

Modifiable Nutritional and Lifestyle Factors in Sperm DNA Fragmentation

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Why test DNA fragmentation?

15% of men
with a normal
semen analysis
have fertility
issues

Men with
abnormal
semen analyses
can have natural
conceptions

1 in 4 men have
a normal semen
analysis but
have elevated
DNA
fragmentation

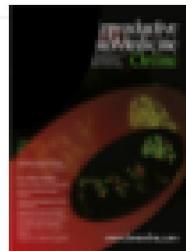
Nallella et al, 2006, Fertil Steril. 85(3):629-34

Agarwal & Allamaneni, 2005, Fertil Steril. 84(4):850-3

Oleszczuk et al, 2013, Anndroloy 1, 357-60

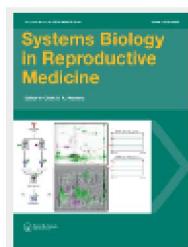
Giwercman et al, 2010, Int J Androl, 33, e221-7

Why test DNA fragmentation?



Sperm DNA damage caused by oxidative stress: modifiable clinical, lifestyle and nutritional factors in male infertility

C Wright ^{a,*}, S Milne ^b, H Leeson ^b

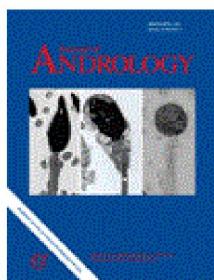


Research Articles

Dietary supplementation with docosahexaenoic acid (DHA) improves seminal antioxidant status and decreases sperm DNA fragmentation

Juan Carlos Martínez-Soto  Joan Carles Domingo, Begoña Cordobilla, María Nicolás, Laura Fernández, Pilar Albero, Joaquín Gadea & José Landeras [...Show less](#)

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Reduction of the Incidence of Sperm DNA Fragmentation by Oral Antioxidant Treatment

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Causes of DNA fragmentation

Reactive oxygen species

Immature sperm
Infection
Varicocele
Inflammation
Smoking
Overweight
Heat
Xenobiotics



Antioxidants
Dietary Sources
Supplements

1. Avoid/ give up smoking

	Fertile Non-smokers (n=80)	Fertile Smokers (n=80)	
Seminal ROS	436.5 RLU	1180.7 RLU	p<0.05
DNA Frag (Flow cytometry - PI)	5.86%	10.85%	p<0.05

- Taha et al. Urology. 2012

2. Avoid testicular heat

- Spermatogenic arrest

19 Healthy Volunteers – testicular warming belt
40-43°C 40min per day, two successive days per week

	Pre-Scrotal Warming	1 month post-scrotal warming	
DNA Frag (SCD)	17.7%	70.7%	p<0.001

- Zhang et al. J Assist Reprod Genet. 2015

2. Avoid testicular heat

- Spermatogenic arrest

- ✗ keeping a mobile phone in trouser pocket**
- ✗ cycling for long periods/ tight clothing**
- ✗ laptop on the lap for extended periods, particularly with closed legs**
- ✗ heated car seats**
- ✗ saunas or jacuzzi**
-  **repeat analysis 3 months after febrile illness**

3. Xenobiotics



**Persistant Organochlorine
Pollutants (POP, PCB)**

Avoid farmed fatty fish



**Organophosphorus,
pyrethroids**

Occupational OR
household exposure to
insecticides/ pesticides



Bisphenol A (BPA)

Plastic food containers,
canned food, heating food
in plastic containers, till
receipts

SSRIs, opiates

History check for medication

4. Weight management

Correlation between central obesity and DNA fragmentation

- BMI measurement vs central adiposity/ waist circumference
- Confounding factors, poor diet, low in antioxidants



Healthy weight loss, low GI diet, plenty of antioxidants...

Causes of DNA fragmentation

Reactive
oxygen species



Antioxidants
Dietary Sources
Supplements

Antioxidants for male subfertility

Increased live
births

OR 4.21 p<0.0001

Increased clinical
pregnancy rate

OR 3.43 p<0.0001

- Showell et al. Cochrane Database Syst Rev. 2015

Antioxidants for DNA fragmentation

Vitamin C Depletion/ Repletion Study

Depletion: 91% increase in sperm with DNA damage

Repletion: Restored after repletion within 2-3 months

- Fraga CC et al, 1991, PNAS, 88, 24, 11003-6

Antioxidants for DNA fragmentation

	DNA Frag (TUNEL)
1 g Vitamin C 1g Vitamin E	placebo controlled double blind RCT (n=64)
1 g Vitamin C 1g Vitamin E	Uncontrolled study(n=38) Infertile males (one failed cycle)

- Greco et al. J Androl. 2005
- Greco et al. Hum Reprod 2005

Antioxidants for DNA fragmentation

	DNA Frag (SCD)
1500mg L-carnitine 20mg CoQ10 60mg Vitamin C 10mg Vitamin E 200µg Vitamin B9 1µg Vitamin B12 10mg zinc 50µg selenium	asthenteratozoospermic males (n=20) uncontrolled

- Abad et al. J Andrologia. 2013

Antioxidants for DNA fragmentation

DNA Frag (SCD)

