ویتامین ها و مواد معدنی

در تغذیه طیور

(تئوری و کاربرد)

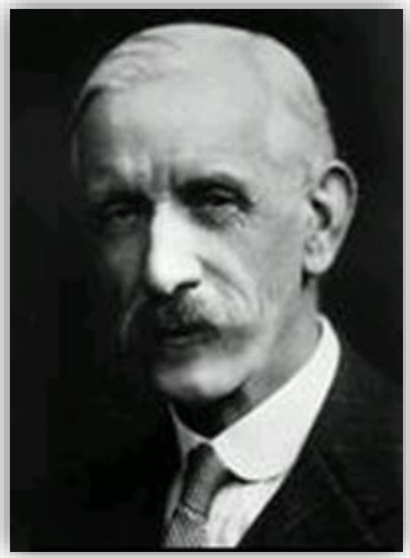
Speaker: M. Zaghari

Available at: www.minatoyoor.com

Vitamin is:

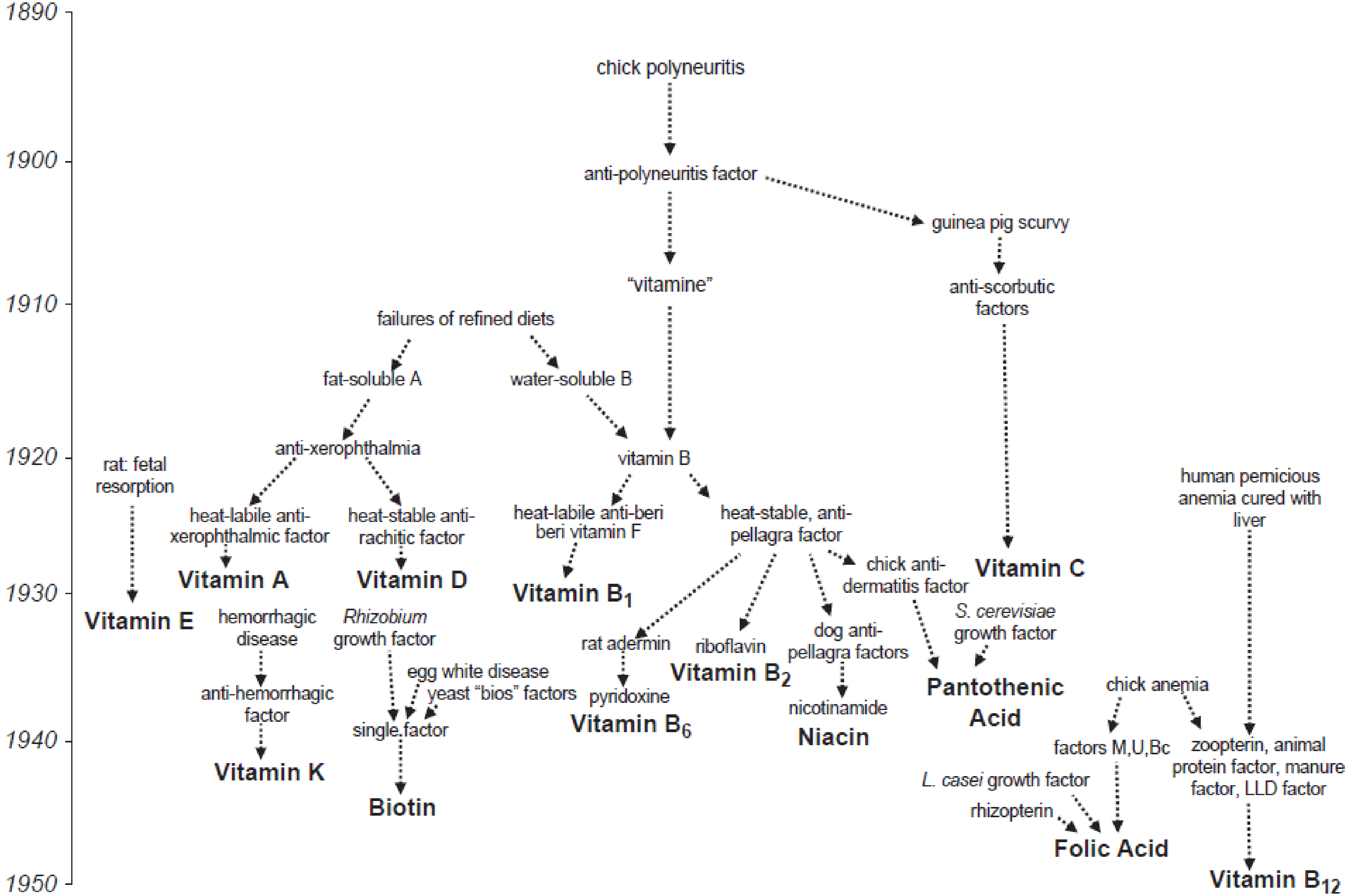
Vitamin is:

- ✓ Organic compound
- ✓ Essential
- ✓ Tiny amounts
- ✓ Enzyme cofactors or coenzyme
- ✓ No structural function

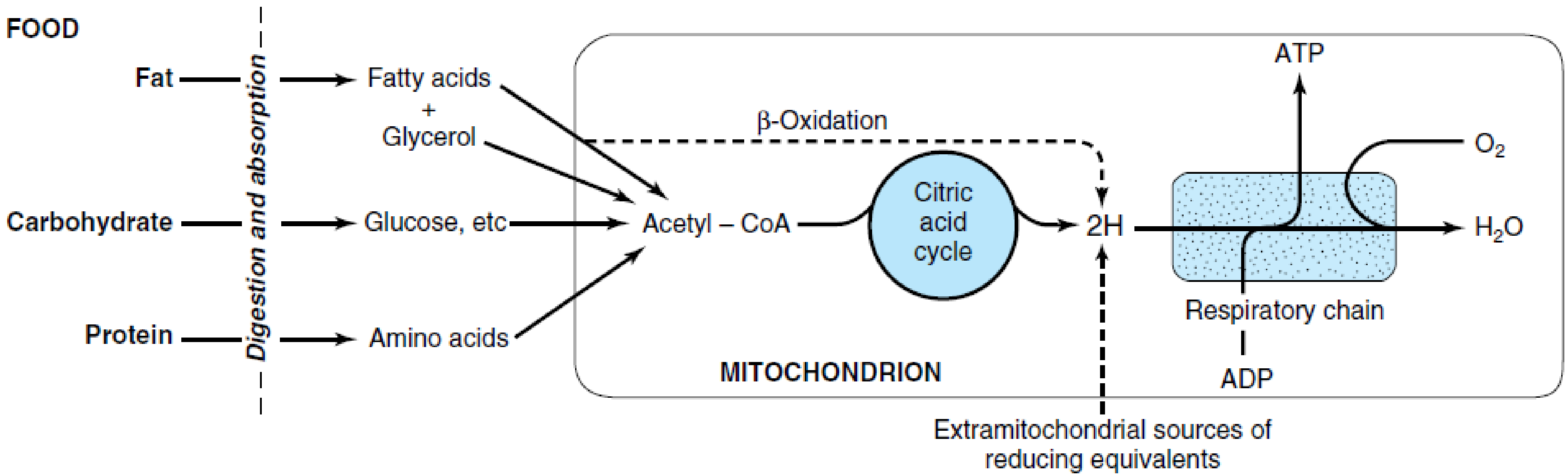


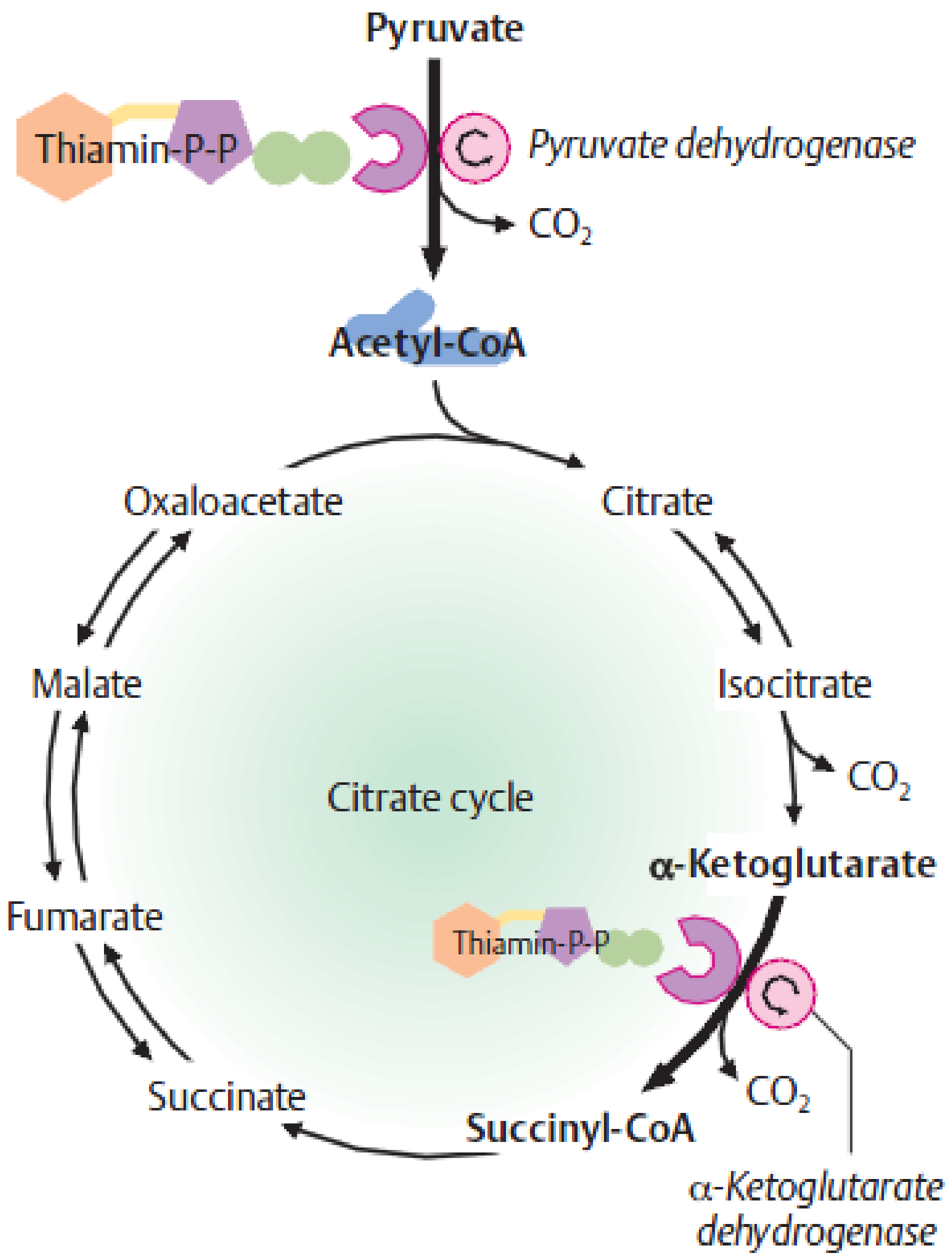
In 1912, Funk and the British biochemist Sir Fredrick Hopkins (one of the founders of modern biochemistry) proposed the Vitamin Hypothesis of Deficiency, theorizing that the absence of a particular vitamin in one's diet could lead to certain diseases.

Sir Hopkins had established his methodology in an experiment whereby he fed mice "a synthetic diet of pure carbohydrate, pure protein, fats, and salts, Hopkins observed that the mice would stop growing unless their diet was supplemented with milk. The milk, he concluded, must contain small amounts of what he called 'additional food factors' in order for growth and the maintenance of health…. Hopkins succeeded in isolating what became known as vitamins A and D.


1890
1900
1910
1920
1930
1940
1950
chick polyneuritis
anti-polyneuritis factor
guinea pig scurvy
"vitamine"
anti-scorbutic factors
failures of refined diets
fat-soluble A
water-soluble B
anti-xerophthalmia
vitamin B
rat: fetal resorption
heat-labile anti-xerophthalmic factor
heat-stable anti-rachitic factor
heat-labile anti-beri beri vitamin F
heat-stable, anti-pellagra factor
human pernicious anemia cured with liver
chick anti-dermatitis factor
Vitamin A
Vitamin D
Vitamin B_1
Vitamin C
Vitamin E
hemorrhagic disease
Rhizobium growth factor
S. cerevisiae growth factor
rat adermin
riboflavin
dog anti-pellagra factors
egg white disease
yeast "bios" factors
Vitamin B_2
Pantothenic Acid
anti-hemorrhagic factor
pyridoxine
nicotinamide
chick anemia
single factor
Vitamin B_6
Niacin
factors M,U,Bc
zoopterin, animal protein factor, manure factor, LLD factor
Vitamin K
L. casei growth factor
Biotin
rhizopterin
Folic Acid
Vitamin B_{12}

Vitamin like substances	
Myo-Inositol	
Carnitine	B_T
PABA	
Polyphenols	
Lipoicacid	
Coenzyme Q	
Orotic acid	B13
Pangamic acid	B15
Laetrile	B17
Gerovital	H3
Gabagin	U


FOOD
Fat
Carbohydrate
Protein
Digestion and absorption
Fatty acids
+
Glycerol
Glucose, etc
Amino acids
β-Oxidation
Acetyl – CoA
Citric
acid
cycle
2H
ATP
O_2
H_2O
Respiratory chain
ADP
MITOCHONDRION
Extramitochondrial sources of
reducing equivalents


Pyruvate
Thiamin-P-P
Pyruvate dehydrogenase
CO_2
Acetyl-CoA
Oxaloacetate
Citrate
Malate
Isocitrate
CO_2
Citrate cycle
α-Ketoglutarate
Fumarate
Thiamin-P-P
CO_2
Succinate
Succinyl-CoA
α-Ketoglutarate dehydrogenase

Requirement of vitamins

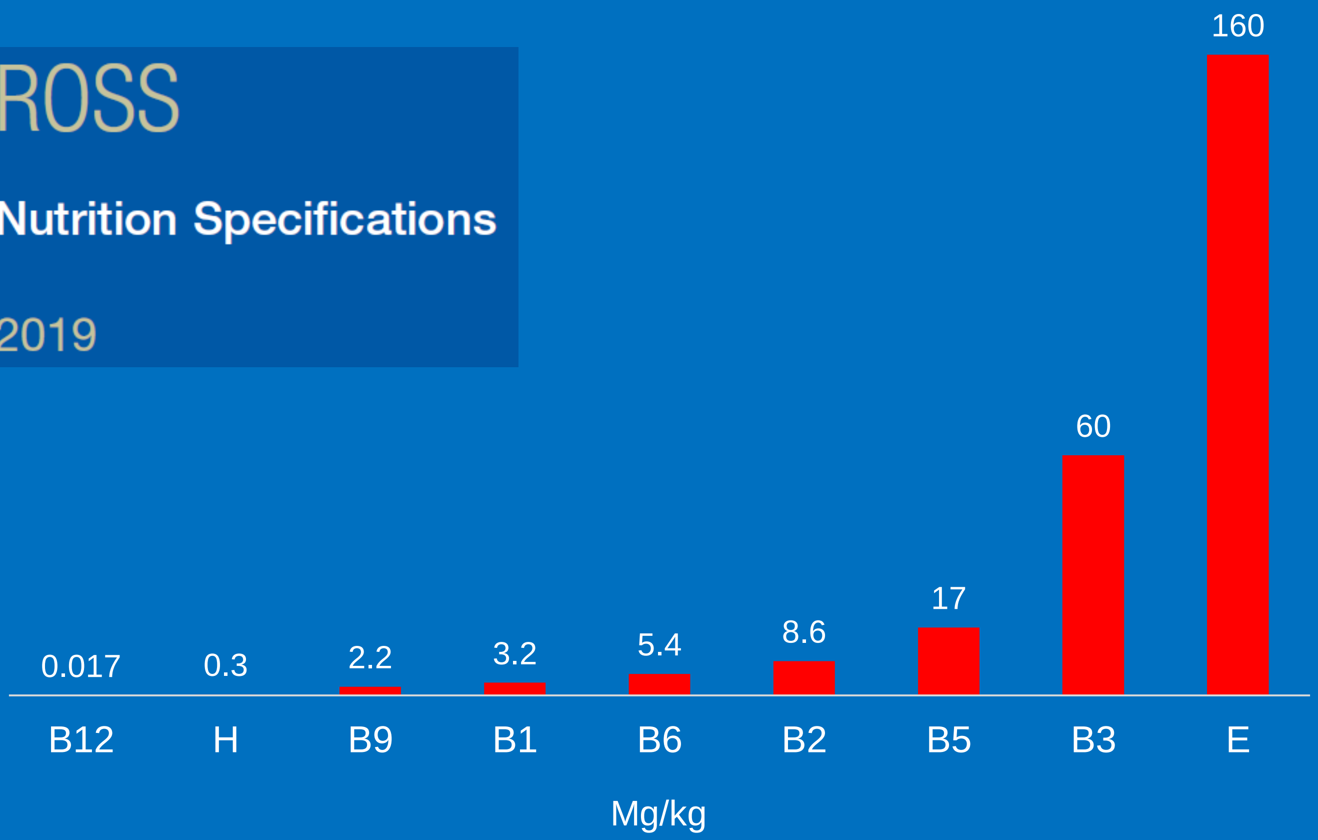
Chickens are not mice with feathers

Requirement of vitamins

ROSS

Nutrition Specifications

2019



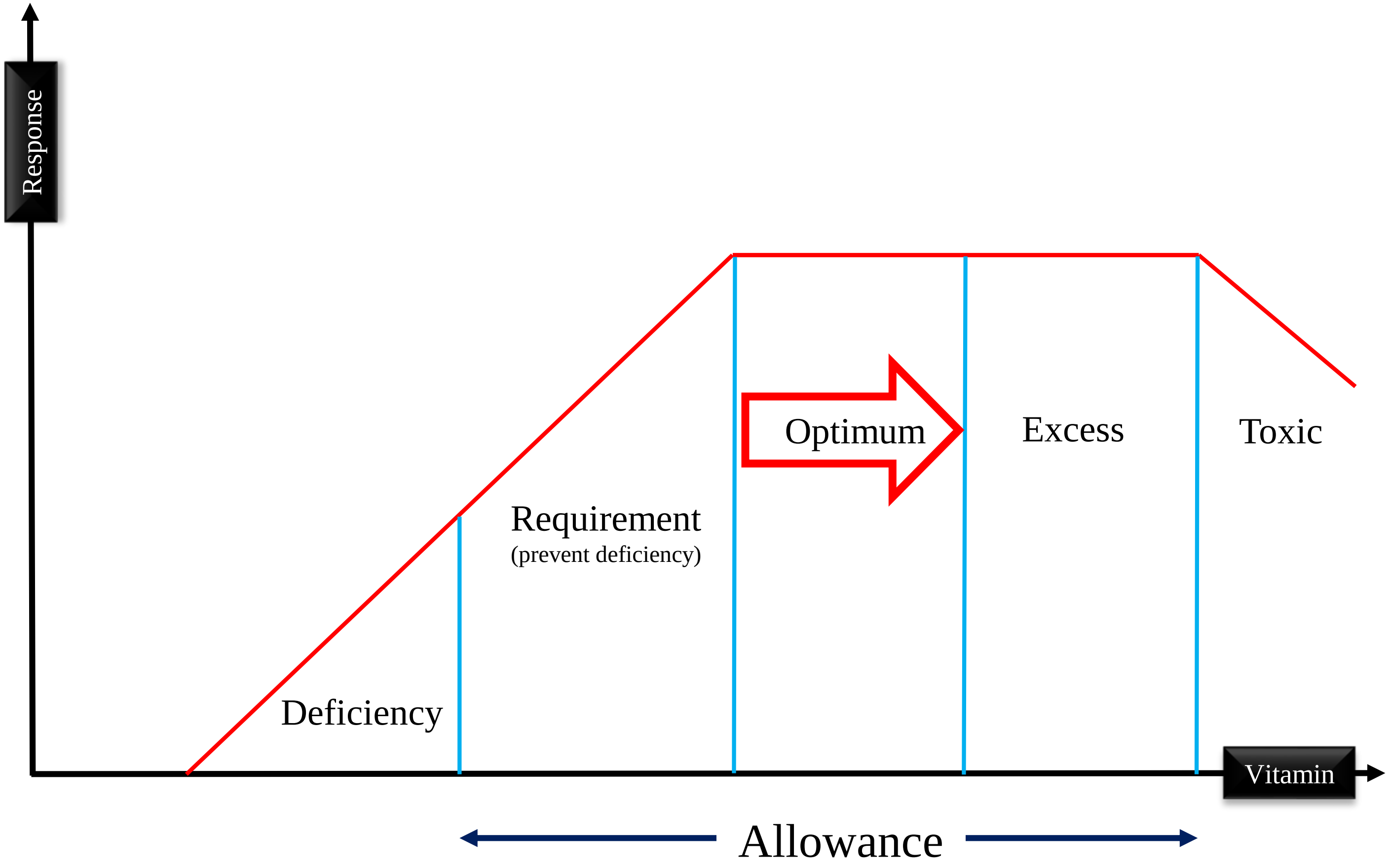
Requirement of vitamins

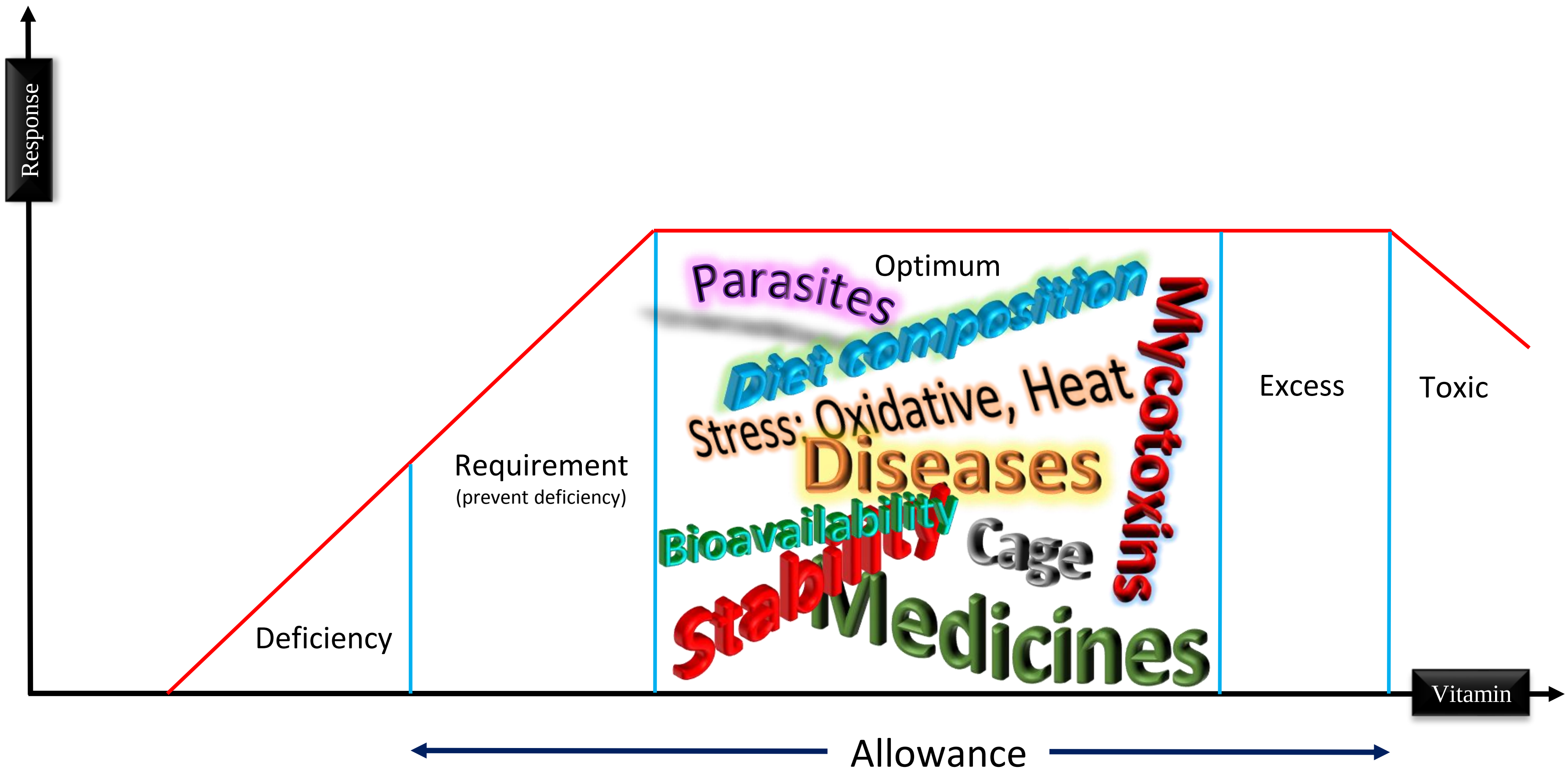
ROSS

Nutrition Specifications

2019

		Starter		Grower		Finisher	
Age Fed	days	0 - 10		11 - 24		25 - market	
Energy	kcal	3000		3100		3200	
	MJ	12.55		12.97		13.39	
ADDED VITAMINS PER KG		**Wheat based feed**	**Maize based feed**	**Wheat based feed**	**Maize based feed**	**Wheat based feed**	**Maize based feed**
Vitamin A	IU	13,000	12,000	11,000	10,000	10,000	9000
Vitamin D3	IU	5000	5000	4500	4500	4000	4000
Vitamin E	IU	80	80	65	65	55	55
Vitamin K (Menadione)	mg	3.2	3.2	3.0	3.0	2.2	2.2
Thiamin (B1)	mg	3.2	3.2	2.5	2.5	2.2	2.2
Riboflavin (B2)	mg	8.6	8.6	6.5	6.5	5.4	5.4
Niacin	mg	60	65	55	60	40	45
Pantothenic Acid	mg	17	20	15	18	13	15
Pyridoxine (B6)	mg	5.4	4.3	4.3	3.2	3.2	2.2
Biotin	mg	0.30	0.22	0.25	0.18	0.20	0.15
Folic Acid	mg	2.20	2.20	1.90	1.90	1.60	1.60
Vitamin B12	mg	0.017	0.017	0.017	0.017	0.011	0.011
MINIMUM SPECIFICATION							
Choline per kg	mg	1700		1600		1550	
Linoleic Acid	%	1.25		1.20		1.00	

