



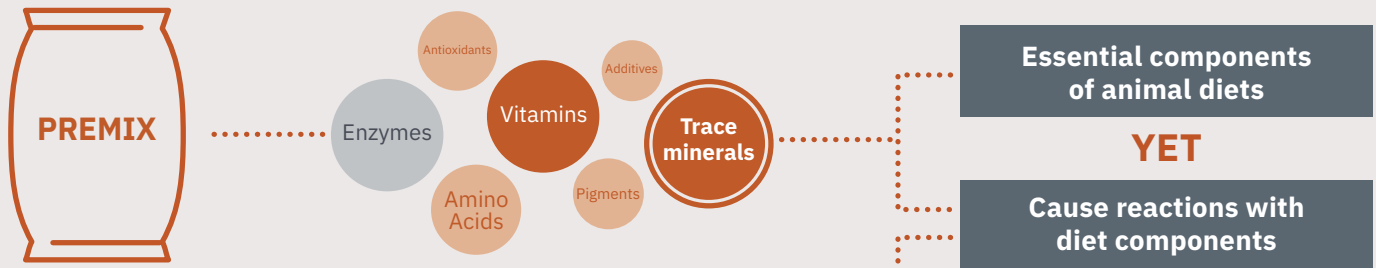
MINERAL MANAGEMENT

Alltech Ireland **Mineral Update**



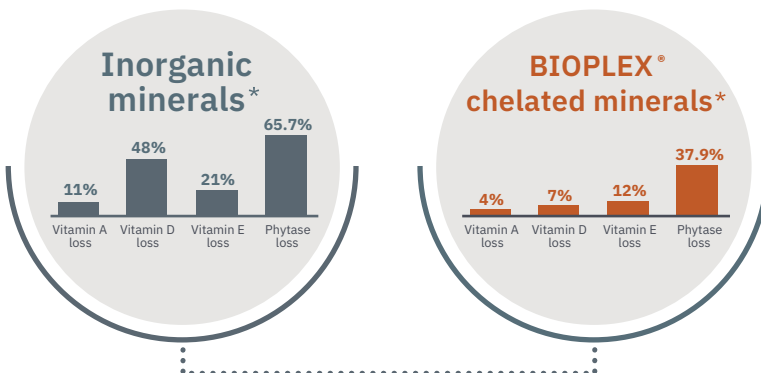
TRACE MINERALS AND PREMIX COMPONENTS

We know that Bioplex minerals improve animal performance. Did you know that they also prevent storage related losses of expensive premix components?



What is the trade-off?

Depends on your trace mineral source



HOW?



Antioxidants

Dissociated free mineral
 ↓
 Free radical formation
 ↓
 Antioxidant loss



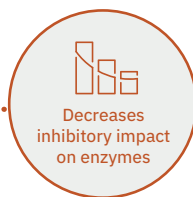
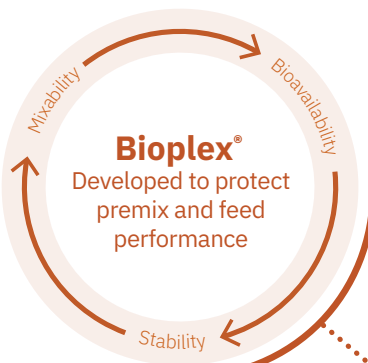
Enzymes

Substrates react with inorganic mineral ions
 ↓
 Lower substrate availability
 ↓
 Reduced enzyme activity



Vitamins

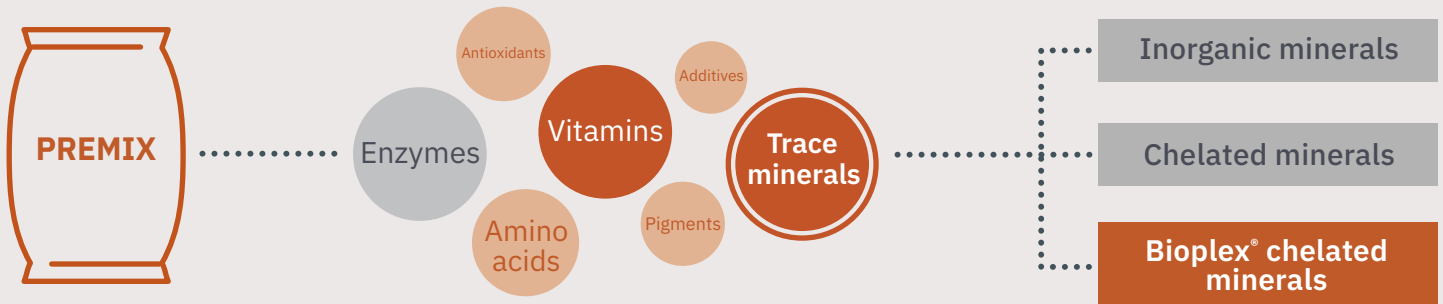
Mineral oxidative action
 ↓
 Functional instability
 ↓
 Increased degradation



BIOPLEX®
 chelated trace minerals getting you more for less

CHOOSING BIOPLEX®

Why is Bioplex superior?



