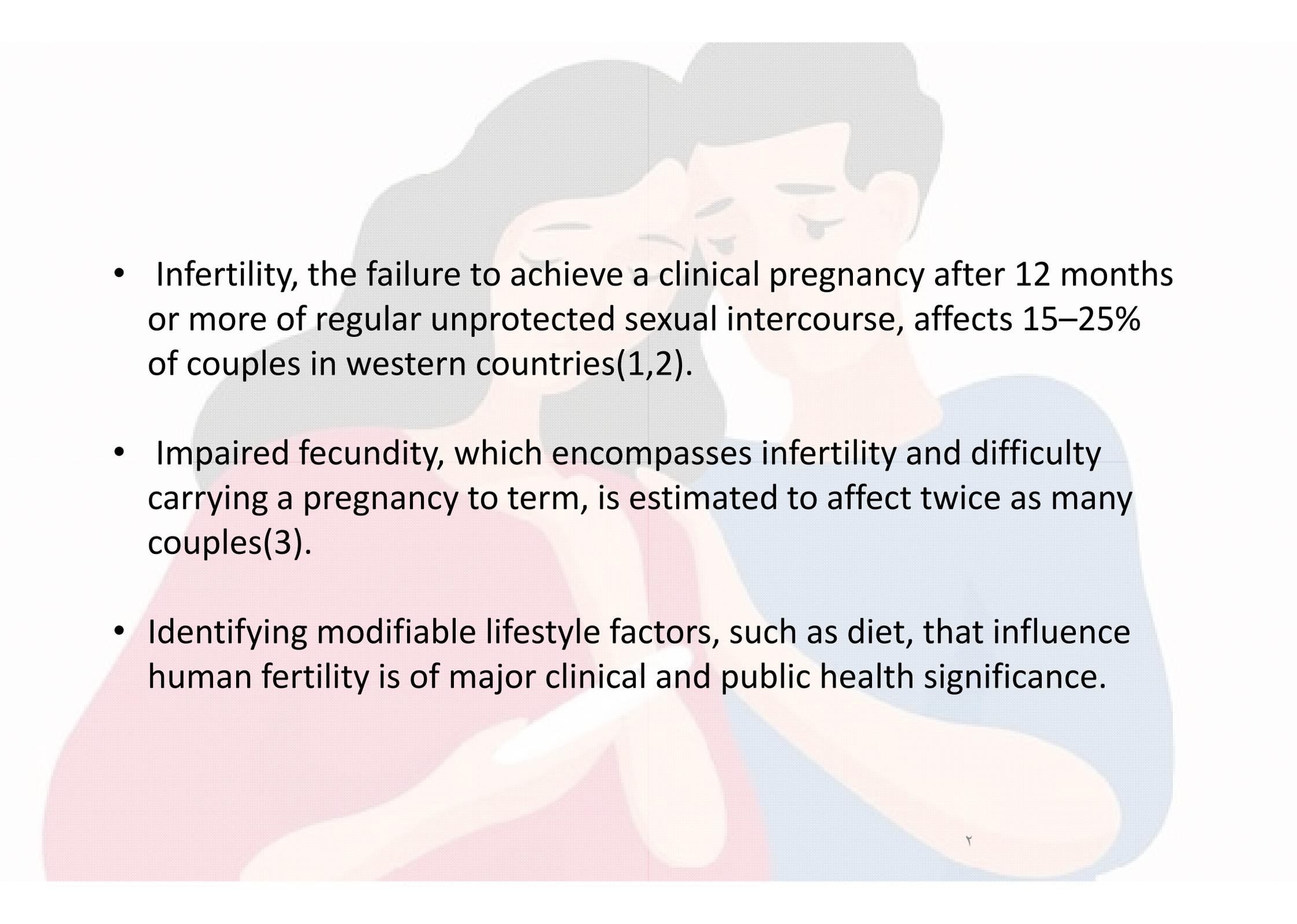
A microscopic view of several sperm and egg cells. The sperm cells are small, oval-shaped with long tails, and the egg cells are larger, round, and have a textured surface. The background is dark with a brownish gradient.

