



Aromatherapy Support for Individuals with Trisomy 21

Katherine Gentil, MS, MEd, CCA



Introduction



- Military background - 20 years US Air Force
 - Missiles, personnel, force structure analyst
- Stay-at-home mom
 - Medically complex child
- Introduced to essential oils
 - ACHS graduate program
 - ACA Level 1
 - Continuing education
 - CO2s, cancer care, terminal illness, skin care, musculoskeletal conditions, women's health, Parkinson's Disease care, etc.



Trisomy 21 Research Foundation



“Down syndrome is the least funded major genetic condition by our National Institutes of Health despite being the most frequent chromosomal disorder.”
(GDSF)

- Biochemistry of T21 researched over the past 30 yrs
- Team of medical and integrative healthcare professionals
 - *Dixie Lawrence, PhD (Biochemistry)
 - *David Swenson, MD
 - Gabi Giacomini, ND
 - Elizabeth Hesse-Sheehan, DC, Functional Medicine
 - Alissa Mitchell-Hodgson, FDN-P
 - Khaki Cooper, RN, CNC
 - And others ...
- Parent involvement

*Founders

Overview

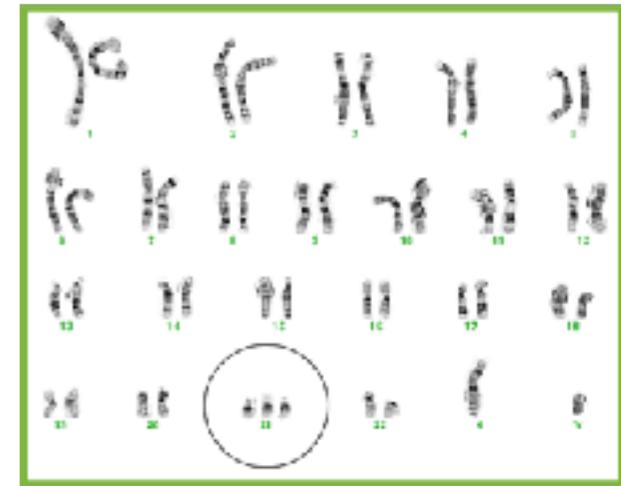
- Introduction to Trisomy 21
- Pathology - impact of extra genetic material
 - Antioxidant process
- Foundational support
- Aromatherapy support
 - Neuroprotection
 - Skin conditions
- Administration
- Safety
- Other Considerations



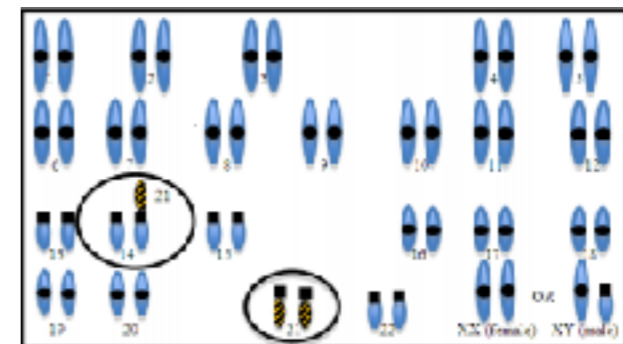
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Down syndrome

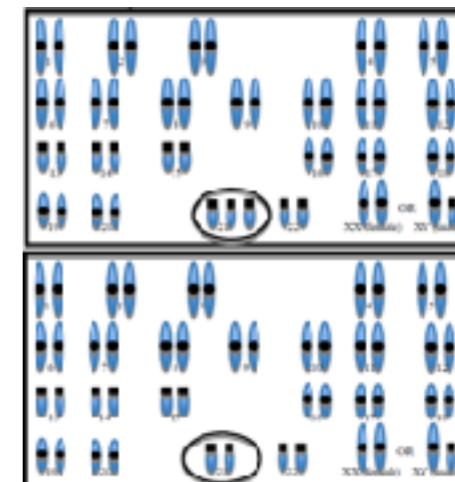
- Physical characteristics identified
 - Dr John Langdon Down (UK) - 1866
- Discovery of extra 21st chromosome
 - Dr Jerome Lejeune (France) - 1958-59
- Types of Down syndrome
 - Trisomy 21 - ~95%
 - 3 separate copies of the 21st chromosome
 - Translocation Down syndrome - ~3%
 - An extra piece or whole 21st chromosome is translocated to another chromosome
 - Mosaic Down syndrome - ~2%
 - A mix of cells with the typical 2 copies of 21st chromosome and 3 copies



mydoctor.kaiserpermanente.org



massgeneral.org



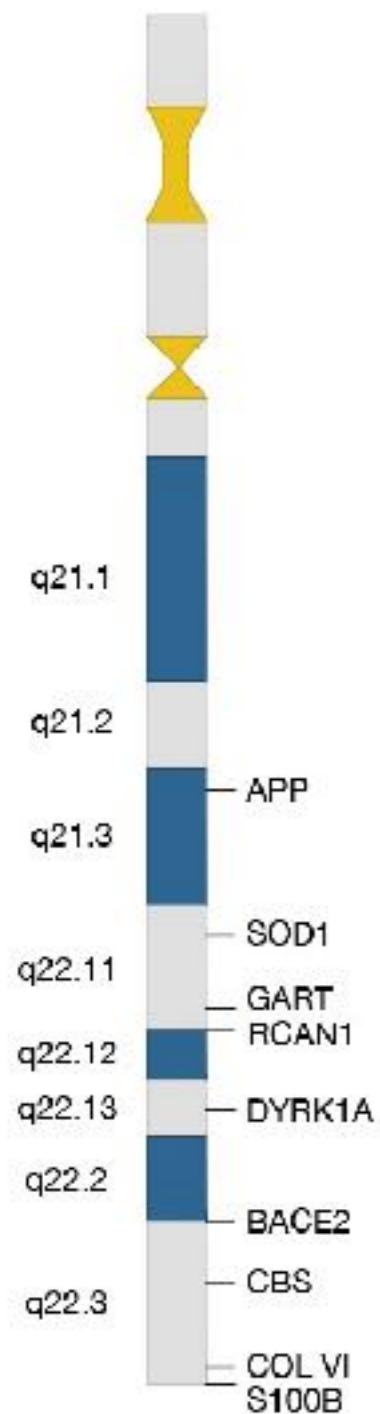
massgeneral.org

Prevalence



- Most common chromosomal abnormality
 - ~1 per 700 births
- Verifying global population information is difficult due to lack of broad scale data collection
 - Population varies significantly by country due to prenatal testing availability and cultural choices where a high percentage of parents may choose to terminate pregnancy
 - 2008 US population estimates 250,000 - 400,000
- Life expectancy: increased significantly an average of age 10 yrs up to 47+ yrs between 1960 - 2007
 - Today we see people with Down syndrome living 60+ years of age
 - Supportive family structure, community programs, medical advances, and quality nutrition contribute to longer life expectancy

