Dairy cattle longevity averages approximately 3 years after first calving, despite improvements in genetics and cow comfort over the past several decades. The natural life span of cattle is about 20 yr. In some parts of Western agriculture, there is a strong push to extend dairy cattle longevity. Our objectives are to first explore economic and environmental incentives for increasing average dairy cattle longevity and then discuss deterrents to increasing longevity. The vast majority of culling decisions, and by extension of dairy cattle longevity, are driven by economic decision-making. Younger herds capitalize on genetic progress but have fewer efficient mature cows and greater replacement costs. There is also a growing interest in the use of beef semen in dairy cattle, which does not add to the supply of dairy heifers. High premiums for crossbred calves suggest a greater marginal value of extending dairy cattle longevity. Extending dairy cattle longevity might also decrease the environmental footprint of milk production. Historically, models focused on optimizing culling decisions for individual cows, while assuming an unlimited supply of heifers, found optimal cull rates of approximately 30%. This suggests a slightly longer longevity than is currently observed. However, cow performance has changed and the average findings of these models may no longer be optimal. Some consider a shorter longevity a result of unavoidable forced culling and a welfare issue. Management and housing may affect longevity by improving health care and cow comfort. On the other hand, this shorter longevity is also driven by an abundance of replacement dairy heifers now available through the use of sexed semen and good reproduction. The dairy community should reevaluate how many dairy heifers are needed, which animals should be the dams, and what to do with animals that do not need to supply replacements. Genetic selection, cow comfort, and health care will increase the ability of cattle to avoid culling for forced reasons. These topics are interdependent and will drive future changes in dairy cattle longevity.

**Key Words:** longevity, culling, productive life

### 345 Replacement heifers: How many, what kind, and how should we manage it all?

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Historically, most producers raised every heifer born. However, advancements in transition and reproductive management, coupled with widespread use of sex-sorted semen in dairy heifers and cows, have led to an oversupply of dairy replacement heifers in the US. In addition to being a large negative cash flow, raising costs are significantly higher than replacement values, resulting in large economic losses, assuming market values fail to recover quickly. Consequently, producers are asking “How many heifers do I need?” and “What do I do with the excess?” Future herd turnover is the driver of replacement needs. To calculate herd turnover, divide the total number of cows (milking and dry) that leave the herd (sold or dead) over 12 mo by the average population at risk (milking and dry) for that same time. Assuming a stable herd size, cows removed due to mortality, disease, infertility, low milk production, or sold for dairy purposes should be replaced immediately with fresh heifers to keep facilities full and more completely dilute fixed costs. Historic farm-level herd turnover risks are a logical starting point for predicting replacement needs but cannot account for unanticipated health, fertility problems, or economic opportunities to improve the herd. Herd turnover is costly, but limiting the number of replacement heifers raised may lead to large future lost opportunity costs due to an inability or unwillingness to replace a less productive cow at the appropriate time. Aside from the anticipated herd turnover, other considerations, beginning at the time of conception, include sire choice, abortion risk, stillbirth risk, heifer mortality risk, heifer reproductive efficiency, heifer abortion risk, and heifer growth rate. Producers are now breeding some of their dairy animals to beef sires and culling excess heifers at various ages, depending on milking and dry) for that same time. Assume heifer growth rate. Producers are now breeding some of their dairy animals to beef sires and culling excess heifers at various ages, depending on the anticipated market values. Criteria for culling include genetic potential, growth performance, and health history. Proper and timely culling decisions can reduce the cash flow drain, lower future economic loss, and increase the net value of heifers entering the milking herd.

**Key Words:** replacement heifer, herd turnover, culling
The impact of genomics combined with Advanced Reproductive Techniques including the improved performance of sexed semen has revolutionized the rate of improvement in dairy cattle genetics and milk production in the last 10 years. According to CDCB, the rate of improvement in production traits doubled in the first 5 years of genomic selection compared with the previous 5 years. Further management traits such as PL have doubled the rate of improvement while DPR has increased by 10-fold (0.17 to 1.74) with genomic selection during the same period as PL. Combining genomic selection with IVF embryo production from heifers as young as 6 mo and improved utilization of early cell production from bulls has decreased the generation interval in the elite genetic population from 7 years for sires of bulls and 5.1 years for dams of bulls to approximately 26 mo for both. As Dechow and Rogers note (2018, J. Dairy Sci. 101:4312–4316), the effect of this shortened generation interval and genetic improvement will migrate rapidly to the commercial population. Sex-sorted semen used on the highest genetic merit animals in a herd has been modeled by STG (Kendall, Heuer, Sun, Deeb) to lower the generation interval for commercial cows to 2.5 years. This rate of genetic improvement combined with a shortened generation interval changes the economics of longevity. This presentation will review the combination of genomics, sexed semen and beef on dairy which will contribute to a longer productive life for the commercial dairy cows.

**Key Words:** genomics, longevity, economics