نقش تغذیه در باروری مردان

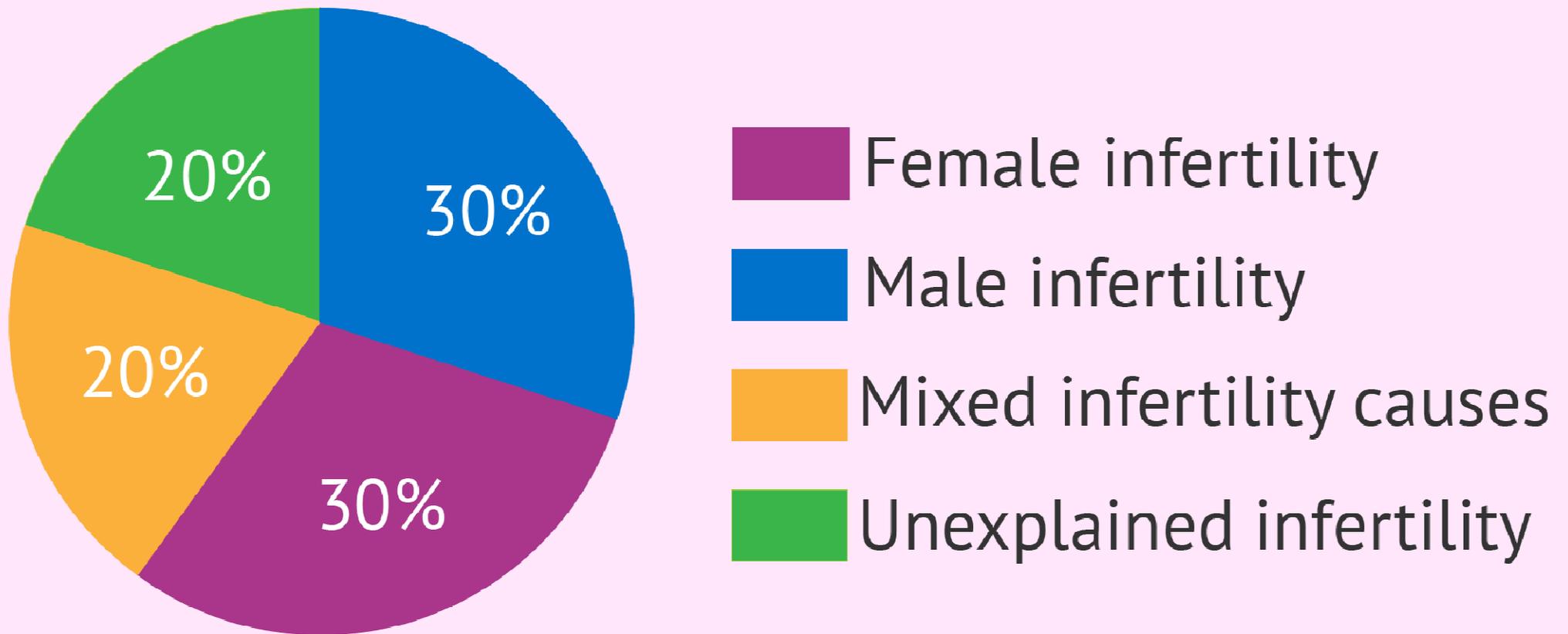
Dr. Mahshid Bazrafkan

Faculty member of Avicenna Research institute

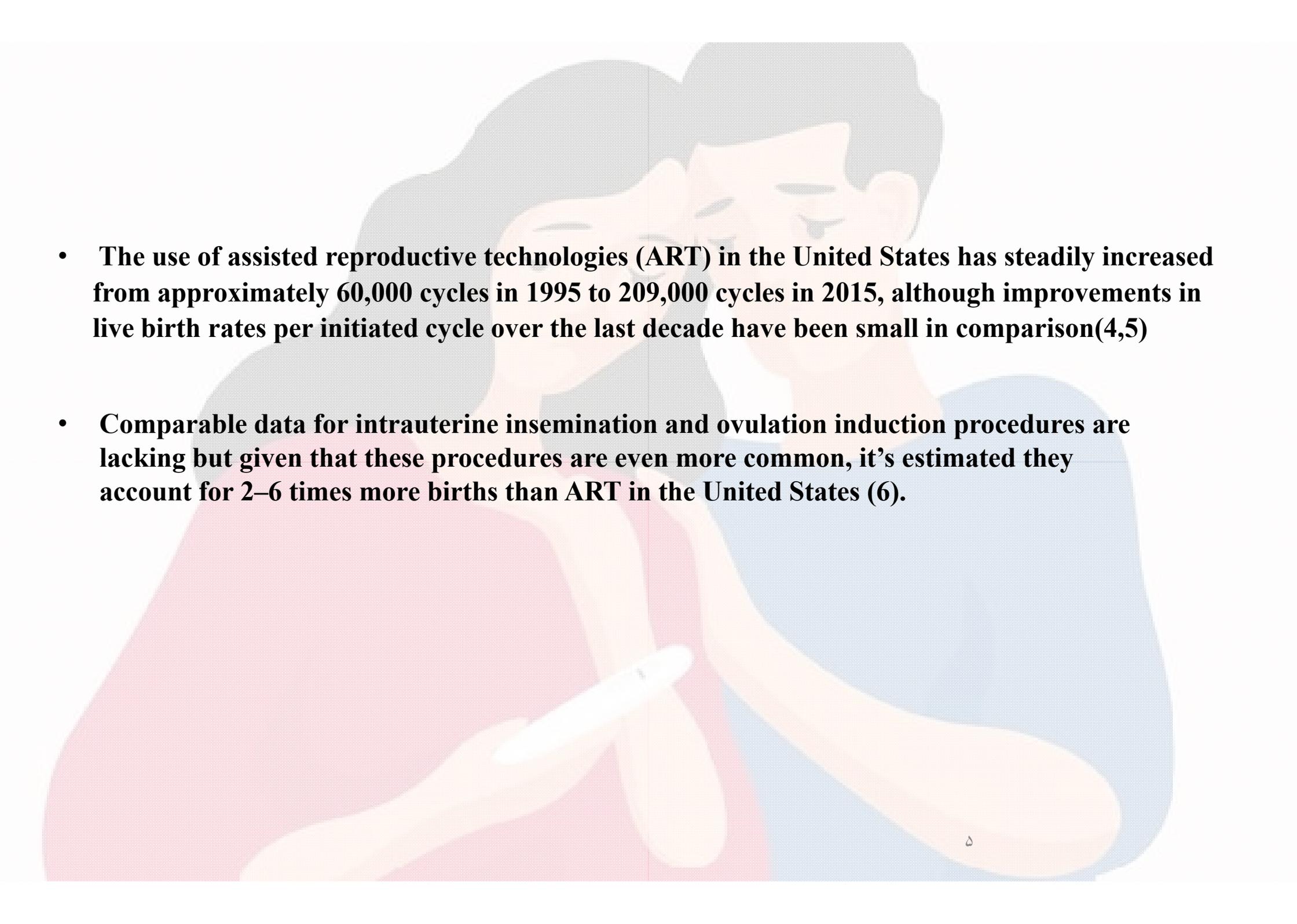
ESHRE certified embryologist

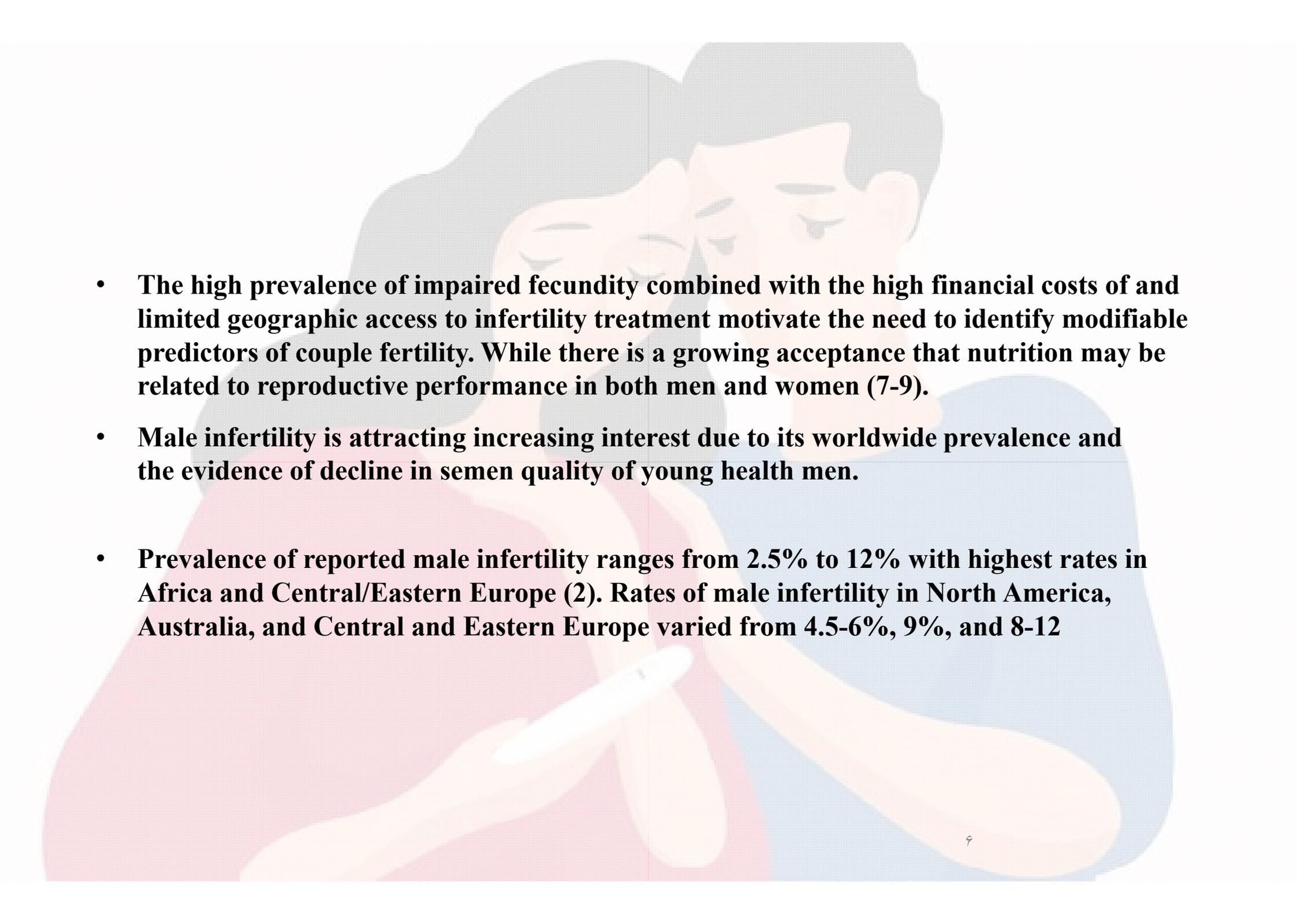
- 
- A stylized illustration of a man and a woman embracing. The woman is on the left, wearing a red top, and the man is on the right, wearing a blue top. They are both looking down and smiling softly. The background is a light, textured grey.
- Infertility, the failure to achieve a clinical pregnancy after 12 months or more of regular unprotected sexual intercourse, affects 15–25% of couples in western countries(1,2).
 - Impaired fecundity, which encompasses infertility and difficulty carrying a pregnancy to term, is estimated to affect twice as many couples(3).
 - Identifying modifiable lifestyle factors, such as diet, that influence human fertility is of major clinical and public health significance.