Pathology



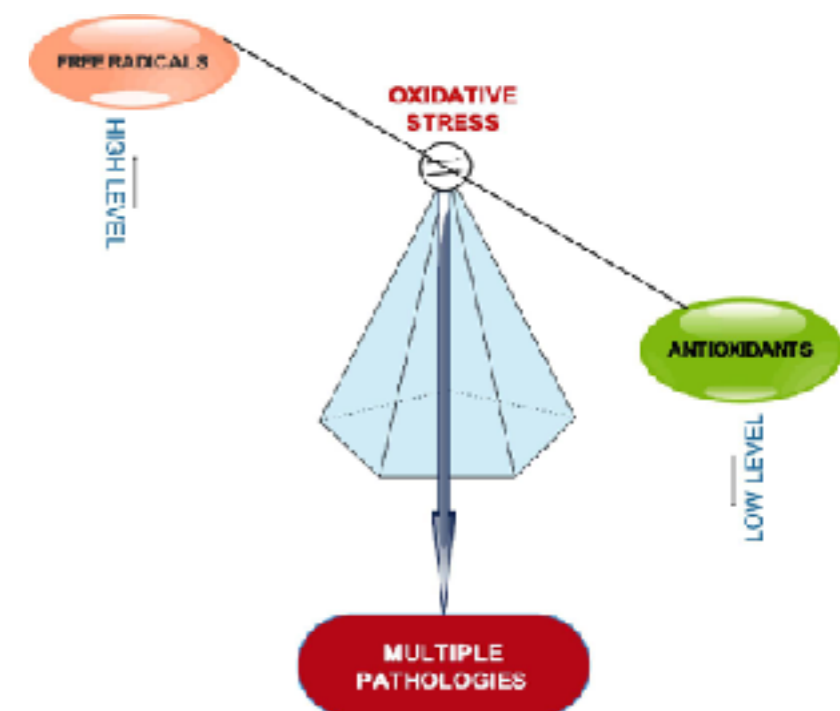
L. Gentil (Graphic)

- 21st chromosome: smallest human chromosome
 - Spans 46 million base pairs, ~1.5 - 2% of DNA in cells
 - ~200 - 300 protein-coding genes
- Extra chromosome = extra set of genes
 - 50% over expression of intended gene action, generates major influence in biochemistry
- Key genes and microRNA impacting health
 - APP, BACE2, CBS, ColVI α 1/2, DYRK1A, GART, RCAN1, SOD1, S100 β
 - miRNA125b and miRNA155 (regulation of gene expression, BBB damage)
- Gene interactions with other chromosomes impacted
 - FOXP2 (chr 7), APOE (chr 19), and PTSG2 (chr 1) impact speech, neural development, and increased COX-2 formation

Antioxidant Process

- Balancing endogenous antioxidant processes and reactive oxygen species generated in the body is critical for maintaining health
 - When reactive oxygen species > available antioxidants → Oxidative stress
- First line defense antioxidant triad:
 1. **SOD**: catalyzes superoxide anion ($*O_2$) to H_2O_2 and O_2
 2. **CAT**: breaks down H_2O_2 to H_2O and O_2
 3. **GPx**: intracellular enzyme catalyzes reduction of H_2O_2 to H_2O and lipid peroxides to alcohols in mitochondria and cytosol using glutathione (GSH)

- **SOD1** on Chr 21 encodes Cu/Zn-SOD, cytosol
- **SOD2** on Chr 6 encodes Mn-SOD, mitochondrial
- **SOD3** on Chr 4 encodes Cu/Zn-SOD, extra cellular
- **CTT1** on Chr 11 encodes CAT, primarily in peroxisomes, absent in mitochondria
- **GPx(1-8)** - encoded by different genes, GPx1 most abundant - selenium needed



SOD1

- Excess **SOD1** from extra 21st chromosome encodes for excess SOD
 - Catalyzation of super oxide ($*O_2$) to H_2O_2 on hyperdrive
 - CAT and GPx/GSH processes get outpaced resulting in excess H_2O_2
 - Excess H_2O_2 is injurious to the body and can also generate other free radicals, resulting downstream reactions to cellular damage
- Extra **CBS** gene together with **DYRK1A** results in increased H_2S production
 - Disrupts/suppresses mitochondrial function
 - CBS converts homocysteine to cystathionine, results in low homocysteine
 - Homocysteine is a critical storage/transfer molecule in forming cysteine, part of the tripeptide GSH, result is low GSH generation
- *Low generation of GSH + excess H_2O_2 produced by the over expressed SOD1 action = constant ROS (and RNS)

