Cogence Immunology

Video Topic Index

To search this index, just hold down the control key (CTRL) and type "F"
If you have a mac, it's Command F

Key: M = module V = video. So, M9V6 = Module 9, Video 6

A

Aceriphyllum rossii **M3V2**
...and complement inhibition M3V2

Acne
...effects of gut microbiota M17V3

Adaptive Immunity
...vs innate immunity M4V1
...inhibition by S. boulardii M17V6

Adenosine **M7V5**
...and mast cell activation M11V11p3
...hypoxia and asthma M21V3
...aspirin-mediated conversion of Th17 to Th2 inflammatory process M21V3

Adiponectin **M21V7**

AIRE (autoimmune regulator) **M6V5**

Alzheimer's Disease
...and complement M3V2
...therapeutic program and addressing underlying physiology M20V5
...and evidence of viral and fungal infection M20V6
...serrapeptase and nattokinase M20V7
...and vitamin D deficiency M20V7
...tau accumulation and insulin resistance M21V8

AMPK (AMP-activated protein kinase) **M7V3**
...promotion by berberine M7V3, M18V6
...and resveratrol M7V3

Amyloid Beta Protein **M20V2, M20V7**
...and complement activation M3V2
...and viral infection M18V4
...and induction of neuron phagocytosis by microglia M19V6
...clearance by glymphatic system M20V2
...antimicrobial functions M20V6
...applications M20V7

Andrographis **M2V3**
...and inhibition of hyperalgesia M17V1
...promotion of NK cells and anti-inflammatory activity M18V7
...inhibition of IL-6 and TNFα in midbrain M21V1, M21V5
...inhibition of inflammasomes and NFκB M21V5

Anemia of chronic disease **M22V2,** M22V8
...labs M22V2
...and hepcidin M22V2
...cases M22V8

Angelica **M1V7**
...and Th1 promotion M13V2, M18V7

Antigen Presentation **M3V4, M3V5**
...and MHC-I M3V4, M3V5
...and MHC-II M3V4, M3V5
...and costimulation M3V4, M3V5

...at the site of infection M3V6
...and CD40 M4V1
...and CD28 M4V1
...applications M7V7, M11V14
...cases M7V9
...persistence of antigen and tolerance M10V8, M11V14
...and B cells M11V1
...gut DCs and the mesenteric lymph node M14V2

Anti-idiotypic antibodies **M22V7**

Aquaporin 4 **M19V5**
...autoantibodies M20V6, M20V8

Arabinogalactans **M6V6**
...and Th2 dominance M6V6
Arginase 1 **M6V10**

Artemesia
...efflux pump inhibition M16V13

Arthritis
...effects of gut microbiota M17V3

Aryl hydrocarbon receptor (AHR) **M10V2**
...and Th22 M10V2
...agonists and antagonists M10V2
...inhibition by curcumin, resveratrol, chlorella, EGCG and retinoic acid M10V10

Asthma M8V1, M8V3, M11V11, **M13V9, M21V3**
...and beta adrenergic agonists M8V3
…IL-12 inhibition by beta adrenergic agonists M11V11
...and mast cells M11V11
…and Vitamin D M13V9
...applications M13V10, M21V5
...association with fungal infection M16V11, M21V4
...influence of hypoxia M21V3
...role of Th2 cytokines M11V11, M21V3, M21V4
...influence of food sensitivities M21V3

...and T cell homing M21V3
...and mold exposure M21V4, M21V5
...role of ILC2s M21V4
...and Th2/Th17 codominance M21V4
...and viral infection M21V4
...role of histamine subtypes M21V4
...role of Th9 M21V4
...alleviation by quercetin M21V5
...allergens and air pollutants M21V5

Astragalus **M6V6**
...and Th1 promotion M13V2, M21V5
...and Treg inhibition M13V2, M17V14
...and Th2 inhibition M6V6, M18V7, M21V5
...and NK cell stimulation M18V7
...inhibition of asthmatic airway inflammation M21V5

ATP (adenosine triphosphate) **M1V4, M12V7**
...as a DAMP M1V4
...release as a “find me” signal during apoptosis M1V4
...effects of extracellular ATP on Th cells M12V7
...and eosinophils M12V7
...and mast cells M12V7
...function as a neuronal “ON” signal M19V2
...second phase of “two-hit” model M19V6

Autism
...and gliadin antibodies M17V2

Autoimmunity **M6V7, M6V8,** M8V5
…and Vitamin D M13V7, M13V8, **M13V10, M13V11**
…and autophagy / NLRP3 inflammasome assembly M21V21-V26
...and aggressiveness of antibodies M6V11
...and chronic infection M6V7, M6V8, M18V1, M18V4
...and Th17 M6V7, M6V8
...and gut microbes M6V7
...and TLR stimulation M6V7
...and predictive antibodies M6V8
...and bystander activation M6V8

...and superantigen M6V8
...and B cells M11V4
...and M2 macrophage presentation of self antigen M12V5
...influence segmented filamentous bacteria M14V9
...intestinal permeability and zonulin M14V9
...and dysbiosis M14V10
...celiac disease and breaking tolerance M14V12
...labs M22V2, M22V6
...and C reactive protein (CRP) M22V2
...total pathogenic burden M22V5
...environmental triggers M22V5
...DC phagocytosis of infected cells M22V5
...epitope spreading M22V6
...antigen-autoantibody immune complexes M22V6
...and Type 1 interferons M22V6
...cases M22V8

Autoinflammatory Disease **M8V8**
...and Vitiligo M8V8
...Autosomal dominant suppurative hidradenitis M8V8
...Behcet's Disease M8V8
...Blau syndrome M8V8
...Cryopyrin-associated periodic syndrome (CAPS) M8V8
...Deficiency of IL-1 receptor antagonist M8V8
...Deficiency of IL-36 receptor antagonist (DITRA) aka Generalized pustular psoriasis M8V8
...Early onset enterocolitis M8V8
...Familial cold autoinflammatory syndrome 2 (FCAS2) M8V8
...Familial Mediterranean Fever (TRAPS) M8V8
...Hyper-IgD Syndrome (HIDS) M8V8
...Majeed syndrome M8V8
...Periodic fever, aphthous stomatitis, pharyngitis, cervical adenitis (PFAPA) aka Marshall Syndrome M8V8
...Proteasome-associated syndromes M8V8
...Pyogenic arthritis M8V8

Autophagy M13V1, **M13V10, M15V2, M21V21-26**
…and inflammasomes **M21V21-26**
...and caloric restriction M13V1

...and vitamin D M13V8, M13V10
...applications M13V10, M15V13, M20V4
...mitophagy and ROS M15V2
...IRGM (Immunity-related GTPase family M protein) M15V2
...cytoplasmic quality control M15V2
...and AMPK M15V2
...naive T cell development M15V2
...and inflammatory bowel disease susceptibility M15V4
...inhibition by HSV-1 M18V5, M19V10
...and brain AI M20V4
...inhibition by mTOR M20V4
…promotion by vitamin D inhibition of mTOR M13V11
...promotion by Th1 cytokines M20V4
...promotion by Vitamin D M20V4
…and Alzheimer's disease M21V20
…and Parkinson's disease M21V20
…and T cell polarization **M21V21-25**
…and Type 2 Diabetes M21V20
…and Chronic Kidney Disease M21V20, M21V28, M21V29

B

B cells **M11V1, M11V2, M11V3, M11V4,** M11V5
...and complement M11V1
...antibody functions M11V1
...affinity maturation M11V1
...isotype switching M11V1, M11V2, M11V3
...memory B cells M11V1
...and Th cell interactions M11V1, M11V2, M11V3
...Fc receptors M11V2
...opsonization M11V2
...ADCC (antibody dependent cell cytotoxicity) M11V2
...epithelial IgA M11V2
...B cell receptors M11V3
...and TLRs M11V3
...IgG subclasses M11V3
...autoreactive B cells M11V3, M11V4

...IL-10 producing B cells M11V3
...and autoimmunity M11V4
...and BAFF (B cell activating factor) M11V4
...and APRIL (a proliferation inducing ligand) M11V4
...immune suppression by B cells M11V4
...variation in antigen level M11V4
...intravenous immunoglobulin M11V4
...CD19 M22V2

Baicalin **M1V7, M7V6**
...epithelial dysregulation M16V7
...BBB integrity M16V7
...Th1 promotion M18V6
...neuro anti-inflammatory effects M18V6
...inhibition of VCAM-1 (vascular cell adhesion molecule) M19V5
...IL-6 and CCL2 M19V5
...decreased permeability of BBB M20V11
...inhibition of CCL2 M20V11

Barrier Systems **M3V2**
...bistable neutrophil - bacteria balance M3V2

Basophils **M11V13**
...and allergy M11V13
...and antibody binding M11V13
...role in tick immunity M11V13
...and IgE M11V13
...and TSLP M14V8
...in the gut M14V8

Berberine **M6V10, M7V7, M8V5**
...and Th1 M7V7, M8V5, M18V6
...and HIF1α inhibition M8V5
...inhibition of VEGF M12V9
...inhibition of IgE production M14V15
...biofilm disruption M16V13
...MMP9 inhibition M18V6
...Th17 inhibition M18V6, M20V11
...AMPK promotion M18V6, M21V8