Causes of infertility

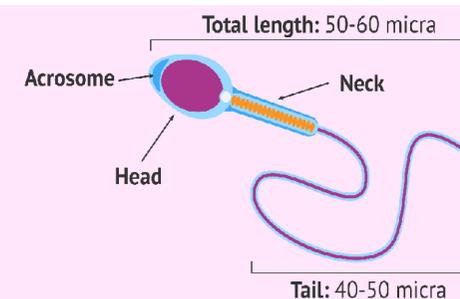




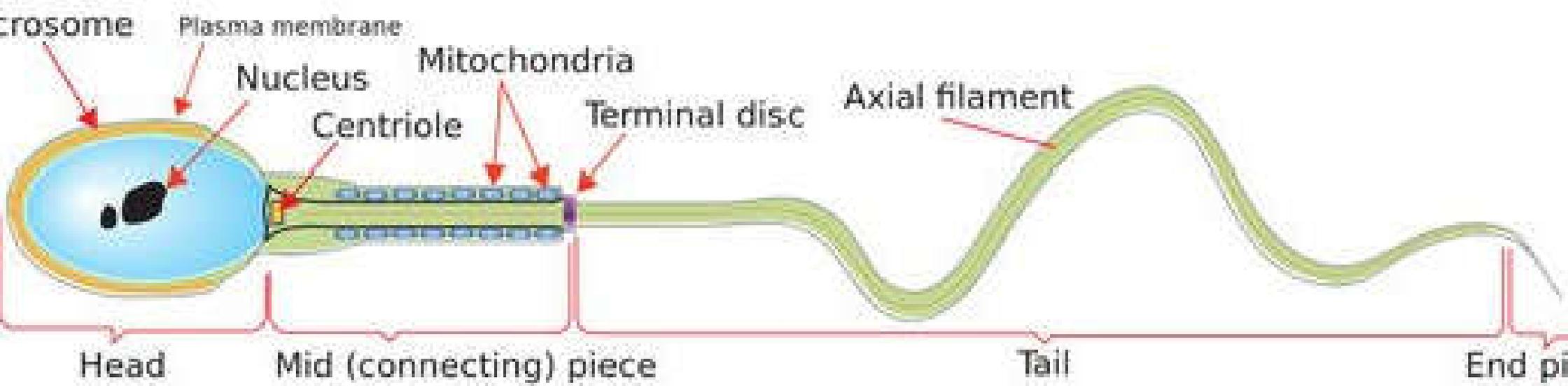
- 
- A stylized illustration of a man and a woman. The woman is on the left, wearing a red top, and the man is on the right, wearing a blue top. They are both looking down at a white pregnancy test stick that the woman is holding. The background is a light, textured grey.
- **The use of assisted reproductive technologies (ART) in the United States has steadily increased from approximately 60,000 cycles in 1995 to 209,000 cycles in 2015, although improvements in live birth rates per initiated cycle over the last decade have been small in comparison(4,5)**
 - **Comparable data for intrauterine insemination and ovulation induction procedures are lacking but given that these procedures are even more common, it's estimated they account for 2–6 times more births than ART in the United States (6).**

- 
- A stylized illustration of a man and a woman in a close embrace. The woman is on the left, wearing a pink top, and the man is on the right, wearing a blue top. They are both looking down at a white pregnancy test held in the woman's hand. The background is a light, textured grey.
- **The high prevalence of impaired fecundity combined with the high financial costs of and limited geographic access to infertility treatment motivate the need to identify modifiable predictors of couple fertility. While there is a growing acceptance that nutrition may be related to reproductive performance in both men and women (7-9).**
 - **Male infertility is attracting increasing interest due to its worldwide prevalence and the evidence of decline in semen quality of young health men.**
 - **Prevalence of reported male infertility ranges from 2.5% to 12% with highest rates in Africa and Central/Eastern Europe (2). Rates of male infertility in North America, Australia, and Central and Eastern Europe varied from 4.5-6%, 9%, and 8-12**

Parameter	Lower Reference Limit
Volume (mL)	1.5
pH	≥ 7.2
Sperm Concentration (10^6 per mL)	15
Total Sperm Number (10^6 per mL)	39
Total Motility	40
Progressive Motility	32
Strict Morphology (normal forms, %)	4