CHRONIC OXIDATIVE STRESS



Cascading Effects

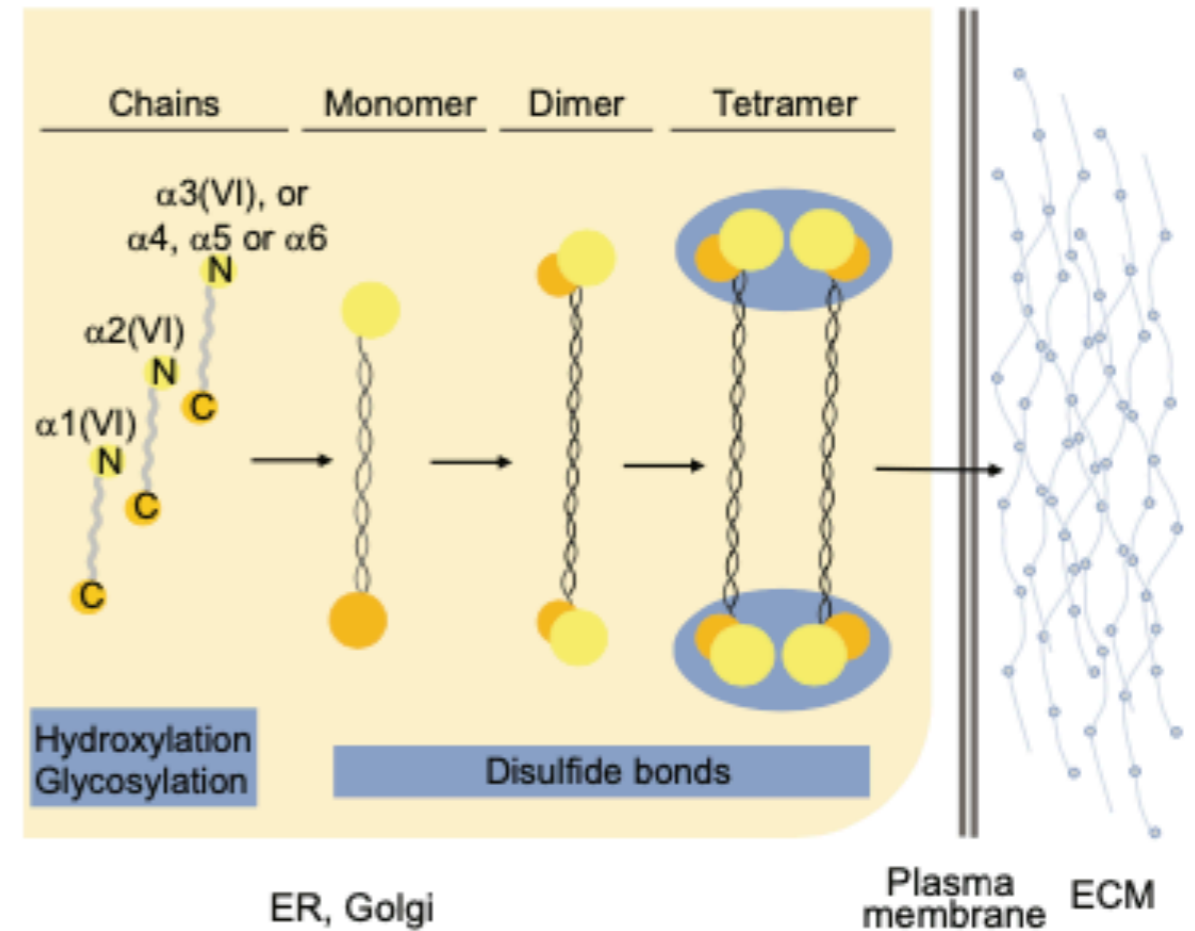
- Glutathione is also required for the biosynthesis of leukotrienes and prostaglandins
- Over expressed genes contribute to dysregulation of immune system pathways and generate systemic and neuro-inflammation
 - **APP & BACE2** - Alzheimer's Disease associated genes
 - People with T21 develop amyloid- β ($A\beta$) deposits early in life
 - Increased pro-inflammatory cytokines IL-2, IL-6, IL-8* and elevated anti-inflammatory IL-1ra and IL-10, as well as VEGF, epo, GM-CSF, COX-2
 - Creates imbalance in inflammatory responses
 - IL-6 highly problematic, increased in brain regions relevant to AD
 - **CBS** excess production of H_2S dysregulates inflammation
 - **S100 β** induces NF- κ B (also contributes to “leaky” BBB)
 - Smaller thymus gland or removed if OHS performed
 - Lower T and B cells, reduced regulatory T lymphocytes, suboptimal antibody response to immunization
 - Increase in autoimmune conditions

* Those with CHD

CHRONIC INFLAMMATION

ColVI α 1/ α 2

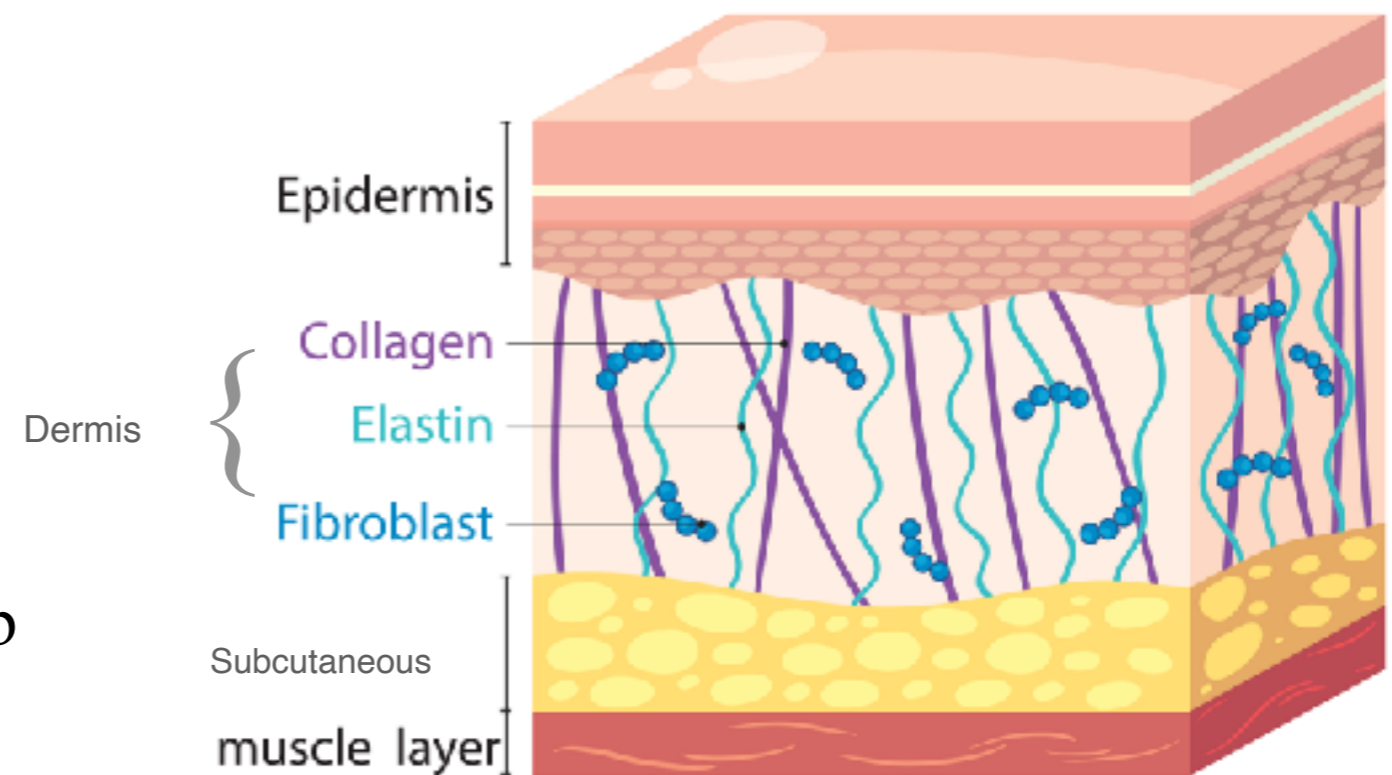
- ColVI modulates structural integrity of the extra cellular matrix
 - 3 main chains (α 1-3)
 - 3 additional chains (α 4-6)
- Impacts all other forms of collagen
- Extra genes create connective tissue disorder, contributes to several features and conditions often seen in individuals with T21
 - e.g., Hypotonia, hyper flexibility, Hirschsprung disease, congenital heart defects, phenotype



