。Hickson 等[28]认为妊娠中期对母牛的饲喂不影响犊牛出生重,但在后 1/3 孕程的补饲营养则显著促使胎儿体重增加,并认为妊娠期间调节母牛营养供给是控制出生重与缓解难产的一项重要措施。普遍得到共识的是,在妊娠的后 1/3 期间,尤其是临产前 2 个月进行营养干预,对犊牛出生重影响极大。在后 1/3 阶段对妊娠母牛过度营养或饲喂高营养饲料,致使犊牛的出生重大幅增加,引起难产,因营养限制引起的出生重过重或过轻均会导致难产。如果妊娠最后 1 ~2 个月的营养严重缺乏,可致使胎儿体重大幅减少,初产母牛的发育也严重受抑,骨盆与产道均未发育成熟,更容易引起难产。另外,妊娠后期限饲不仅影响胎儿体重,也影响母牛产乳;限饲也造成初产母牛的产后返情期延长,影响下一个繁殖期。

5　小　结

综上所述,引起牛难产的因素很多,包括母牛因素、胎儿因素、公牛因素、营养因素与环境因素等,有遗传因素和非遗传因素。其中犊牛出生重、母体骨盆结构和妊娠时长是 3 个最主要的因素。多种因素的交叉互作,使难产成为极其复杂的生理与病理现象。降低犊牛的出生重是减少难产的良好措施。建议:1)掌握母牛的初配年龄。根据青年母牛的体重与体况,尤其是骨盆大小,进行适时配种;体重达到成年母牛标准体重的 70%时,可配种;初配年龄一般在 16 ~18 月龄,体况差的可延长至 20 ~22 月龄。2)进行杂交改良时,注意公牛品种与母牛品种在体型与体重等方面的一致性;小中型品种母牛适宜与同类型品种公牛杂交,可以预防犊牛出生重过大。3)孕期母牛的营养调节尤为重要,特别在妊娠的后 1/3 期间与围产期,注意营养与微量元素和矿物质的平衡,适当减少精料,增加母牛运动量。4)注意配种季节,最好把母牛分娩期安排在春夏季节,气候温和,犊牛的体温调节得到发挥,可保证犊牛成活率。

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Research Rrogress of Stanniocalcin 2 Gene in Livestock

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Abstract: Stanniocalcin 2 (STC2) is a member of the stanniocalcin family first discovered in fish which participates in the regulation of calcium and phosphorus homeostasis. STC2 is widely expressed in various tissues and it also involves in various biological processes as a glycoprotein hormone and as a secreted protein regulating the progress of malignant tumors. STC2 is a new potential tumor marker biomolecule, and it also plays an important role in pregnancy, bone and body size in livestock. In this article, the discovery, molecular structure of *STC2* gene and protein, and its role in animal physiology, pathology, pregnancy, growth were mainly reviewed, and the possibility of its application in cattle breeding in my country was prospected.

Key words: stanniocalcin 2; tumor; livestock; research progress

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Effect and Analysis of Fasciola Hepatica on Physiological and Biochemical Level in Cow

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Abstract: [Objective] In the experiment the effect of Fasciola hepatica on immune level of dairy cows, 5 Theileria Annulata cows and 5 healthy cows were selected in Jinan city about 3 Dairy farms. [Method] The physiological index was studied according to Temperature, respiration, heart rate and HBC, WBC, HB and htc in blood. The biochemical indexes were studied according to GLU, ALT and TB. [Result] The result showed that the temperature, respiration, heart rate was increased significantly compared with the experimental group, RBC, HB and HCT significantly increased and the WBC were significantly decreased in cows infected Fasciola hepatica. The biochemical indexed showed that the GLU, ALT and TB increased were significantly decreased contrasted to healthy group. [Conclusion] The sucking of liver has a certain effect on the physiological and biochemical level of dairy cows.

Key words: Fasciola hepatica; cow; physiology and biochemistry