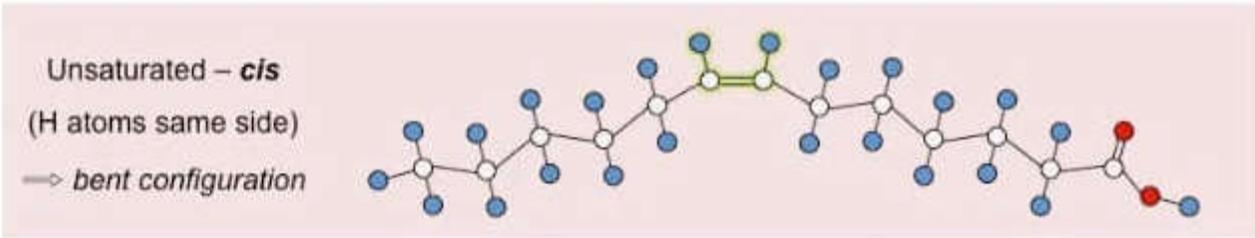
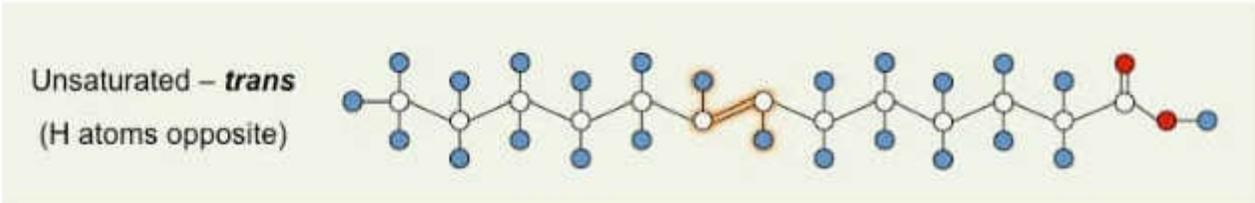
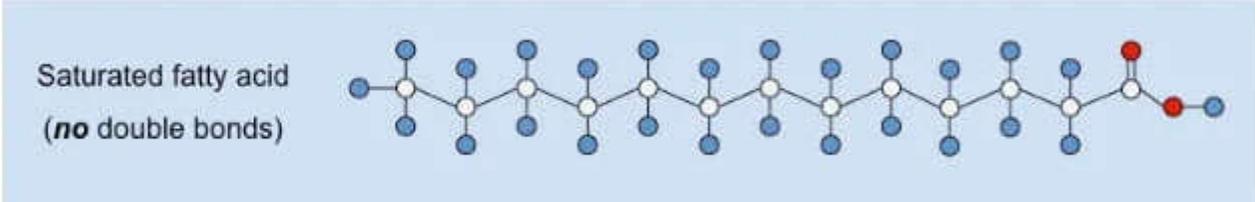


- **Cross-sectional population studies or case-control studies using food questionnaires evaluated the association of dietary patterns or quality of foods with seminal parameters (count, concentration, motility, morphology, DNA fragmentation) or with testis volume or sex hormone levels. In addition, some studies from fertility clinics considered more robust outcomes such as implantation rate, rate of clinical pregnancy and of live birth.**
- **Most of studies focused on the content of saturated fats that could have a negative impact on fertility or on the content of antioxidants and folates that could improve fertility.**



- **saturated fats are prevalent in animal-derived foods as red meat, processed meat and full-fat dairy product while fats from vegetable foods and fishes are polyunsaturated.**
- **Sperm cell are characterized by a high content of polyunsaturated fatty acids, as docosahexaenoic acid (DHA).**
- **Concentrations of DHA with respect to saturated or trans fatty acids influence the melting point of plasmatic membrane, regulate the expression of peroxisome proliferator activated receptor gamma (PPARG), anti-apoptosis and hormone activity.**
- **Particularly, omega-3 PUFAs in fish are precursors of eicosanoids, which contribute to sperm structure and have a positive impact on testicular function.**
- **On the contrary, trans saturated fats interfere with the incorporation of long-chain polyunsaturated fatty acids into sperm membranes during epididymal maturation, and have a negative impact on testicular function, with reduction in total and free testosterone.**