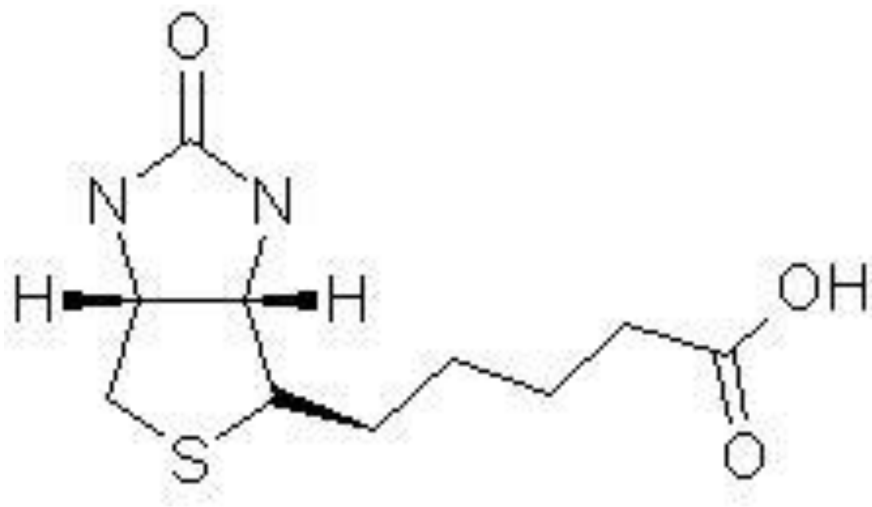

Response
Optimum
Excess
Toxic
Requirement
(prevent deficiency)
Deficiency
Vitamin
Allowance


Response
Optimum
Parasites
Diet composition
Mycotoxins
Stress: Oxidative, Heat
Diseases
Bioavailability
Cage
Stability
Medicines
Requirement
(prevent deficiency)
Deficiency
Excess
Toxic
Vitamin
Allowance

For Instance

Sulfaquinoxaline	Versus	Vitamin K
Amprolium	Versus	Thiamin
Sulfonamide	Versus	Folacin
Avidin (raw egg white)	Versus	Biotin
Strepavidin (*Streptomyces spp* present in soil)	Versus	Biotin
Rancid fat	Versus	Vitamin E

Biotin



Imidazole ring with valeric acid side chain

$C_{10}H_{16}N_2O_3S_1$

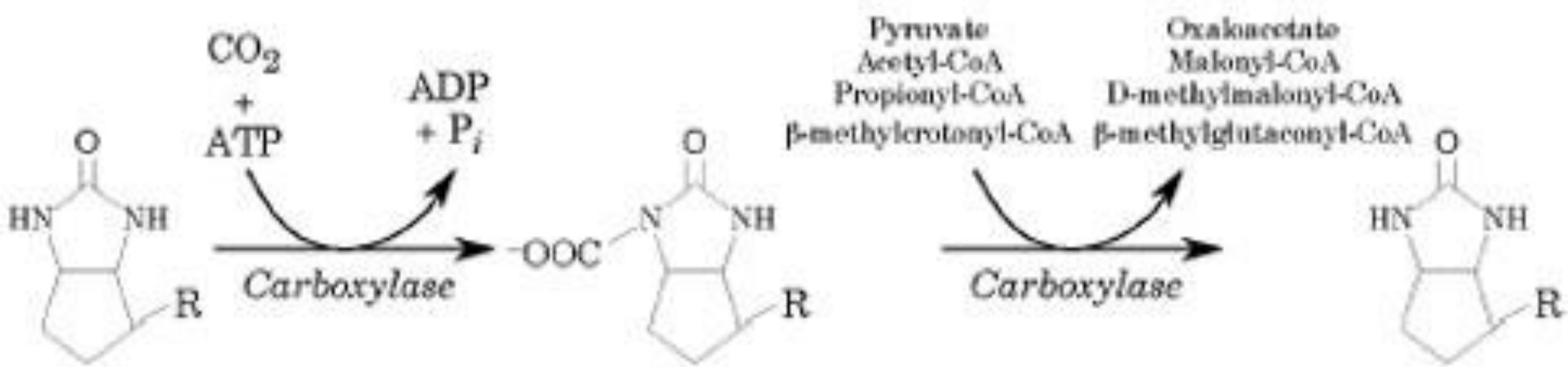
MW: 224.31 g/mol

8 optically isomers

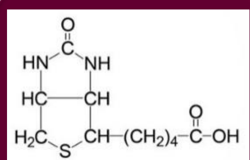
Deficiency: Anorexia, Nausea, Vomiting, Dermatitis

Biochemical function

- **Pyruvate carboxylase**
- **Acetyl CoA carboxylase**
- **Propinyl coA carboxylase**
- **Methyl crotonyl coenzyme A carboxylase**



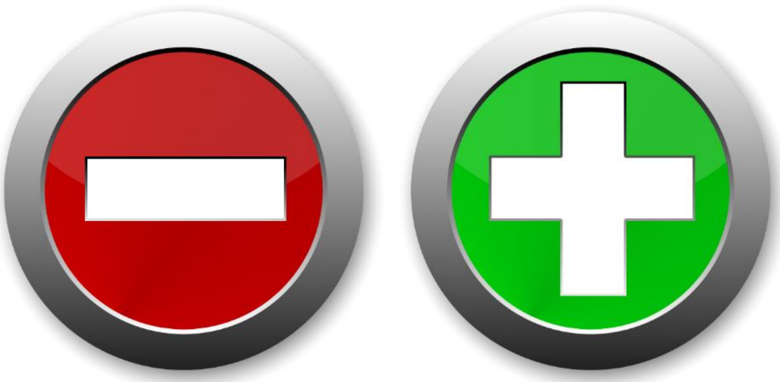
New biochemical function



Carboxylases

Gene expression

- Development
- Immunity
- Growth
- Metabolism
- Reproduction



Cell

Article

Microbial Reconstitution Reverses Maternal Diet-Induced Social and Synaptic Deficits in Offspring

Shelly A. Buffington,[1,2] Gonzalo Viana Di Prisco,[1,2] Thomas A. Auchtung,[3,4] Nadim J. Ajami,[3,4] Joseph F. Petrosino,[3,4] and Mauro Costa-Mattioli[1,2,*]

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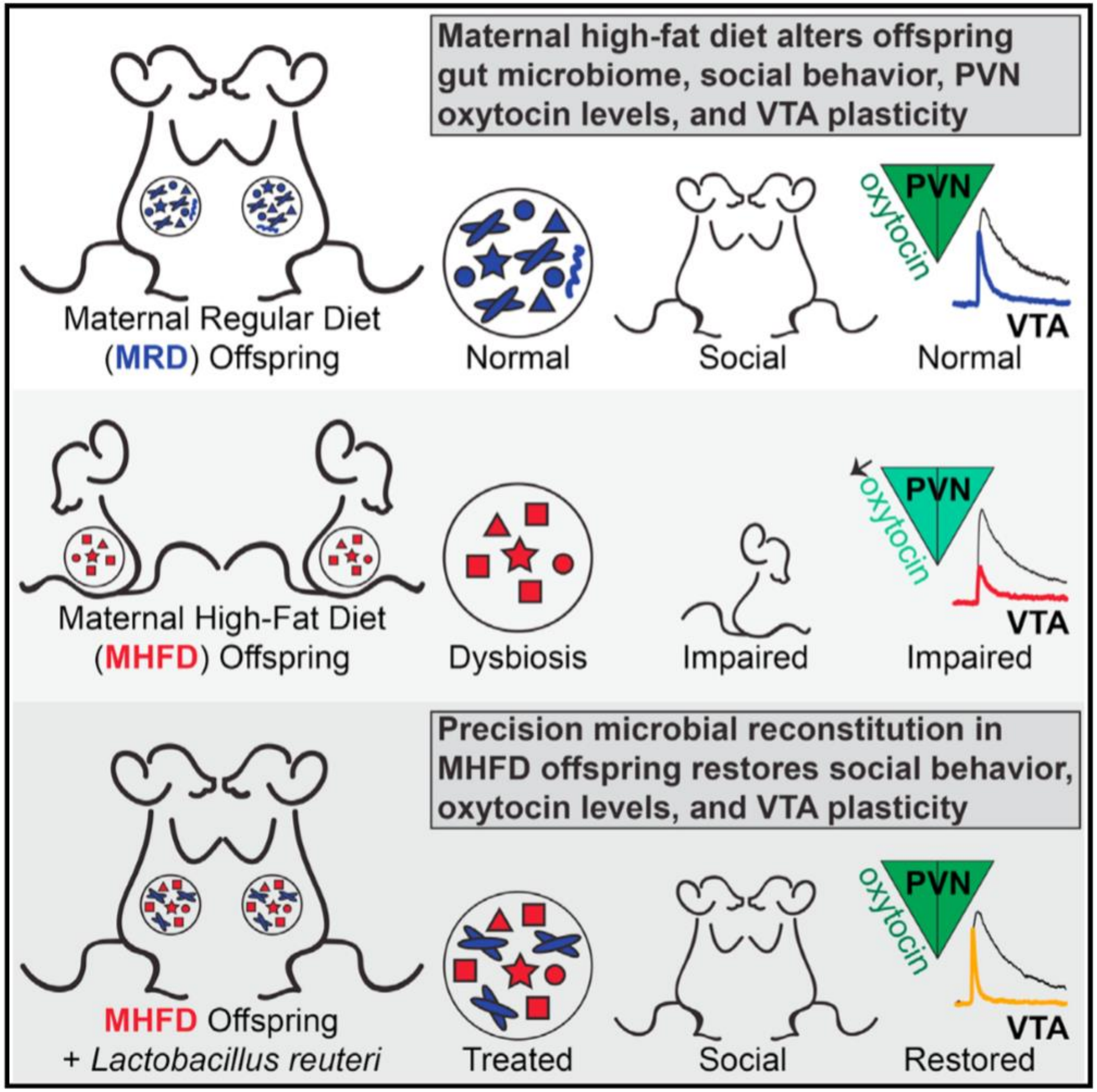
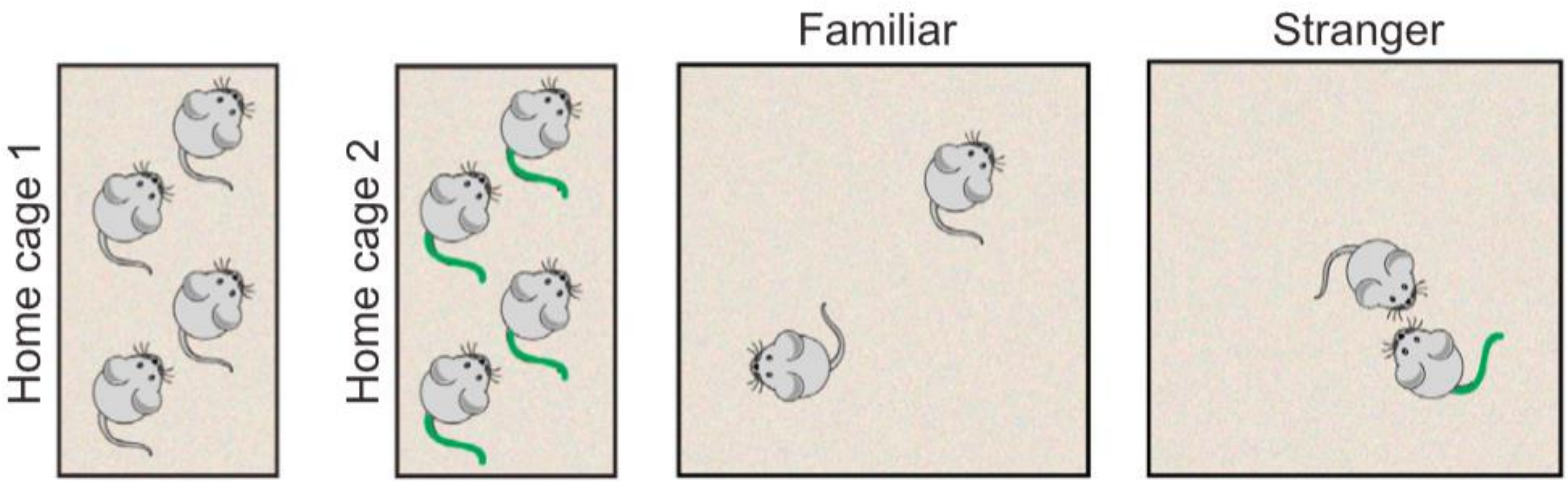
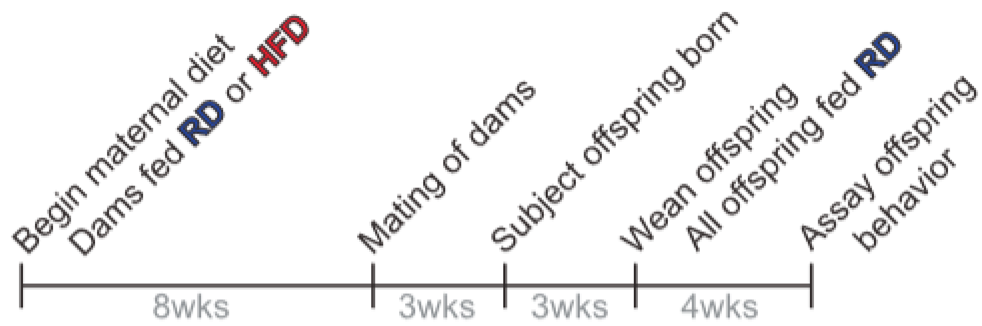
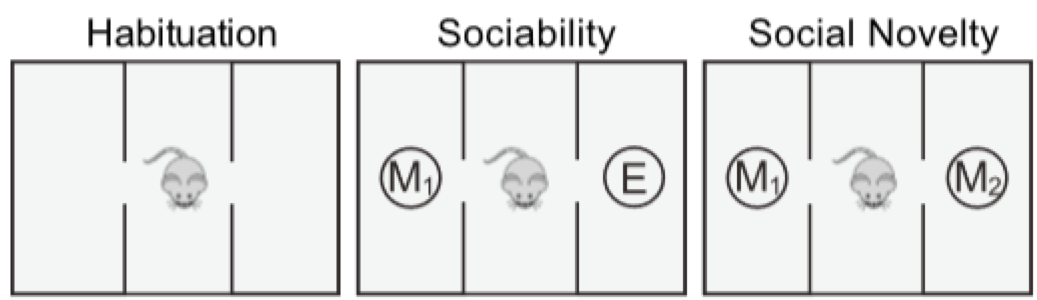
http://dx.doi.org/10.1016/j.cell.2016.06.001

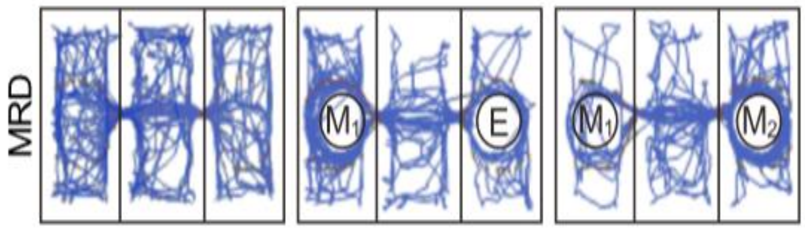
Graphical Abstract

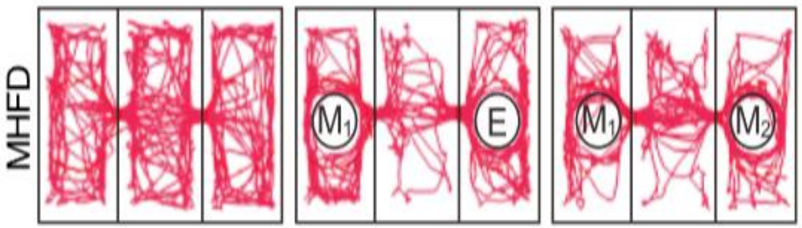


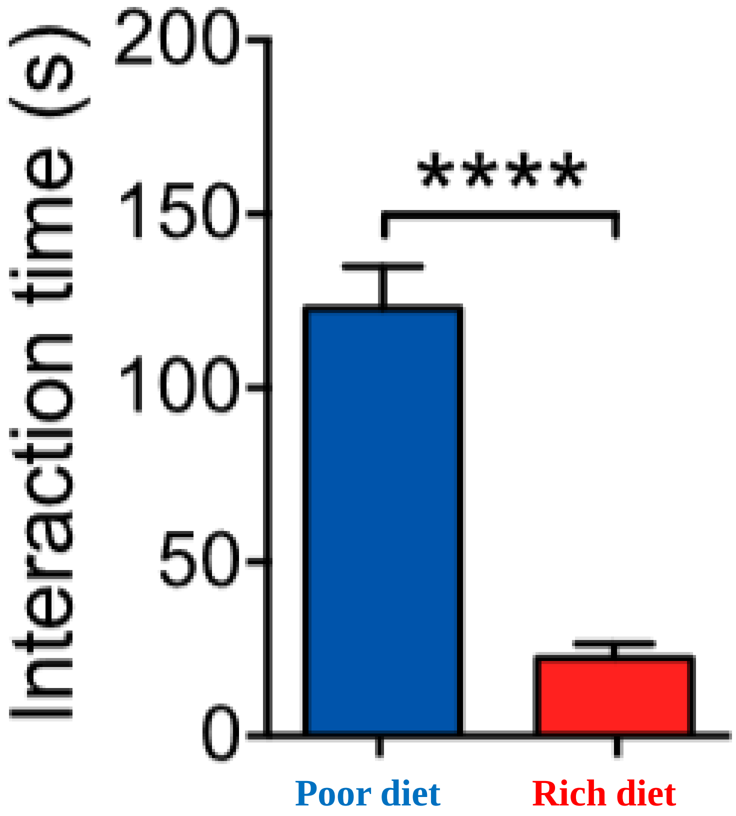

Home cage 1
Home cage 2
Familiar
Stranger

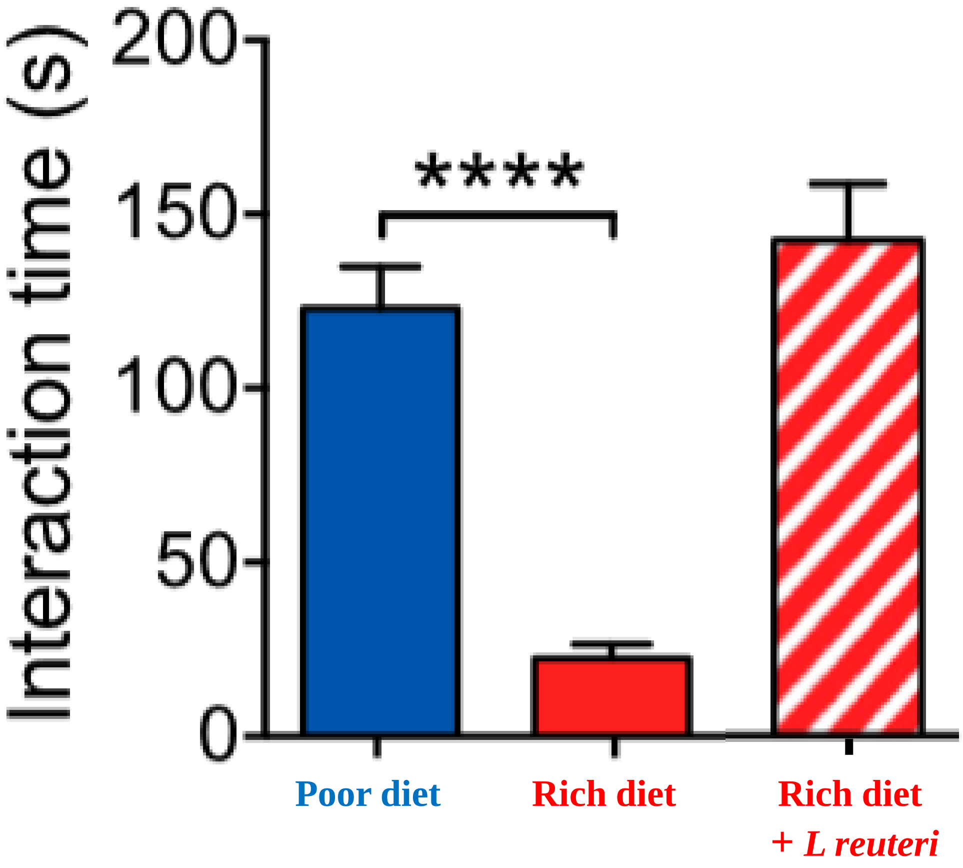

Begin maternal diet
Dams fed RD or HFD
Mating of dams
Subject offspring born
Wean offspring
All offspring fed RD
Assay offspring behavior
8wks
3wks
3wks
4wks


Habituation
Sociability
Social Novelty
M1
E
M1
M2


MRD
M1
E
M1
M2


MHFD
M1
E
M1
M2


Interaction time (s)
200
150
100
50
0
****
Poor diet
Rich diet


Interaction time (s)
200
150
100
50
0
****
Poor diet
Rich diet
Rich diet
+ L reuteri

have been produced in chicks fed corn-soybean meal diets (Pesti et al., 1991).

Self-synthesis of folacin is dependent on dietary composition. For poultry, some research has indicated higher folacin requirements for very high protein diets, or when sucrose was the only source of carbohydrates (Scott et al., 1982). Keagy and Oace (1984) reported that dietary fiber had an effect on folacin utilization; xylan, wheat bran, and beans stimulated folacin synthesis in the rat, reflected as higher fecal and liver folacin. For humans it was concluded that milk type differentially affects intestinal folacin biosynthesis and the superior folacin availability from human (versus cow and goat) milk-containing diets is due in part to enhanced intestinal biosynthesis of folacin (Semchuk et al., 1994).

The levels of antibacterials added to the feed will affect microbial synthesis of folacin. Sulfa drugs, which are commonly added to livestock diets, are folacin antagonists (see Deficiency). In the chicken, sulfa drugs have been shown to increase the requirement (Scott et al., 1982). Moldy feeds (e.g., aflatoxins) have also been shown to contain antagonists that inhibit microbial intestinal synthesis in swine (Purser, 1981).

Folacin requirements are dependent on the form in which it is fed and concentrations and interrelationships of other nutrients. Deficiencies of choline, vitamin B_{12}, iron, and vitamin C all have an effect on folacin needs. Although most folacin in poultry feedstuffs is present in conjugated form, the young chick is fully capable of utilizing it. On the contrary, Baker et al. (1978) reported that human patients over 60 years of age utilized conjugated forms of folacin much less efficiently than monoglutamates.

Folacin requirements are related to type and level of production. Growth rate, age, and pregnancy influence folacin requirements. The requirement decreases with age because diminished growth rate reduces the need for DNA synthesis. Increased catabolism of folacin is a feature of pregnancy. Studies with both rats (McNulty et al., 1993) and humans (McPartlin et al., 1993) demonstrated an enhanced folacin catabolism that was a feature of pregnancy per se and not simply due to increased weight. In poultry the folacin requirement for egg hatchability is higher than that for production (NRC, 1994). Taylor (1947) reported that 0.12 mg of folacin per kilogram of diet was satisfactory for egg production, but higher levels were required for good hatchability. Table 12.1 summarizes the folacin requirements for various livestock species and humans; a more complete listing is given in the appendix, Table A1.