...inhibition of TNFα, CCL2, and IL-6 M19V5, M21V5, M21V8
...protection against diabetes-associated cognitive decline M21V8
...IL-1β inhibition M21V8
...maintenance of mitochondrial efficiency in high fat diets M21V8
...inhibition of insulin resistance M21V8

Beta hydroxybutyrate **M8V8**
...and inflammasome inhibition M8V8

Betulin
...biofilm disruption M16V13

Biofilms **M15V9, M15V10, M15V11, M15V12, M16V7, M16V8, M16V13**
...chart of biofilm disruptors (not exhaustive) **M16V13**
...antibiotic tolerance M15V9, M15V10
...quorum sensing M15V9, M15V12
...efflux pumps M15V9
...persister cells M15V10
...bacterial horizontal gene transfer M15V10
...and oxidative stress M15V10
...acute vs chronic infection M15V11
...inhibition of innate immune response M15V11
...promotion of M2 and Th2 polarization M15V11
...and MyD88 M15V11
...planktonic vs parasitic bacterial infection M15V11
...VBNCs vs persister cells M15V12
...metabolic activation state M15V12
...and mechanical flow M15V12
...applications M15V13
...respiratory infections M16V7
...alginate and macrolides M15V11, M16V7
...protracted bacterial bronchitis M16V7
...otitis media M16V7, M16V9
...chronic rhinosinusitis M16V8
...mucociliary clearance M16V8
...tonsillitis M16V9
...H. pylori M16V9
...chronic prostatitis M16V10
...chronic periodontitis M16V10

...inhibition by licorice root extract M16V10
...and lysine M16V10
...biofilm disrupting agents M16V13
...cymbopogon M16V13
...cinnamaldehyde M16V13
...treatment options M17V12
Bistable Balance **M3V2,** M6V9, M16V13, M19V10
...and glutathione M9V5
...SIgA M14V3
...in the gut M14V6
...in the brain M19V9, M19V10

Black Currant Seed Oil **M2V3**

Blood-Brain Barrier (BBB) **M8V5**
...VEGF in MS M8V5
...protective effects of tVNS M15V1
...TBI and permeability M19V4, M19V7
...applications M19V8, M20V12, M20V15
...restoration by baicalin M20V11, M20V15
...disruption by HIF1α and MMP9 M20V15

Brain Fog **M21V10, M21V11**

Brain immunology **M20V1, M20V2, M20V3, M20V4, M21V10, M21V11**
...alzheimer's
- Therapeutic program and addressing underlying physiology M20V5
- Sleep disruption and loss of amyloid beta glymphatic drainage M20V6

...applications M20V7, M20V12
...autoimmune encephalitis, M20V14, M20V15
- Flares M20V13
- Role of pathogens M20V13
- Molecular mimicry and group A strep infection M20V13, M20V14
- Calcium calmodulin protein kinase II (CaMKII) M20V13, M20V14, M20V15
- Use of IVIG M20V14
- Applications and cases M20V15

...basal ganglia targeted autoimmunity M20V13, M20V14
...blood flow M21V10
...brain antibodies M20V2

- complement-dependent cytotoxicity (CDC) and antibody-dependent cell mediated cytotoxicity (ADCC) M20V2

...Brain AI M20V1, M20V2, M20V4

- and autophagy M20V4
- labs M20V4...microvascular damage in Long COVID M18V12

...cerebellar influence on immune cell activity M20V3

...COVID-19 M18V9 through M18V14

...CSF M20V2, M20V6

...dementia M20V7

- Amyloid beta phagocytosis and inflammasome activation M20V5
- Insulin resistance M20V6, M20V7

...demyelinating disorders M20V8, M20V9, M20V10, M20V11

- AQP4 auto-antibodies M20V8
- Clinically isolated syndrome M20V8
- Environmental factors M20V8
- Role of infection M20V10
- Molecular mimicry M20V10
- Inhibition of CNS inflammation by Type 1 interferons M20V11
- Nutritional factors M20V11
- Increased intestinal permeability M20V11
- Antibody cross-reactivity between MOF and milk butyrophilin M20V11
- Beneficial effects of N-acetylcysteine, Vitamin C, Vitamin A, Vitamin E, Vitamin D, fish oil, EGCG, melatonin and PSA M20V11
- Oxymatrine M20V11
- Baicalin M20V11
- Applications M20V12, M20V15

...factors influencing CNS degeneration M20V5

...glymphatic drainage M20V2, M20V6

...ILC2s M20V3

...invasion of circulating immune cells into the brain M19V1, M19V2

...M1 vs M2 microglia M20V3

...neuronal protection and growth M20V7

- applications M20V7

...PANDAS / PANS M20V13, M20V14, M20V16

...sydenham’s chorea M20V13, M20V14

...systemic IL-1β and brain inflammation M19V2

...tic disorders and OCD M20V14, M20V15

...tourrettes M20V14

C

Caloric restriction **M13V1,** M14V14
...debris field clearance M13V1
...applications M13V10

Cyclic AMP (cAMP) **M7V5,** M9V5
...CD4/CD8 Ratio M10V5, **M10V9**
...and aging M10V9

CCL2 **M19V5**
...recruitment of peripheral immune cells into CNS M19V7

CCL8 **M18V3**
...modulation by CMV infection M18V3

CD57 **M22V2**
...labs M22V2
...NK cells M22V2
...lack of CD57+ lymphocytes in chronic Lyme M22V2

Celiac Disease **M14V11,** M14V12, M14V13
...vs gluten sensitivity M14V11, M14V12
...tissue trans-glutaminase (TTG) antibodies M14V12, M22V4
...and stress M14V12
...treatment options M17V13
...antibody homology with rotavirus peptides M22V4
...gluten cross-reactors M22V4

Central Nervous System (CNS) Injury-Induced Immunodepression **M19V9, M19V10**
...and T cell polarization

Cerebral blood flow **M21V10**
...and Long COVID M18V12

CGRP **M21V11**

Circadian Rhythm **M8V2**

CGRP (Calcitonin Gene-Related Peptide)
...and migraines M17V1

Chronic Inflammation **M1V4, M1V5, M5V2**
...and resolution failure M1V5
...and Th17 M5V2
...and IL-12 inhibition M5V3
...and MDSCs M6V9

Chronic Kidney Disease M13V22, M13V23, M21V20
…and Klotho M13V16

Chronic Obstructive Pulmonary Disease **M8V1**
...use of EPA/DHA M21V5
...applications M21V5

Chronic Periodontitis **M16V10**
...treatment with vitamin D and curcumin M16V10
...doxycycline M16V10
...MMPs M16V10

Chronic Prostatitis **M16V10**
...floroquinolones M16V10

Chronic rhinosinusitis **M16V8**
...IL-25, IL-33 and TSLP in epithelial inflammatory response M11V11p2, M16V8
...P. aeruginosa and promotion of Th2 M16V8
...fungal burden and Th2 bias M16V8
...role of polyps M16V8

Chronic Traumatic Encephalopathy **M19V6**
...immunoexcitotoxicity M19V6

Clonal Expansion and Contraction **M10V6,** M10V7, M10V9
...and nTregs M4V2
...insufficient initial expansion and chronic inflammation M10V7
...applications M10V10
...clonal exhaustion M17V10, M22V6

- Labs M22V6

Coconut Oil **M7V3**, **M7V8**, M7V9

Coleus forskohlii (see forskolin)

Complement **M3V2**
...and membrane attack complex M3V2
...and opsonization M3V2
...in the brain M3V2
...inhibition by biofilms M15V11

Coptis chinensis M6V6
...and Th2 dominance M6V6

Cordyceps (also see glutathione) **M18V6**
...and combating pathogen evasion strategies M12V4
...Th1 promotion M18V6
...maintenance of gut barrier integrity M18V6
...anti-aging effects M18V6
...rescue of monocyte phagocytosis in the presence of group A strep M20V15
...inhibition of IL-4 and GATA3 M21V5

Cortisol **M2V2,** M8V2, **M8V3, M12V8**
…failed cortisol activation with impaired TCA cycle M21V23
...and NFκB Inhibition M2V2
...and NK cells M2V2
...and COX1 and COX2 M2V2
...and glucocorticoid response element M8V3
...and Th2 M8V3, M12V8
...applications M9V6
...and acetyl choline M9V6
...downregulation of cortisol receptors M12V8
...and asthma M12V8

COVID-19 **M18V9, M18V10**
...Long COVID (Long Haulers) **M18V11, M18V12, M18V13, M18V14**
- Microvascular Damage M18V12
- Fibrosis M18V12

- CNS Issues M18V12
- T Cell Polarization M18V13
- Neurogenic Inflammation M18V13
- CNS Inflammation M18V13
- Autoimmunity M18V14
- Barrier Issues M18V14
- Pathogen Expansion M18V14
- Multisystem Inflammatory Syndrome in Children (MIS-C) M18V14

COX1 and COX2 **M1V5**
...COX inhibitors M1V5
...COX2 in periodontitis M16V10

Crohn's Disease
...applications M15V13
...treatment options M17V13

CTLA4 (cytotoxic T-lymphocyte-associated protein 4) **M4V1, M6V5**
...effects of curcumin and resveratrol M4V1
...and Tregs M6V1, M6V2
...and CD28 - CD80/86 M6V2

