Prevention

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Skin cancer prevention

- Melanoma
- BCC
- SCC
- Actinic keratoses

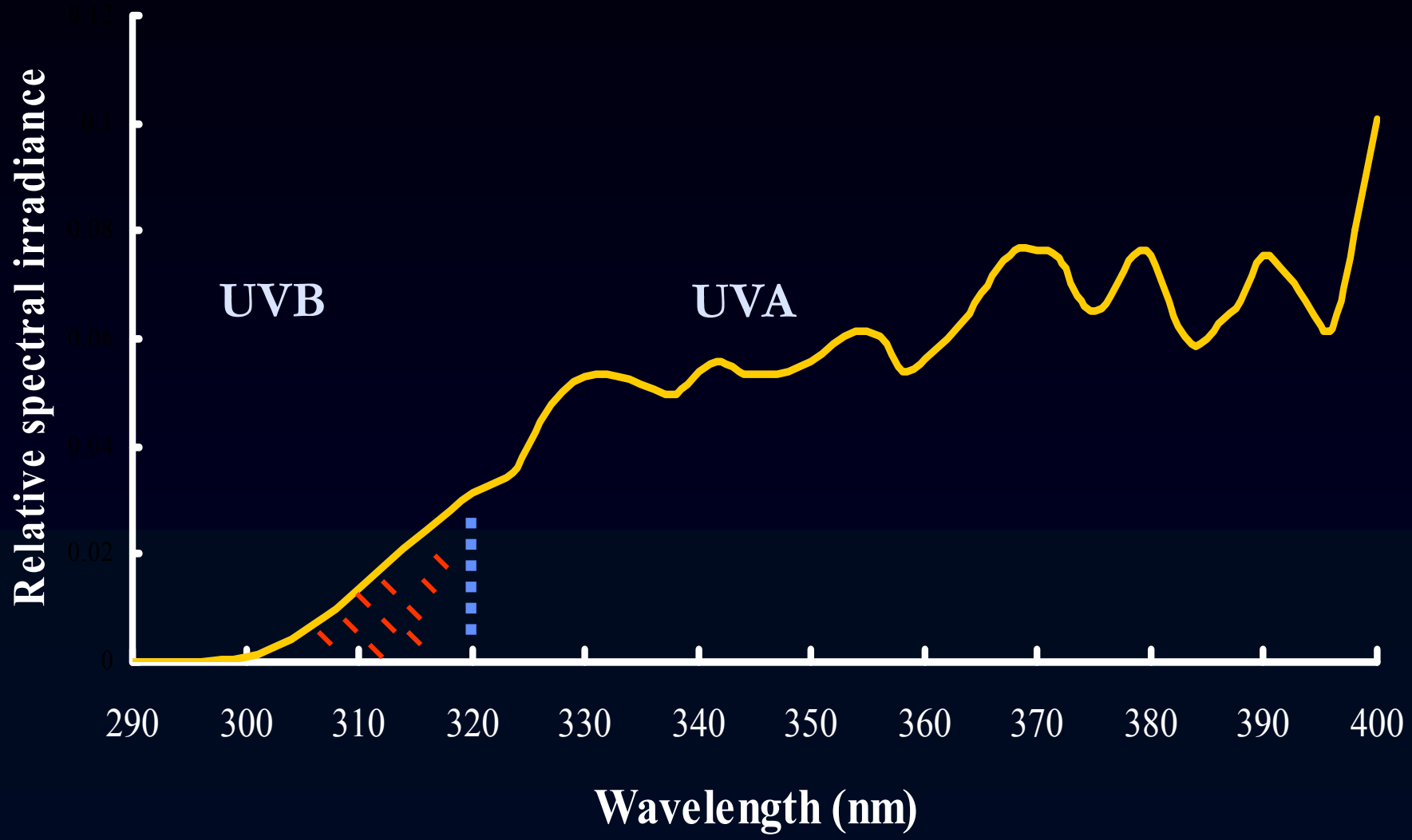
UV minimisation

- Environmental melanoma risk is a/w:
  -intermittent sun exposure

  -sun exposure in childhood and adolescence
- Avoid sunburn
- Shade, broad-brimmed hats, sunglasses, tightly woven clothing

Melanoma Guidelines

Which UV to minimise?