Gregorio, et al.

ColVI α 1/ α 2, APP, Copper

- Skin: extra ColVI α 1 and α 2 genes impact structure of dermis layer where collagen and elastin are produced
 - Ratio to ColVI α 3 from chromosome 2 is out of balance
 - *Creates more dense dermal layer*
- APP expressed in epidermis increases keratinocyte adhesion, migration, and proliferation
 - Contributes to follicular occlusion and other skin conditions
- Copper: lack secondary peptide to absorb copper into cells
 - Impacts collagen production
 - Higher levels of free copper, reduced absorption of copper into cells



@brgfx (edited)

Common Health Conditions

- Heart defects, ~50% have CHD
 - AVSD, VSD, MV, PDA, ToF, ASD, Tricuspid valve, coarctation of aorta
- Vision issues - strabismus
- Hearing loss
- Immune system dysregulation
 - More prone to infections, pneumonia
 - Autoimmune conditions
- Hypothyroidism / Hashimoto's
- Blood disorders
 - Leukemia, anemia, polycythemia
- Connective tissue disorder
 - Skin conditions
 - Hypotonia
- Digestive system disorders
 - Hirschsprung's disease, Celiac disease
- Atlantoaxial instability
- Gum disease, dental disorders
- Sleep disorders, OSA, disrupted sleep patterns
- Cognitive impairment
- Olfactory impairment ↑ w/ age
- Mental health disorders
- Seizure disorders
- Autism - ~7-10%
- Alzheimer's disease - ~50-70%

Dementia/Alzheimer's Disease

Pathology of Alzheimer's disease remains elusive, it is multifactorial; looking at T21 community can help reveal targets

- Amyloid cascade theory has come under scrutiny, yet evidence suggests it plays a role
 - T21 population show increased A β accumulation due to extra [APP](#) and [BACE2](#)
 - β - and γ -secretase cleave APP creating A β
- Chronic neuro-inflammation is a consistent underlying factor
 - T21 shows inflammatory phenotype M2b marker and chronic COX-2 elevation in brain
- Cholinergic degeneration continues to be a factor
 - Acetylcholine is low in T21 due to hyperactive acetylcholinesterase from [RCAN1](#)
 - Affects CNS and whole body systems (including gut function)
 - Inhibiting AChE is key area of study that improves brain and gut health
- Oxidative stress: Blood levels of glutathione decrease in the elderly in the general population just as we see in Trisomy 21 battling low glutathione their entire lives

Dementia/Alzheimer's Disease

Alzheimer's Disease	Elderly General Population	Trisomy 21
● Increased Amyloid β accumulation	✓	✓
● Chronic neuro-inflammation	✓	✓
● Low acetylcholine, hyper AChE (also BChE)	✓	✓
● Oxidative stress: low blood levels of glutathione	✓	✓
● Dysregulated copper levels in brain	✓	✓



Skin Impact

- Skin issues reported in 56% of young adults with T21
- Skin health impacted by internal and external factors
- Internal: NICE - Neuro-immune Cutaneous Endocrine
 - Skin is modulated by genetics, CNS, immune system
 - Endocrine
 - Hypothalamus - pituitary - thyroid (HPT) impact
 - Stress response, chronic inflammation, chronic oxidative stress
 - Genetics: ColVI α 1/ α 2, APP, copper
 - Gut disorders such as celiac, low peristalsis, chronic constipation
- External
 - Diet
 - Hygiene, environmental exposure
 - Touch/massage - lymphatic support

Common Skin Conditions

- Adnexal impact - folliculitis, acne, hidradenitis suppurativa
- Xerotic and eczematous - seborrheic dermatitis, keratosis pilaris
- Autoimmune - alopecia, vitiligo
- Infection - prone to tinea pedis, onychomycosis
- Oral impacts - cheilitis, angular cheilitis
- Psoriasis, scaly papule conditions
- Hematologic/oncologic
- Benign cutaneous neoplasms - syringomas (20%)
- Vascular reactions - mottled appearance (livedo reticularis)
- Premature aging - oxidative stress

Targeted Nutritional Intervention

Critical to address oxidative stress and inflammation

- Nutritional supplements for daily, lifelong support to support the body's processes are primary approach integrated with appropriate medical care
 - **Antioxidant:** Setria[®] reduced l-glutathione
 - NAC not recommended - needs homocysteine for conversion and those with T21 are deficient
 - **Anti-inflammatory:** curcumin (Longvida[®])
 - Down regulates **APP**, **S100β**, reduces inflammatory cytokines
 - **CBS** gene regulation: apigenin*
 - **DYRK1A** and **RCAN1** down regulation: EGCg
 - **APP**, **APOE**, **miRNA125b**, **miRNA 155** - Resveratrol
 - **ColVIα1/2** - select amino acid precursors