Curcumin **M1V7, M7V7, M8V5**
...and NFκB inhibition M7V7, M13V4
...and Th1 inhibition M8V5
...and inhibition of adaptive immunity M8V5, M13V4
...inhibition of IDO M12V6
...glutathione promotion M13V4
...use in alzheimer's M20V7

Cysteine **M9V2, M9V3**
...and glutathione M9V2
...inhibition by Tregs M9V2
...and TGFβ M9V2

Cytomegalovirus (CMV) **M18V3**

Cytotoxic CD8+ T cells **M10V4, M10V5**
...mechanisms of cytotoxicity M10V4

...and NK cells M10V4
…and vitamin D M13V11
...and promotion of Th1 M10V5
…and interactions with DCs M10V5
...CD4/CD8 ratio M10V5
...and self tolerance M10V5
...memory cells M10V7
...T cell exhaustion M10V9
...aging M10V9
...applications M10V10
...labs M22V2
...anemia of chronic disease M22V2
...clonal exhaustion M22V2

D

Debris fields
...applications M13V10

Dendritic Cells **M3V4**
...and E-cadherin M3V4
...in the lymph M3V4
...and migration M3V4
...and cytokine production M3V4
...and MMPs M3V4, M9V5
...influence on TNFα and IL-1β M3V4
...and vitamin D M3V5
...and adenosine M3V6
...and T cells M3V6
...in the gut M3V6
...and autoimmunity M6V7
...Tip DCs M10V5
...and pathogen evasion strategies M12V4
...in gut immunity M14V3
...role in celiac disease M14V12
...phagocytosis of infected cells M12V6, M22V5

DAMPs (damage-associated molecular patterns) **M1V3**

Depression and Anxiety M12V8, **M21V1, M21V2**
...and inflammation M12V8
...chronic stress and inflammation M21V1
...neuronal integrity M21V1
...correlation between infection, autoimmunity and mood disorders M21V1
...role of midbrain M21V1, M21V2
...GABAergic modulation and inhibition of neuroinflammation and anxiety M21V1
...applications M21V2
...influence of gut-related inflammatory process M21V2
...cortisol M21V2

Dermatitis **M11V11p2**

DHA (Docosahexaenoic acid) **M7V3,** M7V7, **M13V12**
...inhibition of adaptive immunity M13V12
...and TLRs M13V12
...applications M13V10
...gut barrier integrity M14V10

Diabetes **M21V6, M21V7**
...type III diabetes M21V7, M21V8
...type I diabetes M21V7
- Increased risk in people taking statins M21V7

...adipokines M21V7
- Applications M21V8

...epitope spreading M21V7
...predictive autoantibodies M21V7
...environmental factors
- Vitamin D deficiency M21V7
- A1 beta casein milk protein M21V7
- Gluten and cross reactor consumption M21V7
- Aberrant mucosal immunity M21V7
- Breastfeeding duration M21V7

...insulin resistance M21V8
- Diminished acetylcholine function M21V8

...protective effects of vitamin E M21V8
...association with vanadium and chromium deficiency M21V8

...beneficial effects of ginseng, Vitamin D, and ginger M21V8
...labs M21V8
...applications
- Insulin resistance M21V8
...cases M22V8

Dietary Lectins **M14V14**, **M17V4**
...and NFκB M14V14
...effects on GI immunology M17V4
...inhibition of epithelial membrane repair M17V4
...diet modulation approaches M17V4
Dopamine **M20V14**
...promotion of IL-17 production M20V14
...promotion of Th17 M20V14

Dysbiosis **M17V8**
...and chronic stress M17V8
...decreased pathogen killing efficiency M17V8

E

Echinacea **M6V6**
...and Th2 dominance M6V6
...and Th1 promotion M13V2

Eczema **M11V11p2**

EGCG (Epigallocatechin gallate) **M13V3**
...inhibition of antigen presentation, Th cell activity and adaptive immunity M13V3
...protective role in demyelinating disease M20V11

Endocrine Disruptors / Endocrine Disrupting Chemicals / EDCs / Xenoestrogens
...and Th2 M7V6
...and glutathione M11V11p3

Endotypes **M8V1**

eNOS (endothelial nitric oxide synthase)
...in the lymphatic system M1V6

Eosinophils **M4V4,** M11V8, **M11V12**
...and mast cells M11V12
...and FPIES (Food Protein-Induced Enterocolitis Syndrome) M11V12
...and fibrosis M11V12
...role in asthma M21V3
...CBC range M22V1

EPA (Eicosapentaenoic acid) **M1V7,** M7V3, M7V7, **M13V12**

Epithelial surfaces **M5V1**
...mucus layers and short chain fatty acids M14V14
...T cell homing M15V8, M15V13
...Th2 persistence M15V8

Epitope Spreading **M5V3, M6V7, M6V8,** M8V4, M11V14
...and Th17 M5V3
...applications M10V8

Epstein Barr Virus (EBV) **M18V2, M18V3**
...and autoimmunity M18V3
...vIL-10 and BNLF2a immunoevasins M18V3
...early antigen M18V3
...chronic active EBV M18V4
...evidence in MS M18V4, M20V10
...B cell oncogenesis M18V4
...inhibition by cordyceps M18V6
...influence of astragalus M18V7
...inhibition by vitamin C M18V7

Erythema Nodosum **M8V8**
Exercise
...and IL-6 as a myokine M5V4

Extracellular Matrix **M2V4, M9V4, M9V5**

F

Fasting (see caloric restriction)

Fatigue **M21V10, M21V11**
...and cerebral blood flow M21V10
...and histamine M21V11

Fatty Acids **M7V3**
...saturated vs unsaturated FA M7V3
...and TLRs M7V3, M13V12

Fenton Reaction **M9V1**

Fibrosis **M9V1, M9V2**
...and TGFβ M9V1
...and Long COVID M18V12
…and failed mitophagy driving ROS / TGFβ M21V23

Fisetin
...inhibition of adaptive immunity and macrophage activation M13V3

Fish oil (See EPA and/or DHA)

Follicular T helper cells (Tfh) M4V1, M10V1, **M11V5, M11V6, M11V7**
...and Th17 M11V5, M11V6
...and IL-21 M11V5
...and IL-4 M11V5, M11V6
...and germinal centers M11V5
...Bcl-6 and CXCR5 M11V5
...and iCOS (inducible T cell costimulator) M11V5
...IgG and chronic infection M11V6
...class switching and TLR9 M11V6
...IL-12 M11V6
...and MS M11V6, M20V9
...and lupus M11V7
...and SIgA M11V7, M15V3
...in the gut M15V3

...Tfh subtypes M20V9
...role in neuromyelitis optica M20V10

Food sensitivity **M14V14,** M14V15
...applications M14V15
...treatment options M17V12
...labs M17V12
...cross-reactivity M17V12
...food reintroduction M22V4
...molecular mimicry M22V7
...and autoimmunity M22V7

Forskolin **M1V7,** M7V8

FOXp3 **M6V1**
...and Tregs M6V1

Fungal Infection **M16V11, M16V12**
...promotion of Tregs and Th2 M16V11
...herxheimer reaction M16V11
...and chronic inflammation M16V11
...ochratoxin A and cholestyramine M16V12
...neutrophil elastase M16V12
...evidence in alzheimer's disease M20V6

G

Ganoderma **M18V7**
...Th1 activation M18V7
...microglial inhibition M18V7

Garlic
...biofilm and quorum sensing disruption M16V13

GATA3 **M4V4,** M18V7
...and low TCR signal strength M4V5
...inhibition by oxymatrine M6V6

...CD4 T cell development precursor M10V5
...inhibition by cordyceps M18V6

Ginger
...biofilm disruption M16V13
...Th1 promotion and Th2 inhibition M18V6
...promotion of insulin sensitivity M18V6
...inhibition of IL-6 and TNFα M21V5
...promotion of glutathione M21V5

Ginkgo
...inhibition of PAF M21V5
...inhibition of Th2 cytokines M21V5

Gastrointestinal Tract / Intestines / Intestinal Immunology **M14V1,** M14V2, **M14V3**, **M14V4, M14V7,** M14V8,
...routes of food antigen acquisition M14V1
...oral tolerance and Tregs M14V1
...mucus layers M14V2
…and vitamin D M13V9
...intestinal DCs and stimulation of T & B cells in the surrounding tissue M14V2, M14V4
...epithelial cells as immune cells M14V2
...paneth cells M14V2
...bistable balance M14V3, M14V4, M14V6
...IgG against commensal bacteria M14V3
...gut epithelial barrier integrity M14V3, M14V15
- tight junctions and food additives M14V14
...Tregs vs Th2 M14V4
...and Th1 M14V5
...lactic acid bacteria M14V5
...dysbiosis M14V5, M14V6, M14V8, M14V10
...food sensitivity M14V5, M14V6
...immune suppression M14V6
...and NFκB M14V7
...and TSLP M14V7, M14V8
...gut microbes and TLR stimulation M14V7, M14V8
...intestinal epithelial cell production of TGFβ and IL-10 M14V7
...BAFF and APRIL M14V7
...and parasitic infection M14V8