- Both UVB and UVA can cause melanoma and SCC in animal models
- UVB and UVA cause mutations
- UVB and UVA are immune suppressive

Solaria

- Mainly UVA
- Meta-analysis of 19 studies *(IARC. Int J Cancer 2007;120:1116)*
- "Ever" *versus* "never" use: RR 1.15
- RR 1.75 for sunbed use before age 35

- Use of sunbeds and tanning booths is associated with a small increase in melanoma risk. This risk may be more significant when exposure occurs before age 35

Melanoma Guidelines

How protective are sunscreens?

Protection from erythema (mainly UVB)

$$\text{SPF} = \frac{\text{MED of sunscreen-protected skin}}{\text{MED of unprotected skin}}$$

eg: MED with sunscreen = 300 seconds

MED without sunscreen = 10 seconds

SPF = 30

Factors affecting the SPF

- Sunscreen film thickness

  (2 *vs* 0.5 mg/cm^2)

- Application technique

  "Rub-in" *versus* "Lay-on" *(≥ 20% variability)*

- Substantivity

  Perspiration; inadequate reapplication

Factors affecting the SPF

- **UV spectrum**

  Sunlight has more UVA *cf* artificial sources

  UVA-rich solar simulator:

  SPFs 20 -50% < *labelled* values (*Poon, 2002*)

- **Photodecay**

"Real life" SPF is < half the laboratory SPF

SPF is a means of ranking products; should not be used to calculate duration of "safe sun exposure"

Immunosuppression and skin cancer

- Immunosuppression ↑s skin cancer risk
- Even low UV doses suppress skin immunity
- Risk of skin cancer correlates with susceptibility to UV immunosuppression
- UV immunosuppression plays a key role in skin cancer development

Which wavelengths cause immunosuppression?

- Nickel allergy as a model of skin immunity
- Groups of volunteers exposed to narrowband UV (290 - 390nm)
- Calculate the minimum immune suppressive dose at each wavelength

- Broad spectrum sunscreens (UVA + UVB) are more immune protective than narrow-spectrum sunscreens

Do sunscreens prevent skin cancer?

Daily high-SPF sunscreen reduces:

- **Actinic keratoses** *(Thompson 1993)*
- **SCC** *(van der Pols 2006)*
- **?BCC** **(25% ↓ BCCs after 8 years, NS;**

van der Pols 2006)

- Sunscreens have not conclusively been shown to reduce the risk of melanoma

- Sunscreens should be used to complement but not replace physical methods of UV protection