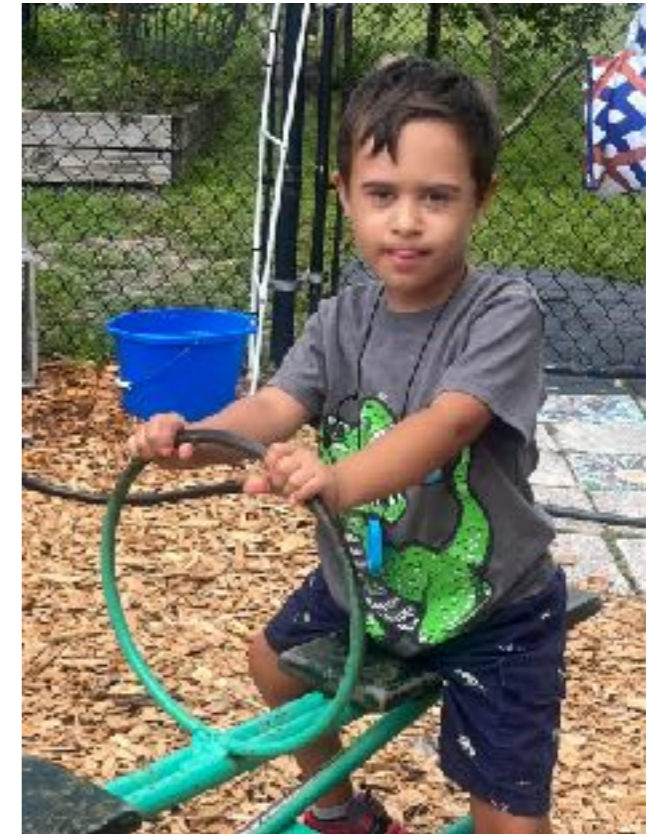
(See appendix slide for nutritional supplement details)



Adjunct Support

- Aromatherapy is very well suited for the T21 community
 - Best to have nutritional support in place for optimal benefit
- Inhalation and topical administration routes are excellent options for neuro and integumentary support
 - Essential oils can cross BBB supporting CNS health
 - Those with T21 tend to have a more permeable BBB
 - Support vagus nerve action, boost gut motility
 - Provide grounded support for behavior and boost mental health
 - Topical provides direct support to local tissues, skin care
 - Respond well for respiratory conditions, ear infections

IMPROVE QUALITY OF LIFE



Essential Oil Action

- Essential oils exhibit a wide range of antioxidant effects
 - Induce body's SOD and GSH expression
 - But in T21, this is an area the person struggles *unless properly supported*
 - Induce CAT
 - Constituents can directly reduce/inhibit formation of ($*O_2$), scavenge H_2O_2 , and OH^* , reducing signal for SOD over reaction
 - **Inhibit NF- κ B: can reduce CBS excess activity to assist increasing GSH production**
 - Reduce lipid peroxidation (very beneficial in CNS)
- Anti-inflammatory targets
 - Essential oils /constituents decrease inflammatory cytokines
 - Reduce neuro-inflammation

Aromatic Goals

- Anti-inflammatory: target IL-2, IL-6, IL-8, COX-2
- Antioxidant: balance as much as possible, look for NF- κ B inhibition activity to down regulate CBS
- Neuroprotective action
 - Cholinergic pathway support - AChE and β -secretase inhibitor potential
 - ANS balance (sympathetic - parasympathetic) - reduce stress, assist sleep
- Skin care
 - Nourish epidermis and dermis
 - Promote desquamation - soften and loosen dead cells
 - Support skin flora, provide antimicrobial action as needed
 - Stimulate waste removal, lymph movement

REDUCE STRESS

Melissa officinalis

- Beautifully complex chemistry
- CNS anti-inflammatory, anti-oxidant, neuroprotective, antidepressant
 - Supports cholinergic pathway
 - COX-2 inhibitor
 - Evidence-based support in AD
 - Shows potential to have receptor binding action across all neurotransmitter pathways associated with AD agitation
- Look for quality constituent profile
 - Citral (neral and geranial)
 - β -caryophyllene
 - Germacrene D
 - Esters - low in percentage but key part of complexity



Organic Facts

Alternative option:

- *Eucalyptus staigeriana*
 - Moderate citral and complexity

Curcuma longa

Turmeric Rhizome: EO, CO2

- Neuroprotective
- Anti-inflammatory, anti-oxidant
 - Inhibits COX-2 & NF- κ B
- β -secretase inhibitor
 - BACE2 gene over expression
- Neural stem cell proliferator
- Sesquiterpene ketones
 - β -turmerone
 - α -turmerone
 - α r-turmerone



Organic Facts

Copaifera langsdorfi/officinalis

Copaiba balsam

- Neural and peripheral anti-inflammatory
 - COX-2 inhibitor
- Gentle respiratory support
- Anti-microbial, reduce infections
- Potential AChE inhibitor
- Significant β -caryophyllene content
 - Inhibition of NF- κ B
- Grounding, calming



[healthline.com](https://www.healthline.com)

Angelica archangelica

Angelica root - CO₂ sel and EO

- Grounding, calming
- Neuroprotective
 - Potential AChE inhibitor and seizure suppression
- Immunomodulation
- α/β -phellandrene, α -pinene, limonene; osthol in CO₂

Lavandula angustifolia

Lavender

- Calming, carminative
- AChE inhibitor
- Seizure suppression
- Traditional evidence-based use for dementia/AD agitation reduction
- (-)-linalool, linalyl acetate



betternutrition.com



Kathy's front yard

Gut-Brain Connection

Citrus - *Citrus spp* (peel, leaf, flower)

- Limonene - AChE inhibitor
 - Bergamot brings linalyl acetate, linalool
 - Neuroprotective
- NF- κ B inhibitor
- ANS balancing
 - Uplifting and calming
- Digestive support, gently encourage peristalsis
- Anti-inflammatory, immune support



Rachel Studio

Coriander - *Coriandrum sativum* (Seed)

- (+)-linalool - balancing, anxiolytic
- Anti-inflammatory (COX-2), antioxidant
- Neuroprotective potential for use in AD and seizure disorders
- Support bowels