...segmented filamentous bacteria M14V8, M14V9
...and Th17 M14V5, M14V9
...and molecular mimicry M14V9
...claudins M14V9
...zonulin and tight junctions M14V9
...glutamine M14V10, M17V9
...garlic M14V10
...STAT3 M14V10
...intestinal inflammation and stress M14V15
...gut-brain axis M16V6
...neuroplasticity and neuroinflammation M16V6
...hypo/hyperinnervation in GI neuroplasticity M16V6
...role of IL-1β M17V1, M17V10
...effects of low carb diets M17V4
...gut microbiota M17V5, M17V6, M17V7, M17V13
…chronic stress and dysbiosis M17V8
...affinity maturation and food sensitivity M17V8
...gut macrophage functions M17V8
...bistable bacteria-neutrophil balance M17V8
...mast cells M17V9
...development of antibiotic resistance mutations in biofilms M17V9
...loss of Th1 and serum IgG M17V9
...Th2 driven epithelial inflammation M17V9
...and biofilms M17V9, M17V10
...and the MMC M17V9
...epithelial NFκB M17V10
...immune dysregulation M17V10
...chronic GI inflammation M17V10
...treatment options M17V11, M17V12, M17V13
- Intestinal infection M17V11
- tVNS M17V11
- Intestinal permeability M17V11
- Food sensitivities M17V12
- Promoting oral tolerance M17V12
- Food lectins M17V12
- Pathogen evasion M17V12

...labs M17V13, M17V14, M17V15, M17V16
...cases M17V14
...anxiety and depression M21V2

- Applications M21V2

Glutamate
...function as a neuronal “ON” signal M19V2
...neuron excitotoxicity M19V4

Glutamine **M14V10**
...maintenance of gut barrier integrity M14V10
...GI treatment M17V11

Glutathione **M2V1, M4V3,** M6V10, M7V6, M7V7, **M9V1**
...and IL-27 M7V6
...and NAC M7V6
...GSTM1 snips M7V7, M9V1
...cordyceps M7V7, M9V3
...vs TGFβ M9V1, M9V6
...and endocrine disrupting chemicals M9V1, M11V11p2, M11V11p3
...and MMPs M9V1
...and T cell polarization M11V11p2, M11V11p3
...applications M9V6
...maintenance of gut barrier integrity M14V10, M15V4
...COPD and respiratory tract infections M16V7
...inhibition of astrocyte glutathione production by extracellular glutamate M19V7
...treatment of fungal infection M16V12, M21V4

Gluten Sensitivity **M14V11**
...gliadins and zonulin M14V11, M14V12
...neuroinflammation M14V11, M14V12
...vs wheat allergy M14V12
...HLA DQ2/DQ8 M14V12

Glycyrrhiza uralensis
...inhibition of Th2 M18V7

Glymphatic system **M19V5,** M19V7, **M20V2**
...and sleep M19V7
...aquaporin 4 M20V2
...applications M20V7

Golden seal **M6V6**
...and Th2 dominance M6V6

Gout **M8V7, M8V8**

Green Tea (see EGCG)

Gut microbiota M14V14, **M17V5, M17V6, M17V7**
...and circadian rhythms M14V14
...role in arthritis and acne M17V3
...community resilience vs implantation M17V5
...T cell polarization effects M17V5
...effects of antibiotics M17V5
...effects of probiotics M17V5
...antibiotic resistance and horizontal gene transfer M17V5
...lactobacillus promotion of Th1 M17V6
...S. boulardii dampening of adaptive immune response M17V6
...treatment options M17V13
...short chain fatty acid effects on microglial function M20V11

Gut-brain axis M14V15, **M17V1, M17V2**
...applications M14V15
...gluten sensitivity M17V1
...transglutaminase-gliadin complexes M17V1
...celiac disease vs gluten sensitivity M17V2
...gliadins and tight junction breakdown M17V2
...gluten ataxia M17V2
...treatment options M17V13
...TBI M19V7
...role in anxiety and depression M21V2

H

Heart
…fibrosis, hypertrophy, inflammation, strategies M13V21

Herpes Simplex Virus 1 (HSV-1)

...encephalitis M18V5
...inhibition of autophagy M18V5, M19V10
...evidence in alzheimer's M20V6

Histamine M11V8, M11V9, **M11V10, M21V10, M21V11**
...and Th2 cytokines M11V10
...and estrogen M11V10
...and cysteine M11V10
...and neurogenic inflammation M21V11
...and neurotransmitters M11V11p2, M11V11p3
...inhibition by quercetin M11V14
...applications M11V14, M21V5
...inhibition by lipoic acid M12V7
...inhibition by Vitamin C M13V5
...low histamine diets and DAO M17V4
...role in MS M20V8

Hollow Space Infection **M5V1**
...and Th2 M11V11p2, M11V11p3

Human Herpesvirus 6 (HHV-6)
...antibodies in MS M20V10

H. pylori **M16V9**
...biofilms M16V9
...efflux pumps M16V9
...bismuth treatment M16V9

Homeostasis-associated molecular processes (HAMPs) **M8V7**

Honey
...biofilm disruption M16V13

HIF1α (hypoxia-inducible factor 1α) **M2V1,** M7V5, M8V4, M8V5
...and MDSCs M6V10
...and glycolysis M7V5
...inhibition by berberine M7V7, M9V6, M18V6, M20V15
...and NFkB and STAT3 M8V4, M8V5
...and VEGF M8V5

...applications M9V6, M18V8, M20V15
...inhibition by minocycline M20V15

Hypoxia **M2V1, M7V5,** M8V4, M8V5
...and Th2 M7V5, M8V5
...applications M7V7, M21V5
...and ROS M8V4
...and neutrophil survival and apoptosis M8V4
...and adenosine M8V5
...and inhibition of T cell response M8V5
...and inflammatory bowel diseases M15V4

I

Icariin
...anti-inflammatory and anti-MDSC functions M16V7

IgA M11V2
...in epithelia M11V2
...SIgA M11V7

IgE
...and basophils M11V13

IgG
...representation of chronic infection M22V4
...food sensitivities M22V4

IL-1β **M1V7,** M8V7, M8V8
...and inflammasomes M8V7, M8V8
...and MMP9 M9V4
...and TSLP in the gut M14V7
...systemic inflammation resulting in brain inflammation M17V1
...CNS inflammation M19V2, M20V2
...activation of HPA axis M19V10
IL-2 M13V5
...autocrine signaling M13V5

IL-4 **M4V4**
...and basophils M4V5, M11V13
...and STAT6 M4V5
...and Th9 activation IntroV11, M4V5, M10V3
...and mitochondria M6V6
...inhibition by perilla M6V6
...and Tfh M11V5

IL-5 **M4V4**
...and eosinophils M11V12

IL-6 **M2V1,** M9V4
...and Th22-mediated antibody aggressiveness M6V11
...and CRP
...and hypoferritinemia M5V4
...and rT3 M5V4, M6V6
...and dopamine M5V4
...and exercise M5V4
...inhibition by berberine M6V6, M7V7
...and the HPA (Hypothalamic–pituitary–adrenal) axis M5V4
...inhibition by quercetin M11V11
...and basophils M11V13
...and Tr1 cells in the gut M14V5, M17V8
...role in neuroinflammation and stress M21V1
...inhibition of Th1 via SOCS1 upregulation M21V4
...promotion of Th2 by activation of NFAT M21V4
...promotion of CRP secretion M5V1, M21V7

IL-8 **M2V1,** M9V4

IL-9 **M10V3**
...promotion of Tregs M10V3
...promotion of mast cells M10V3
...promotion of Th17 M10V3
...promotion of allergic inflammation and Th17 M21V4

IL-10 **M6V1, M7V2**
...and Tregs M6V1

...IL-10 producing B cells
...inhibition of autophagy M15V2
...promotion by Tr1 cells M17V8
...modulation by CMV infection M18V3
...loss of IL-10 in the aging brain M19V7

IL-12 **M4V3,** M2V3
...IL-12 Receptor M5V3, M5V4
- inhibition by Th17 M5V3
- p40 M5V4
- and IL-23R M5V4
- Inhibition by phagocytosis of TLR ligand carrying cells M18V1

...inhibition by Th9 M10V3
...and antibody production M11V6
...inhibition by beta adrenergic agonists M11V11
...hygiene hypothesis M12V4
...inhibition by blackberry extract M13V3
...inhibition by curcumin M13V4
...promotion of Tfh M15V3
...promotion by lactobacillus M17V7
...inhibition by bifidobacteria M17V7
...inhibition by beta adrenoceptors and glucocorticoids as mediated by histamine and PGE2 M21V4

IL-13 **M4V4**
...and eosinophils M11V12
...smooth muscle hypercontractility M16V3
...inhibition by baicalin M16V7

IL-15 **M13V6**
...promotion of inflammatory environment in the intestine M13V6

IL-17 **M5V1, M5V2, M5V3,** M7V2
...and TNFα M5V2
...and innate IL-17 producing cells M5V2
...inhibition by Vitamin D M13V7
...mucosal and gut immunity M14V4
...and Th2 M14V15
...inhibition by oxymatrine M18V7