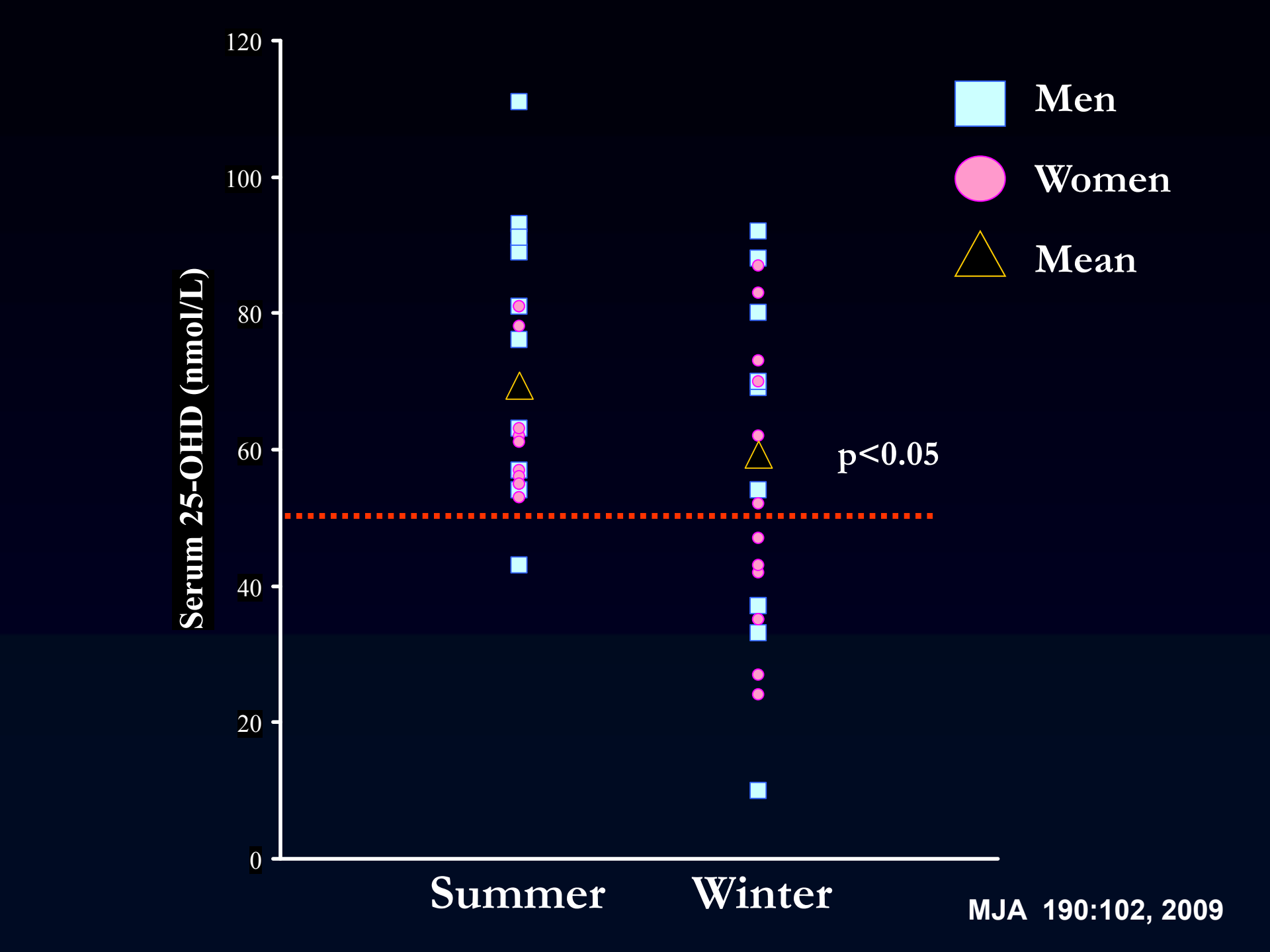
Melanoma Guidelines

Adverse effects of sun protection: ?vitamin D deficiency

- Osteoporosis
- Autoimmune disease
- Cardiovascular disease
- Internal malignancy

Vitamin D deficiency in Sydney ?

- Pilot study
- 25 skin cancer patients, mean age 67 years
- 25-OH-D measured in summer and winter


120
100
80
60
40
20
0
Serum 25-OHD (nmol/L)
Men
Women
Mean
p<0.05
Summer
Winter
MJA 190:102, 2009

- **Brief sun exposures are needed to maintain vitamin D levels: total sun avoidance is not advised without vitamin D supplementation**

Melanoma Guidelines

Skin cancer prevention: general measures

Smoking and skin cancer

- **Surgical side effects of smoking**

  wound healing, flap/graft survival, infection

- **2 x risk of AKs, SCC** *(De Hertog, 2001)*

- **↑ risk of morphoeic BCC** *(Erbaqci, 2002)*

- **? via immunosuppression, ? mast cell effects**

Dietary fats and skin cancer

- 1939: high dietary fat →↑ UV-induced skin cancer in animals

- Reducing fat from 40% to 20% of caloric intake → >70% ↓ in AKs and SCC in humans *(Black, 1998)*

Diet and skin cancer

- High meat and fat diet: SCC RR 1.8
- Fruit and vegetable diet: SCC RR 0.5
- Protective effect largely due to green leafy vegetables *(Ibiebele 2007)*