Marjoram - *Origanum majorana*

- Carminative/digestive tonic
- Anti-inflammatory, antioxidant
- Terpinen-4-ol reduces NF- κ B expression
- Respiratory antispasmodic, ease breathing
- Tonifying, nervine, AChE inhibitor

Cholinergic + Respiratory support

1,8 cineole and α - & β -pinene constituents perform well in AChE inhibition tests and provide anti-inflammatory and targeted antioxidant action

- 1,8 cineole is mucolytic and COX-2 inhibitor
- Pinene aids in thinning secretions
- Hung, et al (2022) indicate synergistic AChE inhibition with blend
- Cardamom - *Elettaria cardamomum* - Carminative/digestive tonic;
1,8 cineole, α -terpinyl acetate lends softness, COX-2 inhibitor
- Eucalyptus - *E. radiata* - gentle 1,8 cineole-rich eucalyptus
- Cajuput - *Melaleuca cajuputi* - also carminative
- Fragonia™ - *Agonis fragrans* - Trio of 1,8 cineole, α -pinene, linalool
 - “Herbal Simple” → “Aromatherapy Simple”
- Juniperberry - *Juniperus communis* - also acts as carminative, skin decongestant
- Frankincense - *Boswellia frereana/sacra/carterii* - pinene-rich species
- Conifers: Douglas fir, Siberian fir, Scots pine, balsam fir, black spruce ...

Neuroprotective blends

- Inhalation blend to support inhibit AChE, antioxidant, anti-inflammatory, olfactory stimulation (diffuser, personal inhaler, aroma patch)

30% Mandarin (*Citrus reticulata*)

20% Melissa (*Melissa officinalis*)

20% Lavender (*Lavandula angustifolia*)

20% Copaiba (*Copaifera officinalis*)

10% Turmeric (*Curcuma longa*)

- Blend to support focus:

40% Sweet orange (*Citrus sinensis*)

25% Frankincense (*Boswellia carterii/sacra*)

20% Balsam fir (*Abies balsamia*)

15% Vetiver (*Vetiveria zizanooides*)



- “Simple”
Fragonia (*Agonis fragrans*)

Skincare Options

- Therapeutic fixed oil base!
 - Apricot kernel (*Prunus armeniaca*), jojoba (*Simmondsia chinensis*), Sesame (*Sesamum indicum*)
 - Black cumin seed (*Nigella sativa*)
 - Tamanu (*Caulophyllum inophyllum*)
 - Neem (*Azadirachta indica*) 5%
- Macerates
 - Calendula (*Calendula officinalis*)
 - German chamomile (*Matricaria recutita*)
 - Helichrysum (*H. italicum*)
 - St John's Wort (*Hypericum perforatum*)
- CO2s
 - Black cumin seed
 - Calendula
 - Rosehip seed



Dionisvero

Hydrolats/Hydrosols

- Hydrolats!!!!
 - Safe for daily use, especially on the face
 - Provide gentle micro layer of plant based support
 - Best for inflamed, irritated skin
- Blend with ...
 - Aloe for adhesion and soothing therapeutic properties
 - Glycerin (< 10%) for demulcent properties
 - Supports desquamation
 - Charge with kaolin or green clay



Massage, Manual Movement



- Exfoliation - gentle skin brushing
- Gentle tissue stimulation
 - Lymph drainage support
 - Roller ball applications

- “Touch” communicates to the CNS - NICE
- Increase circulation
- Clear toxins



Skincare support case

- **Hidradenitis suppurativa (HS)** (aka, acne inversa) one type of follicular occlusion condition that is more prevalent in teens and adults
 - Occurs at a rate 7 times that of the general population
 - Higher prevalence in those with celiac or Chron's disease (gut-skin connection), TNF, VEGF, IL-8, IL-1 β
 - Affects apocrine gland areas, chronic, and painful
 - Arm pits, groin, back, chest and under breast area
 - Tunneling in lymph-vessel rich areas
 - Type of secondary pathogen growth can differ
 - Cultures show *Staphylococcus lugdunensis* along with a variety of streptococci and other microflora
 - Anaerobic bacterial species of *Prevotella* and *Porphyromas*
 - *Saccharomyces cerevisiae* yeast
 - *Fusobacterium* and *Parvimonas spp* correlate with condition severity

No cure

Skincare support: HS Blend

Therapeutic actions sought:

- Antibacterial/antimicrobial
- Anti-inflammatory
- Encourage lymph-flow
- Decongest
- Analgesic



ausdoc.com

Hydrolat spray daily

- 40% Lavender (*Lavandula angustifolia*)
- 20% Helichrysum (*Helichrysum italicum*)
- 20% Bay laurel (*Laurus nobilis*)
- 20% Rose geranium (*Pelargonium x capitatum*)

Fixed oil and CO2 base:

- 70% Apricot kernel oil (*Prunus armeniaca*)
- 20% Black cumin oil (*Nigella sativa*)
- 5% Neem oil (*Azadirachta indica*)
- 5% Black cumin seed CO2 extract

Essential oils

- 20% Tea tree (*Melaleuca alternifolia*)
- 15% Helichrysum (*H. italicum*)
- 15% Juniper berry (*Juniperus communis*)
- 15% Grapefruit (*Citrus paradisi*)*
- 10% Angelica root (*Angelica archangelica*)*
- 10% Patchouli (*Pogostemon cablin*)
- 10% Copaiba (*Copaifera officianalis*)
- 5% Winter savory (*Satureja montana*)

Concentration at 7.5% for acute flair

Prophylactic use: reduce to 4%, remove photosensitive oils

*phototoxic/sensitive

10 ml rollerball - apply light, gentle pressure on application

Add zinc oxide-rich based ointments for groin areas

Other Skincare Options

- Seborrheic dermatitis
 - Essential oil based shampoos (care to avoid eyes)
 - *Cedrus atlantica*, *E. radiata*, *L. angustifolia*, *Pogostemon cablin*, *Melaleuca alternifolia*, *Chamaemulum nobile*, etc
 - Professionally formulated baby shampoos and body washes containing safe levels of essential oils
 - Exfoliate scalp to stimulate desquamation
- Chelitis, angular chelitis
 - Nourishing lip balms with tamanu, calendula, carrot seed, helichrysum
 - Autoimmune or vitamin deficiencies can contribute
- Syringomas - use non-volatile options
 - Cornflower hydrolat (*Centaurea cyanus*) spray
 - Eyebright (*Euphrasia officinalis*) herb infusion, compress (if tolerated)