Differences Between Saturated and Unsaturated fatty acids



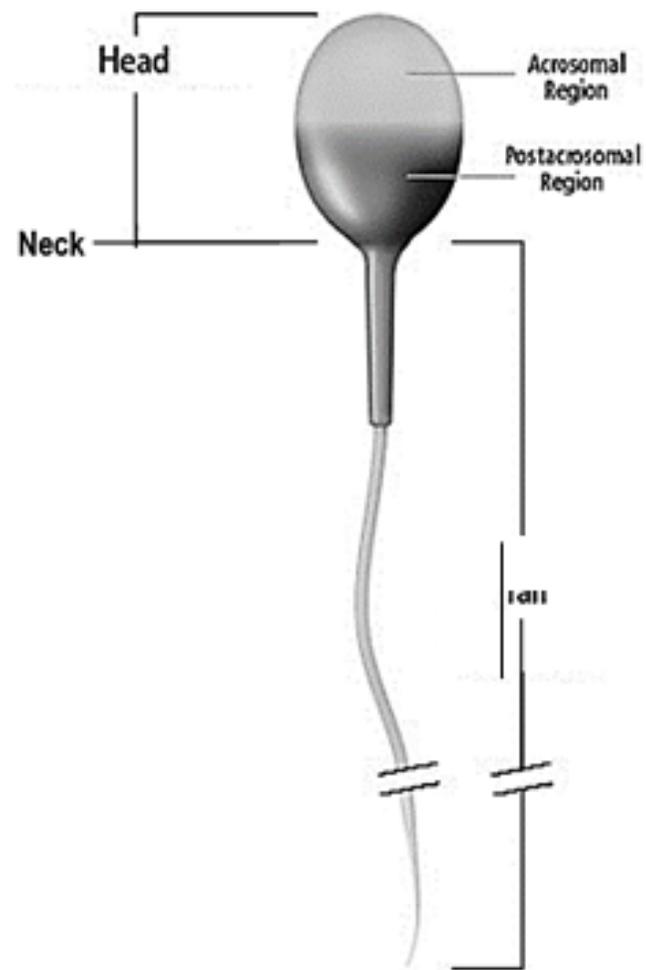
○ = C ● = O ● = H



FORMATION OF FREE RADICALS

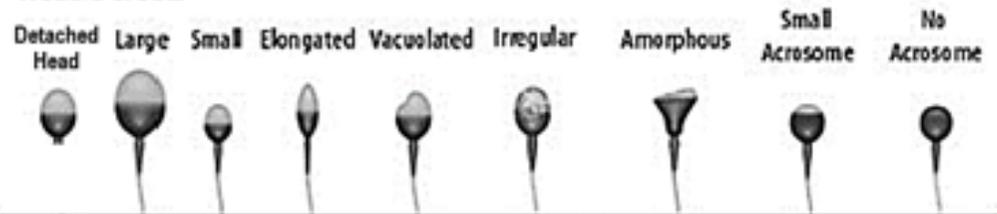
- Antioxidants molecules, that are abundant in fruits and vegetables, have a positive effect on male fertility and in general on health conditions, by contrasting the activity of reactive oxygen species (ROS).
- ROS (reactive oxygen species) show a biphasic effect on sperm cell function
 - **physiological concentrations** ROS from mitochondria have an important role in **capacitation by activation of different intracellular mechanisms** :
 - high levels of cAMP
 - activating the PKA pathway
 - and leading to tyrosine phosphorylation
 - **oxidative stress** from excess ROS production causes peroxidation of lipids in the plasmatic membrane together with a damage of spermatid DNA.
- ROS have a negative effect on sperm motility by damaging plasmatic membrane and mitochondrial function

- Folates are involved in DNA synthesis and in methylation processes connected with protein synthesis. Folate deficiency causes instability and fragility of DNA by reducing availability of methyl groups that are a protection factor of DNA.
- Other micronutrients are involved in the development of male infertility, as divalent cations such as selenium, zinc or manganese that have a role in oxidative stress being incorporated in enzymes such as glutathione peroxidase or superoxide dismutase .
- Optimal levels are requested for spermiogenesis, whereas both deficiency and excess intake are associated with alterations of seminal parameters and serum testosterone levels.

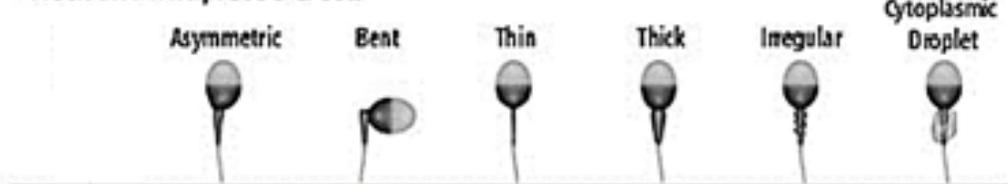


NORMAL SPERM

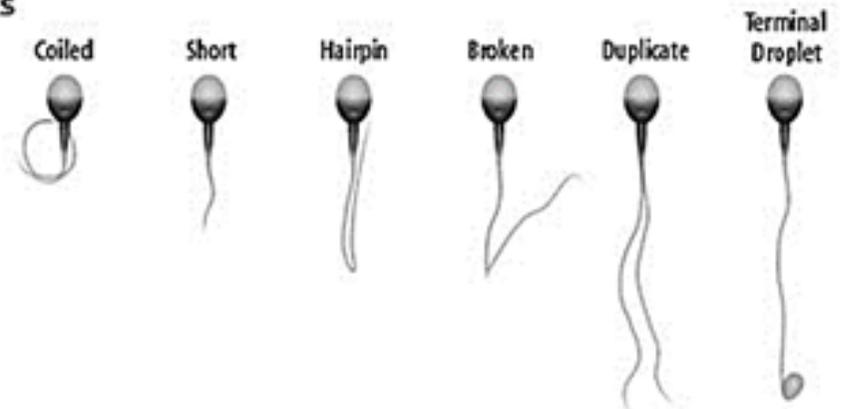
Head Defects



Neck and Midpiece Defects



Tail Defects



ABNORMAL SPERM

Normal Forms



Abnormal Forms



- environmental factors that affect male fertility comprise
 1. smoking cigarettes and cannabis
 2. anabolic steroid use
 3. excessive alcohol consumption
 4. emotional stress
 5. excessive exposure to high temperatures
 6. age
 7. tight clothing
 8. environmental pollution
 9. sedentary lifestyle
 10. exposure to pesticides and toxins
 11. radiofrequency electromagnetic radiation
 12. cytotoxic drugs
 13. Cadmium and lead

