Relationship Between Skin Tone and Pediatric-Onset Multiple Sclerosis (MS)

Candice L Dunn, BSc[1], Carmen Yea, MSc[2], Heather E Hanwell, PhD[3], E. Ann Yeh, MD, MA, FRCPC, Dip ABPN[4], Ruth Ann Marrie, MD, PhD, FRCPC[5], Amit Bar-Or, MD[6], Neda Ebrahimi, PhD[2]
Brenda Banwell, MD[1] and Julia O'Mahony, BSc[7]

(1) Children's Hospital of Philadelphia, Philadelphia, PA, (2) The Hospital for Sick Children, Toronto, ON, Canada, (3) Neurosciences and Mental Health, Hospital for Sick Children, University of Toronto, Toronto, ON, Canada, (4) Neurology, The Hospital for Sick Children, Toronto, ON, Canada, (5) Departments of Internal Medicine & Community Health Sciences, University of Manitoba, Winnipeg, MB, Canada, (6) University of Pennsylvania, Philadelphia, PA, (7) Hospital for Sick Children, Toronto, ON, Canada

INTRODUCTION

- Multiple sclerosis (MS) risk varies by geographical location, particularly residence during childhood, with an inverse relationship to ambient ultraviolet radiation.[1]
- Fair skin phenotype and limited sun exposure are associated with an increased rate of MS.[2]
- Since melanin content can increase with age (*at least in sun-exposed skin*), determining relationships between skin tone and MS risk may be uniquely valuable in pediatric MS.

OBJECTIVES

To determine whether skin tone is associated with MS outcome following incident acquired demyelinating syndromes (ADS) in children.

METHODS

- Children diagnosed with ADS between 2004-2017 were recruited prospectively
- MS was diagnosed using 2010 McDonald criteria as of December 2017
- Skin tone data were collected using four measures:

1. Self-reported race
2. Self-reported skin tone using categorical descriptions
3. Self-reported skin tone using a 10-point panel
4. Average melanin level of the upper inner arm using a verified skin pigmentation tool (DSM II ColorMeter)[3]

RESULTS

Table 1: Demographics of Study Participants

	All (n=97)	MS (n=38)	MonoADS (n=59)	p-value
Age at onset, years				**< 0.001**
Mean (SD)	10.24 (4.5)	12.98 (3.4)	8.78 (4.3)	
Females (n,%)	52 (55.3)	25 (71.4)	27 (45.8)	**0.016**
Participant's Ethnicity (n, %)				0.751
European	51 (54.8)	19 (52.8)	32 (56.1)	
Non-European	42 (45.2)	17 (47.2)	25 (43.9)	
Participant's Race (n, %)				0.127
Caucasian, White	62 (68.1)	23 (63.9)	39 (70.9)	
Black	10 (11.0)	7 (19.4)	3 (5.5)	
Other	19 (20.9)	6 (16.7)	13 (23.6)	
Presenting Phenotype (n, %)				**0.007**
ADEM	14 (14.9)	0	14 (23.7)	
Monofocal	68 (72.3)	29 (82.9)	39 (66.1)	
Polyfocal	12 (12.8)	6 (17.1)	6 (10.2)	

Figure 1: Self-Reported Skin Tone

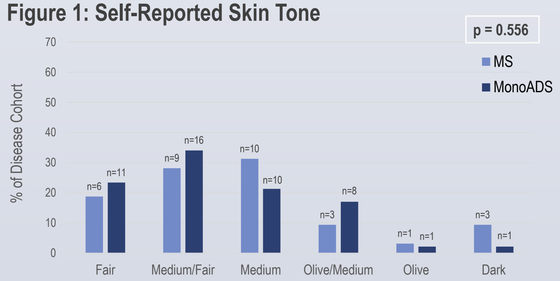

Figure 2: Patient-Graded 10-Point Skin Tone

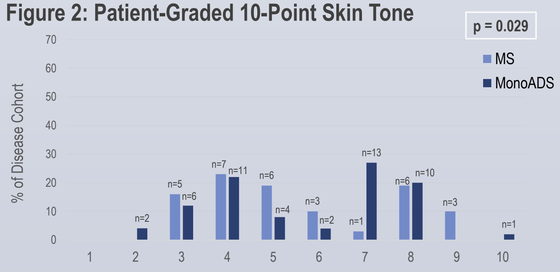

Figure 3: ColorMeter VS 10-Point Panel

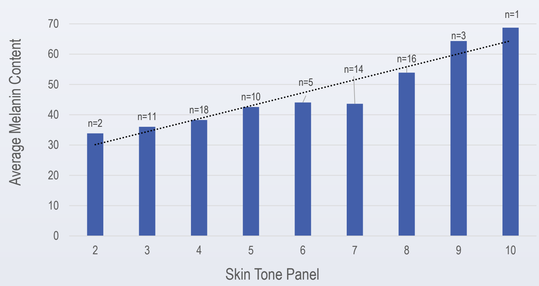

Figure 4: DSM II ColorMeter (Non-exposed skin)

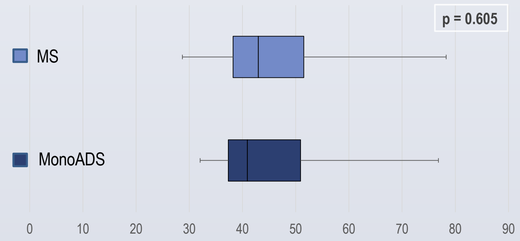

Figure 5: Non-Exposed Melanin Content Controlled by Season

CONCLUSIONS

- There is no clear relationship between skin tone and MS risk in children.
- Seasonal sun absorption may be relevant.
- MS risk is likely influenced by complex interactions between UV exposure, UV absorption, diet and genetic predisposition.
- Given studies showing a strong relationship between low 25-hydroxyvitamin D concentrations and MS risk, studies incorporating factors that mediate vitamin D status are relevant.

LIMITATIONS & FUTURE AIMS

1. Skin tone data was not collected at disease onset and thus changes in sun exposure post-onset could confound results.
2. Repeated skin tone analyses across multiple seasons per patient would be of value.
3. Skin tone analyses and serum [25(OH)D] are now being analyzed.

ACKNOWLEDGEMENTS

Thank you to the Multiple Sclerosis Scientific Research Foundation for funding this project and to Rachel Rogers for cross-validating our statistics.

REFERENCES

1. Taylor BV, Lucas RM, Dear K, et al. Latitudinal variation in incidence and type of first central nervous system demyelinating events. *Mult Scler.,* 2010 Apr; 16(4): 398–405.
2. Dwyer T, van der Mei I, Ponsonby AL, et al. Melanocortin 1 receptor genotype, past environmental sun exposure, and risk of multiple sclerosis. *Neurology*, 2008; 71(8): 583–589.
3. van der Wal M, Bloemen M, Verhaegen P, et al. Objective Color Measurements: Clinimetric performance of three devices on normal skin and scar tissue. *Journal of Burn Care & Research,* 2013; 34(3): 187-194.