Working with Your Client

- Most individuals with T21 can be self advocates, but depending on understanding of client, may need to work with parent/care giver
- Introduce oils slowly, give time for processing and assessing
- Those who are nonverbal with limited communication skills may not understand or follow directions, e.g., not touching the oils then eyes which affects administration options
 - Communication can be delayed - can take up to 20 seconds for some to respond
- Traditional applications approaches for skin issues such as impetigo, rashes, ... may be typical, or formulation may have to be tailored for what the client can tolerate
 - Hydrolats with aloe for facial issues vs an EO-based blend

- Topical administration needs to factor in their acceptance
 - Back of the neck, down the spine
 - Texture of product such as gels or butters, cool or warm may be a factor to acceptance
 - Sensory issues to touch or field of vision
 - May not tolerate compresses, clay applications
- Inhalation options: personal inhalers may not be suitable but light intermittent diffusion or aroma patches are often good options
 - Aroma patches may be need to be placed on the back shoulder
 - Can tend to breathe with mouth open, especially when young so inhalation methods may not get as direct olfactory connection
- Oral: buccal applications, sprays can depend on tolerance



Safety Considerations

- We don't have studies to know of any significant difference in the pharmacokinetics/dynamics of essential oils specifically within Trisomy 21
 - Isolated cases of pharmaceuticals can show “altered” response with higher level of adverse reactions
 - Increased reactions from chemotherapy drugs; pro-oxidative state considered underlying cause
 - Show higher plasma elevations of same dose of drug donepezil compared to those without T21
 - Infants show slower clearance of theophylline used for respiratory support
- Experience has shown traditional use of aromatherapy to be positive/beneficial
 - Do not know impact of constituents that have risks in areas of neurotoxicity such as thujone or camphor (e.g., *Salvia officinalis*, *S. rosmarinus*, *Lavandula stoechas*, *L. Latifolia*, ...) so best to avoid or use in short duration
 - Tend to reserve phenylpropanoid-rich oils for times of illness, short duration, low dose

Other Considerations

- Fixed oil bases: assess as you would with any client for allergies/sensitivities
 - Wheat germ oil (*Triticum vulgare*) might not be best as celiac is highly common and can show up later in life; while topical application is determined to be ok, do not want cross contamination or accidental introduction to mouth
- Hydrolats/hydrosols: *prefer* those distilled in stainless steel
 - Copper stills can release copper ions into the hydrolats, especially those with azulene present
 - Decreasing intracellular copper levels decreases effects of CBS overexpression, so we try to avoid excess sources of copper
 - Need balance of zinc and copper which are cofactors for SOD1 to assist in proper functioning. They tend to be elevated in copper and low in zinc
 - Topical GHK-cu can help with copper absorption

Traditional safe use of most essential oils is going to be fine. Work with the person in front of you.

Summary

- Individuals with T21 have a highly impacted biochemistry that causes chronic oxidative stress and chronic inflammation that needs to be understood and supported to bring them closer to a typical baseline
- Aromatherapy can provide a wonderful support option to contribute quality of life across the spectrum of care
- Contact information
Kathy Gentil
mkgentil@verizon.net
Social Media: ICAN, Facebook, IG, MeWe
Facebook and MeWe Groups (Parents/Care providers/Self-advocates):
T21 (Down syndrome) Aromatherapy and Herbal Support

Parent Resources:

Trisomy 21 Research. (n.d.). The Basics. Learn the basic differences of T21 and how TNI works. Available from <http://trisomy21research.org/the-basics/>

Giacomin, G. (2023) The Conscious Pod: Holistic Solutions for Down syndrome. Available from <http://www.theconsciouspod.com>

Hesse-Sheehan, E. (n.d.) Experience Health Inc, Trisomy 21/Down syndrome (T21/Ds). Available from: <https://www.oneextraordinaryjourney.com/trisomy-21-and-why-treat-it>

Appendix

Targeted Nutritional Intervention

Nutritional supplements recommended to address specific issues of excess gene expression

- Multivitamin/mineral using natural methyl components (Methyl folate, methylcobalamin), no copper
 - Note: synthetic folic acid is not to be used in this population due to MTHFR gene mutation/variant
 - Recommended brand: Nutrivene-D, available from <https://www.nutrivene.com> (Custom formulations available)
- Collagen precursor amino acid complex - address COL6a1/2 (available in Nutrivene-D formulation)
- Setria reduced l-glutathione - SOD1 (does not down regulate but boosts GSH to keep up)
 - Recommended over NAC as NAC can lower homocysteine levels in T21
- Omega 3 fatty acids (EPA, DHA) - increases BDNF, neuroprotective, neurogenesis, anti-inflammatory
- Apigenin - CBS gene Theoretical at this time. Results have yet to be verified.
- Curcumin - S100B, APOE, APP, miRNA 125b, inflammatory ILs, enhance BDNF
- Resveratrol - APP, APOE, miRNA125b, miRNA 155
- EGCg - downregulate DYRK1a, RCAN1
- PQQ - RCAN1, mitochondria support, reduces IL-6, (O2) scavenger
- CoQ10 - support cardiovascular health, mitochondria, and cognitive enhancement
- Luteolin and rutin - stabilize miRNA 132 which is hindered by over expressed RCAN1, anti-inflammatory, supports acetylcholine function
- Quercetin - COX-2 (included in Nutrivene, low dose)
- Huperzine A - AChE inhibitor, works with choline, improve gut motility (use low dose); can add choline at low doses
- Lycopene (also mango or papaya powder) - FOXP2, RCAN1
- Hesperidin - anti-inflammatory, support neurogenesis
- Lithium orotate - low dose as needed to assist with methylation, B12 and folate absorption (important for MCV and MCH stabilization)
- Gut health: pre and probiotics as needed
- Neuroinflammation - Kaempferol
- Increase BDNF, prevent synaptic loss/memory deficits/demyelination - 7,8 dihydroxyflavone

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Photo Sources

Slide 1 Gentil, L. (2024). Down syndrome advocacy ribbon and butterfly. [Graphic design.]

