UNDERSTANDING ALBINISM
Albinism is a group of genetic disorders characterized by a reduction in Melanin Biosynthesis associated with reduced vision that presents in childhood
ALBINISM

Reduced pigmentation compared to other of the same ethnic and racial background.

Ocular Albinism
No detectable loss of pigmentation on skin and hair

Oculocutaneous Albinism
Hypopigmentation of skin and hair
DIAGNOSIS IN IMPORTANT

Avoid concern child will be blind

Delayed visual maturation is common

Nystagmus is often misinterpreted

Albinism is not degenerative

Give advise
It may be limited to the eyes (*Ocular albinism*)

or

Affect Skin, Hair and Eyes (*Oculocutaneous albinism*)
OTHER FEATURES OF ALBINISM

Reduced vision with delayed visual maturation
Nystagmus
Foveal Hypoplasia
Iris globe retinal hypo-pigmentation
Photophobia glare and dazzle due to ocular stray light
Strabismus
Reduced stereo acuity
Refractive error – astigmatism – myopia – hyperopia
Anomalous chiasmal and higher visual pathways
Anomalous auditory pathways
Behavioural problems
Clinical Features

Iris Trans-illumination
Nystagmus
Abnormal Head Posture
Strabismus
Refractive Errors
Macular Hypoplasia

Hypopigmentation of Fundus

Abnormal decussation of visual pathway
3 Phases

Birth and Diagnosis

Pre-School

School
Classification

Molecular Genetics

Gene based Nomenclature for OCA - OA
Type 1 OCA  Tyrosinase Related

Most common form of OCA
1 – 16 – 20,000 live births

Tyrosinase gene is located on the long arm of Chromosome 11

Autosomal Recessive

4 subtypes: 1A  1B  1MP  1TS
Type 1A OCA
Truly Tyrosinase-negative form
SEVERE
Increased Risk of Cancer

Type 1B
Tyrosinase activity reduced to 7%
Hair can be eventually blond or light brown
Vision decreased nystagmus
Type 1MP OCA is the minimal pigment form decreased Tyrosinase activity
Hair Blond Skin Nevi
Variability in Iris Trans illumination

Type 1TS OCA temperature sensitive
Production of Tyrosinase varies according to Temperature. Cooler areas of body normal Tyrosinase Activity in warmer areas, activity reduced
Type 2 OCA

This group of disorders is unrelated to Tyrosinase Activity.

The molecular genetic deficit is in the P gene located on the long arm of chromosome 15.

Skin colour ranges from white to fair complexion and hair colour can be yellow, red, brown or black.

Vision better – less nystagmus.
Dominant OCA

Uncommon, Variable expressivity

Xlinked OA

10% of Albinism

More severe

poor Vision
<table>
<thead>
<tr>
<th>Full name</th>
<th>Abbreviation</th>
<th>Type</th>
<th>Gene/protein</th>
<th>Locus</th>
<th>OMIM*</th>
<th>Inheritance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tyrosine negative</td>
<td>OCA1A</td>
<td>OCA</td>
<td>Tyrosinase</td>
<td>11q14-q21</td>
<td>203100</td>
<td>AR</td>
</tr>
<tr>
<td>Yellow variant</td>
<td>OCA1B</td>
<td>OCA</td>
<td>Tyrosinase</td>
<td>11q14-q21</td>
<td>606952</td>
<td>AR</td>
</tr>
<tr>
<td>Minimal pigment</td>
<td>OCA1MP</td>
<td>OCA</td>
<td>Tyrosinase</td>
<td>11q14-q21</td>
<td>606952</td>
<td>AR</td>
</tr>
<tr>
<td>Temperature sensitive</td>
<td>OCA1TS</td>
<td>OCA</td>
<td>Tyrosinase</td>
<td>11q14-q21</td>
<td>606952</td>
<td>AR</td>
</tr>
<tr>
<td>Type 2 OCA</td>
<td>OCA2</td>
<td>OCA</td>
<td>P gene</td>
<td>15q11.2-q12</td>
<td>203200</td>
<td>AR</td>
</tr>
<tr>
<td>Brown albinism</td>
<td>BOCA</td>
<td>OCA</td>
<td>P gene</td>
<td>15q11.2-q12</td>
<td>203200</td>
<td>AR</td>
</tr>
<tr>
<td>Type 3 OCA</td>
<td>OCA3</td>
<td>OCA</td>
<td>Tyrosinase related protein</td>
<td>9q23</td>
<td>203290</td>
<td>AR</td>
</tr>
<tr>
<td>Type 4 OCA</td>
<td>OCA4</td>
<td>OCA</td>
<td>Membrane associated transport protein</td>
<td>5p13.3</td>
<td>606574</td>
<td>AR</td>
</tr>
<tr>
<td>Hermansky-Pudlak syndrome</td>
<td>HPS</td>
<td>OA, OCA</td>
<td>multiple</td>
<td>multiple</td>
<td>203300</td>
<td>AR</td>
</tr>
<tr>
<td>Chediak-Higashi syndrome</td>
<td>CHS</td>
<td>OCA</td>
<td>LYST</td>
<td>1q42.1-q42.2</td>
<td>214500</td>
<td></td>
</tr>
<tr>
<td>X-linked ocular albinism</td>
<td>OA1</td>
<td>OA</td>
<td>GPR143</td>
<td>Xp22.3</td>
<td>300500</td>
<td>XLR</td>
</tr>
<tr>
<td>Piebald trait</td>
<td>PBT</td>
<td>not true albinism</td>
<td>c-kit</td>
<td>8q11</td>
<td>172800</td>
<td>AD</td>
</tr>
</tbody>
</table>
Rare types of Albinism with malfunction of other Lysosomes-related organelles.

