

PIG BREEDING**A. J. Webb**

Today the pig breeding industry finds itself at the point of confluence of two technologies: the quantitative and the molecular. For thirty years performance testing and selection have delivered improvements in lean growth that have maintained the competitive position of the industry. Now with well over 1500 potential marker genes from international maps, the questions are only of timing and the most cost-effective methods for introducing marker-assisted selection.

As well as methods, the genetic objectives for pig improvement are changing. Along with continued reduction in the cost per kilo of lean, mainly through lean growth and litter productivity, there will be increasing pressure to improve all aspects of meat quality and uniformity. As the size of enterprise grows, and perhaps multifactorial diseases become more complex, so the need for reliability and manageability increase. Already many industries probably fail to realize up to 30% of their existing genetic potential. Future objectives therefore split into two distinct classes: first to increase the genetic potential for performance traits, and second to raise the probability that this potential can be realized in practice.

Although there are some very spectacular opportunities on the horizon for almost in vitro marker-based selection using the new reproductive technologies, there is no suggestion that quantitative selection will be superseded in the short term. It is therefore reassuring to learn in this session that BLUP is very robust to departures from the optimum population structure, and is in many respects a "self optimising" system for more diverse national improvement programs (Groeneveld and Spilke). There is equally reassuring evidence that there is still plenty of genetic variation for selection, that there are no serious genetic antagonisms, that BLUP selection has been successful in practice, and that these improvements are reaching commercial producers.

For the present the cost of marker assisted selection is still high in relation to the benefit. There is a need for caution since the performance benefits may be small, there may be undesirable correlated effects, and there is a risk that

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marker selection may be unsuccessful while slowing down progress from conventional selection. However there is no doubt that the cost of DNA testing will come down with the appearance of new cheaper methods such as RAPDs and AFLPs. Greatest benefits from markers are likely for traits that are difficult to measure directly (Visscher and Haley), and the timing of their arrival is likely to coincide exactly with the need to change objectives.

So what are the special challenges to emerge for pig genetics? Undoubtedly the greatest is disease resistance with the promise of better welfare, improved performance, lower medication costs, and reduced risk of residues. Another will be to meet rising standards for quality and uniformity set by retailers. For breeding programmes, the challenge will be to deliver competitive rates of improvement while minimising the overhead cost of nucleus and multiplication without loss of heterozygosity or genetic variation. It is also perhaps not too early to consider the role of pig production in sustainable systems of the future where human health, the animal environment, and stewardship of the countryside are critical issues. It is very evident from this Congress that current quantitative methods with or without assistance from markers can continue to provide competitive rates of improvement for at last the next decade, so the pig industries of the world will not be under great pressure to venture hastily into the molecular technologies. However, all of us will have to share in the responsibility of entering the debate about their role.

UZGOJ SVINJA

Danas se industrijski uzgoj svinja nalazi na stjecištu dviju tehnologija: kvantitativne i molekularne. Trideset godina testiranja performance i selekcije dovelo je do poboljšanja rasta mršavog (mesa), što je održalo takmičarski duh industrije. Danas sa znatno više od 1500 marker gena s međunarodnih karata, pitanja su samo vremena i isplativih metoda za uvođenje selekcije uz pomoć markera.

Genetski ciljevi za poboljšanje svinja mijenjaju se, kao i metode. Sa stalnim smanjenjem troškova po kilogramu mršavog, uglavnom rastom mršavog i proizvodnosti mladunčadi, doći će do sve većeg pritiska za poboljšanje svih oblika kakvoće mesa i njegove jednoličnosti. S rastom poduzeća, a možda i kompleksne bolesti postanu još kompleksnije, porast će potreba za pouzdanosti i izvedivosti. Mnoge već industrije nisu svjesne do 30% svog postojećeg genetskog potencijala. Budući se ciljevi zato dijele u dva određena dijela: prvo povećati genetski potencijal za osobinu performance, a drugo potaknuti mogućnost da se taj potencijal ostvari u praksi.

Iako su na pomolu neke vrlo spektakularne mogućnosti za selekciju in vitro na osnovi markera primjenom ovih reproduktivnih tehnologija, nema navještaja da će kvantitativnu selekciju uskoro istisnuti. Stoga ohrabruje čuti na ovom skupu da je BLUP vrlo žilav za skretanja od optimalne populacijske strukture i u mnogom pogledu sustav "koji se sam usavršava" za raznolikije nacionalne programe za poboljšanje (Groeneveld i Spilke). Jednako ohrabruje podatak da još uvijek ima mnogo genetskih antagonizama, da je BLUP selekcija uspješna u praksi, te da poboljšanja dopiru do komercijalnih proizvođača.

Za sada je cijena selekcije pomoću markera još uvijek visoka u odnosu na korist. Potreban je oprez jer prednosti performance mogu biti male, može doći do neželjenih uzajamnih učinaka, rizika neuspjeha marker selekcije, te istodobno do usporavanja napretka u komercijalnoj selekciji. Međutim, nema sumnje da će cijena DNA testiranja pasti s pojavom novih jeftinijih metoda kao što su RAPD i AFLP. Markeri su vjerojatno od najveće koristi za osobine koje je teško izravno mjeriti (Visscher i Haley) i vrijeme njihovog dolaska vjerojatno će se podudarati s potrebom za promjenom ciljeva.

Prema tome što su posebni izazovi koji će se pojaviti u genetici svinja? Nesumljivo je najveći otpornost na bolesti s nadom u bolju skrb, bolju performancu, niže troškove za lijekove i smanjen rizik rezidua. Zatim će biti udovoljavanje sve višim standardima kakvoće, ujednačenosti, koje postavljaju trgovci. U uzgojnim programima izazov će biti donošenje konkurentnih cijena za poboljšanje uz smanjenje režijskih troškova za nukleus i multiplikaciju bez gubitka heterozigotnosti ili genetske raznolikosti. Isto tako možda nije prerano razmatrati ulogu proizvodnje svinja u održivim sustavima budućnosti gdje su ljudsko zdravlje, životinjski okoliš i upravljanje prirodom kritična pitanja. Vrlo je očito da današnje kvantitativne metode, sa ili bez markera, mogu bez takmaca nastaviti na poboljšanju barem u sljedećem desetljeću, pa industrija svinja u svijetu neće biti pod velikim pritiskom da se upuste nepromišljeno u nove tehnologije. Međutim, svi ćemo morati dijeliti odgovornost upuštanja u raspravu o njihovoj ulozi.

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