Chelated minerals

Unstable complex/chelate

Amino acids bound weakly to metal ion



Performance

By providing a stable chelate structure, more mineral is available for absorption, allowing for utilization and maximizing performance



Bonds

The types of bonds present determine the chelate's properties, including its strength and stability



Bioavailability

The strength and stability of the bonds will impact how much mineral reaches the absorption site



Structure

The raw materials and manufacturing processes utilized impact the type and quality of the chelating bonds

Not all chelated minerals are created equal

Bioplex® chelated minerals

Stable chelate

Peptides and amino acids (AA) bound to metal ion

Poor stability + Reduced bioavailability

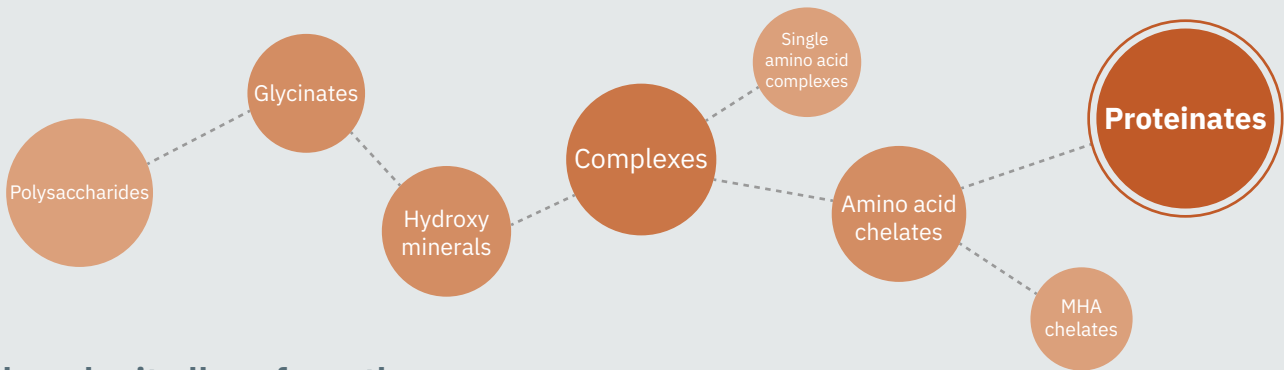
BIOPLEX®

Designed to improve the absorption of essential trace minerals

Improved stability + Enhanced bioavailability

Source: 2021 internal meta-analysis (pending publication)

There are many different types of organic trace minerals available,



but they don't all perform the same.

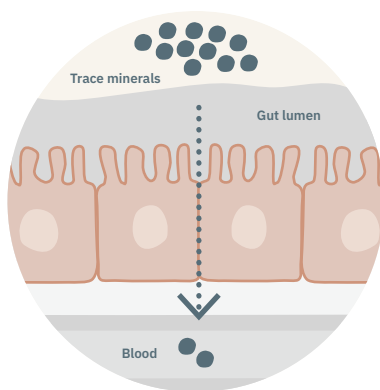
WHAT ARE ORGANIC TRACE MINERALS (OTMs)?

An OTM is simply a mineral that is attached to something that contains carbon. They are created by a process known as complexing, or chelating, during which mineral salts are attached to organic compounds such as amino acids, proteinate chains, sugars and even organic acids. There are many different types of production processes, resulting in many types of OTM products on the market.

WHAT ARE THE BENEFITS OF USING OTMs?

Inorganic minerals

Sulphates, oxides and chlorides



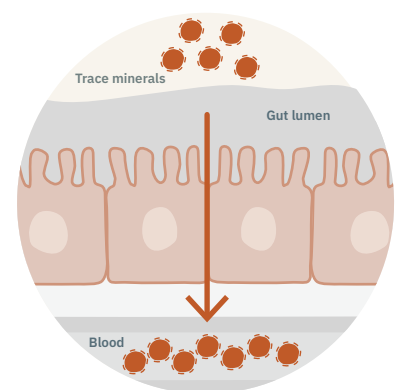
Minerals must be protected to keep them from interacting as they travel through the GI tract.