The current Recommended Dietary Allowances (RDAs) for folates

CHEMICAL STRUCTURE, PROPERTIES, AND ANTAGONISTS

The chemical structure of biotin in metabolism includes a sulfur atom in its ring (like thiamin) and a transverse bond across the ring (Fig. 11.1). The empirical formula for biotin is $C_{11}H_{18}O_3N_2S$. Biotin is a fusion of an imidazolidone ring with a tetrahydrothiophene ring bearing a valeric acid side chain. It is a monocarboxylic acid with sulfur as a thioether linkage. Biotin, with its rather unique structure, contains three asymmetric carbonations, and therefore eight different isomers are possible. Of these isomers only one contains vitamin activity, *d*-biotin. The stereoisomer *l*-biotin is inactive.

Biotin crystallizes from water solution as long, white needles. Its melting point is 232 to 233°C. Free biotin is soluble in dilute alkali and hot water and practically insoluble in fats and organic solvents. Biotin is quite stable under ordinary conditions. It is destroyed by nitrous acid, other strong acids, strong bases, and formaldehyde and is inactivated by rancid fats and choline (Scott et al., 1982). It is gradually destroyed by ultraviolet radiation.

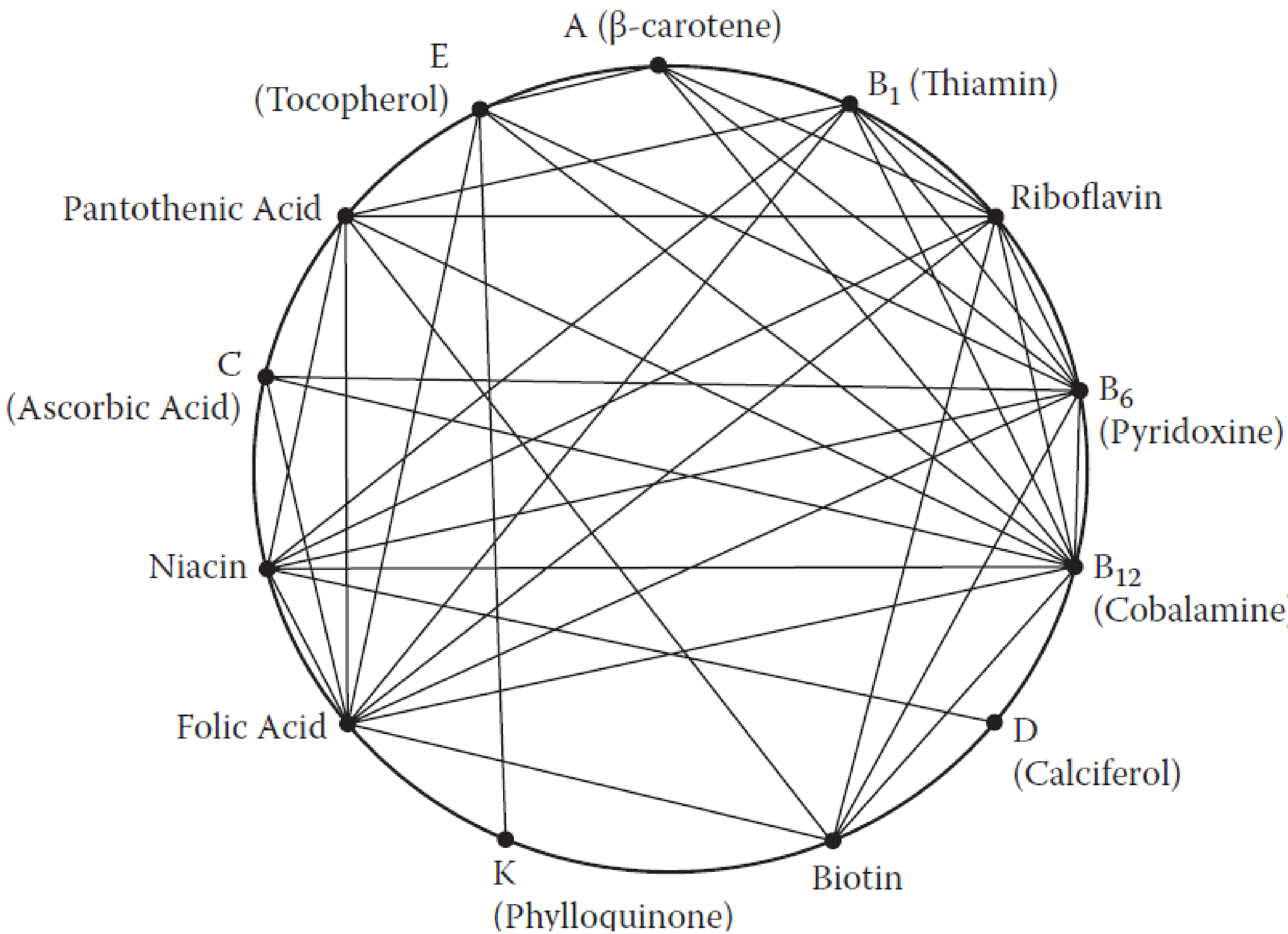
Fig. 10.6 Pantothenic acid deficiency in a turkey with dermatitis on lower beak and at angle of mouth (lower turkey). Sticky exudate that formed on the eyelid resulted in encrustation and caused swollen eyelids to remain stuck together. Normal turkey above is the control. (Courtesy of T.M. Ferguson [deceased] and J.R. Couch, Texas A&M University.)

feet is evident over the toes, in contrast to biotin defic... marily affects the foot pads and is often ... acid deficiency.

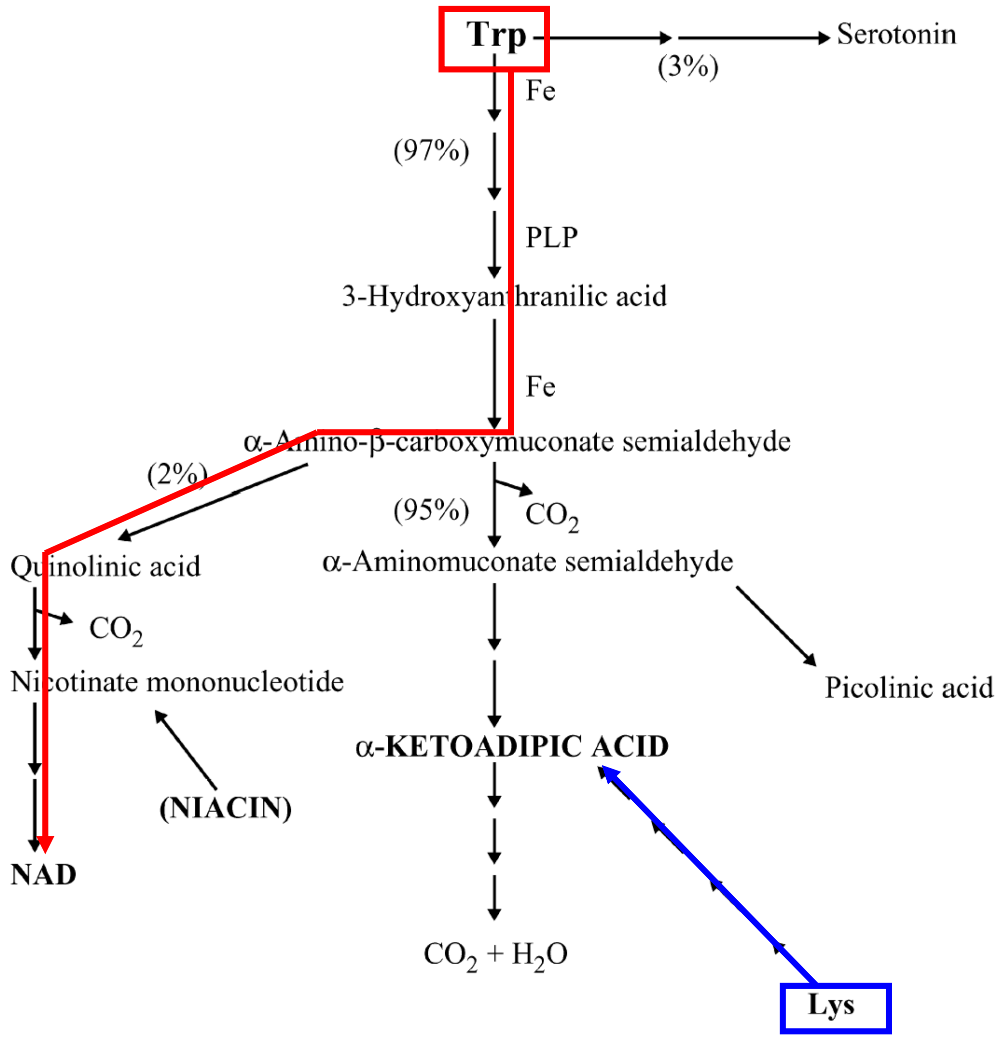
Signs of ...

They found that the hens required addition of 1.0 mg/kg for optimum egg production, at least 4.0 mg/kg for maximum hatchability, and 8.0 mg/kg for optimum hatchability and viability of offspring.

...ormally affect egg production ...ability, and chicks that hatch may be too ... Embryonic mortality in pantothenic acid deficiency oc...urs usually during the last few days of incubation. A direct linear relationship exists between diet pantothenic acid and hatchability. Beer et al. (1963) fed a purified diet to White Leghorn hens that contained 0.9 mg of pantothenic acid per kilogram of diet. They found that the hens required addition of 1.0 mg/kg for optimum egg production, at least 4.0 mg/kg for maximum hatchability, and 8.0 mg/kg for optimum hatchability and viability of offspring. Dawson et al. (1962) reported that turkey breeder hens fed a diet deficient in pantothenic acid demonstrated a high embryonic mortality during the first week of development. After 17 days, the surviving embryos were small and poorly feathered, and showed signs of edema, hemorrhaging, fatty livers, and pale dilated hearts.



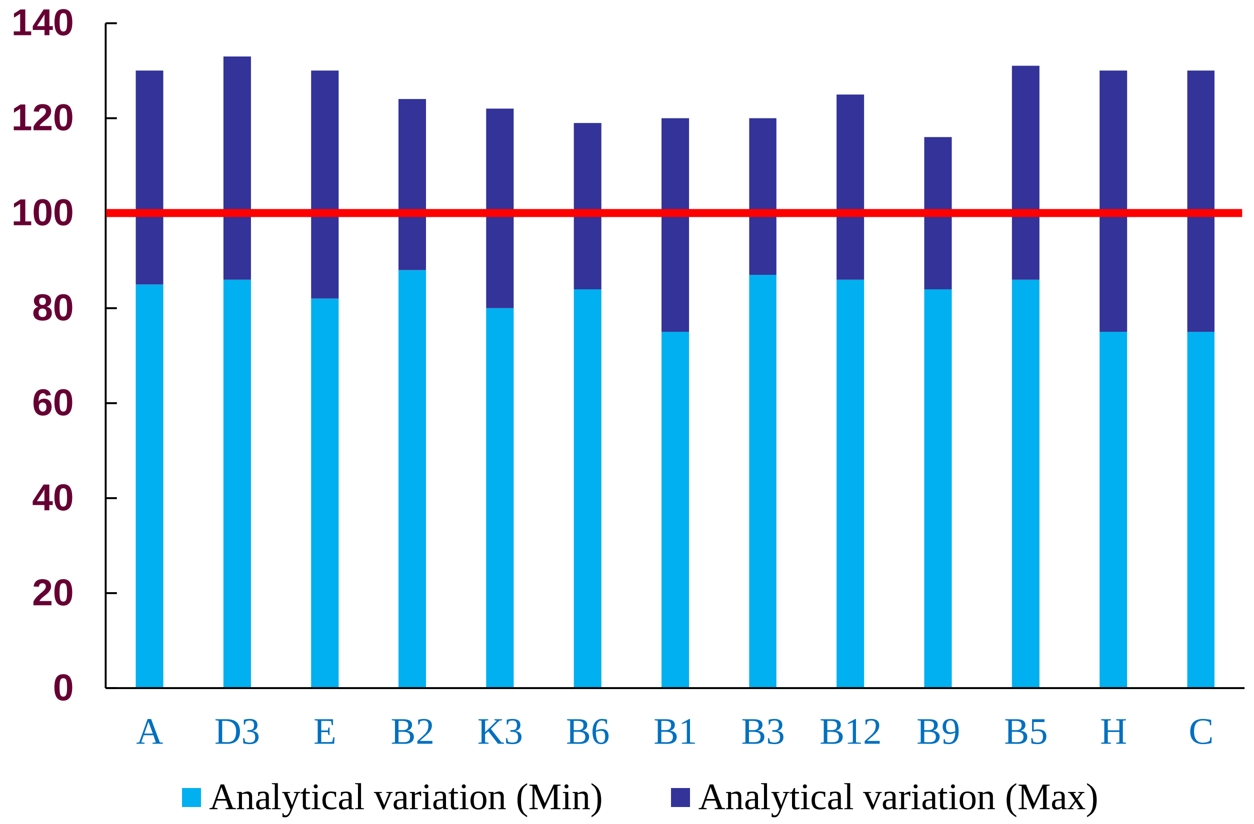
Amino acid chelation in human and animal nutrition, H. DeWAYNE ASHMEAD



Trp
Serotonin
(3%)
Fe
(97%)
PLP
3-Hydroxyanthranilic acid
Fe
α-Amino-β-carboxymuconate semialdehyde
(2%)
(95%)
CO_2
Quinolinic acid
α-Aminomuconate semialdehyde
CO_2
Nicotinate mononucleotide
Picolinic acid
α-KETOADIPIC ACID
(NIACIN)
NAD
$CO_2 + H_2O$
Lys

Method of analysis of vitamins, provitamins and chemically well defined substances having a similar biological effect

Vitamin	Other name	Reference	Assay Principle
Vitamin A	Viitamin A concentrate (oily form, synthetic)	European Pharmacopoeia 01/2005:0219	Ultraviolet absorption spectrophotometry (see PhEur 2.2.25) or liquid chromatography (see PhEur 2.2.29).
	Vitamin A concentrate (powder form, synthetic)	European Pharmacopoeia 01/2005:0218	Liquid chromatography (see PhEur 2.2.29)



140
120
100
80
60
40
20
0
A
D3
E
B2
K3
B6
B1
B3
B12
B9
B5
H
C
Analytical variation (Min)
Analytical variation (Max)

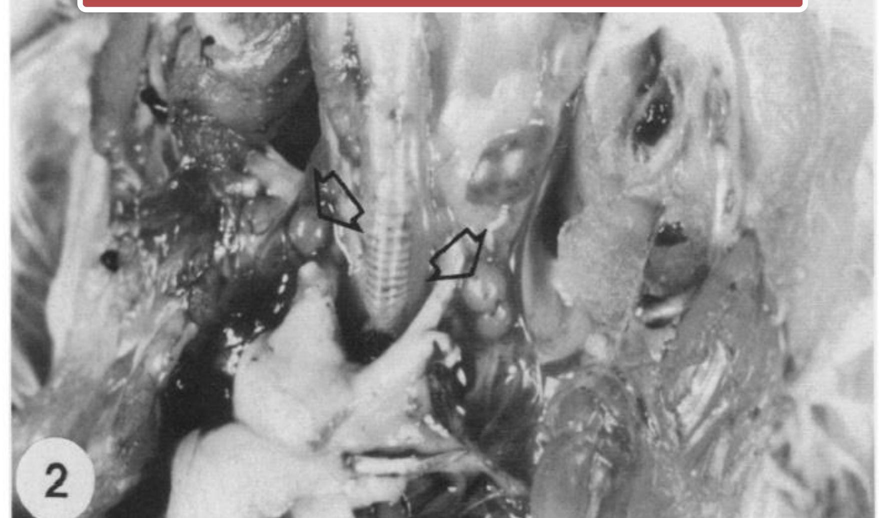
ویتامین	معیار تعیین وضعیت
A	ویتامین آ کبد، پلاسما، فشار مایع مغزی نخاعی
D3	↑ آلکالین فسفاتاز خون نشانه کمبود، 25-OHD3 پلاسما
E	نشت آنزیمهای SGOT و ASPAT به خون به دلیل صدمات سلولها
K	↑ زمان پروترومبین (۱۷ ثانیه به ۵ دقیقه)، فاکتورX
B1	لاکتات↑، ترانس کتولاز↓
B2	تعیین فعالیت EGR (اریتروسیت گلوتاتیون ردوکتاز)
B3	اندازه گیری متابولیت دفعی متیل نیکوتین آمید
B5	میزان پانتوتنیک اسید خون
B6	Tryptophan load test: Kynurenic acid , Xanthurenic acid
B9	ذخیره کبد
B12	اندازه تخم مرغ↓ (در حالی که تولید طبیعی است)، B12 سرم
H	فعالیت پایروات کربوکسیلاز، نسبت پالمیتولئیک به استئاریک↑
Choline	استیل کولین↓، نسبت فسفاتیدیل کولین: فسفاتیدیل اتانول آمین↓

Hypervitaminosis

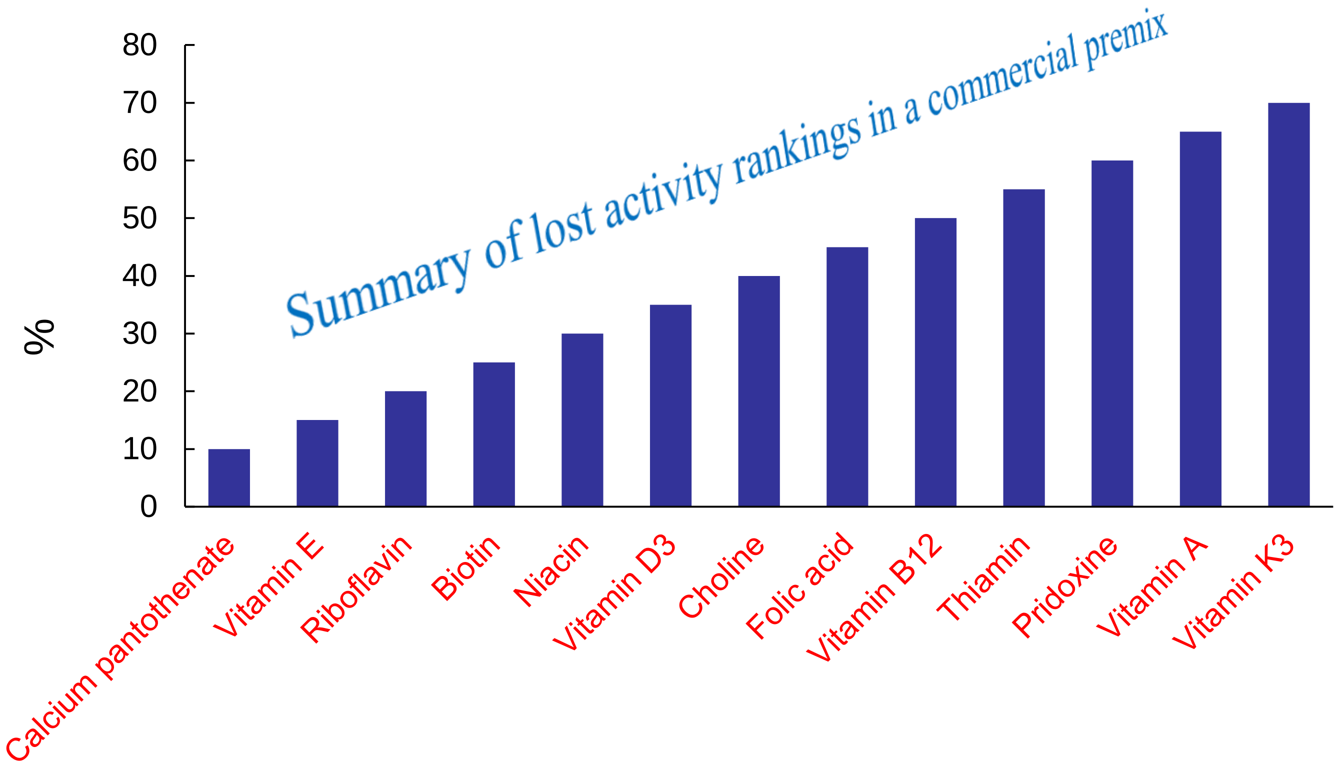
Clinical signs of hypervitaminosis A in broilers and leghorns

- Anorexia
- Ataxia
- Growth retardation
- Decrease of skin’s yellow color
- Conjunctivitis with sealed eyelids
- Osteodystrophy
- Mortality
- Parathyroid gland hyperplasia

Bilateral enlargement of parathyroid glands

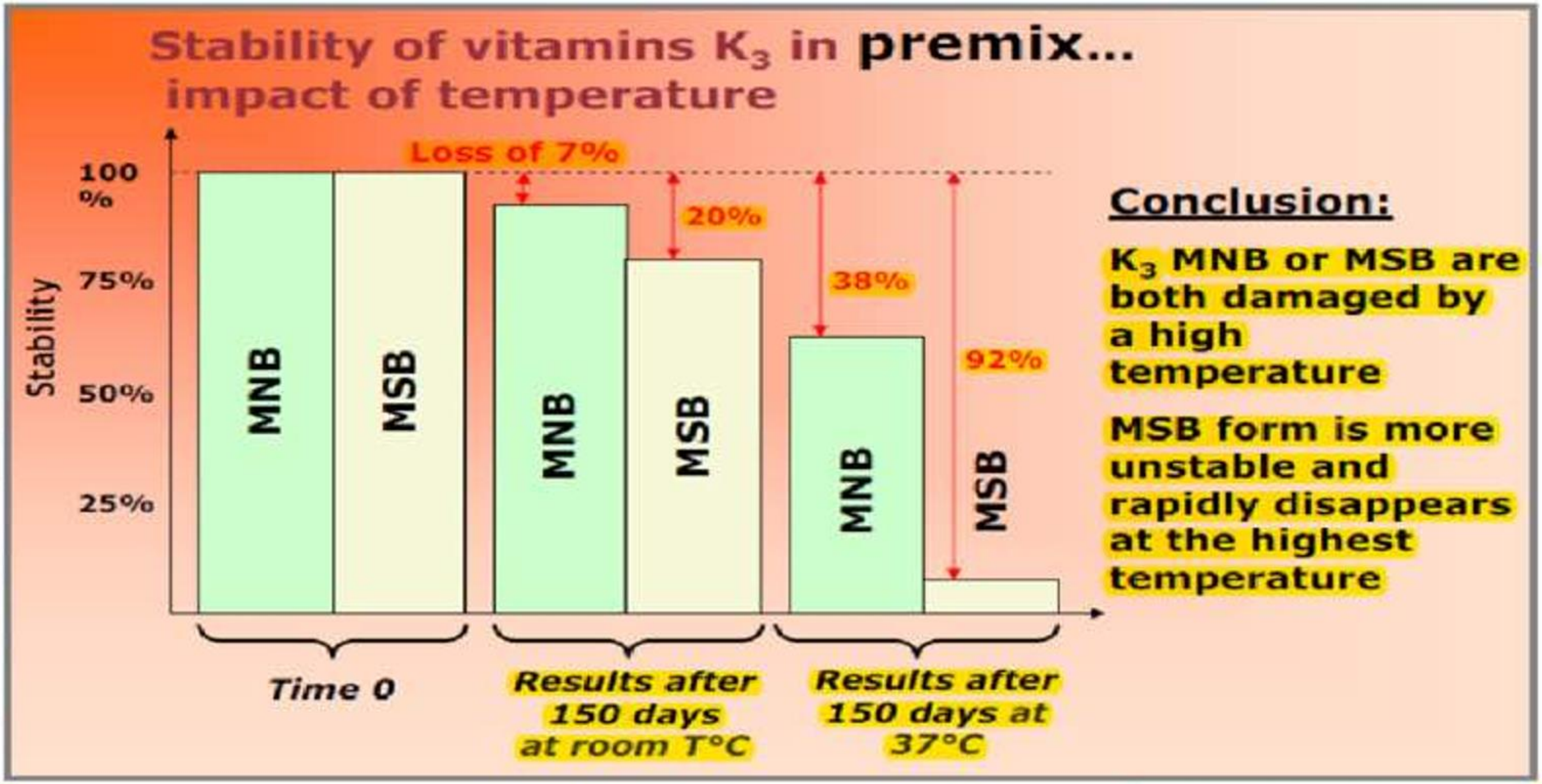


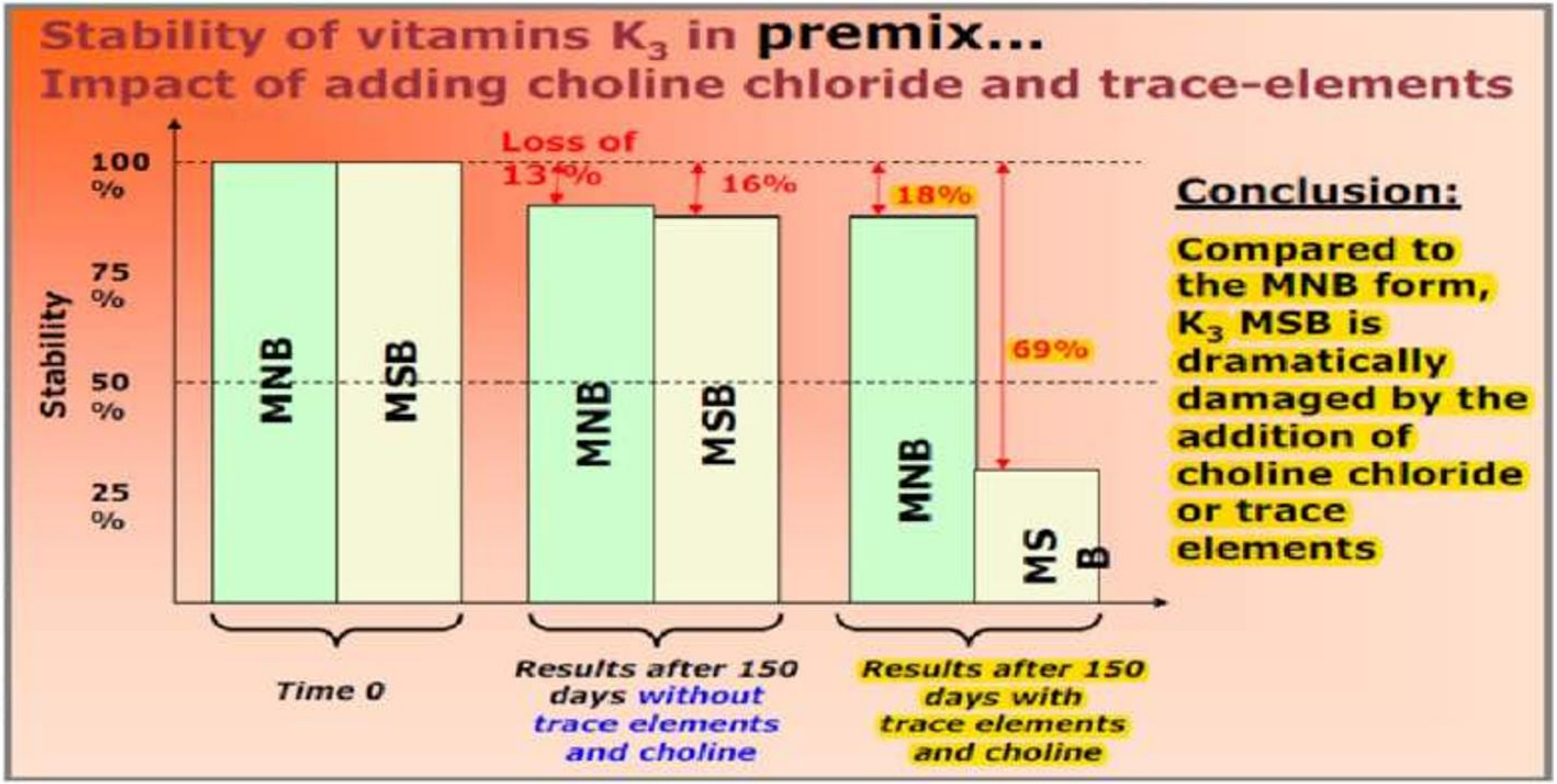

ویتامین ها
دما
رطوبت
اسیدیته
اکسیژن
نور و تشعشع
کاتالیزورها مانند آهن یا مس
بازدارنده ها
اثرات متقابل عوامل مختلف
انرژی
زمان