Lysosomes-related organelles
They traffic substances, melanosomes, platlet
Dense granules, lytic granules

Hermansky-pudlak syndrome
Lightly pigmented skin and iris
Normal or decreased vision
Bleeding diatheses
Pulmonary fibrosis
Chediak-Higashi syndrome

Variable pigmentation
Normal to moderately reduced vision
Recurrent bacterial infection
Congenital dislocation of hips
Neurological dysfunction
Interaction of gene with other genes
Gene defect on long arm of Chromosome 15 in the region of the P gene
Prader-Willi Syndrome
Infantile hypotonia
Hyperphagia – obesity
Hypogonadism – mental retardation
Short stature
Small hands/feet
Translucent irides
Hypopigmented skin
Angelman’s syndrome

Developmental Delay
Speech Impairment
Ataxia – microcephaly – seizures

Evidence of Chiasm
Mistrouting without other evidence of Albinism
DIAGNOSIS

Molecular Genetics
Pedigree, examination of Skin, Hair, Eyes

Skin biopsy – visual evoked potential
Molecular Genetics, diagnosis provide the ultimate explanation of the clinical scenario
MANAGEMENT

Genetic Counselling
Spectacles
Hand Held Telescopes others
Correct Refractive errors
Education
Strabismus Surgery
Sun block
Gene Therapy
Intellectual and Educational Attainment in Albinism

*Temple St. and Dept. of Psychology UCD 1995*
The eye features include decreased vision, Photophobia, Nystagmus, Iris Trans-illumination and macular hypoplasia
What about the intellectual and educational abilities?
2 Groups of Children
18 Albino Children compared to a group of demographically matched controls

Intellectual ability was measured using Raven’s standard progressive matrices

Educational ability was measured by reading Spelling and arithmetic tests of wide range achievement tests
Albino children had normal intelligence but performed more poorly in reading, spelling and arithmetic ability. Study unable to correlate this to type of albinism or vision
22% of Albino children attended special schools for visually impaired and 6% were in special classes in normal schools
Evaluation of vision–specific quality-of-life in Albinism

University of Minnesota  April ‘09
3 Questionnaires

1. Medical Social Vocational Educational
2. General Health
3. Vision targeted characteristics
19 Males 25 Females in study median age 30.5 years – Range 18-79 mean corrected Vision was 20/80 median 20/80 range 20/20 – 20/320

Mild Visual Impairment 50%
Moderate to Severe visual impairment 20-40%
Study used National Eye Institute visual function questionnaire (NEI-VFQ) to determine The effect of Albinism associated ophthalmic Pathology on quality of life (QOL)
48% were able to drive

Impairment of distance vision

Vision specific health difficulties
All but one graduated from High School

35 Attended College

At the time of the study all were in college, employed full time or retired from full time employment
Conclusion

Excellent Prognosis for Education Future