...neuroinflammation and IL-17a M19V10

IL-18 **M8V7, M8V8**
...and inflammasomes M8V7, M8V8

IL-21 **M5V1, M5V2**
…and antibody aggressiveness M6V11
...and Tfh M11V5, M11V6, M15V3
...and Th17 M11V5
...role in MS M20V9

IL-22 **M5V1, M5V2, M10V2**
...and antibody aggressiveness M6V11
...and mucosal repair M10V2
...in the gut M14V4, M14V5
...stimulation of gut epithelia M14V10

IL-23
...role of SGK1 in Th17 induction M20V11
...regulation of autoantibody activity M20V14

IL-25 **M15V6**
...production by epithelial cells M15V6
...gut Th2 response M15V6

IL-27 **M6V3**
...and Tr1 cells M6V3

IL-33 **M15V6**
...and mast cells M11V9, M11V11p2
...driver of eosinophils M11V12
...production by epithelial cells M15V6
...gut Th2 response M14V15, M15V6
...CNS inflammatory response M20V3
...promotion of M2 macrophages M20V14

Immunoexcitotoxicity **M19V1**
...applications M19V8

Infection
…and inflammation & food sensitivity M14V2-V8
…and autophagy M15V2
…and Biofilms M15V9-V12, M16V7-10
…Biofilm disrupting agents M16V13
…and Mold/Fungal Infection M16V11-V12
…and SIBO M16V1-V5
…and vitamin D **M13V7**
…and VDR downregulation M13V8
…Viral Illness M18V1-V8
…COVID-19 M18V9-V14

Inflammasomes **M8V7, M8V8, M21V21-26**
...and COVID-19 M18V9, M18V10
...and SIRT2 M8V7
...and NFκB M8V7
...and HAMPs M8V7
...and autoinflammatory disease M8V8
...regulation by natural compounds M8V8
...role in fibrosis M21V4
...applications M21V5, M21V8
...role in diabetes M21V6
...promotion by mitochondrial DAMPs M21V6
...role in metabolic syndrome M21V6
...in adipose tissue M21V6

Inflammatory bowel diseases **M15V4, M15V5**
...activation by viral infection M15V4
...role of TNFα and IFNγ M15V4
...neuromodulation M15V4
...effects of Vitamin A, Vitamin E, Vitamin D, and Curcumin M15V5
...diarrhea M15V7

Inflammatory response **M1V2,** M7V7, M8V4, M8V5
…driven by inflammasomes **M21V21-25**
...and dampening of adaptive immunity M9V5
...allergic inflammation and addiction M11V8
...epithelial remodeling in allergic inflammation M11V9
...anti-inflammatory activity of EPA/DHA M13V12

...promotion of insulin resistance M21V7
...inflammatory influence of adipose tissue M21V7

Innate lymphoid cells **M15V6**
...applications M15V13

iNOS (inducible nitric oxide synthase) **M1V6**
...and lymphedema M1V6
...inhibition by vinpocetine M6V6
…iNOS inhibits inflammasome activation M21V23
...promotion of neurotoxicity M19V6

Insulin autoimmune syndrome **M21V8**
...instigation by sulfhydryl compounds and alpha lipoic acid M21V8

Interferon gamma (FNγ) **M4V3,** M2V3
...and IL-18 M4V2
...and inhibition of MMP9 M9V4
...and Tip DCs M10V5
...inhibition by lipoic acid M13V4
...promotion of autophagy **M13V10**, M15V2, **M21V21-23**
...and impaired epithelial barrier function M15V4
...promotion by baicalin M18V6Intestinal Intraepithelial Lymphocytosis **M14V13**
...intestinal epithelial damage M14V13
...increased all-cause mortality M14V13

Invariant Natural Killer T (iNKT) Cells **M13V12**

Irritable Bowel Syndrome (IBS) **M15V7,** M16V3
...gut-brain axis M15V7
...gluten and gluten cross-reactors M15V7
...fecal biomarkers M15V7
...mucosal permeability M15V7
...applications M15V13
...effects of gut microbiota M17V5, M17V7

IVIg **M11V2**

L

Labs M22V1
...considerations of space and time M22V1, M22V3
...CBC M22V1
- With differential white count M22V1
...anemia M22V2
...clusters of differentiation M22V2
...TGFβ M22V3
...GSH M22V3
...biofilms M22V3
...antibody testing M22V4
- Negative internal controls
- Result scaling
...viral infection M22V5
...autoimmunity M22V6, M22V8
...predictive autoantibodies M22V6
...antinuclear antibody M22V6
...anti-idiotypic antibodies M22V7
...changes in antibody levels over time M22V7
...GAD65 antibodies M22V7

Lactoferrin M1V3, **M1V7**
...biofilm disruption M16V13

Lauric acid
...biofilm disruption M16V13

Luteolin M13V3
...inhibition of NFκB, TNFα, and IL-12 M13V3

Lymphatic system **M1V6**
...lymph flow M1V6
...and antigen presentation M1V6

M

Macrophages **M1V2, M3V3, M12V1, M12V2, M21V6**
...and phagocytosis of apoptotic neutrophils M1V2, M3V3
...and phagocytosis of necrotic neutrophils M3V3
...and antigen presentation M3V3, M12V6
- after phagocytosis of necrotic cells M12V5

...and M1 vs M2 polarization M3V3, M12V1, M12V2, M12V9, M21V6
- Glycolysis vs oxidative phosphorylation M21V6
- Effects of metabolism M21V6

…and T cell anergy M3V3
...regulatory macrophages M12V1, M12V2
...influences of MDSCs M12V2
...macrophage biomarkers M12V2
...wound healing and fibrosis M12V2
...pathogen evasion strategies M12V3
...and influences on T cells via bystander effects M12V6
...applications M12V9
...antigen presentation vs phagocytosis M22V1

Mast Cell Activation Syndrome (MCAS) **M11V11, M11V11p2, M11V11p3**
- See mast cells

Mast cells **M11V8, M11V9, M11V10, M11V11, M11V11p2, M11V11p3, M13V9, M21V10, M21V11**
…and vitamin D M13V9
...and Th9 M10V3, M11V11p3
...and neurogenic inflammation M21V11
...bile and charcoal M10V8, M11V14
...mast cell activation independent of IgE M11V11p2
...and IgE M11V8
...and histamine M11V8
- histamine intolerance M11V10, M11V11

...and Th17 M11V8
...and platelet activating factor (PAF) M11V8, M11V11p2
...and TLRs M11V8
...and GI inflammation M11V9
...and TSLP M11V9
...and IL-33 M11V9
...activation by adenosine M11V9, M21V3
...inhibition of neurotransmitter release by H3 receptors M11V9

...and diamine oxidase (DAO) M11V10, M11V11
...T cell polarizing effects M11V10, M11V11p2, M11V11p3
...Th2 promotion M11V10, M11V11p2, M11V11p3
...release of mitochondrial DAMPs M11V11p3
...and eosinophils M11V10
...and asthma M11V11, M21V3
...and chrysin M11V11, M11V14
...and substance P M11V11
...and mastocytosis M11V11
...non-clonal mast cell activation sydrome M11V11, M11V11p2, M11V11p3
...applications M12V9
...and transcutaneous vagal nerve stimulation treatment M11V11p3
...IBS nerve symptomatology M15V7, M17V9
...role of brain mast cells in acute inflammatory process M19V10

Mold **M16V11, M16V12**
...see also “pathogen evasion strategies”

Monocyte chemoattractant protein 1 (MCP-1) (see CCL2)

Melatonin **M8V2, M8V3,** M8V8
...and blue light M8V2
...as an antioxidant M8V2, M8V3
...and inflammatory gene expression M8V2
...and apoptosis M8V2
...in aging M8V3
...and Th1 M8V3
...and inflammasome inhibition M8V8
...promotion of glutathione M9V3
...applications M9V6
...gut barrier integrity M14V10
...GI treatment M17V11
...protective effects in demyelinating disease M20V11

Memory cells M4V1, **M10V6, M10V7,** M10V8, M10V9
...PD-1 and PD-L1 (programmed cell death protein 1) M10V6, M10V7, M10V10
...and T cell exhaustion M10V6, M10V7
...origins of memory cells M10V6
...and the maintenance of their T cell polarization M10V6, M20V9

...chronic infection M10V9
...loss of TCR repertoire diversity M10V9
...applications M10V10
...methyl donors M10V10
...T cell epithelial homing M15V8

Metabolic integrity **M13V1**
...and eNOS M13V1
...of neurons M19V4

Metabolic syndrome **M21V6 thru M21V9**
...and inflammasomes M21V6
...M1/M2 macrophage polarization M21V6
...applications M21V8

MHC-I (major histocompatibility complex I) **M3V1, M3V5,** M10V4
...and cytotoxic CD8+ T cells M10V4
...and NK cells M10V4

MHC-II (major histocompatibility complex II) **M3V4, M3V5**

Microglia **M19V1**, **M19V2**
...neuron - microglial interactions M19V1
...neuronal on and off signals M19V1, M19V2
- Applications M20V12
...neuronal frequency of firing (FOF) M19V1, M19V2
...MHC-II expression M19V1
- Upregulation by neuronal inflammation M19V2
...apoptosis of infiltrating T cells M19V1
...M1 vs M2 microglia polarization M19V3, M19V4, M19V7
...priming by neurotoxins, infections and trauma M19V6, M19V7
...applications M19V8, M20V12