Summary of lost activity rankings in a commercial premix
%
80
70
60
50
40
30
20
10
0
Calcium pantothenate
Vitamin E
Riboflavin
Biotin
Niacin
Vitamin D3
Choline
Folic acid
Vitamin B12
Thiamin
Pridoxine
Vitamin A
Vitamin K3

Vitamin	Colo(u)r change/cause
B_1	Darker colo(u)r due to formation of *thiochrome*
B_2	Loss of colo(u)r due to *photolysis*
B_{12}	Decoloration due to *oxidation* or *photolysis*
C	Yellow or brown colo(u)r due to *hydrolysis*
E (alcohol)	Darker colo(u)r due to *oxidation*
Beta-carotene	Change to a more reddish colo(u)r due to *isomerization*, decoloration due to *photolysis*

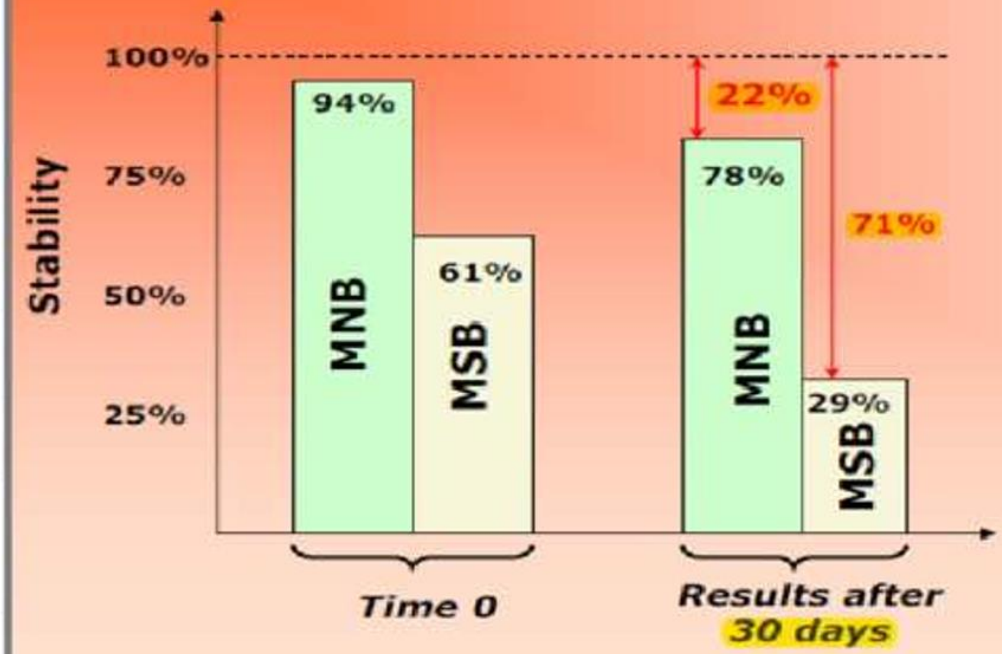

ویتامین ها
دما
رطوبت
اسیدیته
اکسیژن
نور و تشعشع
کاتالیزورها مانند آهن یا مس
بازدارنده ها
اثرات متقابل عوامل مختلف
انرژی
زمان


Stability of vitamins K3 in premix...
impact of temperature
Loss of 7%
20%
38%
92%
100 %
75%
50%
25%
Stability
MNB
MSB
MNB
MSB
MNB
MSB
Time 0
Results after 150 days at room T°C
Results after 150 days at 37°C
Conclusion:
K3 MNB or MSB are both damaged by a high temperature
MSB form is more unstable and rapidly disappears at the highest temperature



Stability of vitamins K3 in premix...
Impact of adding choline chloride and trace-elements
Stability
100 %
75 %
50 %
25 %
Loss of 13 %
16%
18%
69%
MNB
MSB
MNB
MSB
MNB
MS B
Time 0
Results after 150 days without trace elements and choline
Results after 150 days with trace elements and choline
Conclusion:
Compared to the MNB form, K3 MSB is dramatically damaged by the addition of choline chloride or trace elements

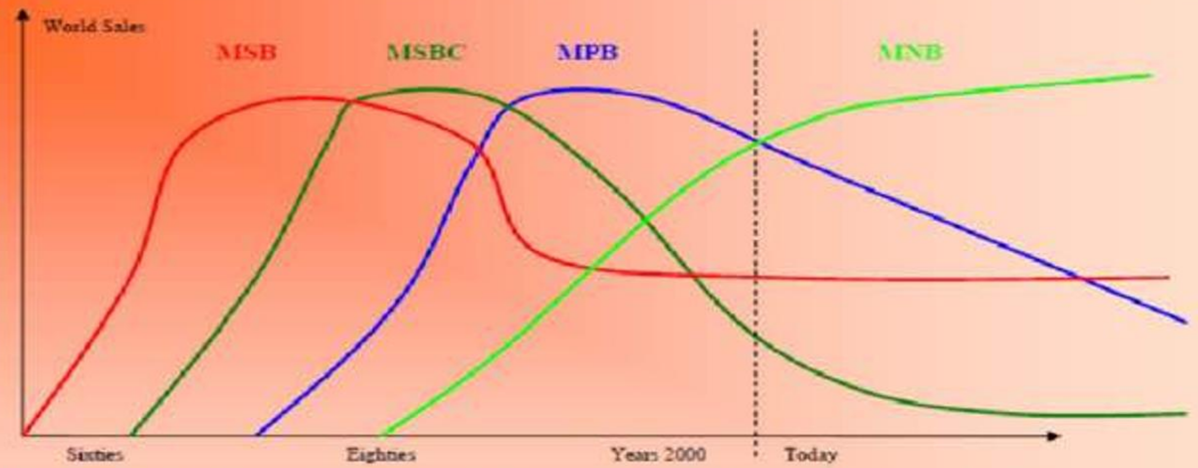
Stability of vitamins K_3 in feed... after pelleting (pig feed) and storage



Conclusion:

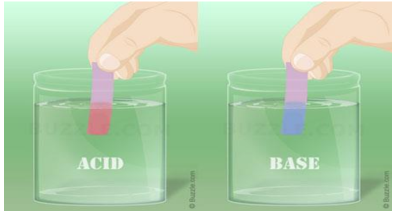
K_3 MNB is globally stable during the pelleting process but MNB is superior during storage

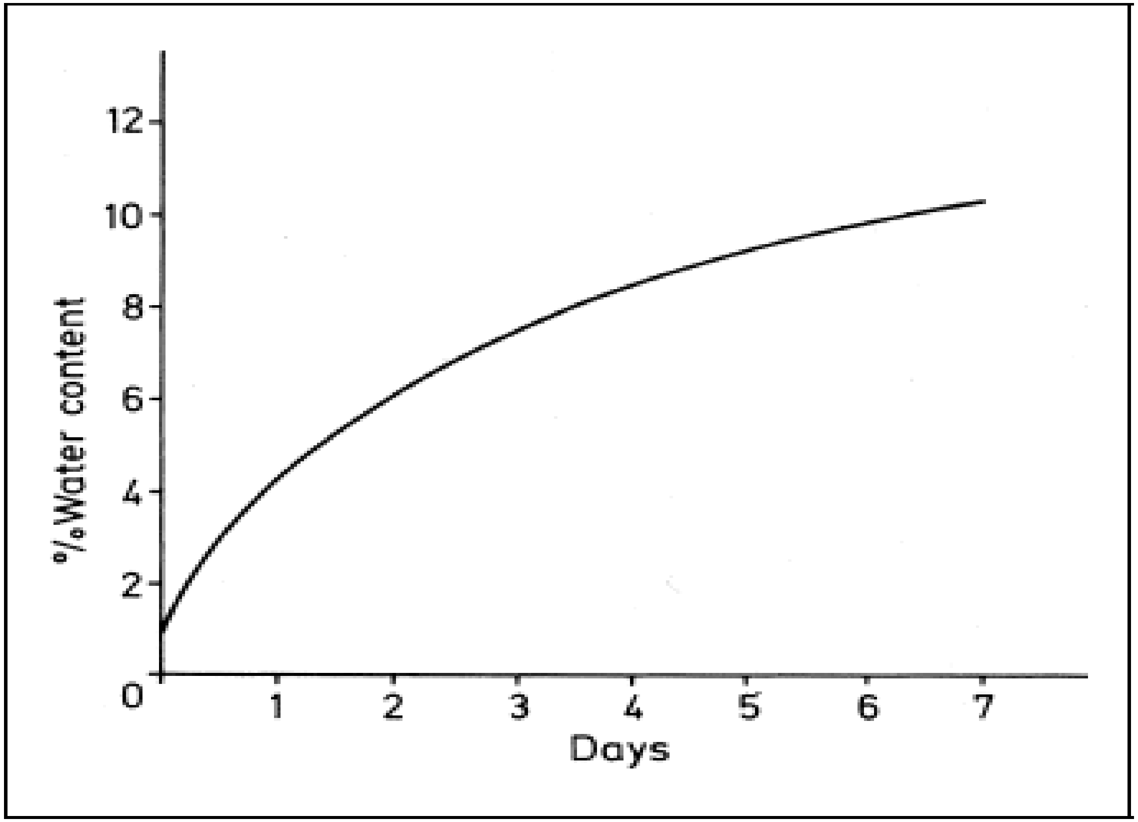
MSB form is highly damaged during the pelleting process and the losses of activity continue dramatically during storage



- MSB is still used for some specific applications (soluble products)
- MSBC has disappeared
- MPB is declining.
- MNB is the new standard (Microvit® K_3)

ویتامین ها
دما
رطوبت
اسیدیته
اکسیژن
نور و تشعشع
کاتالیزورها مانند آهن یا مس
بازدارنده ها
اثرات متقابل عوامل مختلف
انرژی
زمان

		O_2				
A	××	××	×	××	×	
D3	×	××	×	×	×	
E	×		×	×	×	×
K3	××	×	××	×	××	
B1	×	×	×	×		××
B2			×	×		
B6	××		×	×	×	
B9	××		×	××	××	



Uptake of water by calcium D-pantothenate at 80 % relative humidity.


ویتامین ها
دما
رطوبت
اسیدیته
اکسیژن
نور و تشعشع
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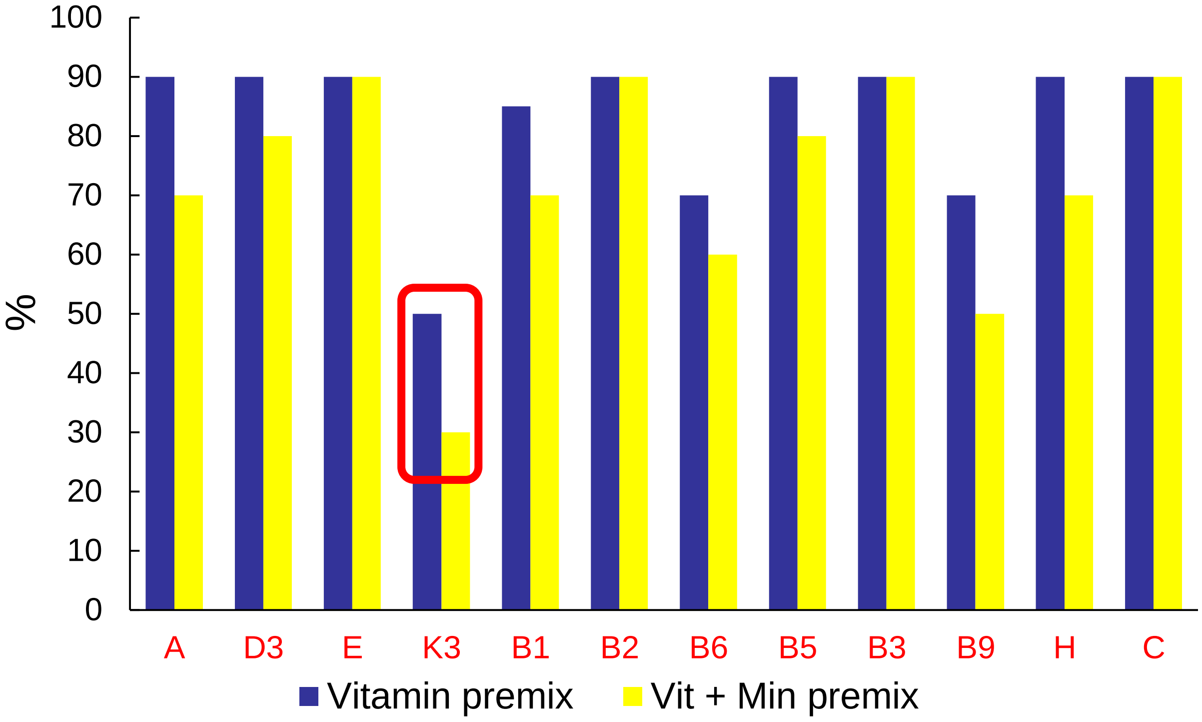
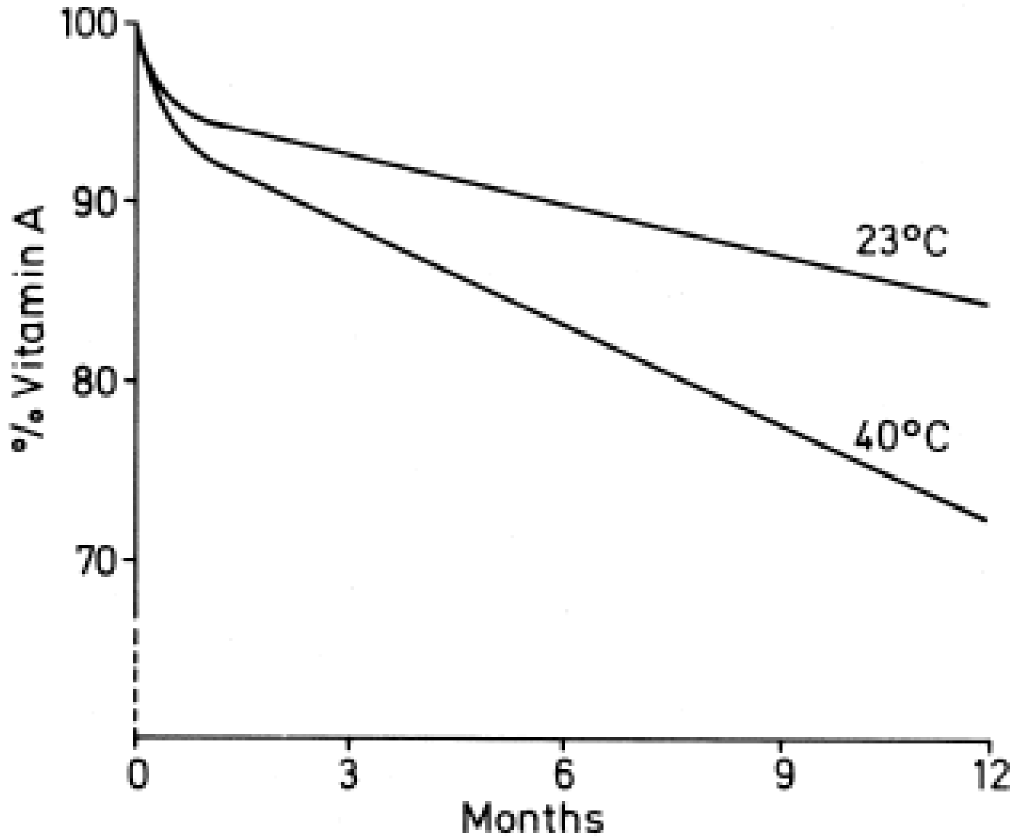
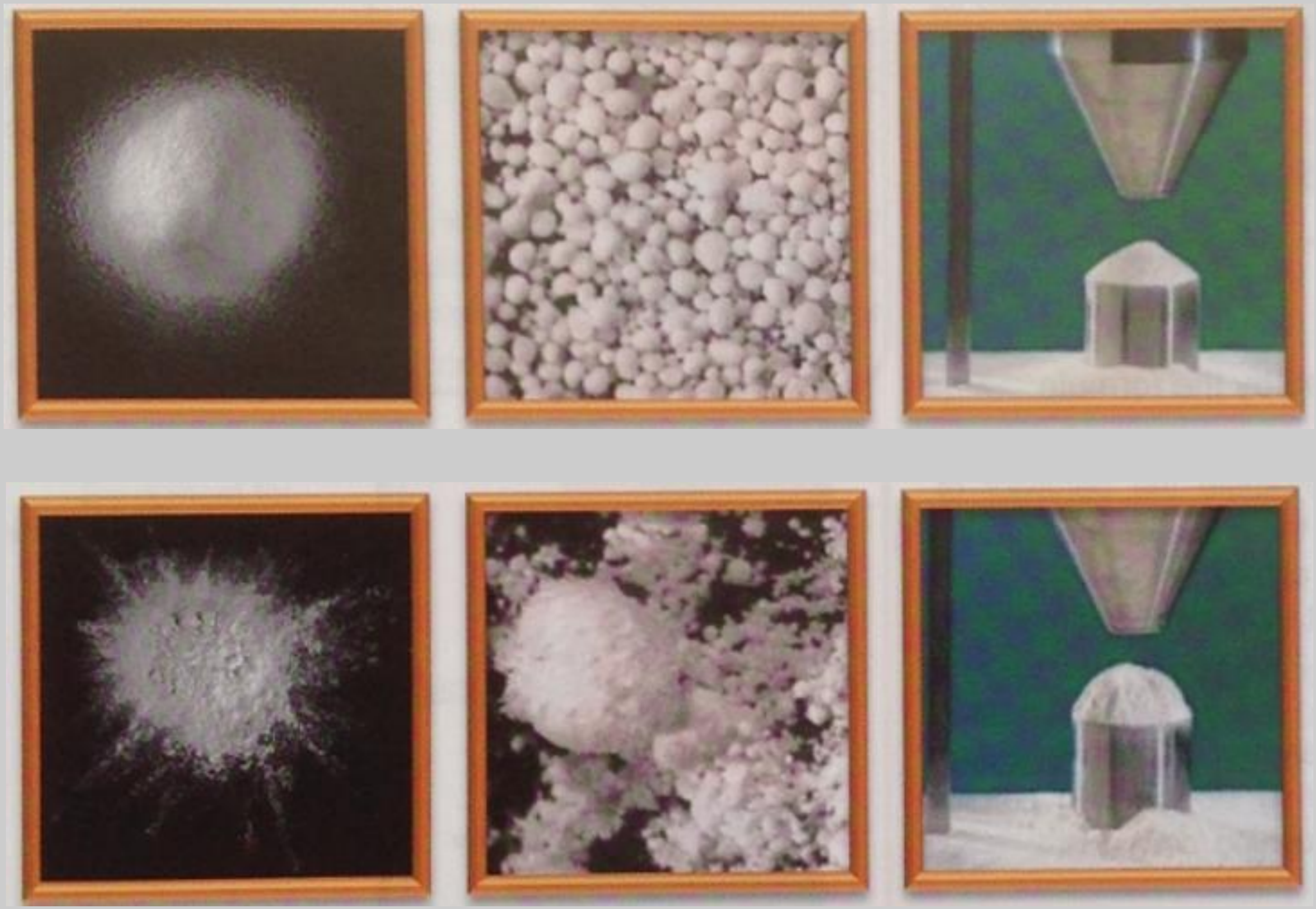
بازدارنده ها
اثرات متقابل عوامل مختلف
انرژی
زمان

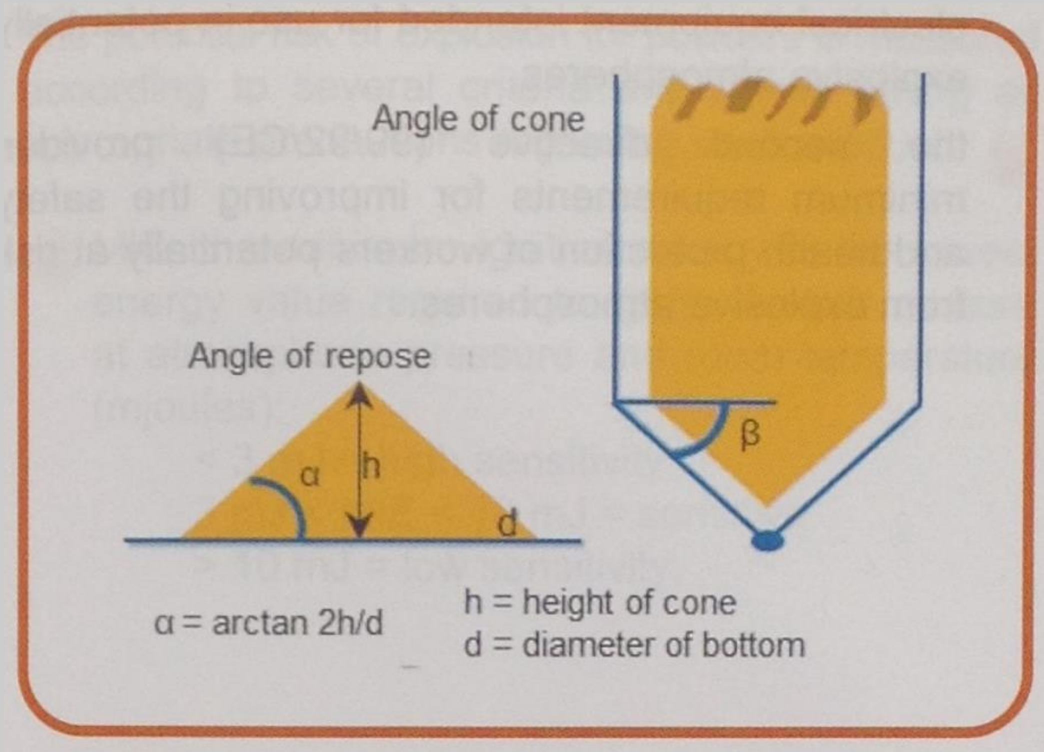
Retention of vitamin after 3 months



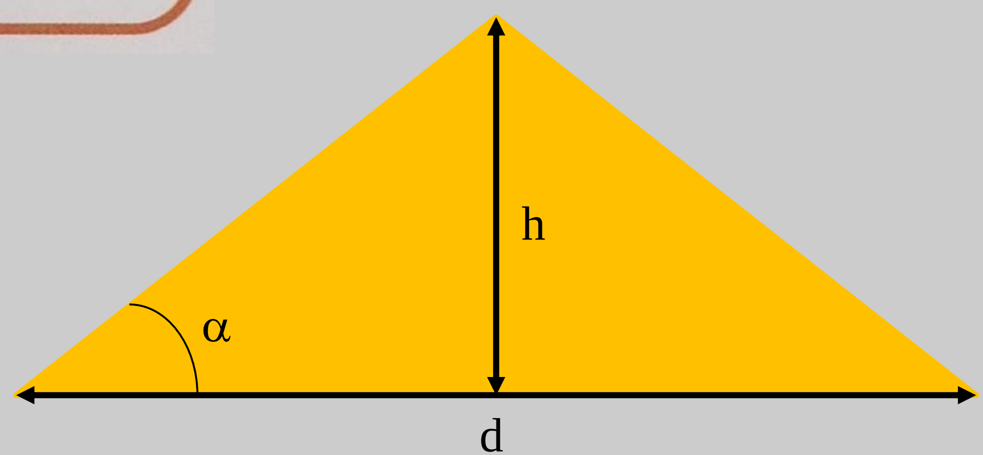

100
90
80
70
% Vitamin A
23°C
40°C
0
3
6
9
12
Months

Comparison of two sources of vitamin E





Angle of repose



$\alpha = \arctan 2h/d$


COPLEY


4
36
7
28

Now, gently and smoothly but rapidly move the knob of the shutter arm to the right to allow the powder to flow freely though the nozzle such that it forms a conical pile on the test platform.