recent research data point to the fact that diet is also directly associated with semen quality and that overall lifestyle plays a crucial role in maintaining proper reproductive functions.

Diet and Nutritional Factors in Male(In)fertility—Underestimated Factors

- A high-fat diet and obesity, resulting from an unhealthy lifestyle, affects the structure of spermatozoa, but also the development of offspring and their health in later stages of life.
- In obese individuals, disorders on the hypothalamic-pituitary-gonadal axis are observed, as well as elevated estrogen levels with a simultaneous decrease in testosterone, luteinizing hormone (LH), and follicle-stimulating hormone(FSH) levels.

An unhealthy hypercaloric diet, excessive intake of saturated fats and trans-fatty acids, high glycaemic index, and low nutritional density

increased oxidative stress, intestinal dysbiosis, type 2 diabetes, and insulin resistance = metabolic disorders = deterioration of fertility mainly due to

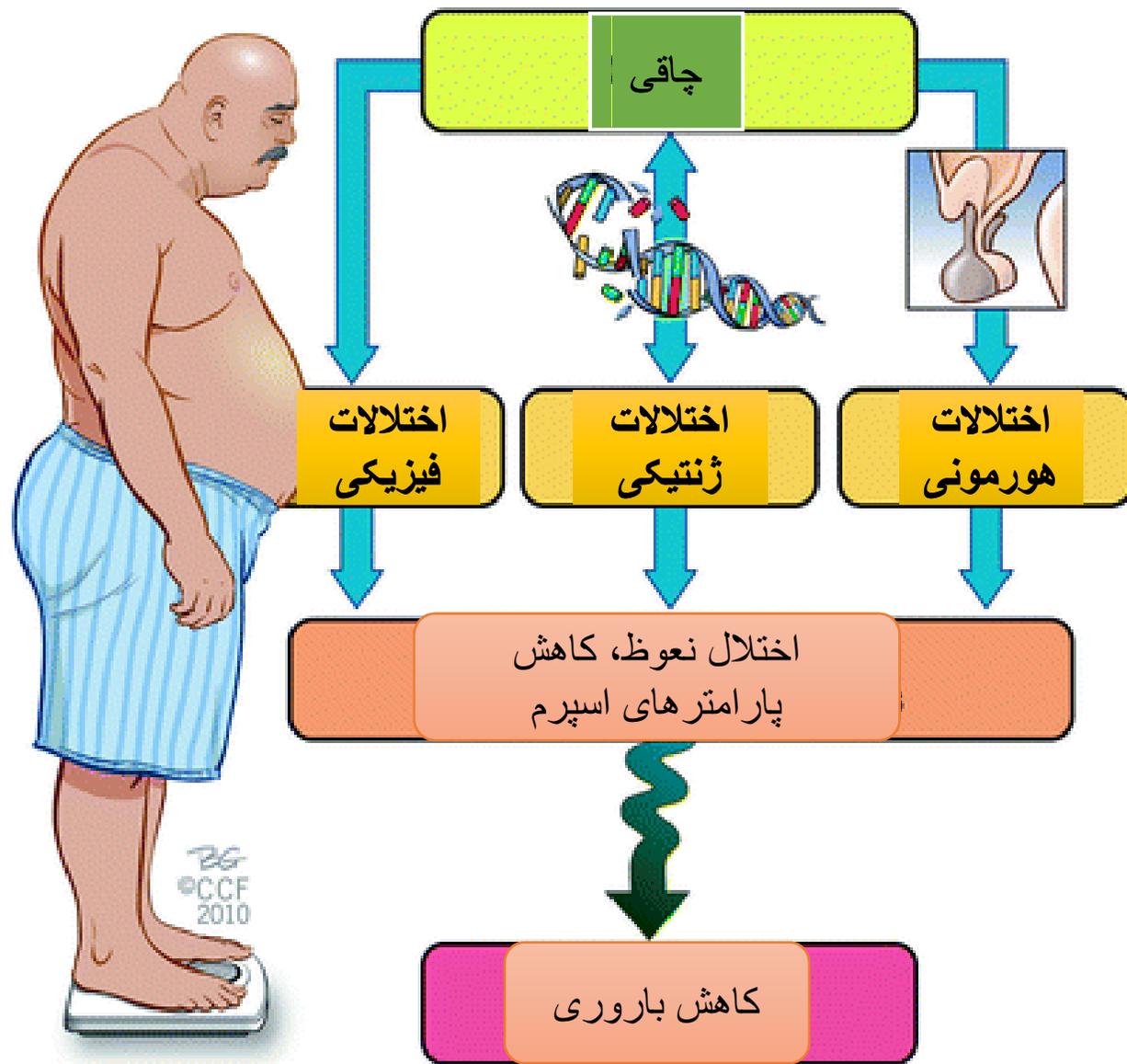
the generation of oxidative stress regarded as one of the main factors leading to decreased sperm quality and a higher risk of infertility, as well as hormonal and immunological disorders