Migrating Motor Complex (MMC) **M16V3,** M16V4, M17V9
...inhibition by snacking M16V3
...influence of gut microbiota M16V3
...influence of serotonin and other neurotransmitters M16V4

...contraction physiology M16V4
...motilin and ghrelin M16V4, M16V5
...gastric phase III and hunger M16V5
...and obesity M16V5
...and anorexia M16V5
...and vagal motor outflow M16V5
...and low pH M16V5
...and erythryomycin M16V5

Mitophagy **M21V21-25**

MMP9 (matrix metalloproteinase 9) **M2V4, M9V4**
...and scarring M2V4
...and TNFα - IL-1β M9V4
...inhibition by berberine and Vitamin D M9V4, M9V6
...inhibition by hypoxia M9V6
...inhibition by forskolin M9V6
...inhibition by glutathione M9V6
...applications M9V6
...inflammatory bowel diseases M15V4

Monocytes **M3V3**

Multiple sclerosis (MS) M15V3, **M20V8**
...Th1 vs Th17 style Tfh cells M15V3
...protective effects of minocycline M19V7
...aquaporin 4 auto-antibodies M20V2
...role of histamine M20V8
...roles of Th9 and Th17 M20V9
...deleterious influence of dopamine M20V9
...correlation with Vitamin D deficiency M13V7, M13V11, M20V11
...role of melatonin in seasonal relapses M20V11

Multisystem Inflammatory Syndrome in Children (MIS-C) **M18V14**

Mycotoxins **M16V11, M16V12**

Myeloid-Derived Suppressor Cells (MDSC's) **M6V9, M6V10**
...and TGFβ M6V9

...and zeta chain degradation M6V9, M6V10
...and icariin M6V10
...and berberine M6V10
...applications M12V9
...inhibition by all-trans retinoic acid M18V6
...labs M22V1
...promotion of ROS M22V3

N

NADPH oxidase **M2V1,** M6V10
...promotion of neurotoxicity M19V6

NALP1 Inflammasome
...see Inflammasome

Natural Killer Cells **M2V3, M3V1**
…cytotoxic NK cells M3V1
...cytokine producing NK cells M3V1
...and NFκB M3V1
...and Th1 polarization M3V1
...and macrophage costimulation M2V3
...vs Th17 M7V1, M20V3
...interactions with DCs in the gut M14V5
...influences of gut microbiota M17V7
...activation by sulforaphane M18V6
...suppression of Th17 and CNS AI M20V3
...MS amelioration M20V9
...labs M22V2
...anemia of chronic disease M22V2
...inhibition of anti-viral activity by hypoxia M22V2
...inhibition by TGFβ M22V3
...degradation of zeta chains M22V3

Neem
...biofilm disruption M16V13

Nettle
...inhibiting histamine H1 receptors M11V11p3

Neurogenic Inflammation **M21V10, M21V11**
...and Long COVID M18V13

Neuroinflammation **M19V7**
...effects on microglial polarization M19V7
...depression M19V7
...applications M19V8
...brain AI M20V1

Neuromyelitis optica **M20V10**
...AQP4 autoantibodies and anti-SSA Ab M20V10
...role of Tfh M20V10

Neuronal frequency of firing (FOF) **M19V1**
...inhibition of MHC expression by microglia M19V7
...applications M19V8, M20V4, M20V7
...inhibition by neuroinflammation M20V1

Neuronal “ON” and “OFF” signals **M19V2**

Neuropathy **M21V12 through M21V19**
…Autoimmune neuropathies M21V12
…Mitochondrial defects in neuropathy M21V13
…and c-peptide M21V14
…and autophagy failure M21V15, M21V16
…Ferroptosis and beta cell death M21V17
…assessment & treatment M21V19

Neutrophils **M1V2, M12V1**
...and chemotaxis M1V2
...and apoptosis M1V2, M1V3
...and secondary necrosis M1V3
...and hypoxia M2V1
...and bistable balance M3V2, M14V6
...and IL-8 M3V2
...and Neutrophil Extracellular Traps (NETs) M3V2, M12V3

...and Neutrophil Extracellular Traps in COVID-19 M18V9, M18V10
...N1/N2 polarization M12V1
...and barrier integrity M14V6
...neutrophil elastase
- inhibition by ursolic and boswellic acid M16V12
...CBC range M22V1

Niacin
...utility in increasing muscle burning of FAs M21V8

Nicotinamide riboside
...inflammasome inhibition M19V4

NFκB (nuclear factor kappa b) **M1V7,** M7V7, M8V4, M8V5
...and iNOS M2V1
...inhibition by curcumin M6V6, M7V7
...inhibition by resveratrol M7V7
...applications M7V7, M18V8, M20V7
...cases M7V9
...and cortisol M8V3, M12V8
...IL-1β & TNFα activation M8V4, M8V5
...and TLRs M8V5
...and viral infection M8V4, M18V2
...and inflammasomes M8V7
...B cell class switching M11V3
...pathogen evasion strategies M12V4
...and TSLP in the gut M14V7

Nicotinamide Riboside **M8V8**
...and inflammasome inhibition M8V8
...inhibition by berberine M18V6
- in the lung M16V7
...production by the gut epithelia M17V1
...inhibition by baicalin M18V6
...inhibition by oxymatrine M18V7
...production by adipose tissue M21V6
...promotion by overnutrition/excess calories M21V7

NLRP3 Inflammasome

...see Inflammasome

NOD-like receptors
...and inflammasomes M8V7

Nrf2 (Nuclear factor (erythroid-derived 2)-like 2) **M7V6**
...promotion by sulforaphanes M7V6, M13V4, M18V6
...and glutathione M13V4
...and fungal infection M16V12

O

Oleanolic acid **M3V2**
...and complement inhibition M3V2

Oral Allergy Syndrome **M14V14**

Oral Tolerance M14V1, **M14V2**
...gut DCs M14V2
...food sensitivity M14V2
...applications M14V15

Otitis Media **M16V9**
...biofilms M16V9
...VBNCs M16V9

Oxidative Stress **M6V9**
...and MDSCs M6V9
...and TGFβ M9V2
...inhibition by vitamin C and vitamin E M13V5
...and inflammatory bowel diseases M15V4
...EBV and B cell oncogenesis M18V4

Oxymatrine
...biofilm disruption M16V13
...anti-inflammatory effects M18V7
...Th2 and GATA3 inhibition M18V7, M21V5

...inhibition of Th17 M18V7
...inhibition of p38 MAPK M21V5
...inhibition of TNFα M21V5

P

Paleo Diet M14V14

Pain **M21V10, M21V11**
...refer to the Clinical Pearl “Immunology of Pain” in the Clinical Pearls section.

PAMPs (pathogen-associated molecular patterns) **M1V3**

PANDAS / PANS **M20V13, M20V16**
...instigation by viral, fungal or bacterial infection M20V13
...applications M20V15

Parasitic Infection **M4V4,** M11V12
...and Th2 M4V2
...and pathogen evasion strategies M4V5
...and eosinophils M11V12
...cases M17V14

Pathogen Burden **M3V2**
...applications M18V8

Pathogen evasion strategies **M2V3, M12V3, M12V4**
...catalase M2V3
...Th2 promotion M12V3
...superantigens M12V3
...viral infection M12V4
...inhibition of Th1 M12V4
...applications M12V9
...chronic rhinosinusitis and Th2 promotion M16V8
...treatment options M17V12
- Th1 support M17V12

...labs M17V12

Perilla
...Th2 inhibition M18V7
...alleviation of allergic inflammation M21V5

Peristalsis M16V3, M16V4
...Th1 vs Th2 influence on smooth muscle contractility M16V3

PGE2 (prostaglandin E2) **M1V3, M1V5**
...role in neuroinflammation M19V6

Plastic additives **M11V11p3**

Platelets **M2V2**

Platelet activating factor **M1V3**
...and Th17 response M11V11p2

Polyreactive antibodies aka Polyreactivity **M22V4**
...TLR stimulation M22V4
...high total IgM M22V4
...cross-reactivity between infectious and food antigens M22V5

Postural Orthostatic Tachycardia Syndrome (POTS) **M21V10**

Pro-resolving lipid mediators **M1V2, M1V5**
...lipoxins, resolvins and protectins M1V5
...inhibition of inflammatory cytokines in the intestine M17V4

Phosphatidylserine **M1V3**

Phytohemagglutinin (PHA) (see dietary lectins)

Platelet Activating Factor (PAF) **M11V8**

Psoriasis
…and vitamin D M13V11

Pyroptosis **M8V7, M8V8**

p38 mitogen-activated protein kinases (p38 MAPK) **M7V5**

Q

Quercetin **M1V7, M11V11**
...Th1 promotion M13V2, M21V5
...Th2 inhibition M18V7, M21V5
...inhibiting mast cell degranulation M11V11p3

R

Reactive Oxygen Species (ROS) **M9V1**, M9V2
…and mitophagy and inflammasomes **M21V21-25**
...promotion by TGFβ M9V1
...applications M13V10
...and aging M13V10
...role in TBI M19V4