The *tangent* of the angle of repose θ can be determined by reading off the height of the powder cone in mm from the digital display of the height gauge and dividing it by 50. Take the *inverse tangent* of this figure to obtain the angle in degrees.

$$\tan\theta = \frac{\text{Height of Cone (mm)}}{\text{Half of Cone Base Diameter}} \quad \therefore \quad \theta = \tan^{-1}\left(\frac{\text{Height of Cone (mm)}}{\text{50mm}}\right)$$

If a cone of powder is not forthcoming, this method is not appropriate.

A stirrer (optional) can be provided to assist in the flow of more difficult products.

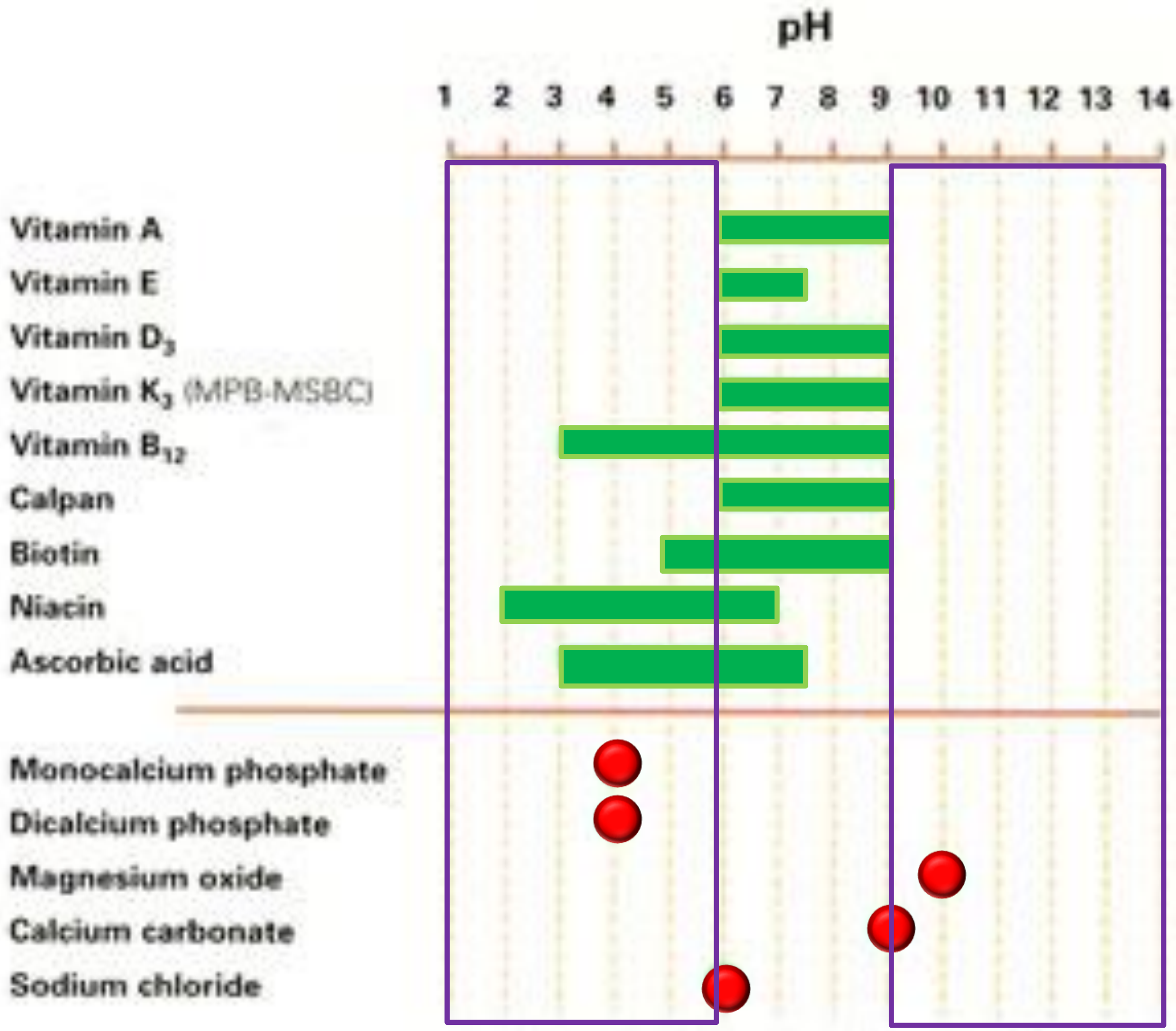
The following table of Flow Properties and Corresponding Angles of Repose may prove helpful.

Flow Properties and Corresponding Angles of Repose

Flow Property	Angle of Repose (degrees)
Excellent	25 - 30
Good	31 - 35
Fair – aid not needed	36 - 40
Passable – may hang up	41 - 45
Poor – must agitate, vibrate	46 - 55
Very poor	56 - 65
Very, very poor	>66

pH:

In premixes, the pH becomes a factor when the amount of free water is sufficient to allow the release of cations and anions from soluble components.



Most vitamins show greatest stability at approximately pH **5.5**

Buffering capacity or B-value in a feed is often expressed as meq of 1.0 M HCl required to acidify 1 kg of material (feed or feed Ingredient) to pH 3-5. Usually, the amount of 0.1 M HCl required to reduce the pH to 5 of 10 g feed in 90 ml distilled water is represented as buffering capacity.

Feed Ingredient	pH	B-value
Tapioca	5.2	1.3
Rice	6.5	2.8
Barley	5.8	3.0
Maize	6.1	3.5
Wheat	6.7	3.7
Sorghum	5.9	5.0
Triticale	6.8	7.0
Wheat middlings	6.7	11.4
Peas	6.5	11.0
Alfalfa meal	5.9	18.5
Potato protein	5.4	3.0
Rapeseed meal	5.3	6.8
Linseed	5.8	7.9
Soybean hulls	6.1	8.5
Soybeans	6.3	18.0
Sunflower seed hulls	6.1	16.4
Animal meal	6.2	25.4
Meat meal	6.0	26.0
Soybean oil meal 53%	6.6	28.8
Whey powder	6.4	31.0
Meat and bone meal	8.3	32.0
Milk powder	6.5	37.0
Dicalcium phosphate	7.3	248.0
Limestone	9.7	1750.0

Redox activity of minerals and trace minerals (according to NFIA 1992)	
Trace Mineral	**Redox activity**
Cu CO_3	+
Cu O	+
Cu SO_4, 5 H_2O	+++
Ca $(IO_3)_2$	++
KI	+
Fe CO_3	+
Fe_2 O_3	-
Fe SO_4, 7 H_2O	++
Fe SO_4, 1 H_2O	+
Mn O	+
Mn SO_4	++
Zn O	+
Zn SO_4, 1 H_2O	++

Carrier	Straight through flow	Angle of repose	Bulk density	Moisture	Absorption of moisture		pH
	mm orifice	degree	Lb/ft3	%	day	%	
Ground rice hulls	26	41	18.7	5	1 3 7	0.06 0.82 2.25	6.3
Fine limestone	26	70	62.4	0.2	1 3 7	0.02 0.02 0.02	**9.2**
Course limestone	7	27	71.2	0.4	1 3 7	0.27 0.35 0.44	9.0
Wheat midds	28	48	20.6	11.3	1 3 7	0.30 1.87 4.34	6.7
Dry wheat midds	35	47	22.5	5	1 3 7	5.31 8.94 11.7	6.9
Ground corn cob	20	50	25.5	5	1 3 7	2.69 5.66 8.13	5.4
Dicalcium phosphate	5	29	58.7	2.8	1 3 7	3.84 5.34 6.20	3.4
Dicalcium propionate	24	57	33.7	1.3	1 3 7	0.27 0.67 1.66	6.7
Vermiculite	9	28	8.1	5.1	1 3 7	0.39 0.48 3.37	6.3
Silicon dioxide	4	33	14.3	4.4	1 3 7	3.50 5.08 5.75	6.9

Carrier	Straight through flow	Angle of repose	Bulk density	Moisture	Absorption of moisture		pH
	mm orifice	degree	Lb/ft3	%	day	%	
Ground rice hulls	26	41	18.7	5	1 3 7	0.06 0.82 2.25	6.3
Fine limestone	26	70	62.4	0.2	1 3 7	0.02 0.02 0.02	9.2
Course limestone	7	27	71.2	0.4	1 3 7	0.27 0.35 0.44	9.0
Wheat midds	28	48	20.6	11.3	1 3 7	0.30 1.87 4.34	6.7
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Vermiculite	9	28	8.1	5.1	1 3 7	0.39 0.48 3.37	6.3
Silicon dioxide	4	33	14.3	4.4	1 3 7	3.50 5.08 5.75	6.9

New generation:

Activated peptide

(pH, flowability, particle size, no water absorption, porosity)

Vit Supplement Formulation

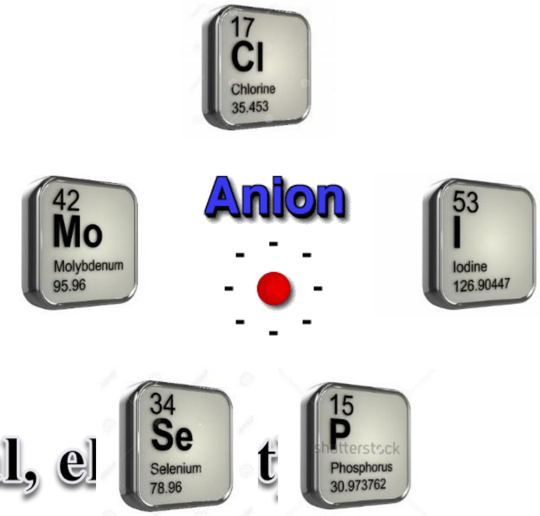
Formula Code: VIT00005
Date: 03/09/2018
Formula Name: MINA TOYOOR
Birds Type: Broiler breeder
Stage: Laying
Strain: Ross 308

Ingredients	Description	Requirement	Unit	Concentration	Unit	Purity	Bioavalibility	Days PPD**	Density (g/cm3)	Price (Rial/kg)
Vit A	All Tra Retinol	11000	(IU/Kg)	1000000000	(IU/Kg)	1	1	0	0.5	23000000
Vit D3	Cholecalciferol	3500	(IU/Kg)	500000000	(IU/Kg)	1	1	0	0.5	5200000
Vit E	DLaTocophery	100	(IU/Kg)	500000	(IU/Kg)	1	1	0	0.5	1100000
Vit K3	MNBS	5	(mg/Kg)	96	(%)	0.4552	1	0	0.5	1700000
Vit B1	TMN	3	(mg/Kg)	98	(%)	0.92	1	0	0.5	5300000
Vit B2	Riboflavine	12	(mg/Kg)	80	(%)	1	1	0	0.5	3570000
Vit B3	Nicotinic Acid	55	(mg/Kg)	99.5	(%)	1	1	0	0.5	550000
Vit B5	D Ca Pantothena	15	(mg/Kg)	98	(%)	0.92	1	0	0.5	5200000
Vit B6	Pyridoxin-HCl	4	(mg/Kg)	99	(%)	0.823	1	0	0.5	4700000
Vit B9	Folic Acid	2	(mg/kg)	95	(%)	1	1	0	0.5	4700000
Vit B12	Cyanocobalamin	0.03	(mg/kg)	10000	(mg/kg)	1	1	0	0.5	10000000
Vit H2	Biotin	0.25	(mg/Kg)	2	(%)	1	1	0	0.5	1700000
Choline	Choline chloride	0	(mg/Kg)	60	(%)	0.86	1	0	0.5	90000
AntiOxid	200		(g/1000 Kg)						0.5	150000
Corn Cob	100000		(g/1000 Kg)		Filler & Carrier				0.4	2000
Active Peptid	200000		(g/1000 Kg)						0.8	2000
CaCo3									0.7	1500

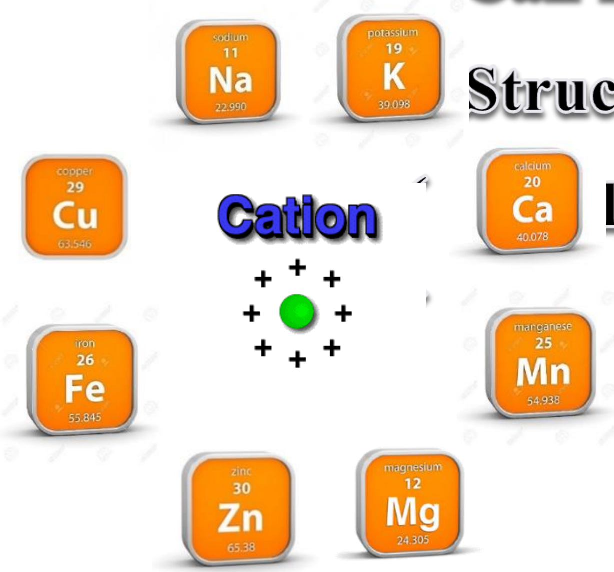
** Days Past from Production Date

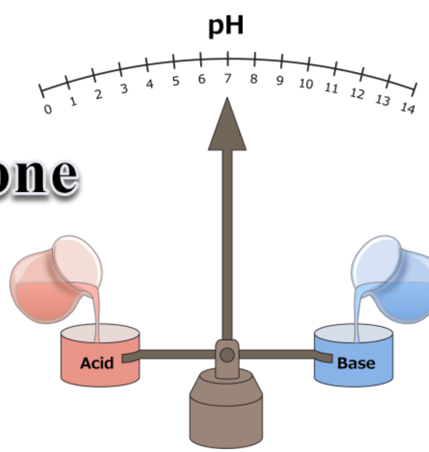
Save Data | Close | Save Values | Show

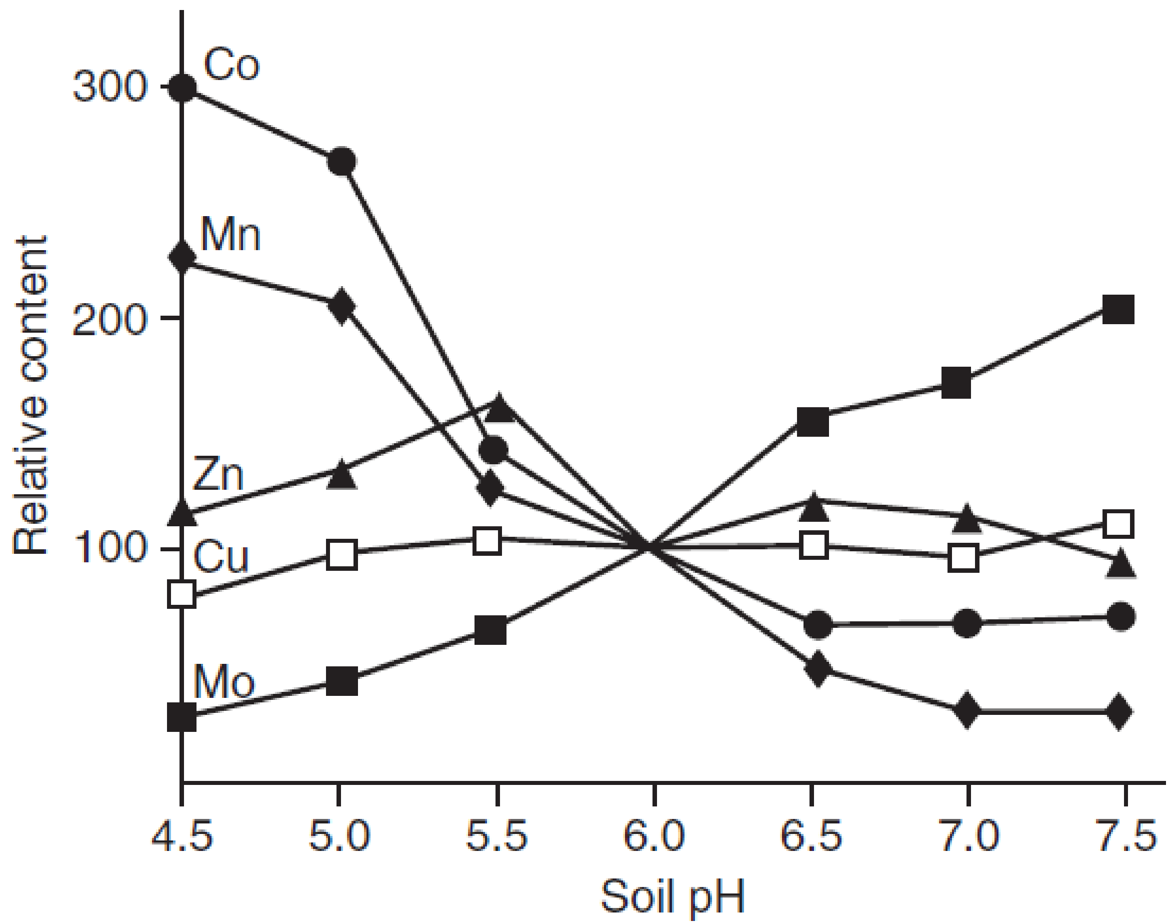
Mineral is:

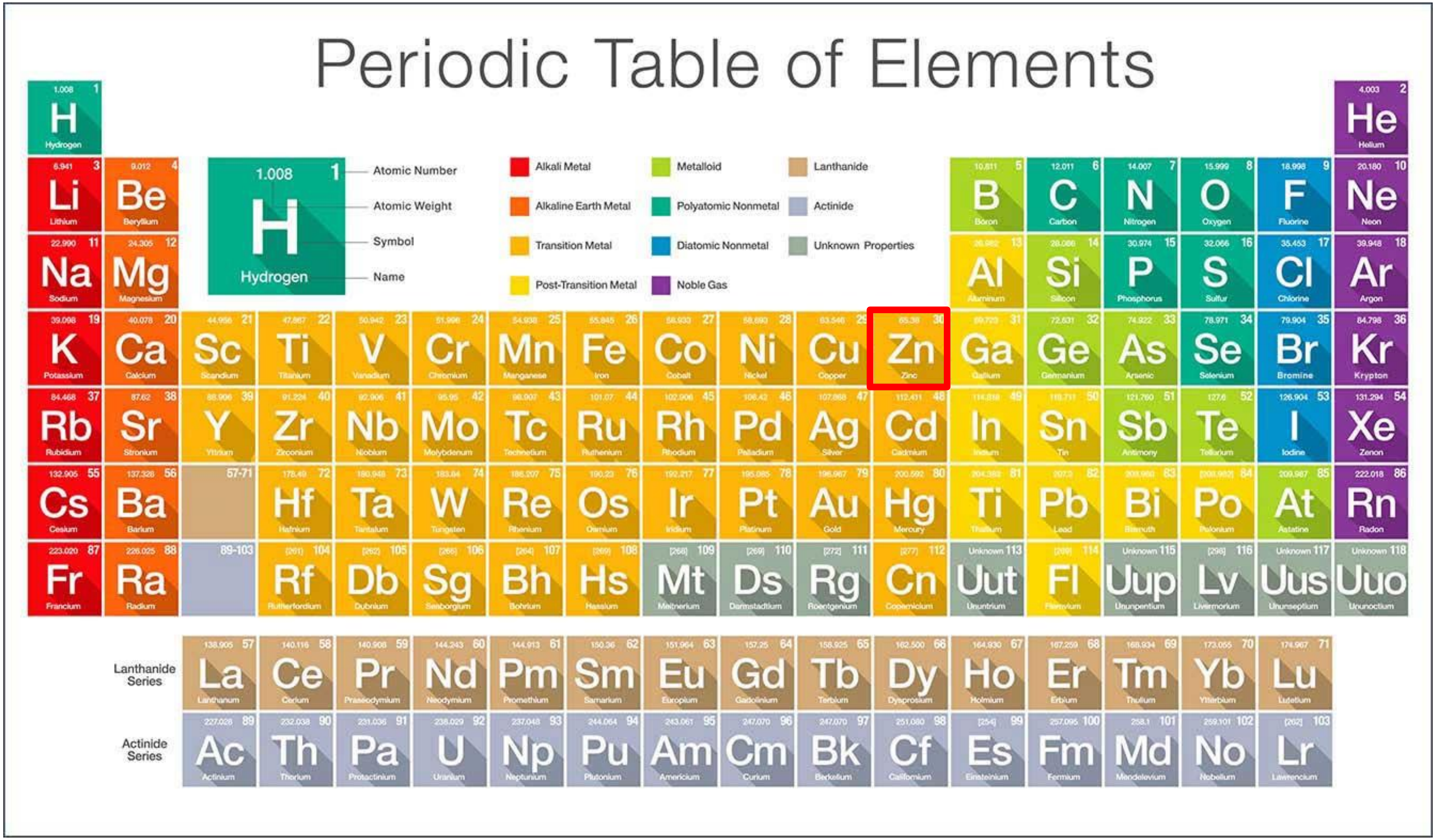


- ✓ Inorganic compound (mineral, el … t
- ✓ Essential
- ✓ Solid, crystalline chemical elements
- ✓ Can not be decomposed or synthesized
- Structural function
- … lysts in enzyme and hormone
- … fluids, osmotic pressure






Co
Mn
Zn
Cu
Mo
300
200
100
Relative content
4.5
5.0
5.5
6.0
6.5
7.0
7.5
Soil pH


Periodic Table of Elements
1.008 1 H Hydrogen
Atomic Number
Atomic Weight
Symbol
Name
Alkali Metal
Alkaline Earth Metal
Transition Metal
Post-Transition Metal
Metalloid
Polyatomic Nonmetal
Diatomic Nonmetal
Noble Gas
Lanthanide
Actinide
Unknown Properties
H He
Li Be B C N O F Ne
Na Mg Al Si P S Cl Ar
K Ca Sc Ti V Cr Mn Fe Co Ni Cu Zn Ga Ge As Se Br Kr
Rb Sr Y Zr Nb Mo Tc Ru Rh Pd Ag Cd In Sn Sb Te I Xe
Cs Ba 57-71 Hf Ta W Re Os Ir Pt Au Hg Tl Pb Bi Po At Rn
Fr Ra 89-103 Rf Db Sg Bh Hs Mt Ds Rg Cn Uut Fl Uup Lv Uus Uuo
Lanthanide Series
La Ce Pr Nd Pm Sm Eu Gd Tb Dy Ho Er Tm Yb Lu
Actinide Series
Ac Th Pa U Np Pu Am Cm Bk Cf Es Fm Md No Lr

- Essential trace element
- Cofactor in more than 300 enzymes
- Required for the structural and functional integrity of over 2000 transcription factors and almost every signaling and metabolic pathway is dependent on one or more zinc-requiring proteins
- Cell growth and proliferation is strictly depend on zinc (immune system, skin, reproductive system)
- Gene expression
- Appetite control
- Protein, carbohydrate and fat metabolism
- Antioxidant defense
- No storage system for zinc

Some studies showing the zinc requirement of broiler chickens

References	Year	Sex	Age (Day)	Diet type	Traits evaluated	Estimated requirement (mg kg^{-1})
Rossi, *et al.*	2007	M [a]	0-42	Corn-soy	Skin tearing	105
Vieira *et al.*	2013	M	0-42	Corn-soy	Footpad integrity	100
Gomez	2008	M and F	8-21	Practical	Tibia Zn	86
Huang *et al.*	2007	M	0-21	Corn-soy	Weight gain	84
Mohanna and Nys	1999	-	5-21	Corn-soy	Tibia and plasma Zn	75
Bao *et al.*	2009	-	14-35	-	Weight gain	68
Xiudong Liao *et al.*	2013	-	22-42	Corn-soy	Tibia Zn	62
Ao *et al.*	2007	M	0-21	Corn-soy	Weight gain	37
Wedekind and Baker	1990	M	8-12	Semi purified	Weight gain	33
Ao *et al.*	2006	M	0-21	Corn-soy	Weight gain	32.8
Steinruck and Kirchgessner	1993	-	72-107	Semi purified	Weight gain	32
Zeigler *et al.*	1961	-	-	Semi purified	Weight gain	28
Batal *et al.*	2001	F [b]	1-3	Semi purified	Weight gain	27.1
Dewar and Downie	1984	M and F	0-3	Purified	Live weight	18
Emmert and Baker	1995	-	8-22	Purified	Weight gain	10.6

[a] Male, [b] Female.