When the mineral is protected, more is delivered to the site of absorption.

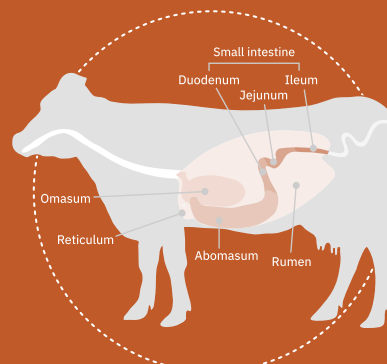
The best protection comes from having the strongest bonds.

Organic minerals

Proteinate chelate: Amino acids and peptides bound to trace mineral



Bonds are considered strong when they stay together in low-pH conditions (like those in the GI tract).



Region	pH
Reticulorumen	5.5 – 7.5
Omasum	2.5
Abomasum	2.0 – 2.5
Duodenum	2.7 – 4
Jejunum	4 – 7
Ileum	7 – 8

*Not applicable for EU



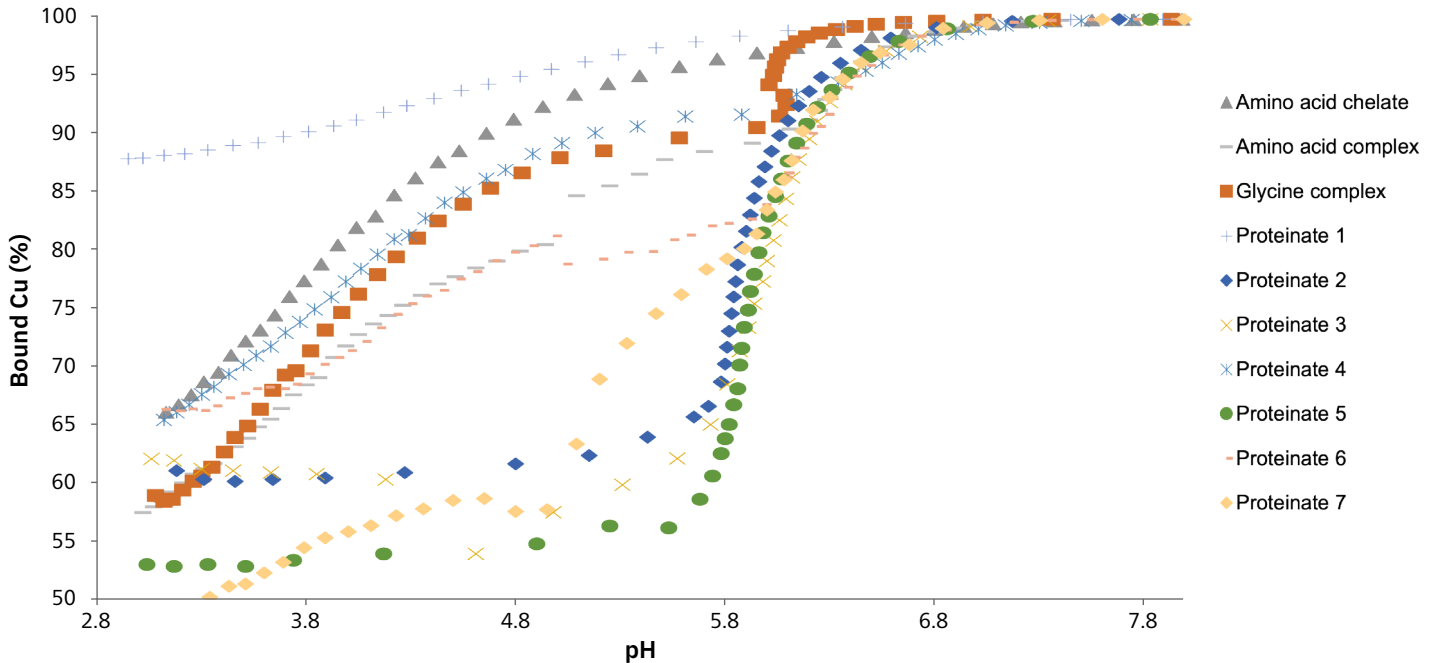
When OTM bonds are not strong, they break and release the mineral. This means that the mineral is less likely to be absorbed, and instead, the mineral gets excreted and is not used by the animal.