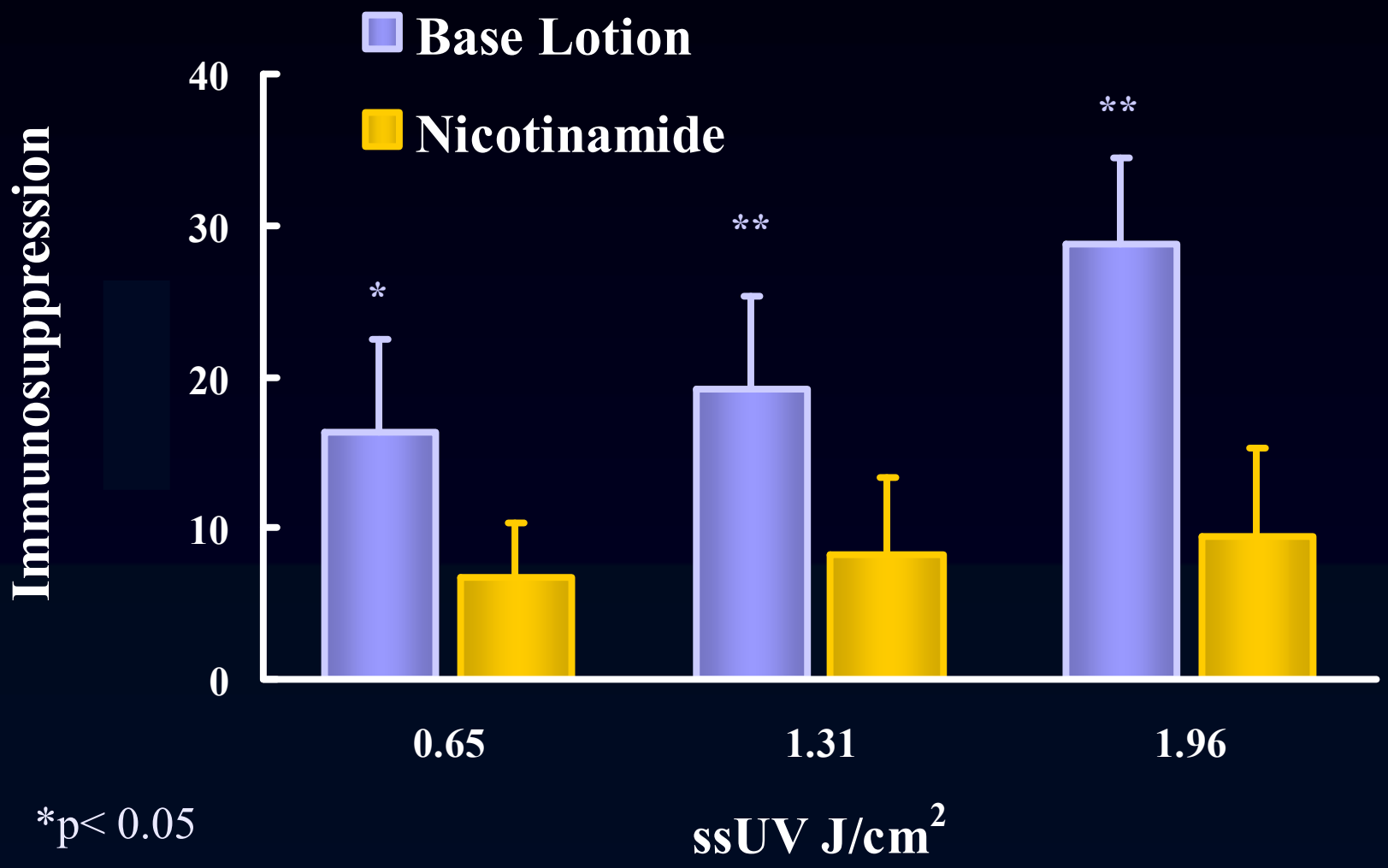
Nicotinamide

- Active form of Vitamin B3
- B3 deficiency → pellagra

  (diarrhoea, dementia, photosensitive dermatitis)