Reishi mushroom (also see ganoderma) **M6V6**
...and Th2 dominance M6V6

Regulatory T cells **M6V1, M6V2, M6V3, M6V4, M6V5,** M4V1
...inducible Tregs M4V2, M6V1
...natural Tregs M4V2, M6V1
- effector T cell anergy M6V5

...Tr1 Cells **M6V3, M6V4, M6V5,** M6V6
- and CD46 M6V4
- and IgA M6V4
- In the gut M14V4

...and fish oil M6V1
...and vitamin D M6V1, M6V6
...and vitamin A M6V1, M6V6
...and adenosine M6V2
...and infectious tolerance M6V2
...and IL-2 M6V4
...and fibrosis M6V4

...and T cell hybridization M6V5
...and tolerogenic DCs M6V5
...and PGE2 M6V5
...applications M7V7
...and cysteine M9V2
...differentiation into Tfh M11V7
...and SIgA in the gut M14V6
...fungal infection and IDO M16V11
...promotion by bacteroides fragilis M17V7
...vs glutathione M17V9
...diminishment in mS M20V9
...promotion by PSA in neuroinflammation M20V11

Respiratory Immunology **M21V3, M21V4**
...asthma M21V3, M21V4, M21V5
...histamine and depression M21V4
...role of inflammasomes M21V4
...role of Th9 M21V4
...and COPD M21V5

Restless Leg Syndrome
...association with IBS and SIBO M17V3

Resveratrol **M1V7, M8V5**
...and inhibition of Th2 M8V5, M13V4, M21V5
...and inhibition of adaptive immunity M8V5, M13V4
...and inflammasome inhibition M8V8
...inhibition of IDO M12V6
...as a caloric restriction mimetic M13V1
...sulphation and quercetin M13V1
...inhibition of PGE2 M19V6

Retinoic Acid **M7V4**
...promotion of Th2 and inhibition of Th1 M7V4
...RORc (RAR-related orphan receptor c) **M5V1**

Rosmarinic acid (see perilla)

S

Sarcoidosis **M8V8**

Secretory IgA (SIgA) **M15V3**
...applications

Selenium **M13V6**
...Th1 promotion M13V6
...promotion of TCR signaling M13V6

SIBO (Small intestinal bacterial overgrowth) M14V15, **M16V1, M16V2, M16V3,** M16V5
...applications M14V15
...reduced vagal motor outflow M16V1
...VBNCs and lab testing M16V1
...and proton pump inhibitors M16V1
...mechanisms of diarrhea M16V1
...DC PRR stimulation and loss of food tolerance M16V2
...and hyperalgesia M16V2
...and fibromyalgia M16V2
...rifaximin M16V2, M16V13
...MMC inhibition M16V3, M16V4
...as a result of insulin resistance and vagal inhibition M21V7

Sjogren's Syndrome **M8V5**

SOCS (suppressor of cytokine signaling) M7V1, M12V3
...pathogen evasion strategies M12V3

STAT3 (Signal transducer and activator of transcription 3) **M5V1,** M6V6, M7V3, M8V4, M8V5
...and IL-23 M5V1
...and NFκB M5V2
...inhibition by curcumin and resveratrol M6V6, M9V6, M11V14
...and Vitamin A M6V6, M11V14
...inhibition by AMPK M7V3, M18V6
...and NFκB coactivation M8V5
...and IL-6 M8V5

...inhibition by glutathione M9V1
...and oleanolic acid M11V14
...and antimicrobial effector production by epithelial cells M14V10
...fungal infection M16V11
...applications M18V8

STAT Transcriptions factors **M4V2**

Stress **M12V8**
...and cortisol M2V2
...and histamine M12V8
...and adaptogens M12V8
...applications M12V9
...and expression of celiac disease M14V12
...promotion of M1 microglia M19V7
...increased barrier permeability M19V10

Substance P **M21V11**

Sulforaphane **M2V3,** M8V8
...and inflammasome inhibition M8V8
...NK cell activation M18V6
...Nrf2 activation M18V6
...promotion of Nrf2 in macrophages M21V5

Systemic Lupus Erythematosus (SLE)
…and vitamin D M13V11

T

T cell clonal exhaustion **M10V6, M10V7, M10V9**

T cell polarization **M4V1, M4V2, M6V6,** M7V1, M7V8, M10V1, M13V2
…and autophagy / mitophagy **M21V21-26**
…and inflammasomes **M21V21-25**
...and COVID-19 M18V9, M18V10
...and Long COVID M18V13
...and the cytokine milieu M4V1

...applications M6V6, M7V8, M20V7, M20V12, M21V5
...mechanisms of reciprocal inhibition M7V1, M7V2
...cases M7V9
...and mast cells M11V10
...and Vitamin D M13V8, M13V9
...SIgA production M15V3
...Th1/Th2 influence on smooth muscle contractility M16V3
...influence of fungal infection M16V11
...effects of probiotics and the debris of probiotics M17V5
...effects of various gut microbes M17V6, M17V13
...brain AI M20V1, M20V3
...self-tissue debris M20V1
...epitope spreading M20V1
...in neurodegenerative disease M20V7
...demyelinating disorders M20V9
...memory cells M20V9
...CBC M22V1

T cell receptors **M3V5**
...and the TCR complex M3V5
...TCR signal inhibition by hypoxia M9V5
...applications M13V10
...zeta chain degradation M22V3

T-bet **M4V3,** M7V1, M7V2
...and innate lymphoid cells M15V3

TBI (traumatic brain injury) immunology **M19V3, M19V6**
...and CNS Injury-Induced Immunodepression M19V9, M19V10
...neuroinflammation
- Roles of IL-1β, IL-6, CXCL8, TNFα M19V3, M19V4
- Necessity of inflammation for tissue healing M19V4

...M1 vs M2 microglia polarization M19V3
...inflammasomes M19V4
...production of ROS M19V4
...protective effects of minocycline M19V4, M19V5
...benefits of mild exercise M19V5
...chronic traumatic encephalopathy M19V5
...biomarkers for TBI diagnosis M19V5

...immunoexcitotoxicity M19V6, M19V7
..."two-hit" model M19V6
...role of PGE2 M19V6
...sleep and repair M19V7
...applications M19V8
...CIDS M19V9, M19V10
...reduced splenic DC MHC-II expression M19V9

TGFβ (transforming growth factor beta) **M5V1, M5V2, M6V1, M9V1, M9V2,** M9V3
...and Th17 M5V1, M5V2
...and ROS M6V1, M9V1, M9V2
...and IgA M6V4
...vs glutathione M6V6, M9V1, M9V2, M9V3, M9V6
- applications M20V4
...and NK cell anergy M6V10
...and cysteine M9V2
...and cell cycle arrest M9V3
...production by tumor cells M9V3
...applications M9V6
...Th9 IntroV11, M10V3
...function as a neuronal "OFF" signal M19V2
...loss of TGF-b in the aging brain M19V7
...increased production in presence of group A strep M20V14
...MDSCs M22V3
...inflammasome activation M22V3
...hypoxia M22V3
...debris clearance M22V3

Th1 **M4V3,** M2V3, M4V1, M6V6, M13V2
…and STAT4 M4V2
...and macrophages M4V3
...and NK cells M4V3, M6V6
...and T-bet M4V3
...and lactic acid bacteria M6V6
...Th1 - Th2 Balance M4V2, M7V1, M7V7
...vs Th17 M7V1
...and glutathione M7V6
...applications M7V7, M13V10, M18V8

...inhibition by extracellular ATP M12V5
...promotion by ginseng, withania somnifera, larch arabinogalactan, angelica, astragalus, quercetin, perilla and rooibos tea M13V2
...and melatonin M8V2, M8V3
...CD8+ memory cells M10V7
...inhibition by genistein M13V3
...Th1 promoting substances M13V10, M18V6
...and aging M13V10
...gut immune defense and healing M14V5, M15V4
...TLR9-driven class-switching M15V3
...inhibition by biofilms M15V11
...promotion by lactobacillus M17V6
...viral infection M18V6
...inhibition by TBI M19V9, M19V10
...considerations in MS M20V9

Th2 **M4V4, M4V5,** M4V1, M6V6
...and GATA3 M4V2
...and mast cells M4V4
...and B cells M4V4
...and M2 Macrophages M4V4
...and TSLP M4V5, M14V8, M14V15
...and eosinophils M4V5, M11V12
...and Th17 activation M4V5, M7V2, M12V6
...Th1 - Th2 Balance M4V2, M7V1, M7V7
...and age M6V6
...and perilla M6V6
...and oxymatrine M6V6
...and Vitamin A M7V4, M13V6
...and adenosine M7V5
...and endocrine disruptors M7V6
...applications M7V7, M11V14, M13V10
...and Th9 coactivation M10V3
...and basophils M11V13
...inhibition by chrysin M11V14
...beta adrenergic agonists, caffeine and stress M11V14
...and chronic stress M12V8
...cases M12V10, M13V11
...promotion by acai M13V3