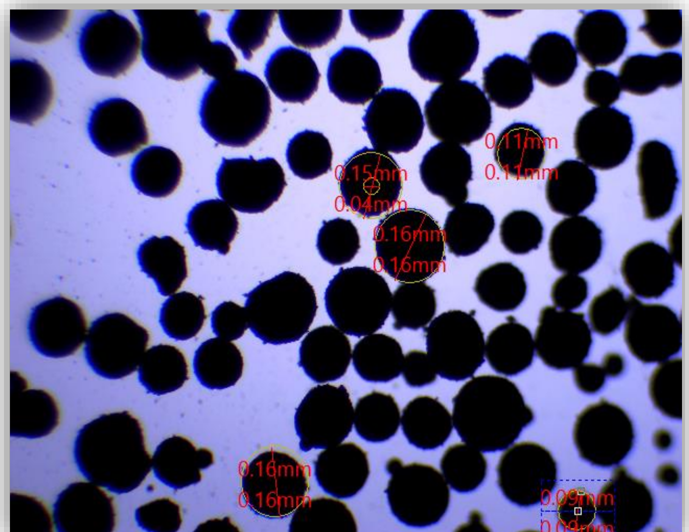
Feed Ingredients	Zinc content (mg/kg)
Corn	18
Soybean meal	40
Wheat	34
Wheat bran	100
Barley	30
Canola meal	71
Corn gluten	33

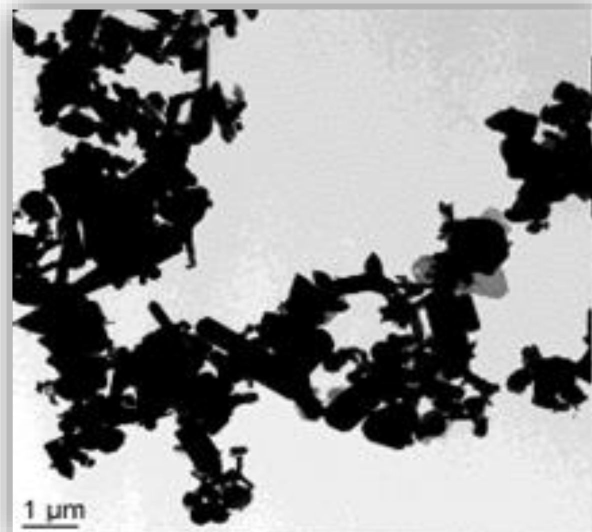
What does it means?

Natural Zn concentrations in feedstuffs are generally lower than the daily Zn requirement for broiler chickens leading to the necessity of dietary Zn supplementation.

مقایسه خصوصیات فیزیکی انواع اکسید روی

منبع اکسید روی	اندازه ذرات (µm)	شکل	زاویه ریزش (درجه)	قابلیت میکس شدن	رنگ	نسبت سطح به وزن (m2/g)	آلودگی به عناصر سنگین			
							آرسنیک (ppm)	کادمیوم (ppm)	سرب (ppm)	دی اکسین (ng)
اکسید روی فعال شده	کمتر از ۱۰۰	صفحه‌ای	۲۸	خوب	کرم	۴۲	۵	۲	۲۰	۱/۵
اکسید روی معمولی	۱۰۰ تا ۱۰۰۰	میله‌ای	۳۵	ضعیف	سفید	۴/۲	۱۰	۱۱	۸۰	۱/۵



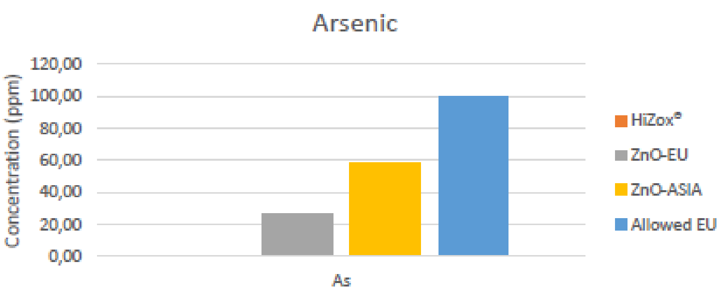


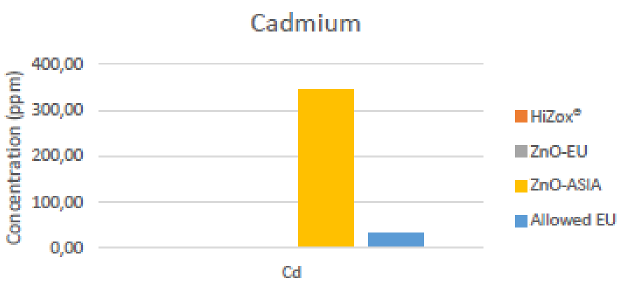
- Crystallite size: X-Ray diffraction

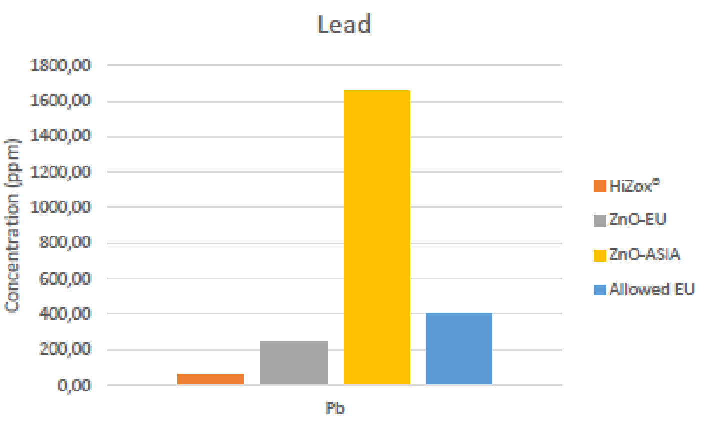
- Aggregate/agglomerate sizes: low-angle laser light scattering.

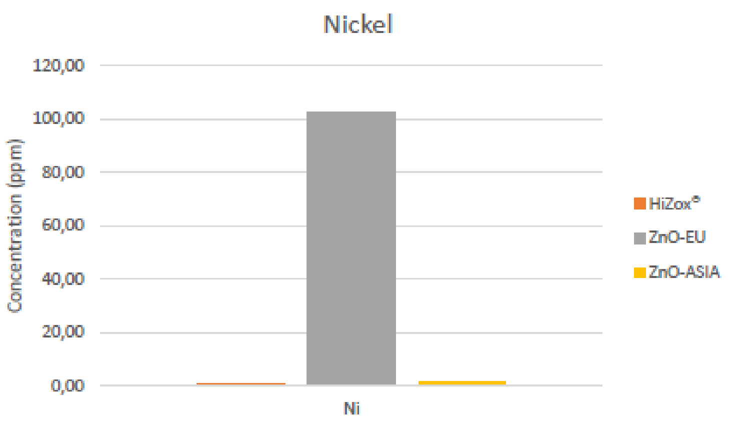
- Primary particle size and shape: transmission electron microscopy (TEM) and scan electron microscopy (SEM).

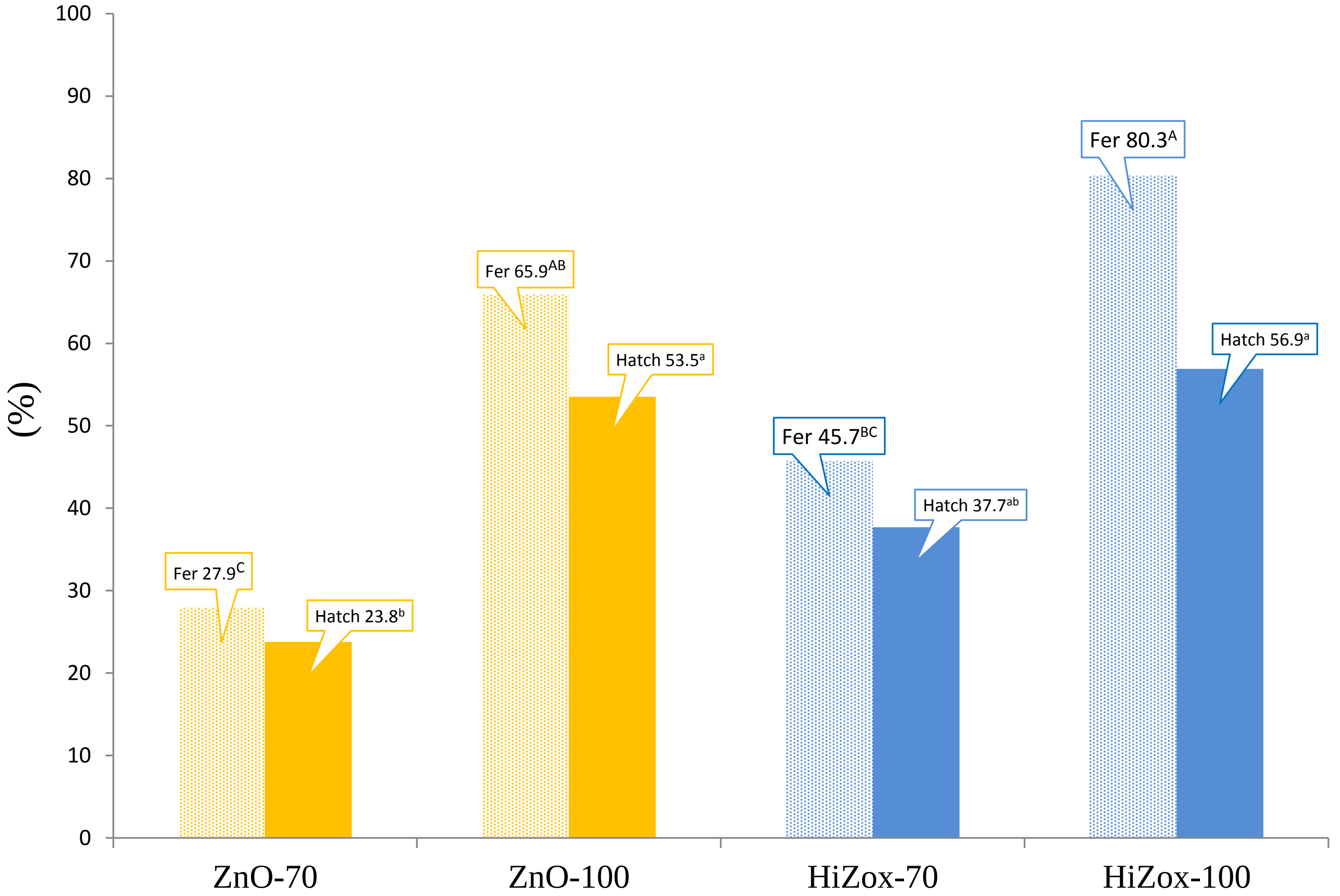
- Specific surface area and porosity: nitrogen adsorption applied to BET theory.


Arsenic
Concentration (ppm)
120,00
100,00
80,00
60,00
40,00
20,00
0,00
As
HiZox®
ZnO-EU
ZnO-ASIA
Allowed EU


Cadmium
Concentration (ppm)
400,00
300,00
200,00
100,00
0,00
Cd
HiZox®
ZnO-EU
ZnO-ASIA
Allowed EU


Lead
Concentration (ppm)
1800,00
1600,00
1400,00
1200,00
1000,00
800,00
600,00
400,00
200,00
0,00
Pb
HiZox®
ZnO-EU
ZnO-ASIA
Allowed EU

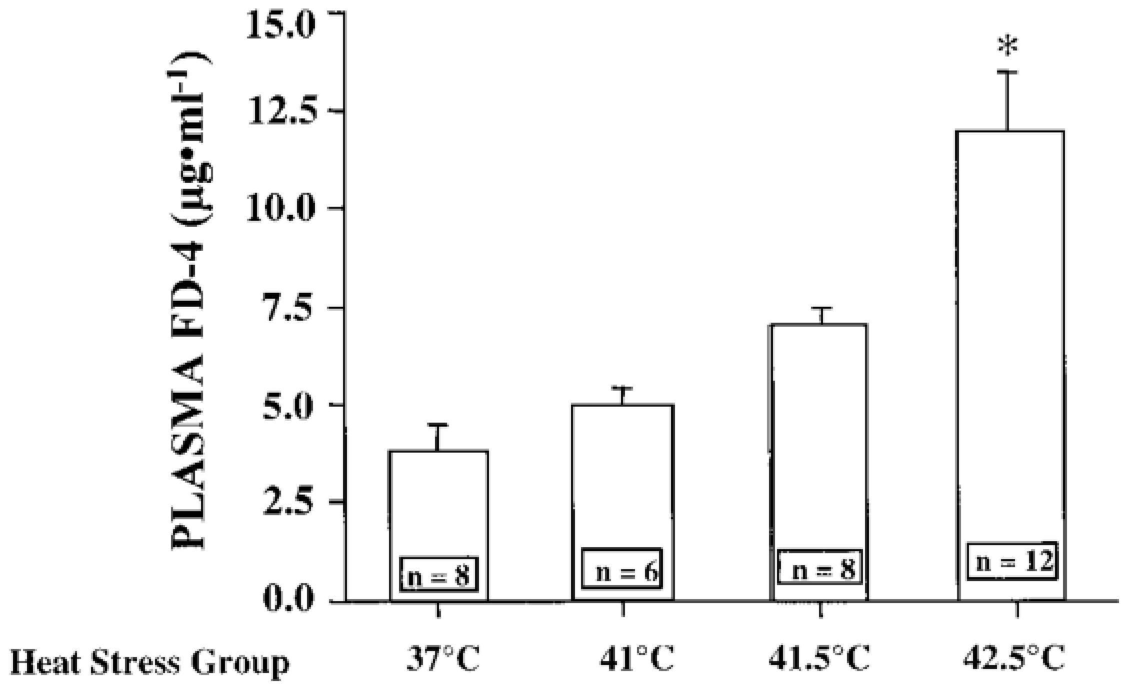

Nickel
Concentration (ppm)
120,00
100,00
80,00
60,00
40,00
20,00
0,00
Ni
HiZox®
ZnO-EU
ZnO-ASIA

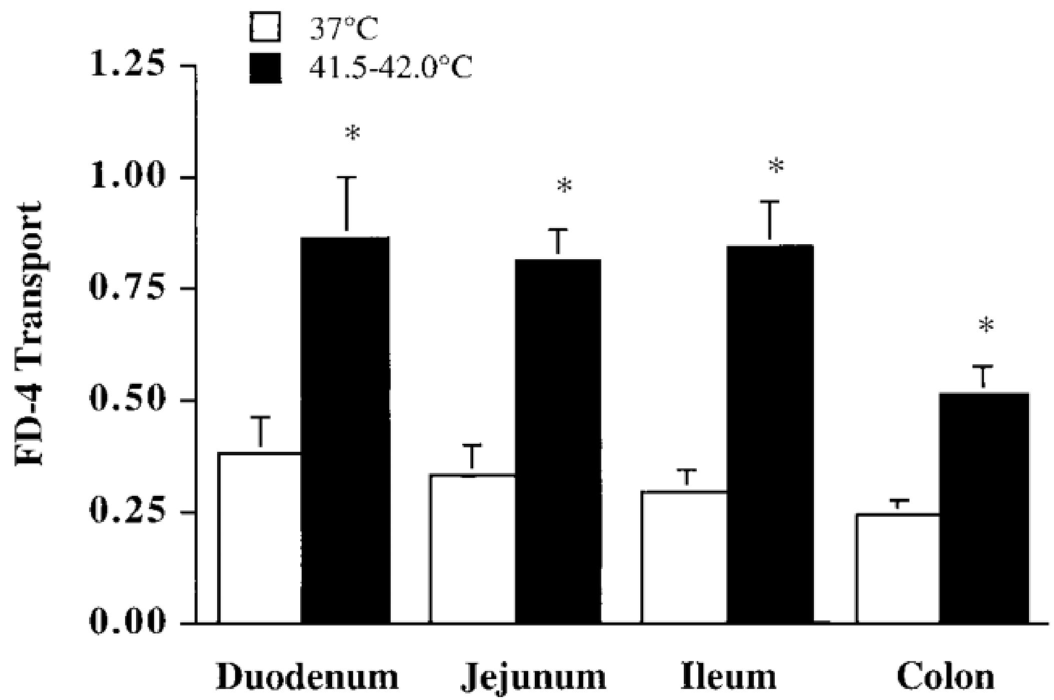


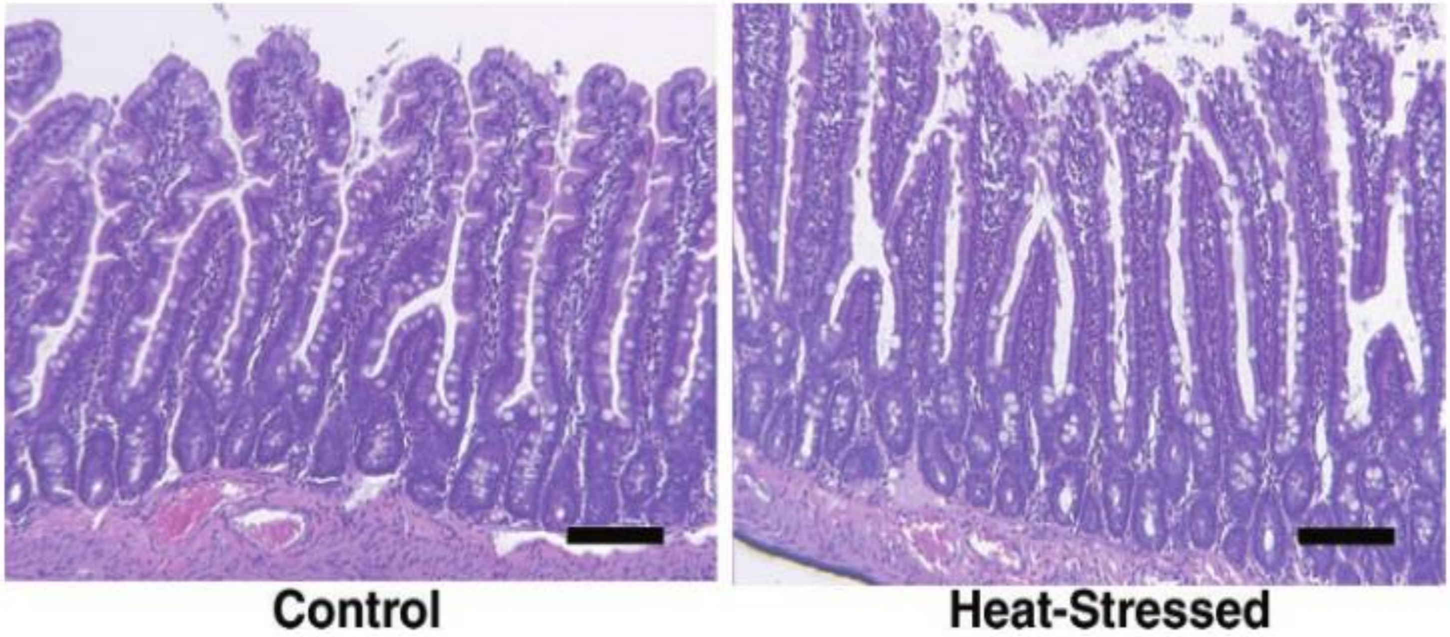
(%)
100
90
80
70
60
50
40
30
20
10
0
Fer 27.9C
Hatch 23.8b
Fer 65.9AB
Hatch 53.5a
Fer 45.7BC
Hatch 37.7ab
Fer 80.3A
Hatch 56.9a
ZnO-70
ZnO-100
HiZox-70
HiZox-100

Heat Stress

Hyperthermia, increased permeability and marked intestinal epithelial damage in rats (Lambert et al. 2002).

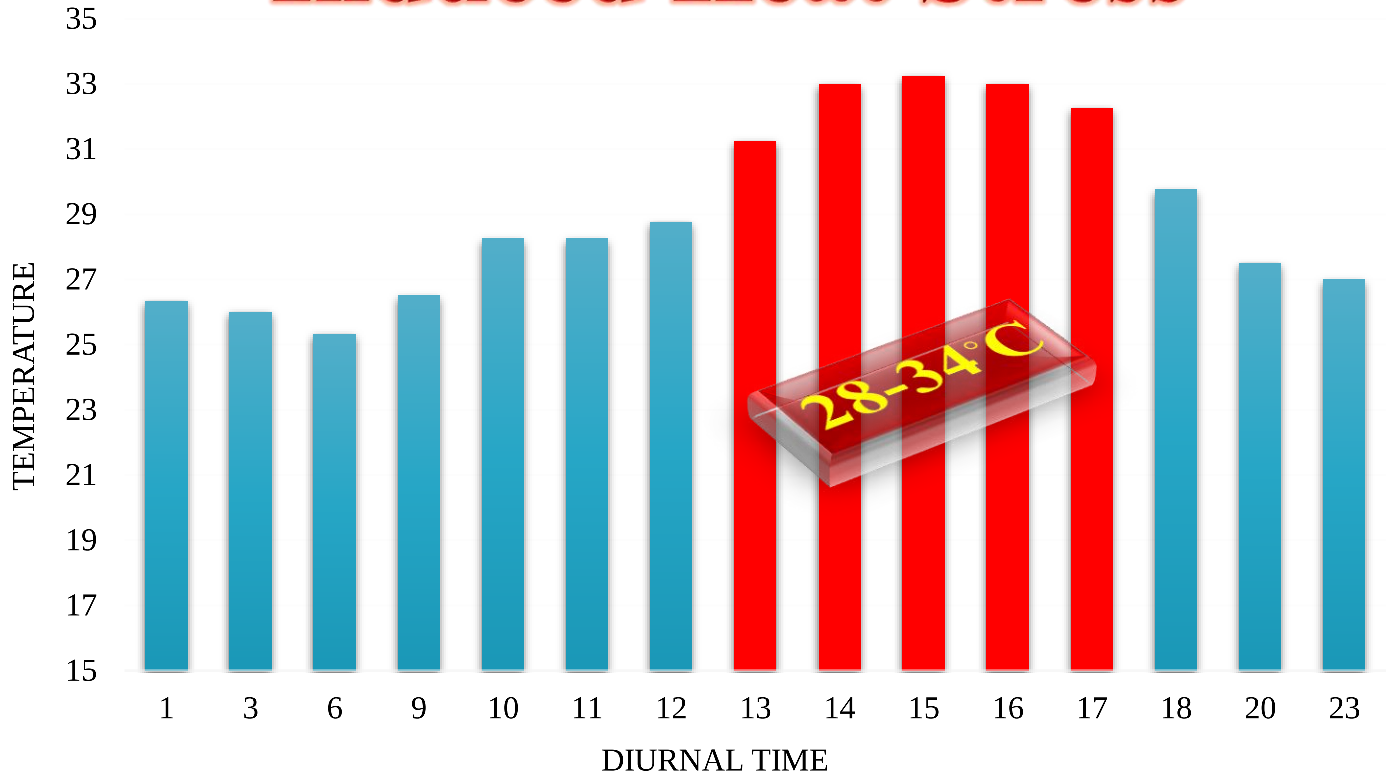

PLASMA FD-4 (μg•ml-1)
15.0
12.5
10.0
7.5
5.0
2.5
0.0
*
n = 8
n = 6
n = 8
n = 12
Heat Stress Group
37°C
41°C
41.5°C
42.5°C


37°C
41.5-42.0°C
FD-4 Transport
1.25
1.00
0.75
0.50
0.25
0.00
*
*
*
*
Duodenum
Jejunum
Ileum
Colon



Sloughing of epithelium off the basement membrane at the villus tips of the heat-stressed tissue compared with the control tissue. Bars represent 100 µM (Lambert et al. 2002).

