STAGE 4: WEANING

Current situation at weaning

Weaning is the most crucial stage for the farmer and his animals. If it goes well, it paves the way for a bright and easy future. If it goes bad, most of the times it will be a lost race in the fattening phase. From birth onwards, piglets are really good at the digestion of fat. Fat is abundantly present in colostrum and sows milk. The change from a fat rich to a carbohydrate rich diet during weaning proves to be a challenge for piglets.

Good results in the fattening phase are determined by 2 key factors. Weaning age and weaning weight. Weaning age is mostly dependent on the managing system. Weaning weight is dependent on weaning age and the genetics of the sow (birth weight and litter size). But a weight difference of 500g at weaning results in weight difference of 1kg at 42 days after weaning [87] and 100 g extra at weaning gives 10 g/day extra growth [88]

At weaning, food and water intake from the piglet decreases causing a disruption in gut health and giving infections a chance to penetrate the piglet from within. A new key insight is that there are more streptoccoccus suis present in the gut than presumed. This implicates that a damaged intestinal lining at weaning imposes a huge danger for the piglet.[89]

It is well known that after weaning the gut microbiota diversity of piglets changes when the diet switches from liquid to solid. During this change piglets are also highly susceptible to enteric diseases such as post weaning diarrhea which causes an overgrowth of enterotoxigenic Escherichia coli and a reduction of lactic acid bacteria in the gastrointestinal tract.

At the age of weaning the immune system is not yet mature and the impact of abrupt removal of maternal protection coupled with stress and potential infection creates an immunity gap. Adding functional nutrients that augment immune development in the young animal to feeds can provide a competent immune system in later life while reducing the need for antibiotic interventions.

A smooth transition from the preweaning to the post weaning period can be achieve by feeding piglet more or less the same high quality feeds before and after weaning. This can enhance faster feed intake and reduce the devastating effect on gut integrity due to fasting. All of these can be translated into higher growth and better faeces consistency allowing higher within-batch homogeneity in later phases.[90]

[87] Bruyninx et al 2001
[88] Kristien vanbelleghem varkensbedrijf 2015
[89] MAM Spreeuwenberg 2002
[90] MAM Spreeuwenberg 2001

Literature statements and key numbers about weaning

The gut is largely accepted to be the gatekeeper of general health in animals as in humans. The surface of the intestinal tract is 300 times the size of the skin's surface. At the same time, it should give a similar level of protection against invaders, while being highly permeable in order to absorb precious nutrients. This is why 70% of the immune cells are located in the mucosa of the gut.[91] The small intestines are the place where uptake of most nutrients happen. This uptake is regulated by specific receptors on the cells for every type of nutrient. This is the result of the presence of tight junctions.[92]

Tight junctions in between the mucosal lining of the gut have a major task to close the cell lines and to avoid paracellular passage of bacteria, toxins and other undesired substances from the lumen to the inside of the body. These tight junctions are protein structures that consume lots of energy to stay intact.[93] Several stress factors can have a negative impact on the quality of these tight junctions, leading to the 'leaky gut' syndrome by which big sized molecules such as toxins, bacteria or aggressive radicals are able to pass in between, resulting in cell damage, production of inflammatory cytokines and consequently the activation of the immune system.

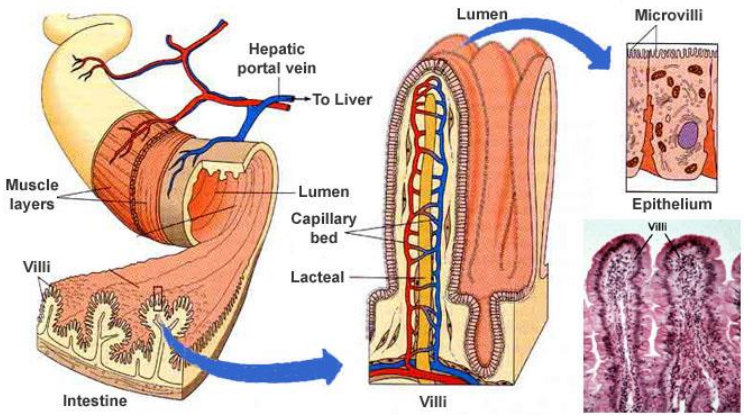


Fig 9: Presentation of the small intestines

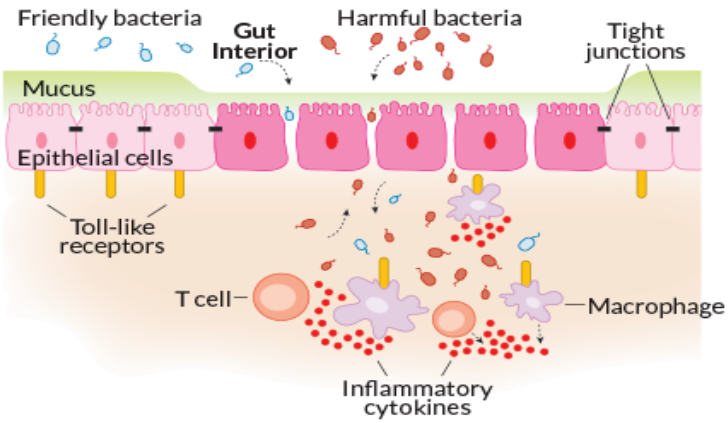


Fig 10: presentation of intestinal lining and tight junctions

[91] Symposium guthealth 2016 Schothorst feed research
[92] C. H. Hu et al 2013
[93] C. H. Hu et al 2013