...and Vitamin E M13V5
...zinc deficiency M13V6
...inhibition by Vitamin D in asthma M13V9
...promotion by DHA M13V12
...Th2 promoting substances M13V10
...in GI immunology M14V4
...IL-33 and IL-17e M14V15
...inhibition of autophagy by IL-4, IL-13 and STAT6 M15V2
...and inflammatory bowel diseases M15V4
...and ILCs M15V4
...IL-25, IL-33 and TSLP M11V11p2, M15V4
...persistence in epithelia M15V8
...and T cell homing M15V8
...promotion by biofilms M15V11
...promotion by fungal infection M16V11
...intestinal Th2 dominance M17V8
...and loss of intestinal tight junctions M17V8
...Th2 inhibiting substances M18V7
...Th2 cytokine inhibition of autophagy M13V10, M20V4
...promotion by norepinephrine and antidepressants M21V2
...promotion by low TCR signal strength M21V3

Th9 M4V1, M10V1, M10V3
...applications M10V10
...and inflammatory bowel diseases M15V4
...brain AI M20V3
...clinical errors that promote IntroV11
...IL-4 induction with TGF beta IntroV11
...role in asthma M21V4

Th17 **M5V1, M5V2, M5V3, M5V4,** M4V1, M6V6
...and STAT3 M4V2, M5V2
...and PAF M4V4, M7V1, M11V8
...vs Th1 M5V1, M7V1
...and NSAIDs M5V1
...and autoimmune flares M5V2
...and epithelial surfaces M5V2
...and autoimmunity M5V3
...and apoptosis of infected cells M5V3

...and dopamine M5V4
...and intravenous immunoglobulin M5V4
...and IL-23 receptors M5V4
...and cMAF M7V2
...applications M7V7, M15V13
...in the intestine M11V7
...IL-23 independent Th17 response M11V7
...and SIgA M11V7
...cases M12V10
...inhibition by Interferon gamma IntroV11
...inhibition by Th1 and Tregs IntroV11
...inhibition by Vitamin A M13V6
...and the intestinal mucus layers M14V2
...normal function in gut immune defense M14V5
...role in gut autoimmunity M14V9, M14V10
...NaCl and autoimmunity M14V14
...IL-23 independent cells in peyer's patches and production of IgA M15V3
...role in inflammatory bowel diseases M15V4
...promotion by phagocytosis of TLR ligand carrying cells M18V1
...brain AI M20V3
...role in MS M20V9
...Th17 subtypes M20V9
...promotion by group A strep M20V14
...labs M22V1

Th22 M4V1, M6V11, M10V1, **M10V2**
...and antibody aggressiveness M6V11
...inhibition by TGFβ M10V2
...inhibition by Vitamin D M10V2
...mucosal defense M10V2
...skin inflammation M10V2
...applications M10V10

TLRs M7V1, M7V2, M11V3
...and DCs M7V1
...list of TLR ligands M15V3
...biofilms and TLR agonists M15V11
...TLR3 upregulation by elderberry and astragalus M17V6
...secretion of polyreactive antibodies M22V4

...activation by antibody-antigen immune complexes M22V6

Tregs (see Regulatory T cells)

Tfh (see Follicular Th cells)

TNFα (tumor necrosis factor alpha) **M1V7**
...and Th22-mediated antibody aggressiveness M6V11
...and MMP9 M9V4
...inhibition by vagal motor outflow M15V1
...and impaired epithelial barrier function M15V4
...inhibition by glutathione M18V6
...activation of HPA axis M19V10
...promotion of CRH release M19V10

Tissue Debris Fields M7V7, **M12V5, M12V6, M12V7**
...Th2 promotion M12V5, M12V6, M12V9
...debris field formation M12V5
...epitope spreading M12V6
...and Th17 M12V6
...cases M12V10
...applications M12V9

Tonsillitis **M16V9**
...GAS biofilms M16V9

Toxic Shock Syndrome
...glycerol monolaurate reduces production of IL-8 M17V3

Transverse myelitis **M20V10**
...inflammatory markers in the CSF M20V10

TREM2 ligand **M19V2**
...function as a membrane bound neuronal “ON” signal M19V2

Tr1 cells (see Regulatory T cells)

Tryptase **M11v11p3**

TSLP (thymic stromal lymphopoietin) **M14V7**
...production by gut epithelia M14V7, M14V8, M15V6
...and mast cell activation syndrome (MCAS) M11V11, M11V11p2, M11V11p3
...and NFκB M14V7
...and gut Th2 response M15V6
...epithelial inflammation M17V8
...role in asthma M21V3

U

Ulcerative Colitis
...applications M15V13
...treatment options M17V13

V

Vagus Nerve M14V1, **M15V1,** M17V1, **M21V7,** M21V8
...inhibition of spleen macrophage TNFα production M15V1, M21V7
...transcutaneous vagus nerve stimulation (tVNS) M15V1
    ...and inhibition of mast cell degranulation M11V11p3
    ...requirement of adequate acetyl choline for effectiveness M11V11p3
...and TRH (thyrotropin releasing hormone) M15V1
...suppression by insulin M15V1, M20V15, M21V6, M21V7
...applications M15V13, M19V8
...role in SIBO M16V1
...role in anxiety and depression M21V2

VEGF (vascular endothelial growth factor) **M2V1, M2V4**
...and MDSCs M6V10
...deficiency in COPD M21V5
...excess in asthma M21V5

Vinpocetine M1V7

VIP (vasoactive intestinal polypeptide) **M21V11**

Viral infection **M18V2, M18V3, M18V4, M18V5**
...lytic vs latent infection M18V2, M18V3
...immunocompetence M18V2
...EBV M18V4
- chronic fatigue syndrome M18V2
...NKG2D M18V2
...CMV and cardiovascular disease M18V2
...HHV-6 and nervous system dysfunction M18V2
...viral classifications M18V3
...EBV M18V3
...cytopathic vs non cytopathic M18V4
...IRIS M18V4
- Applications M18V8
...molecular mimicry M18V4
...vitamin D M18V4
...autoimmunity M18V4
- Applications M19V8
...oncogenesis M18V4
...alzheimer's M18V4
...viral encephalitis M18V5
...CNS infection M18V5
...John Cunningham Virus M18V5
...HSV-1 M18V5
...in immunocompromised patients M18V5
...Th1 support M18V6
...cytokine homologue production M18V6
...Th2 inhibition M18V7
...cases M18V8, M22V8
...applications M18V8
...innate immune support
- Applications M18V8
...neuronal infection and Th1 response M19V10
...brain immunology
- applications M20V4
...correlation with MS M20V10
...and demyelinating disease
- Applications M20V12
...labs M22V5
...influence of MDSCs M22V5

...suppression of anti-viral immunity by stress M22V5
...total pathogen burden M22V5

Vitamin A **M7V4, M6V1**, **M13V6,** M6V10
...and Tregs M6V1, M17V4
...and IgA M7V4
...and gut homing T cells M7V4
...and loss of oral tolerance M13V6
...and IL-15 M13V6
...Th17 promotion M13V6
...Th2 promotion M13V6
...applications M13V10
...gut DCs M14V3
...effects on GI immunology M17V4

Vitamin C **M13V5**
...and Th1 promotion M13V5
...antihistaminic effects M11V11p3, M13V5

Vitamin D **M7V4, M6V1, M6V5, M13V7-9**, M6V10, **M13V7 thru M13V27**
…and asthma M13V9
…and food sensitivities M13V12
…renal and extra-renal conversion M13V7
...and autoimmunity M13V7-12
…and infection M13V7-12
…and Interferon gamma and IL-4 M13V7-12
…and inhibition of IL-17 M13V7-12
…and chronic kidney disease M13V16, M13V22, M13V23
…and Klotho M13V16, M13V18, M13V19
…and CYP27B1, CYP2R1, CYP24A1 M13V7-8
…and parathyroid hormone (PTH) M13V7, M13V8, M13V17
...and Tregs M6V1, M17V4
…and Tbet M13V12
…and Lyme M13V12
…and heart M13V12, M13V21
...and macrophages M7V4, M13V7-12
…and mast cells M13V9
...and DCs M7V4, M13V7-12
...and T cells M7V4, M13V8, M13V9

…and B cells M7V4
...and MMPs M7V4
...25 vs 1,25(OH)2D M13V7
...LL37 & DEFB4 M13V7
...and soda M14V14
…and stress M13V14
...effects on GI immunology M13V9, M13V12, M17V4
...dampening of adaptive immunity M17V4
…difficulty raising vitamin D levels M13V15
...promotion of autophagy M13V7-12, M15V2, M20V4, M21V21-26
...use in alzheimer's M20V7
…and amyloid beta M13V20
…and innate lymphoid cells type 3 (ILC3) M13V11

Vitamin D Receptor (VDR) **M13V8**
...downregulation by ROS M13V8
…downregulation by pathogens M13V8
…identification of downregulation by PTH level M13V8

Vitamin E **M13V5**
...and aging M13V5
...alpha vs gamma tocopherol M13V5
...inhibition of neutrophil chemotaxis M13V5
...inhibition of MMP-1 M19V5
...promotion of glutathione-S-transferase a M19V5

Vitiligo **M8V8**
...and Multiple Autoimmunity M8V8

W

White blood cell count
…and autophagy requirement for bone marrow function M13V10

Withania somnifera
...protective effects in alzheimer's M20V7

Z

Zinc **M8V3, M13V6**
...Th1 promotion M13V6
...and aging M13V6

Zonulin **M14V9**
...and gluten M14V11, M14V12