Slide 2: Speaker

Slide 3 Trisomy 21 Research website. <https://Trisomy21Research.org>

Slide 4 “Grant”, speaker’s son.

Slide 5 Kaiser Permanente. (June 2020). Trisomy 21. Available from https://mydoctor.kaiserpermanente.org/ncal/specialty/genetics/resources/conditions/Down_Syndrome.jsp

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Slide 6 Globe. https://www.freepik.com/free-vector/vector-world-globe-map-north-america-centered-map-blue-planet-sphere-icon_36893865.htm#query=globe&position=0&from_view=keyword&track=sph&uuid=6cb06e7e-8299-43d3-85ad-a8183e78cc65

Slide 7 Gentil, L. (2024). Chromosome 21 with select genes highlighted. [Graphic design.]

Slide 8 Ighodaro, O.M. Akinloye, O.A. (2018). First line defence antioxidants-superoxide dismutase (SOD), catalase (CAT) and glutathione peroxidase (GPX): Their fundamental role in the entire antioxidant defence grid. *Alexandria Journal of Medicine*. (54, 4). <https://doi.org/10.1016/j.ajme.2017.09.001>.

Slide 9 <https://blog.fuze32.com/hubfs/three-3-legged-stools-last-one-with-a-short-leg-falling-over.png> [Edited]

Slide 11 Gregoria, et al. See references

Slide 12: [https://www.freepik.com/free-vector/young-skin-structure-diagram_255947395.htm#query=skin layers&position=8&from_view=keyword&track=ais_hybrid&uuid=f4e6f102-d09f-4e4e-a26a-ffffdabc459f](https://www.freepik.com/free-vector/young-skin-structure-diagram_255947395.htm#query=skin%20layers&position=8&from_view=keyword&track=ais_hybrid&uuid=f4e6f102-d09f-4e4e-a26a-ffffdabc459f)

Slide 18 “Matthew” as an infant and 5-yo. Photo provided with parental permission for this presentation.

Slide 19 “Samuel” age 5, provided with parental permission for this presentation.

“Teagan” age 13, provided with parental permission for this presentation.

Slide 22 Organic Facts. (Feb, 2 2020). A bottle of Melissa essential oil with fresh Melissa herb leaves on wooden table. Shutterstock. Available from <https://www.organicfacts.net/health-benefits/essential-oils/health-benefits-of-melissa-essential-oil.html>

Slide 23 Organic Facts. (Feb 11, 2020). Turmeric oil with whole turmeric in a basket against a white background [Photograph]. Shutterstock. Available from <https://www.organicfacts.net/health-benefits/essential-oils/turmeric-essential-oil.html>

Slide 24 Healthline (Jun 10, 2019). Copaiba tree. Available from <https://www.healthline.com/health/copaiba-oil>

Slide 25 Betternutrition. (Mar 1, 2019). Angelica herb. Available from <https://www.betternutrition.com/supplements/uses-for-angelica/>

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Slide 26 Rachel Studio. https://www.freepik.com/free-photo/fresh-grapefruits_7398634.htm#fromView=search&page=1&position=7&uuid=dca26d1b-305d-47ee-b21b-0f1d154bec49>Image by Racool_studio on Freepik

Slide 28 Grant inhaling from aroma stick

Slide 29 Black cumin seed https://www.freepik.com/premium-photo/black-cumin-seeds-drop-oil-with-nigella-sativa-flower-white-background_128764122.htm#fromView=search&page=1&position=6&uuid=d92b4b6d-bccb-4b4a-a330-a96cdcecf46&query=nigella+sativa

Slide 31 Rollerball - Gentil, K. photo

Skin brush https://www.freepik.com/free-photo/close-up-brush-towel-soap-cosmetic-bottle-wooden-surface_3329267.htm#fromView=image_search_similar&page=1&position=38&uuid=0cbb3462-043b-45b4-aa27-848a3b0610f9&query=Dry+Brushing

Gua sha roller tool https://www.freepik.com/free-photo/gua-sha-roller-arrangement-flat-lay_23993749.htm#fromView=search&page=1&position=9&uuid=49117fa3-5158-4885-bf5b-358a916dedb1&query=gua+sha+roller

Slide 33 Aus Doc. <https://www.ausdoc.com.au/specialist-update/hidradenitis-suppurativa-linked-other-inflammatory-diseases/>

Slide 34 Lily Dermis <https://www.lilydermis.ca/services/syringoma-removal/>

Slide 36 “Grant” displaying aroma patch

Abbreviations

A β - amyloid beta

AChE - acetylcholinesterase

APOE - apolipoprotein E

APP - amyloid precursor protein

ASD - atrial septal defect

AVSD - atrioventricular septal defect

BACE2 - beta-secretase 2

BBB - blood-brain barrier

BChE - Butyrylcholinesterase

CAT - catalase

CBS - cystathionine beta-synthase

CHD - congenital heart disease

CNS - central nervous system

COL6A1/2 - type 6 collagen alpha 1 and 2 genes

COX-2 - cyclo-oxygenase-2

DYRK1a - dual specificity tyrosine-phosphorylation-regulated kinase 1A

EGCg - epigallocatechin gallate

EPO - erythropoietin

FOXP2 - Forkhead box protein P2

GART - glycinamide ribonucleotide synthetase (tripeptide)

GHK-cu - glycyl-L-histidyl-L-lysine copper complex (tripeptide)

GM-CSF - granulocyte macrophage colony-stimulating factor

GPx - glutathione peroxidase

GSH - glutathione tripeptide of cysteine, glutamic acid, glycine

IL - Interleukin

MV - mitral valve

NAC - N-acetylcysteine

NF- κ B - nuclear factor - kappa light chain enhancer of activated B cells

OHS - open heart surgery

PDA - patent ductus arteriosus

PTSG2 - prostaglandin-endoperoxide synthase 2

RCAN1 - regulator of calcineurin 1

RNS - reactive nitrogen species

ROS - reactive oxygen species

S100 β - S100 calcium binding protein B

SOD - superoxide dismutase

ToF - Tetralogy of Fallot

VEGF - vascular endothelial growth factor