STRONG MINERAL BONDS INCREASE THE STABILITY OF OTMs AT A LOW pH AND, AS A RESULT, ALSO INCREASE THE AMOUNT OF MINERAL ABSORBED.

DO ALL ORGANIC MINERALS HAVE THE SAME STABILITY?

NO! ➡

A recent study comparing OTMs found that there was a big difference in the amount of bound mineral that was still present when the pH was low.



Byrne et al., *Animals* 11:1730, 2021 (Bioplex-748)

WHAT DOES THIS MEAN?

When OTMs break apart as the pH drops, there is less mineral available for the animal to utilize, and more mineral is excreted as waste.



WHY DO OTMs HAVE DIFFERENT STABILITIES?



OTM structures and manufacturing processes can vary by company, and those differences determine bond strength and stability.

HOW TO CHOOSE A STABLE OTM

Research shows that mineral proteinates, such as Bioplex®, offer **consistently better stability** than other OTM products. But **not all proteinates are the same**; in fact, many of the proteinates featured in the same research mentioned above offered **less than 50% bound mineral** at a low pH. **That's 50% less mineral available to your animals.**

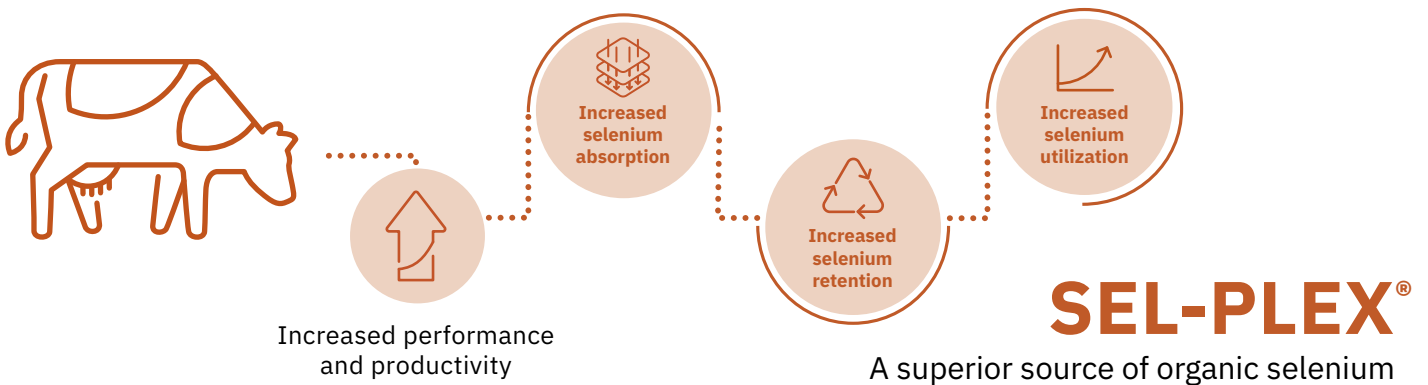
If an OTM is stable, then it can be provided at lower levels, and inorganic minerals can be removed from the diet completely. If your supplier recommends a **TOTAL REPLACEMENT** program, then you can be confident that your mineral remains stable in the gut and that you have a superior mineral program in place.

CHOOSING A SELENIUM SOURCE

Why is Sel-Plex superior?



	Inorganic selenium	L-SeMet / HMSeBA	Sel-Plex
Toxicity	Very high	Comparable to inorganic Se	Low
Source	Inorganic salt	Chemically synthesized	Selenium yeast
Stability	Poor	Poor over time / Not directly determined	High
Bioavailability	Low	Comparable to inorganic Se	High
Performance	Low to no improvement	Comparable to inorganic Se	Multi-factor improvement



- Stored in tissue
- Stable in premix
- High bioavailability
- Low toxicity
- Safe to handle
- Natural yeast fermentation

BIOPLEX®

Long-term effect of organic trace minerals on growth, reproductive performance, and first lactation in dairy heifers



Objective: Investigate the effect of TM (trace mineral) form on growth, reproduction, and first-lactation performance in dairy heifers exposed to inorganic or organic TM in utero through 100 DIM (days in milk) under controlled feeding management.