- Nicotinamide reduces photocarcinogenesis in mice

Nicotinamide applied after UV

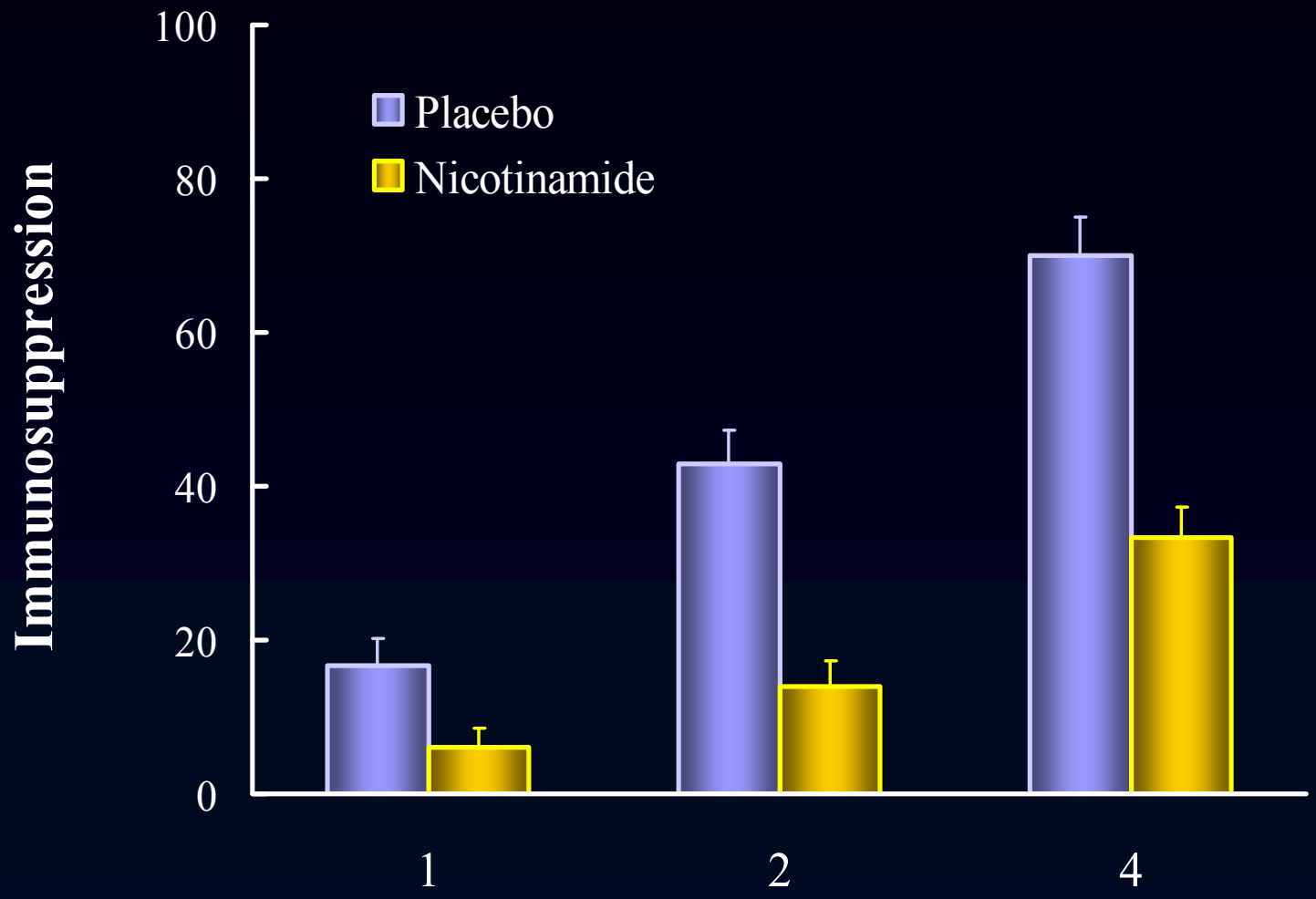


*p< 0.05

**p< 0.01

J Invest Dermatol 128:447-454, 2008

Oral Nicotinamide



n=30

p<0.001 ANOVA

Carcinogenesis 30:101-5, 2009

Nicotinamide cellular effects

- UV exposure depletes cellular ATP
- Nicotinamide maintains levels of cellular energy after UV exposure
- Nicotinamide enhances DNA repair

Nicotinamide is a safe, inexpensive compound; now in trials for prevention of actinic keratoses

Optimising skin cancer prevention

- General measures first

  hats, clothing, shade, diet, stop smoking
- High SPF sunscreens
- Better UVA protection, better immune protection
- Consider vitamin D testing/supplementation
- Non-sunscreen additives for cellular protection and enhanced UV repair

Sun protection is important at any age