400mg Vitamin C
400mg Vitamin E
33mg zinc
80µg selenium
18mg β-carotene

Males with DFI >15%
(n=58) double centred,
uncontrolled

32.4% → 26.2

Increase in HDS

- Menezzo et al. Reprod Biomed Online. 2007

Antioxidants for DNA fragmentation

Reactive
oxygen species

Capacitation
Hyperactivation
Acrosome
reaction



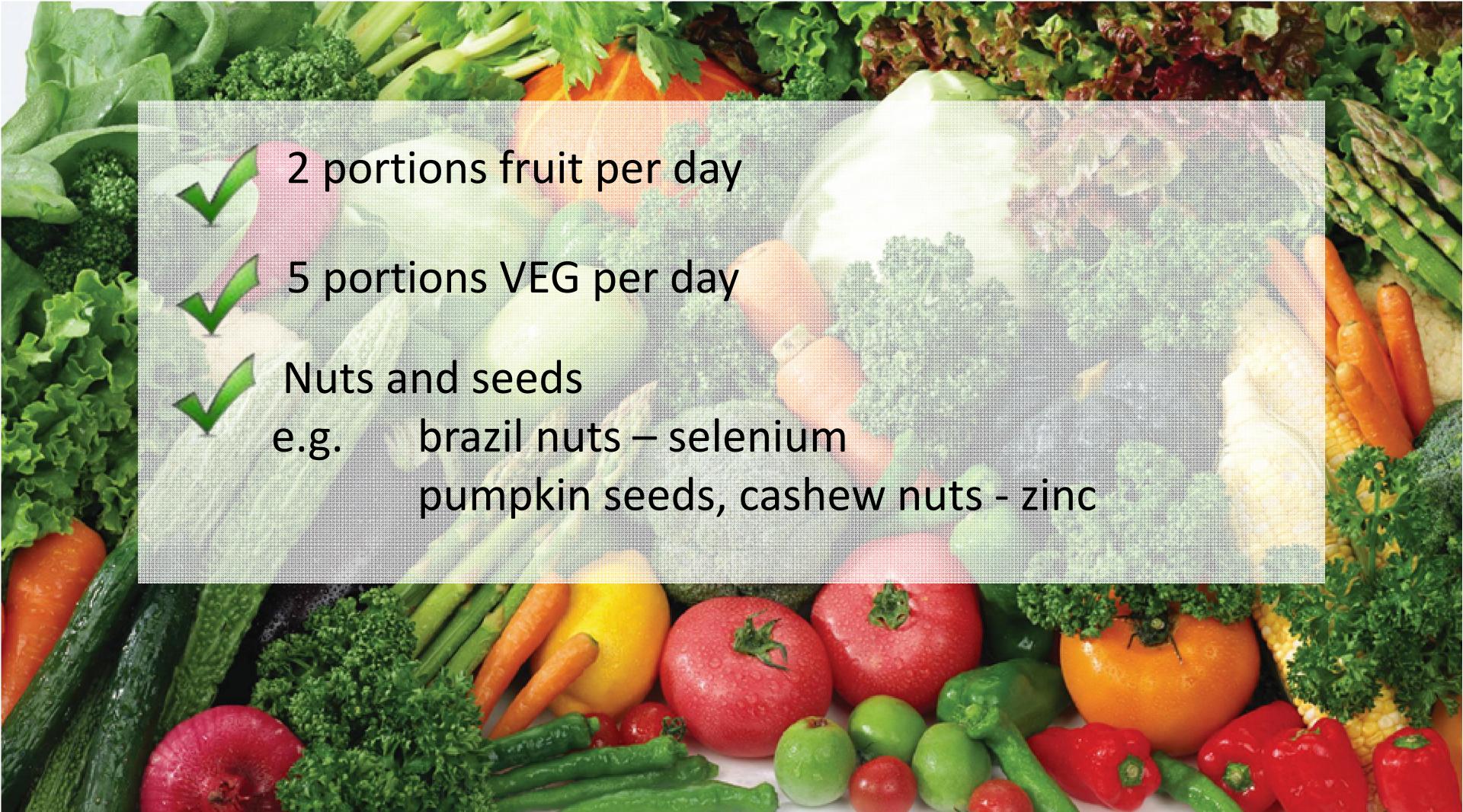
Caution with
excess
antioxidants

Antioxidants for DNA fragmentation

- Measuring blood levels
- Correcting deficiencies
- Supplementing accordingly

Recommendations paper published
Wright et al. Reprod Biomed Online. 2014

Antioxidants for DNA fragmentation

- 
- ✓ 2 portions fruit per day
 - ✓ 5 portions VEG per day
 - ✓ Nuts and seeds
 - e.g. brazil nuts – selenium
 - pumpkin seeds, cashew nuts - zinc

Case Study

- Poor motility, morphology, DNA fragmentation 27%
- IBS, anxiety, stress
- Low levels of Vit C, zinc, magnesium, vitamin D
- Diet low in essential fats, vegetables
- 4 month dietary & lifestyle programme

	Pre	Post	
Count	$14 \times 10^6/\text{ml}$	$22 \times 10^6/\text{ml}$	Baby girl born
Motility	12%	39%	in next IVF
Morphology	2%	7%	cycle
DNA frag %	27%	14%	

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