Induced Heat Stress



Average diurnal house temperature during 21 to 24 days of age

(Red bar show the temperature at daily heat stress period)

Effect of experimental diets on carcass fractional weights (%) of male broiler chickens (d 42).

Treatment	Carcass	Breast	Thighs	AFP[1]	Liver
ZnO-100	75.6	26.8	21.0	1.16	1.67[b]
HiZox-75	75.6	27.2	21.0	1.21	1.80[ab]
HiZox-100	75.4	26.8	20.6	1.27	1.90[a]
HiZox-125	75.5	26.8	20.7	1.33	1.83[ab]
SEM	0.28	0.38	0.17	0.08	0.05
P-Value	0.95	0.84	0.20	0.45	0.04

1. Abdominal fat pad

[abc] Means in a column with different superscripts differ significantly ($P < 0.05$).

Roberson and Edwards, 1994

Stress → liver Zn↑ → plasma zinc↓ → a marginal Zn deficiency

Effect of experimental diets on Zn status of digesta in male broiler chickens (d 42).

Treatment	Gizzard			jejunum		
	Zn (mg/kg DM)	Soluble Zn (mg/kg DM)	Zn solubility[1] (%)	Zn (mg/kg DM)	Soluble Zn (mg/kg DM)	Zn solubility (%)
ZnO-100	64.1[a]	17.5	29.1[b]	291.6[b]	35.1	12.2
HiZox-75	53.6[ab]	19.1	37.7[ab]	222.1[c]	25.3	12.5
HiZox-100	41.3[b]	19.1	45.7[a]	387.3[a]	33.1	8.9
HiZox-125	64.5[a]	17.3	33.0[b]	420.9[a]	37.4	9.4
SEM	6.7	1.5	4.3	24.3	3.2	1.2
P-Value	0.08	0.78	0.03	0.0001	0.09	0.11

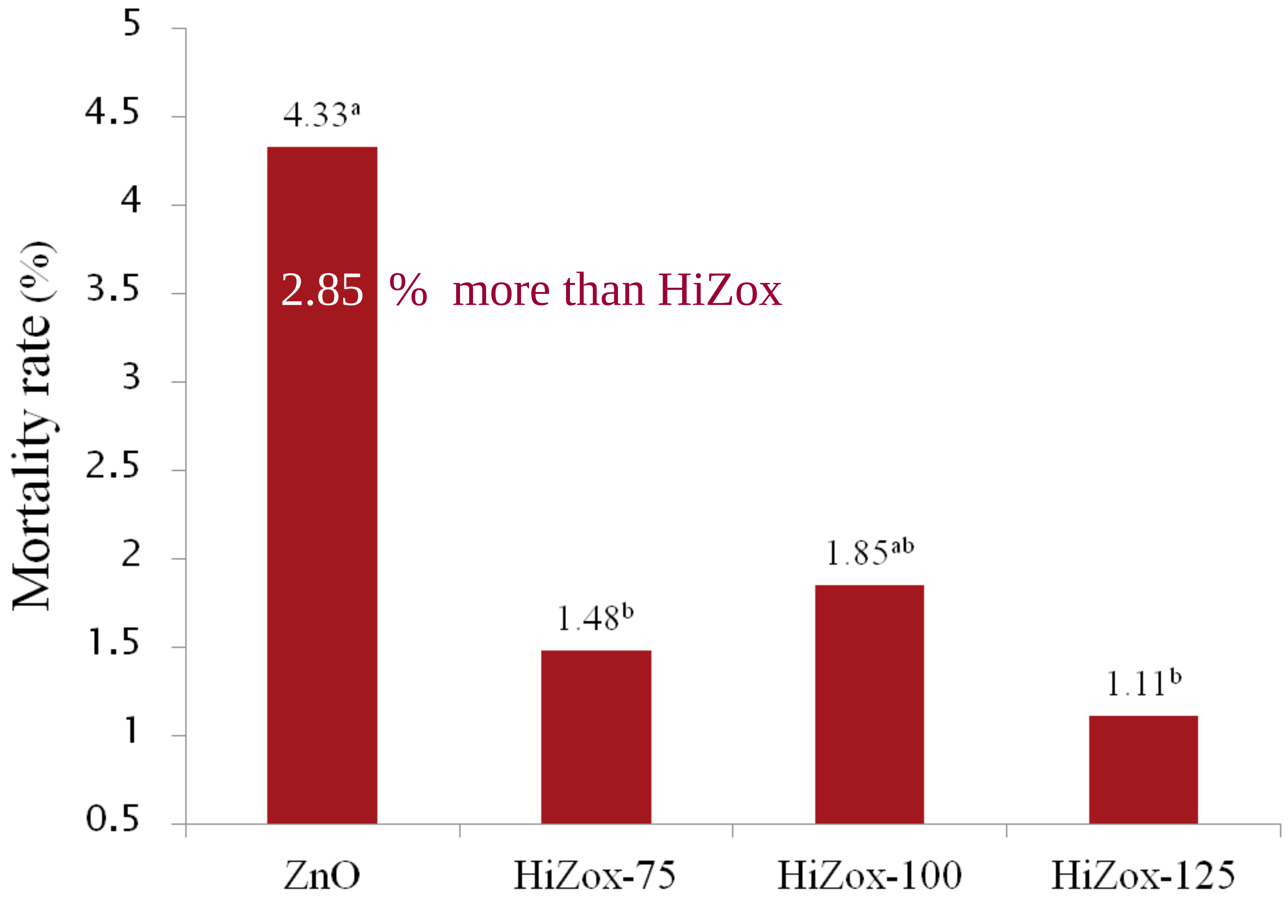
DM = dry matter

1. Calculated as the ratio of total to soluble Zn concentration.

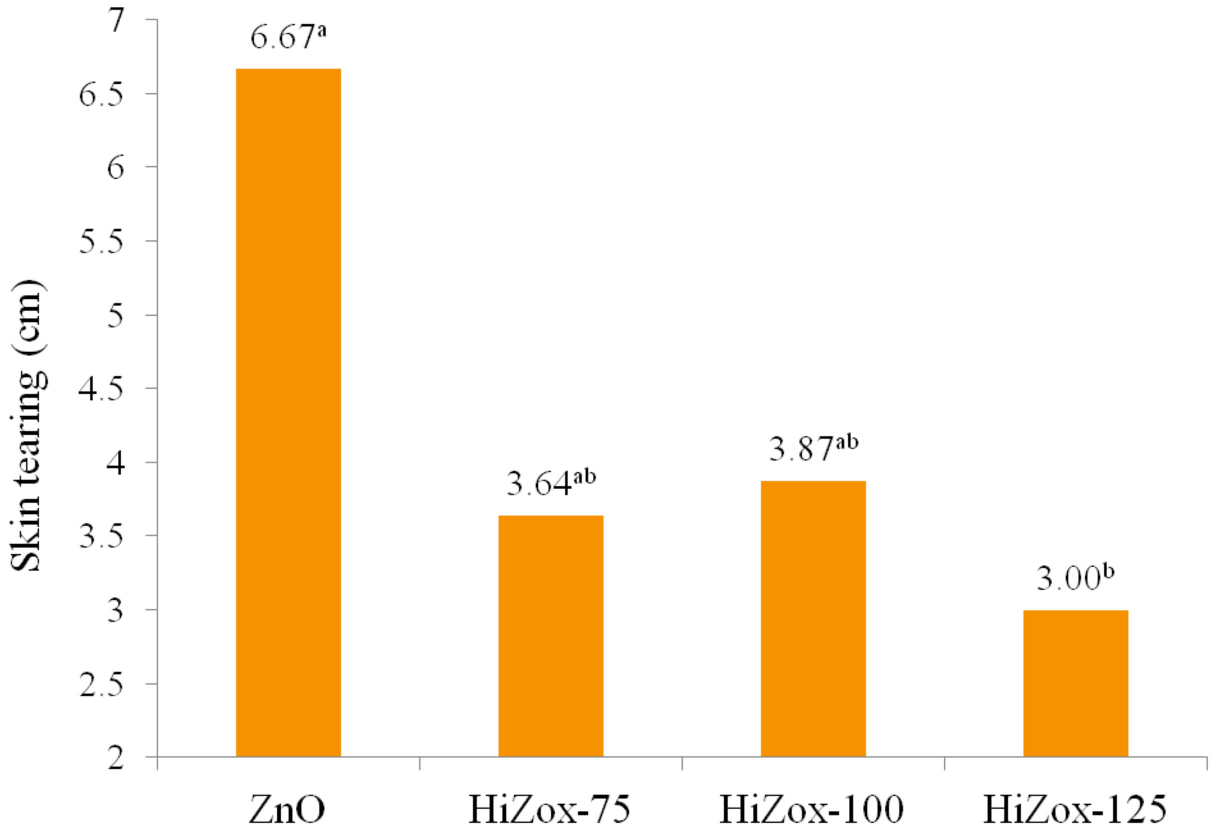
[abc] Means in a column with different superscripts differ significantly ($P < 0.05$).

Zinc solubility in the gizzard

(HiZox) × 1.3 = ZnO

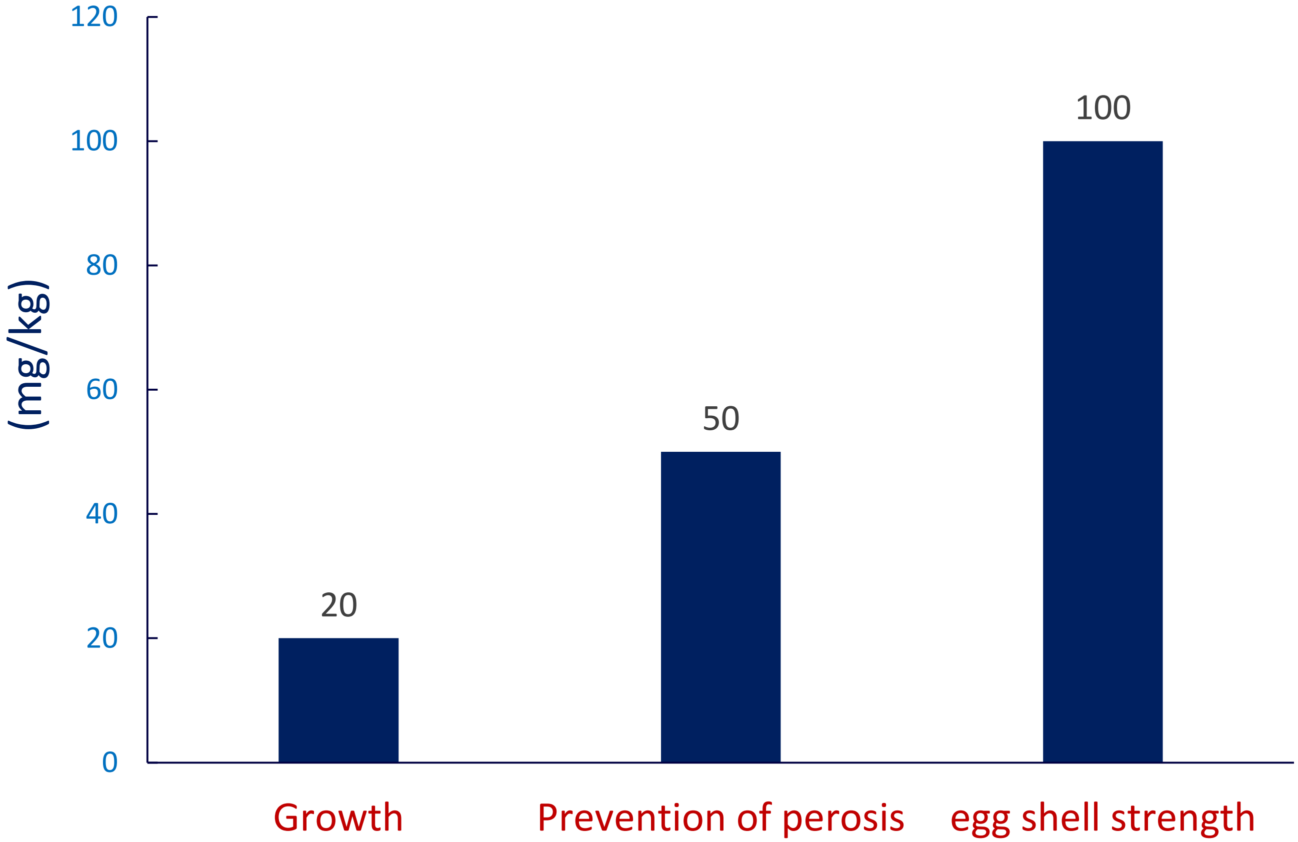


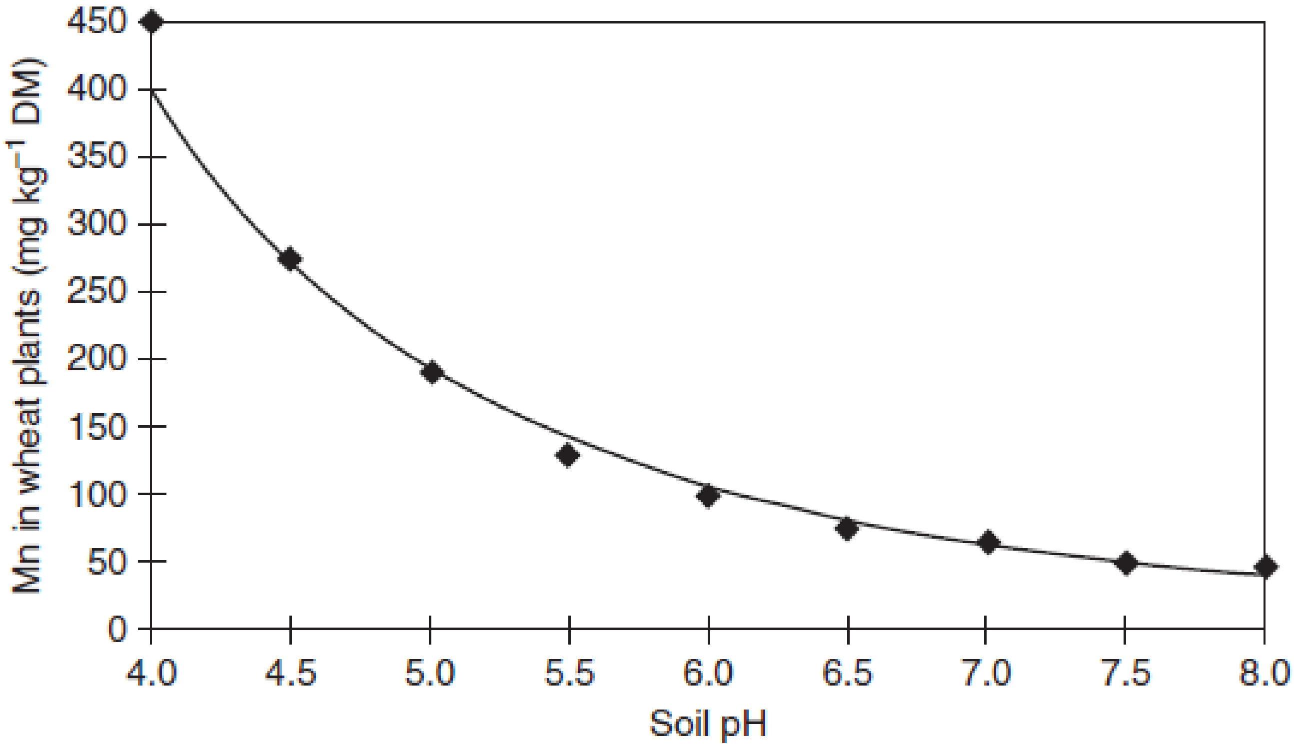
Effect of experimental diets on mortality rate of heat stressed male broiler chicken during 1 to 42 days (P<0.06, SE 0.06).

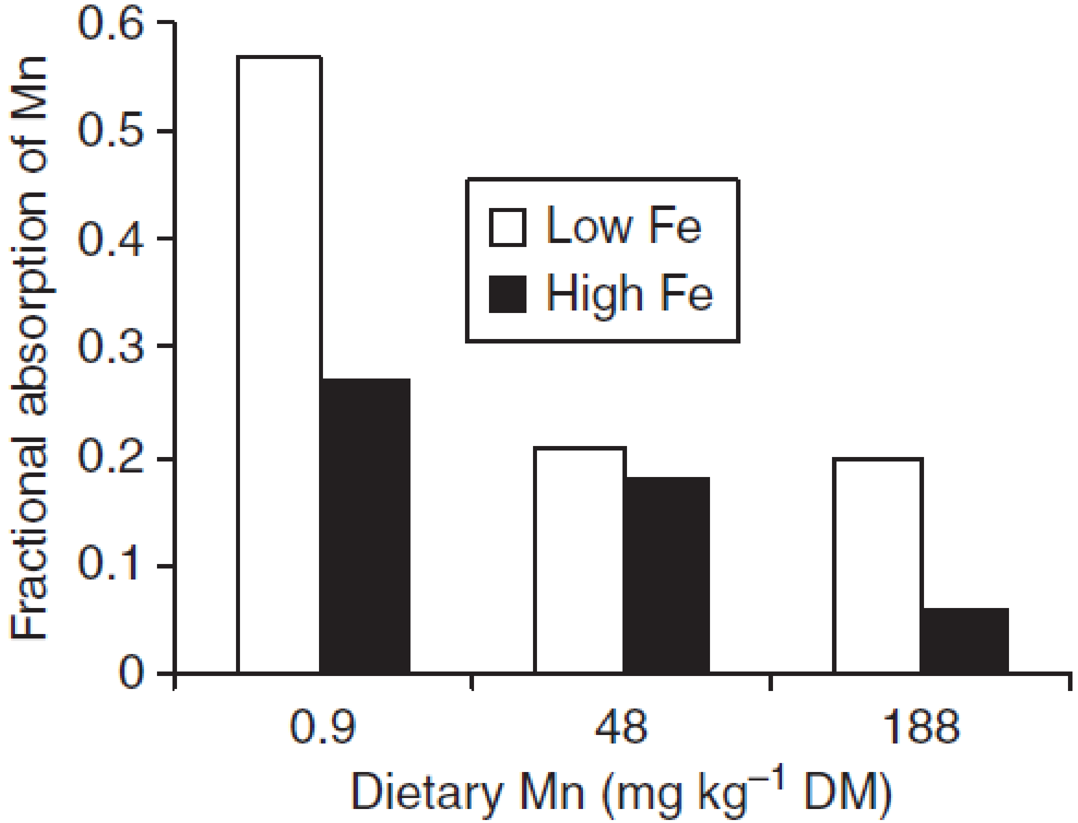


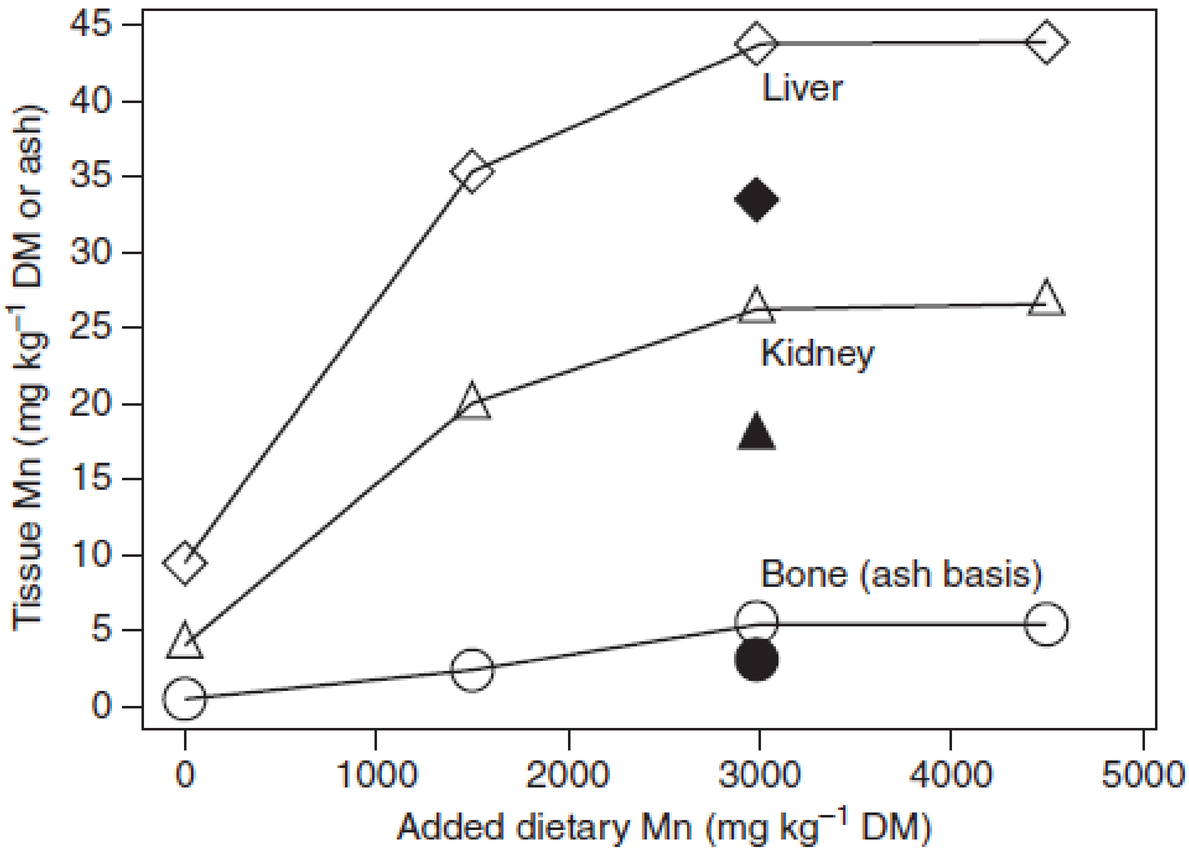
Effect of experimental diets on skin resistance test of heat stressed male broiler chicken at 42 day ($P<0.07$, SE 1.01).