The neutralization of these inflammatory components will consume significant amounts of nutrients, which will be shown in reduced growth rates and increased feed conversion rates. Also, these inflammatory components will damage even further the intestinal lining and increase inflammation and diarrhea.[94] Therefore, reduction of post weaning stress that induces an inflammatory immune response is very critical for improving weaning to market body weights.

Research shows that piglets who learned to eat in the farrowing pen tend to eat better in the nursery phase but that nevertheless 50 % of the piglets doesn't eat 16u post weaning[95].This starvation period has an instant and acute effect on the physical health of the gut and its microbiome. It is proven that the villi, that form the contact surface between the animal and its nutrients become shorter and thicker after only a few hours after the animal stops to eat. Five days after weaning their height is reduced with 50 % and this reduces the capacity to absorb nutrients even more.[96] This results in the fact that energy intake the first week post weaning is only 60-70% of the preweaning milk intake and it takes 2 weeks to achieve full recovery[97]

The intestinal microbiota (microbiome) will also be disturb by this period of diet change and unsure nutrient supply. This can cause a shift in its composition, leaving an opportunity for harmful bacteria to gain in numbers. The microbiome has multiple functions that benefit its host. They are linked to the immunological development and immune competence of its host (they produce antimicrobial peptides) and they also have digestive capacities.[98] It is proven that early life crosstalk in the gut between microbes and the host dictates his immune programming and development.

By investing in higher amounts of starter diet in the immediate post-weaning period (up to six weeks of age) higher feed intake is achieved. From previous studies it is known that high quality starter diets help the piglets cope better with disease pressure in the immediate post-weaning phase but also, stabilize the microbiome of the gut facilitating the nutrient absorption and protein deposition rather than spending higher amounts of energy fighting disease pressure. An added benefit of a stable microbiota is the reduction of diarrhea in the immediate post-weaning period. Daily growth during the first week after weaning determines for 40% the feed intake and growth during the growing phase.[99]

Higher quality in feed can be achieved by reducing the crude protein (CP) levels and add functional amino acids. Although protein rich diets are good for growth, weaned piglets lack the enzyme production to digest them. This will lead to high amounts of indigestible protein that will enter the colon as a fermentable substrate. This fermentation produces ammonia and toxic byproducts having a negative effect on gut integrity and the microbiome.

To fiber as well one should pay attention. There are fermentable carbohydrates and inert carbohydrates in the feed. Research shows that it is better to raise the concentration of inert fibers in the diet right after weaning. They seem to stimulate feed intake and favor the growth performance. They also lowered the concentration of E. Coli and improved the enzyme production.[100]

The last means to improve quality of post weaning feed is to pay attention to additives. Organic acids have proven to lower the pH in the stomach and to lower the speed with which the nutrients pass from the stomach to the small intestines. This improves digestion, leaving less substrate to be fermented in the colon. They also seem to be an energy sources for the cells of gut lining.[101]As important as feed is

[94] C. H. Hu et al 2013
[95] Bruyninx et al 2002
[96] Hampson et al 1986
[97] Jean le Dividich. 2001
[98] Renz et al 2012
[99] Tokach et al 1992
[100] Molist et al 2010, Gerritsen et al 2012
[101] De Lange et al 2010

water intake during the first days after weaning because they are connected. A general advice is 1 drinking spot per 5 piglets during the first days

All this means that the focus for post weaning feed in the first week is more on maintaining gut health than on feed conversion. It means that the relationship between the gut lining, microflora and nutrition should be in a perfect balance.

Supplementing your piglets with the right feed after weaning.

As literature shows, prevention of post weaning problems is a matter of a stress free environment and of learning piglets to eat before they are weaned. This to ensure a weaning moment that passes as smooth as possible. The same high quality feed before and after weaning helps the piglet to cope with this benchmark moment.

For this reason Ardol has developed 2Wean Concentrate. This feed additive can be mixed in starter feed at a 3-4% ratio. It allows you to present your piglets with the same high quality feed from as early as 8 days in the farrowing pen till 10 days post weaning. This is in order to learn the piglets to eat as soon as possible and to install a healthy and stable intestinal microflora that can cope with the exposure to possible pathogens around weaning.

