



Q & A

1. DOES THE NEXT GENERATION IMMUNITY+® STILL INCLUDE COMPONENTS FOR ANTIBODY MEDIATED IMMUNE RESPONSE (AMIR) AND CELL MEDIATED IMMUNE RESPONSE (CMIR)?

Yes. The Next Generation Immunity+ includes significant contributions from Antibody-Mediated Immune Response (AMIR) and Cell-Mediated Immune Response (CMIR). The Antibody component fights bacterial infections that are outside the cells of the body such as those responsible for Mastitis, metritis and digital dermatitis. The Cell component fights viral and mycobacterial infections that reside inside the cells of the body such as those responsible for viral pneumonia, retained placenta and Johne's. Next Generation Immunity+ also includes a new component called Nitric Oxide Response.

2. WHAT PART OF THE IMMUNE RESPONSE DOES THE NEW NITRIC OXIDE COMPONENT ADDRESS AND HOW DOES IT HELP TO IMPROVE OVERALL IMMUNITY?

Nitric Oxide has two main effects on the immune system. The first is as a first line of defense to kill off pathogens quickly, Nitric Oxide itself is toxic to invading organisms, and can kill off minor infections before the rest of the immune system needs to be involved. The second, is as a signalling molecule that primes other components of the immune system to act when dealing with larger pathogen challenges. Although all its' roles in the immune system are not well known, it has been shown to have a positive impact on infectious diseases, tumors, autoimmune processes and chronic disease.

3. IS THAT THE ONLY THING THAT IS NEW ABOUT NEXT GENERATION IMMUNITY+?

The Next Generation Immunity+ includes two major components; Immune Response (which includes AMIR, CMIR and Nitric Oxide) and a composite of publicly available disease traits sourced from CDCB, Lactanet and Zoetis. The inclusion of specific disease traits alongside Immunity ensures animals can both mount a strong overall immune response, but then also be able to recognize the specific pathogens that cause the most important diseases on dairy farms.

4. WILL IMMUNITY+ CONTINUE TO BE PUBLISHED AS A BRAND ONLY ON BULLS, AND LETTER CODES H-A-L ON GENOMIC TESTED FEMALES?

The Next Generation Immunity+ involves the full publication of an Immunity Index on all Semex males and a new value-added trait for Elevate genomic tested females. Since cow diseases are quite distinct in cause from calf diseases, we will also be publishing a Calf Immunity Index. The Calf Immunity Index combines Immune Response traits AMIR and CMIR with specific calf disease proofs. Both indexes will be published with a mean of 100, and a standard deviation of 5 so proofs will generally range from 85 to 115. Immunity+ bulls will be designated as being superior transmitters of high immune response if they have an Immunity Index ≥ 105 and a Calf Immunity Index ≥ 100 . The higher requirement for Immunity Index vs Calf Immunity Index reflects the economic importance of cow disease traits in relation to calf disease traits.

5. HOW WILL THE PUBLICATION OF AN IMMUNITY INDEX AND CALF IMMUNITY INDEX HELP THE DAIRY PRODUCER?

With the publication of the Immunity Index and Calf Immunity Index, clients have more ways to manage health genetics in their herds. Clients will be able to incorporate Immunity values in their sire selection and use Elevate® to sort and filter their females for the two Immunity traits. Publishing both Immunity Index and Calf Immunity Index allows clients to target their genetic selection to specific needs requiring improvement on the dairy. With solutions coming soon, clients will be able to customize their client index and better incorporate Immunity (the best health index available) into their selection goals.



6. IS THIS CHANGE A CONCESSION BY SEMEX THAT SPECIFIC DISEASE TRAIT SELECTION IS BETTER THAN IMMUNITY?

Absolutely not. The past Immunity+® has been shown to be outperforming Wellness traits (WT\$) and CDCB's Health Index (HTH\$) in terms of reducing disease (-22% vs -15% and -21%). The concept for Next Generation Immunity+ is to take the best parts of Immunity+ and the best parts of specific disease trait selection and create something even more powerful than the sum of the parts, reducing disease by a whopping 29%. The new Immunity index exceeds all other global health selection indexes and it continues to be a Semex exclusive.

7. HOW CAN YOU EXPLAIN POPULAR BULLS SUCH AS UNIX, ALLIGATOR, FUEL AND LEMAGIC LOSING THEIR IMMUNITY+ STATUS?

Under the past Immunity system, bulls that qualified for Immunity+ never lost their brand designation. This will no longer be the case under the new system. The Immunity genetic/genomic evaluation will be run each proof round and bulls will need to re-qualify for Immunity+ each time which means some bulls may add Immunity+ status and some may lose it. Semex has made great strides in selection for Immune response, clearly above the population due to intense selection in product development. Genetic progress continues for this trait like all other genetic traits so bulls that passed thresholds at one time may not pass the same thresholds as the population improves over time. In some cases, bulls that formerly qualified for Immunity remain strong for Immunity however they may have lower proofs for specific disease traits, and this new approach to Immunity means they no longer qualify for Immunity+.

8. WHY IS THE NEXT GENERATION IMMUNITY+ BETTER THAN THE OLD IMMUNITY+?

The new approach takes two distinct health selection concepts, one being Immune Response and the other being a selection of the most important disease traits, and it combines those two approaches for maximum impact. The inclusion of specific disease

traits alongside Immunity ensures animals can both mount a strong overall immune response, but also be able to recognize the specific pathogens that cause the most important diseases on dairy farms. Immunity is incredibly strong due to the high heritability (30+%) and the pure quantitative measures of immune responses, however its' only weakness was the number of observations due to the high expense to collect large volumes of phenotypes. Specific disease traits have large volumes of observations via on-farm data, however they all have very low heritabilities due to an abundance of noise in the data coming from inconsistent collection and improper diagnosis both within farm and from farm to farm. The new Immunity+ takes the merits of the two approaches for maximum combined genetic effect, and thus shows the greatest potential for pronounced disease reduction compared to all other health indexes available in the world.

9. HOW DOES SEMEX MONITOR THE PERFORMANCE OF IMMUNITY + DAUGHTERS TO ENSURE THE PRODUCT CONTINUES TO PERFORM IN THE FIELD?

Semex has a very large global database of health events that were used to create this index. That same database will be used for continuous validation in the future, ensuring that the index continues to provide robust resistance to all relevant diseases. Semex will continue to respond and create an optimal index as public health traits or trends in commercial health occurrences change over time.



THE WORLD'S BEST HEALTH INDEX