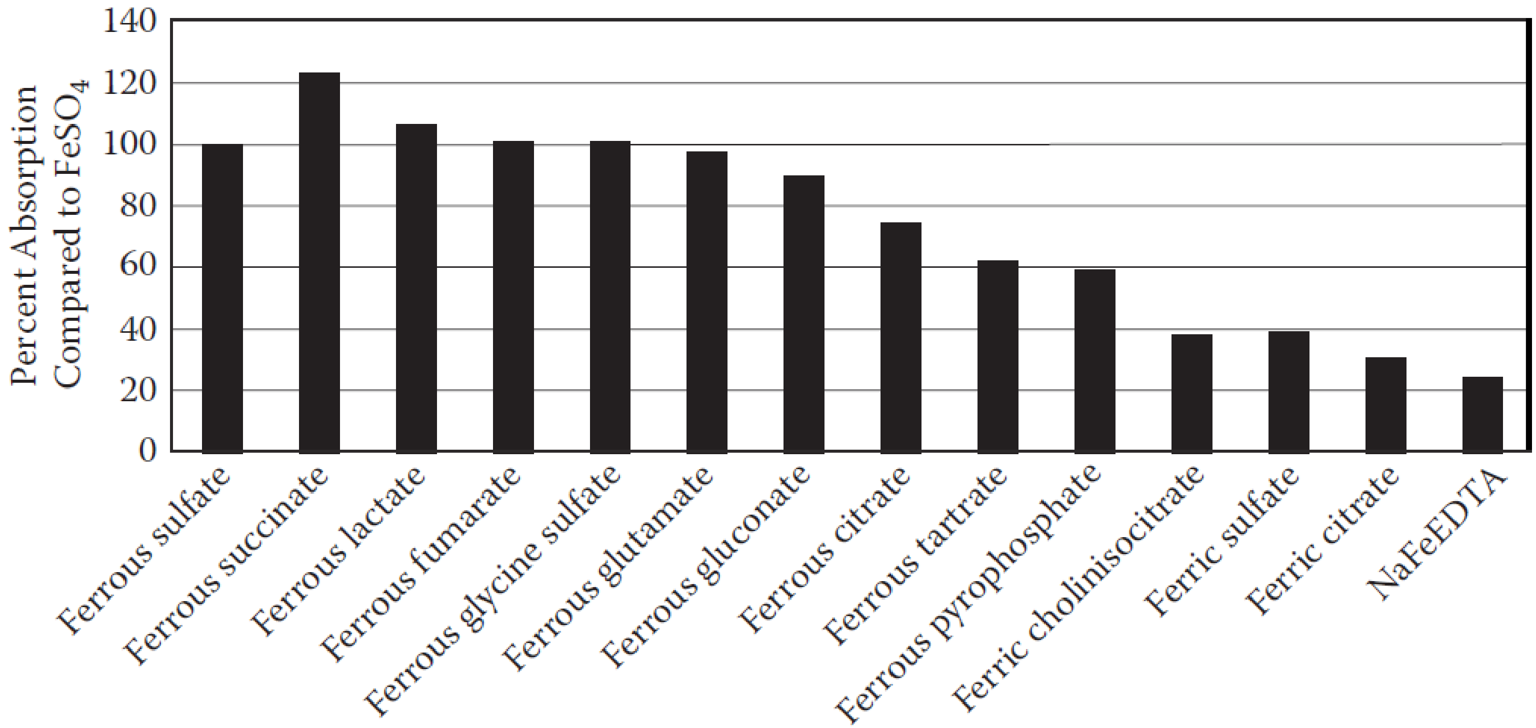
Mn requirements in poultry



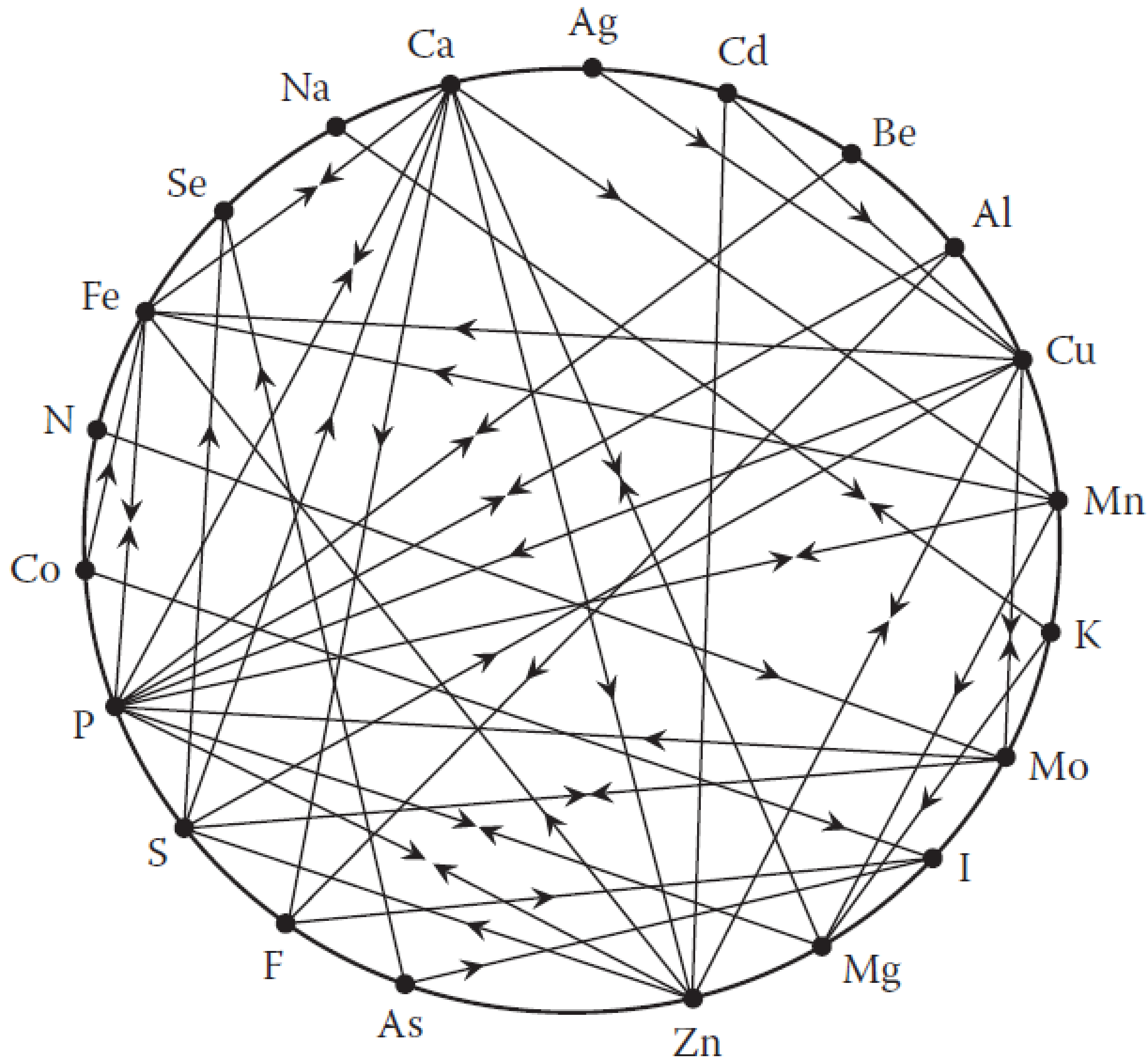

450
400
350
300
250
200
150
100
50
0
Mn in wheat plants (mg kg^{-1} DM)
4.0
4.5
5.0
5.5
6.0
6.5
7.0
7.5
8.0
Soil pH


Fractional absorption of Mn
0.6
0.5
0.4
0.3
0.2
0.1
0
Low Fe
High Fe
0.9
48
188
Dietary Mn (mg kg^{-1} DM)

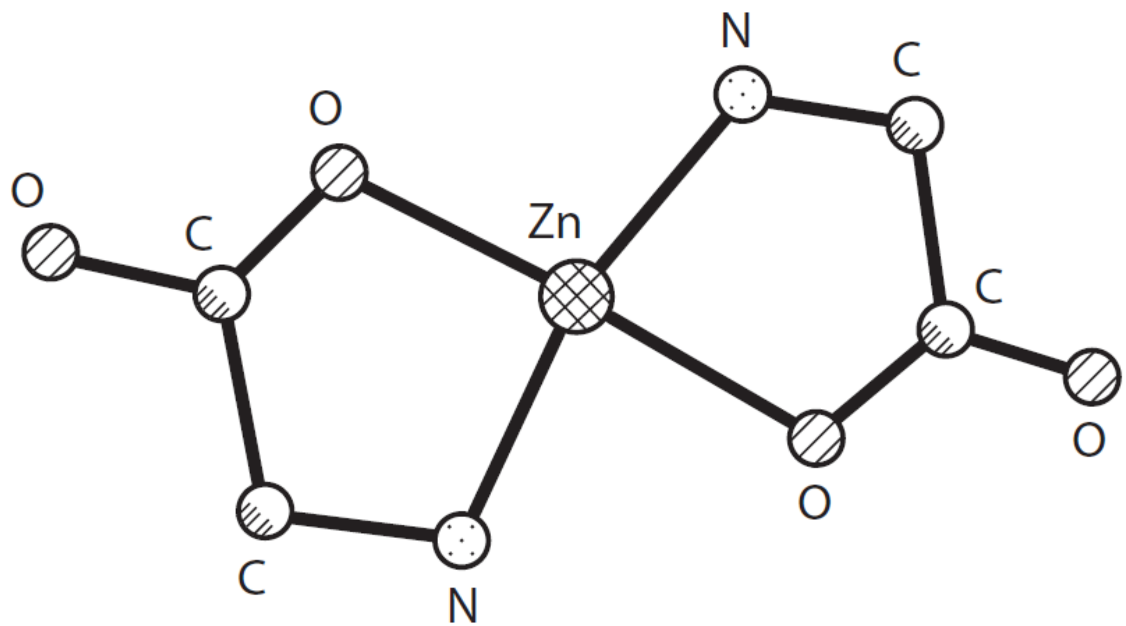

Tissue Mn (mg kg^{-1} DM or ash)
45
40
35
30
25
20
15
10
5
0
Liver
Kidney
Bone (ash basis)
0
1000
2000
3000
4000
5000
Added dietary Mn (mg kg^{-1} DM)

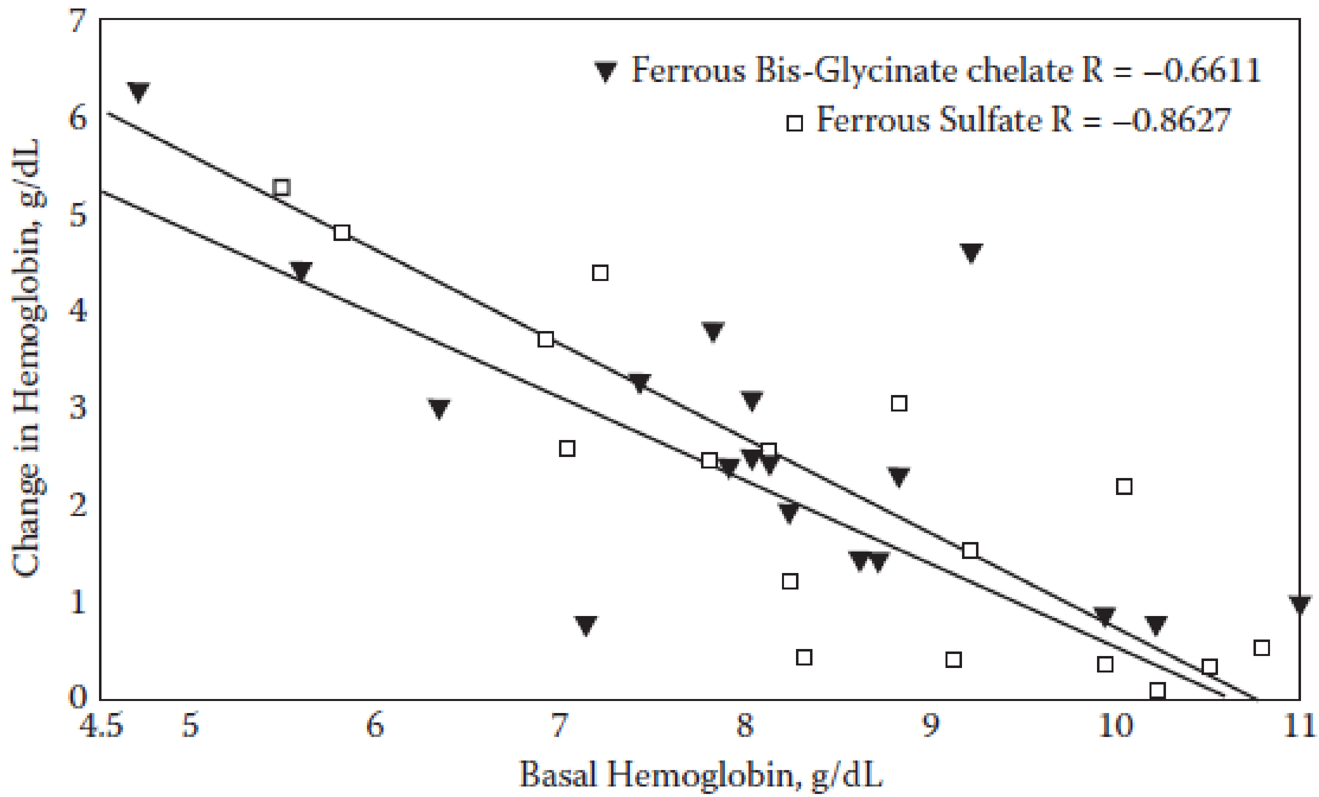


Percent Absorption
Compared to $FeSO_4$
140
120
100
80
60
40
20
0
Ferrous sulfate
Ferrous succinate
Ferrous lactate
Ferrous fumarate
Ferrous glycine sulfate
Ferrous glutamate
Ferrous gluconate
Ferrous citrate
Ferrous tartrate
Ferrous pyrophosphate
Ferric cholinisocitrate
Ferric sulfate
Ferric citrate
NaFeEDTA


Ag
Cd
Ca
Na
Be
Se
Al
Fe
Cu
N
Mn
Co
K
P
Mo
S
I
F
Mg
As
Zn

Chelated mineral products?




Ferrous Bis-Glycinate chelate R = −0.6611
Ferrous Sulfate R = −0.8627
Change in Hemoglobin, g/dL
Basal Hemoglobin, g/dL
0
1
2
3
4
5
6
7
4.5
5
6
7
8
9
10
11

Min Supplement Formulation

Formula Code: Min00004

Date: 03/09/2018

Formula Name: MINA TOYOOR

Birds Type: Broiler breeder

Stage: Laying

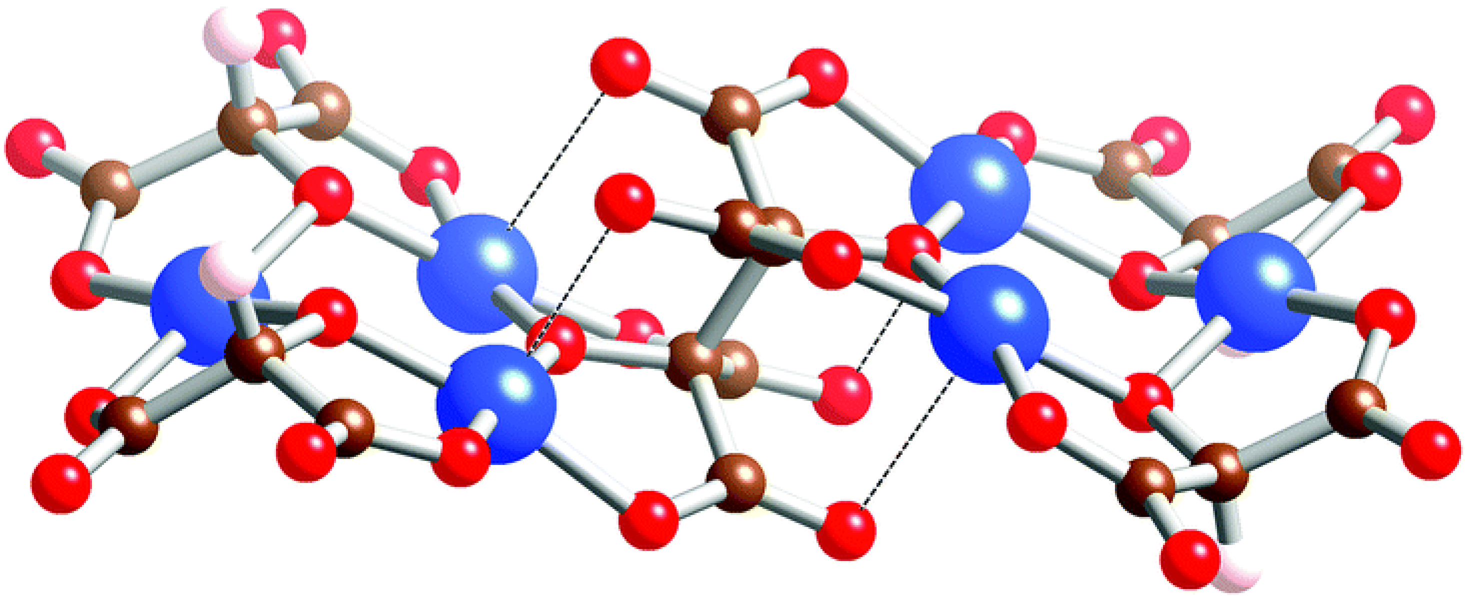
Strain: Ross 308

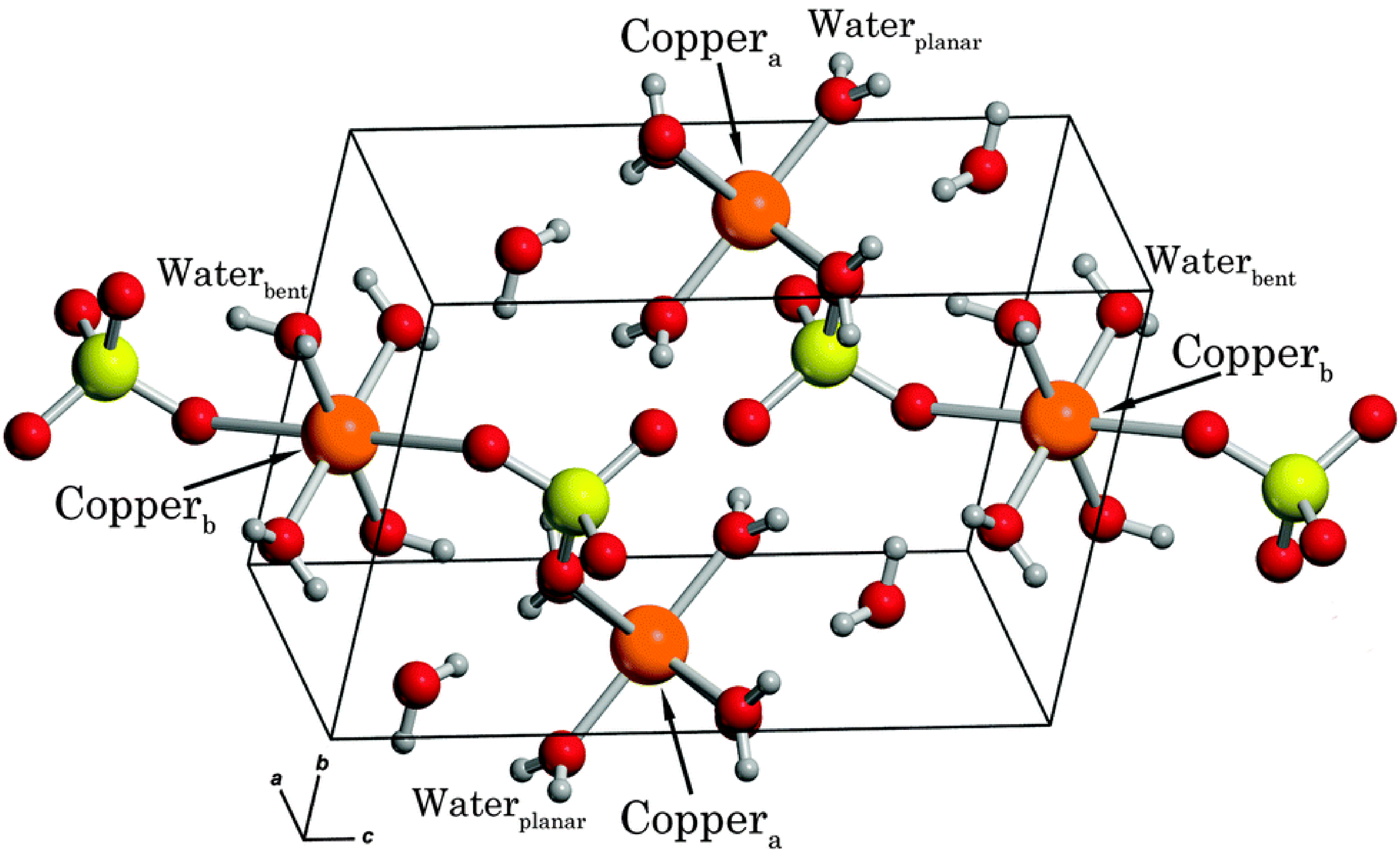
Ingredients	Description	Requirement	Unit	Concentration	Unit	Purity	Bioavalibility	Days PPD**	Density (g/cm3)	Price (Rial/kg)
Ferro	FeSO4,4H2O	50	(mg/Kg)	22.4	(%)	1	1	1	0.8	16000
Manganes	MnO2	120	(mg/Kg)	63.2	(%)	0.537	0.3	1	0.8	5500
Zinc	ZnO	110	(mg/Kg)	80.3	(%)	0.946	1	1	0.8	180000
Copper	CuSO4,5H2O	10	(mg/Kg)	24	(%)	0.9527	1	1	0.8	105000
Seleniume	Sodium Selenite	0.3	(mg/kg)	1	(%)	1	1	1	0.8	52000
Iodine	Ca(IO3)2,H2	2	(mg/kg)	61	(mg/kg)	1	0.95	1	0.8	1700000
Cobalt	COSO4,7H2O	0	(mg/Kg)	30	(%)	1	1	1	0.8	100000
Choline	Choline Choloride	400	(mg/Kg)	60	(%)	0.86	1	0	0.5	90000
AntiOxid			(g/1000 Kg)		Filler & Carrier				0.5	150000
MinOysShell	10000		(g/1000 Kg)						0.5	2000
Active Peptid	20000		(g/1000 Kg)						0.8	2000
Corn Cob									0.4	2000

** Days Past from Production Date

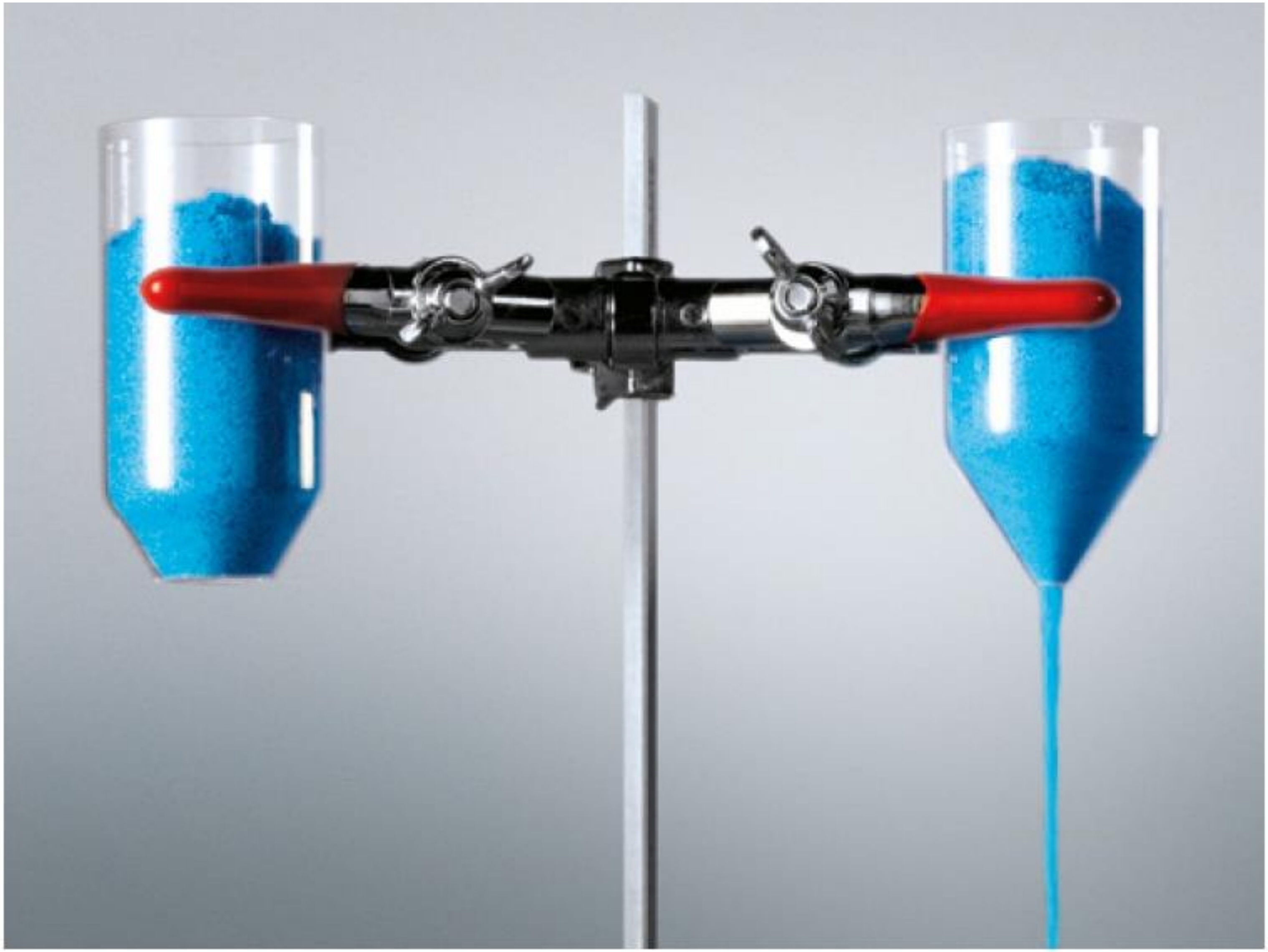
Save Data | Close | Save Values | Show

ویتامین	معیار تعیین وضعیت
Ca	آلکالین فسفاتاز خون
P	Pica ، آلکالین فسفاتاز خون، فسفر معدنی خون↓
Na	اندازه گیری سدیم ادرار
Cl	میزان کلر خون، آلکالوز
K	میزان پتاسیم سرم
Fe	آهن باند شده با ترانسفرین پلاسما↓، ترانسفرین (بدون آهن)↑
Cu	میزان مس در خون یا پلاسما
I	میزان تیروکسین پلاسما
Mn	اندازه گیری آنزیم وابسته به منگنز (سوپراکسید دسموتاز)
Zn	Zn پلاسما، آلکالین فسفاتاز خون، فعالیت متالوتیونین، Zn لوکوسیت ها
Se	نشت آنزیم ها به داخل سرم مانند SGOT و ASPAT





Copper$_a$
Water$_{planar}$
Water$_{bent}$
Water$_{bent}$
Copper$_b$
Copper$_b$
a
b
c
Water$_{planar}$
Copper$_a$



وَإِذْ تَأَذَّنَ رَبُّكُمْ لَئِنْ شَكَرْتُمْ لَأَزِيدَنَّكُمْ
وَلَئِنْ كَفَرْتُمْ إِنَّ عَذَابِي لَشَدِيدٌ