Trial 7: Feed trial – commercial farm

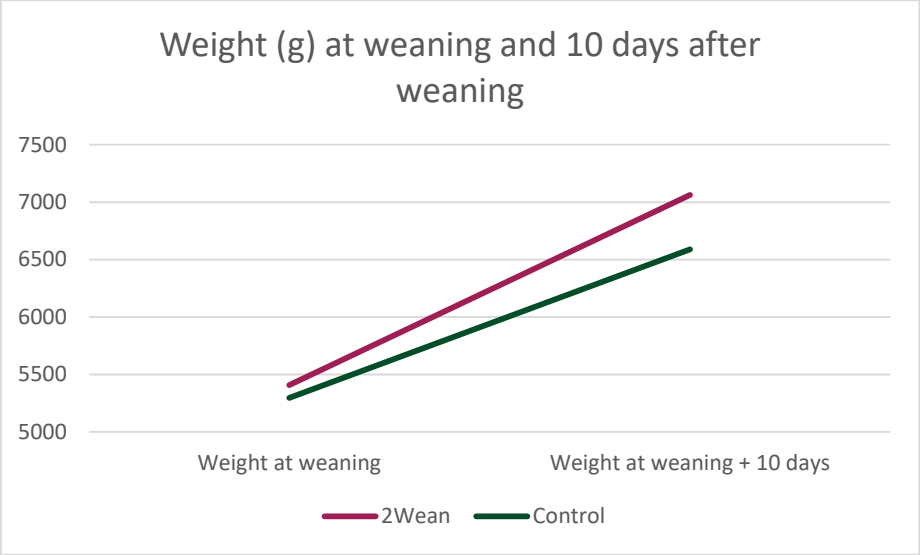
The use of BASDIAR followed by 2Wean feed till 10 days post weaning installs a healthy and stable intestinal microflora that can cope with the exposure to possible pathogens. It allows the piglet to digest the nutrients contained in the sow's milk in an optimal way and boosting its performance around weaning.

Material & Method:

- 1358 piglets divided over the control and 2Wean group.
- The 2Wean group received 100 gram BASDIAR per litter per day during 7 days starting at birth followed by 2Wean feed at day 8 in the farrowing pen till 10 days post weaning.
- The control group got artificial milk and a commercial prestarter.
- The weight was measured individually at birth, after 10 days, at weaning and 10 days post weaning.

Results:

	Test	Control	Difference
Weight at birth	1504 g	1453 g	+ 51 g
Weight at 10 days	2824 g	2703 g	+ 121 g
Weight at weaning	5407 g	5296 g	+ 111 g
Weight at weaning + 10 days	7063 g	6589 g	+ 474 g
Growth per day: birth – weaning	195 g	191 g	+4 g
Growth per day: weaning – weaning +10 days	118 g	93 g	+ 25 g



Conclusion:

The use of BASDIAR together with 2WEAN feed from birth till 10 days post weaning resulted in a smooth weaning period with heavier weights at weaning and at 10 days post weaning.

Trial 8: Feed trial – commercial farm

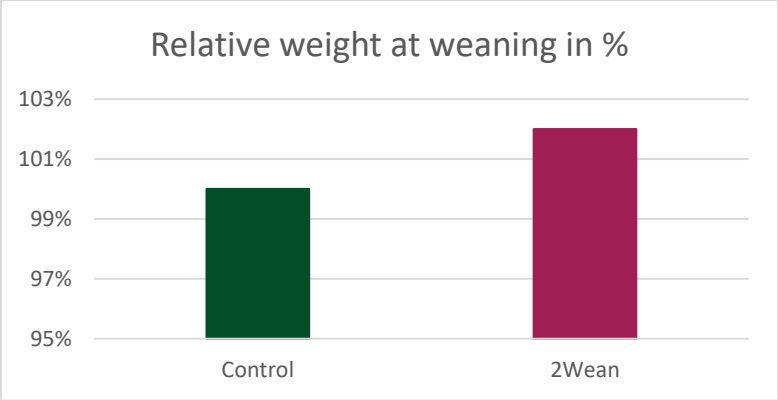
The use of BASDIAR followed by 2Wean feed till 10 days post weaning installs a healthy and stable intestinal microflora that can cope with the exposure to possible pathogens. It allows the piglet to digest the nutrients contained in the sow's milk in an optimal way and boosting its performance around weaning.

Material & Method:

- 707 piglets divided over the control and 2Wean group.
- The 2Wean group received 100 gram BASDIAR per litter per day during 7 days starting at birth followed by 2Wean feed at day 8 in the farrowing pen till weaning.
- The control group got artificial milk and a commercial prestarter.
- The weight was measured individually at birth, after 10 days, and at weaning.

Results:

	Test	Control	Difference
Weaned piglets / sow	12.7	12.3	+0.4
Weight at birth	1622 g	1612 g	+ 10 g
Weight at 10 days	3584 g	3584 g	0 g
Weight at weaning	6598 g	6497 g	+ 101 g
Growth per day: birth – weaning	237 g	231 g	+ 6 g



Conclusion:

The use of BASDIAR together with 2WEAN feed from birth till weaning resulted in more weaned piglets per sow and heavier weighs at weaning.