Materials and methods: **Size:** 64 dry cows and their calves **Duration:** 60 days before calving to 100 DIM (days in milk) **Treatments:** Mn, Cu, Zn and Co were supplemented as either trace mineral proteinates (Bioplex®, Alltech Inc.) and Se as organic selenium-enriched yeast (Sel-Plex®, Alltech Inc.) or inorganic sulfates in the following levels, per life stage:

	Milk replacer (ppm)*		Starter (mg/hd/d)		Heifer (mg/hd/d)		Dry cow (mg/hd/d)		First lactation (mg/hd/d)	
	ITM	OTM	ITM	OTM	ITM	OTM	ITM	OTM	ITM	OTM
Mn	24	35	1.03	0.82	211.6	225.9	145.1	126.5	385.9	353.2
Cu	9	13	1.59	1.20	71.9	75.5	78.8	75.3	128.9	67.0
Zn	38	49	0.77	0.54	213.1	228.3	382.8	387.9	392.8	358.9
Se	0.57	0.62	0.02	0.02	1.3	1.4	1.9	1.9	2.4	2.6
Co	0.32	0.23	0.02	0.03	1.2	1.3	1.3	1.3	1.9	1.0

*Mineral levels in milk replacer were from complete feed (ppm), while levels for starter, heifer, dry cow and 1st lactation diets were from mineral supplementation (mg/hd/d).

TRT study

Results:

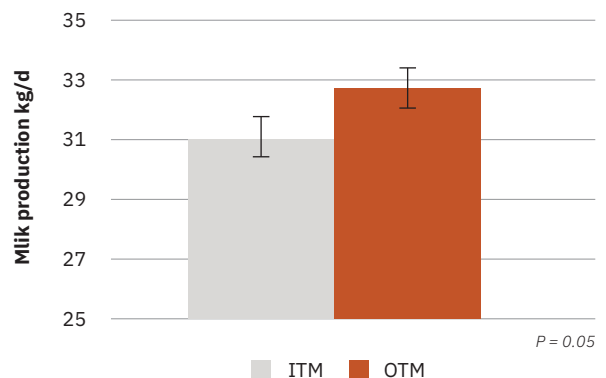
- Heifers that received OTM's calved 22 days earlier and had 19 fewer days open than heifers supplemented with ITM's (145 vs. 164 days open, respectively (Table 1).
- Milk yield was greater (P<0.05) by 1.7 kg/d in OTM-supplemented heifers (Figure 1).

Table 1. Effect of trace mineral (TM) source fed during the cow dry period and from birth to calving of progeny (heifers) and their interaction

Treatment ¹	Age at calving ² , mo	SE	P-value
IH	24.8	0.30	0.07
OH	24.0	-	-
IC	24.6	0.35	0.05
OC	23.7	-	-
IH-IC	24.7	0.54	0.51
IH-OC	24.3	-	-
OH-IC	24.9	-	-
OH-OC	23.3	-	-

¹I = inorganic TM (ITM), O = organic TM (OTM); H = heifer (from birth to calving), C = cow (dry period). Interactions: IH-IC = ITM in heifer, ITM in cow; IH-OC = ITM in heifer, OTM in cow; OH-IC = OTM in heifer, ITM in cow; OH-OC = OTM in heifer, OTM in cow. ²n = 29 for OTM and n = 28 for ITM.

Figure 1. Effect of feeding OTM vs. ITM during growth and lactation on average milk production per day (100 DIM) during the first lactation



Conclusion:

- Cows fed Bioplex prepartum had calves which calved earlier than those supplemented with inorganic trace minerals.
- Milk yield through 100 DIM (days in milk) was higher in those heifers supplemented with Bioplex.
- Organic trace minerals in the form of Bioplex can improve reproductive performance and nutrition of dairy heifers and affect future milk performance.

Authors: F. Pino, N. L. Urrutia, S. L. Gelsinger, A. M. Gehman, and A. J. Heinrichs
Published: The Professional Animal Scientist (2018) 34:51–58



**For more information about
Alltech Mineral Management
please contact:**



Cathal McCormack
Country Manager
Alltech Ireland
cmccormack@Alltech.com
+353 86 806 5219



Kevin Graham
Beef Specialist,
Alltech Ireland
kgraham@alltech.com
+353 86 046 0909



Neil Keane
Commerical Manager
Alltech Ireland
nkeane@Alltech.com
+353 86 021 6164



Eddie Phelan
Ruminant Commercial Manager,
Alltech Ireland
ephelan@alltech.com
+353 86 142 7404



Richard Dudgeon
Northern Ireland Regional Manager,
Alltech N. Ireland
rdudgeon@alltech.com
+44 77 3974 5379



Mark Moloney
Southeast Regional Manager,
Alltech Ireland
mmoloney@alltech.com
+353 87 274 4697