an increase in white adipose tissue leads to an increase in the production of pro-inflammatory cytokines and reactive oxygen species,

the aromatase activity that is responsible for the conversion of testosterone to oestradiol.

On the other hand, obese men with type 2 diabetes and insulin resistance are more likely to experience secondary hypogonadism and lower levels of sex hormone-binding protein (SHBG).

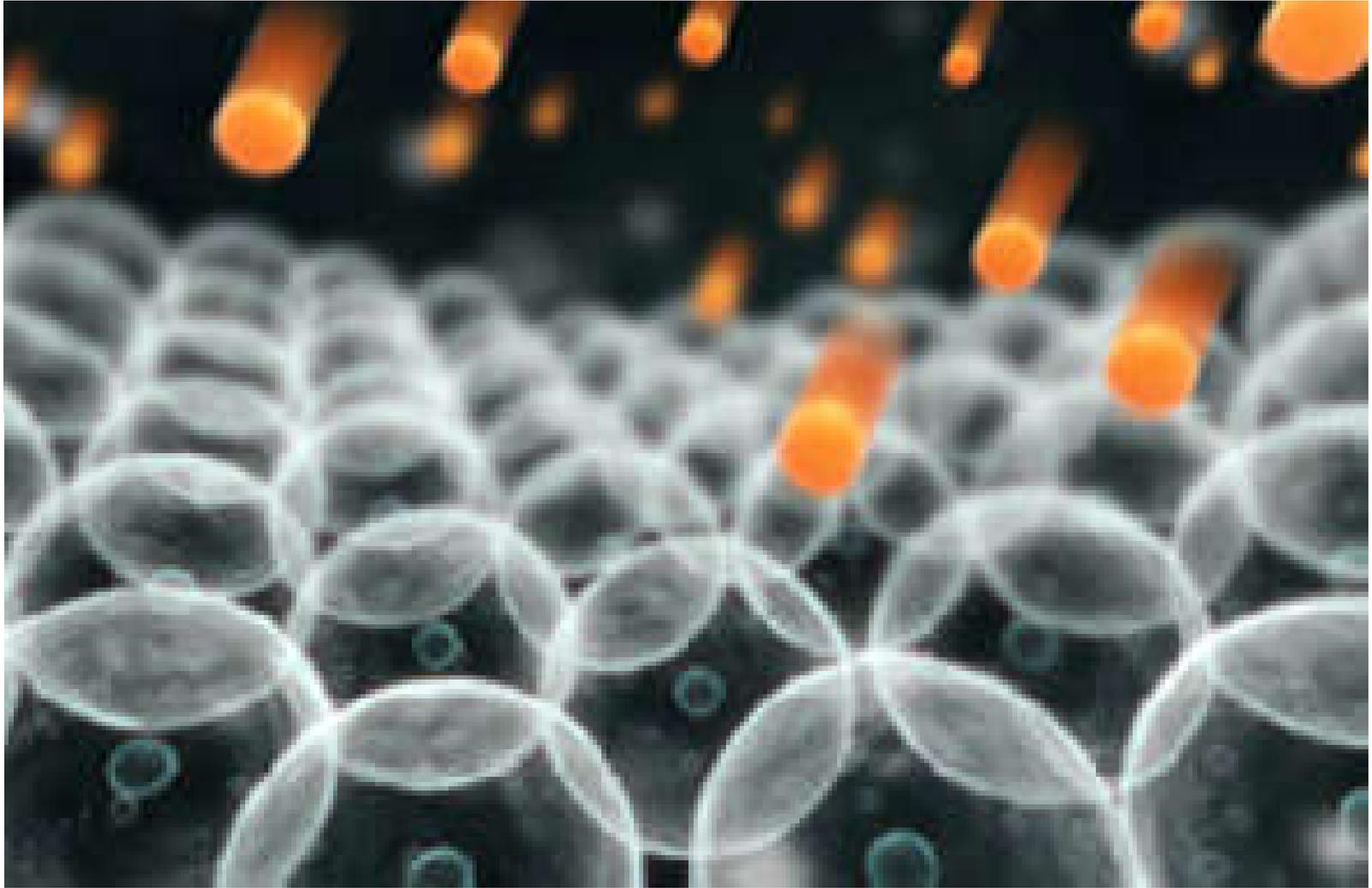
hyperglycaemia has a negative impact on sperm motility and the fertilization process



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Thank
you





FORMATION OF FREE RADICALS

