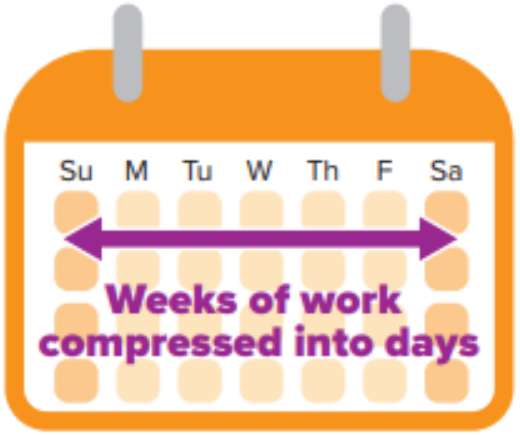
# Comet assay

Zaynab saad abdulghany

Molecular biology department



# single cell gel electrophoresis assay (SCGE, also known as comet assay)

- is an uncomplicated and sensitive technique for the detection of DNA damage at the level of the individual eukaryotic cell.
- It was first developed by Östling & Johansson in 1984 and later modified by Singh et al. in 1988.
- It has since increased in popularity as a standard technique for evaluation of DNA damage/repair, biomonitoring and genotoxicity testing.
- The term "comet" refers to the pattern of DNA migration through the electrophoresis gel, which often resembles a comet

ELSEVIER

Experimental Cell Research

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# A simple technique for quantitation of low levels of DNA damage in individual cells ☆

Narendra P. Singh *, [1], Michael T. McCoy *, [2], Raymond R. Tice †, [3], Edward L. Schneider *

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https://doi.org/10.1016/0014-4827(88)90265-0



## Abstract

Human lymphocytes were either exposed to X-irradiation (25 to 200 rads) or treated with $H_2O_2$ (9.1 to 291 $\mu M$) at 4 °C and the extent of DNA migration was measured using a single-cell microgel electrophoresis technique under

- The comet assay (single-cell gel electrophoresis) is a simple method for measuring DNA strand breaks in eukaryotic cells.
- Cells embedded in agarose on a microscope slide are lysed with detergent and high salt to form nucleoids containing supercoiled loops of DNA linked to the nuclear matrix.
- Electrophoresis at high pH results in structures resembling comets, observed by fluorescence microscopy
- The intensity of the comet tail relative to the head reflects the number of DNA breaks.

- The concept underlying the SCGE assay is that undamaged DNA retains a highly organized association with matrix proteins in the nucleus.
- When damaged, this organization is disrupted. The individual strands of DNA lose their compact structure and relax, expanding out of the cavity into the agarose.
- When the electric field is applied the DNA, which has an overall negative charge, is drawn towards the positively charged anode.
- Undamaged DNA strands are too large and do not leave the cavity, whereas the smaller the fragments, the farther they are free to move in a given period of time.
- Therefore, the amount of DNA that leaves the cavity is a measure of the amount of DNA damage in the cell.

- The comet assay is a versatile technique for detecting damage and with adjustments to the protocol can be used to quantify the presence of a wide variety of DNA altering lesions (damage).
- The damage usually detected are single strand breaks and double strand breaks.
- It is sometimes stated that alkaline conditions and complete denaturating of the DNA is necessary to detect single strand breaks. However this is not true, both single- and double strand breaks are also detected in neutral conditions.
- In alkaline conditions, however, additional DNA structures are detected as DNA damage: AP sites (abasic sites missing either a pyrimidine or purine nucleotide) and sites where excision repair is taking place.

- The comet assay is an extremely sensitive DNA damage assay.
- This sensitivity needs to be handled carefully as it is also vulnerable to physical changes which can affect the reproducibility of results.
- Essentially, anything that can cause DNA damage or denaturation except the factor(s) being researched is to be avoided.
- The most common form of the assay is the alkaline version
- Due to its simple and inexpensive setup, it can be used in conditions where more complex assays are not available.

# Comet Assay formats

1. Neutral Comet Assay:

   the DNA is kept as double strands so that the assay is used to detect double-stranded breaks

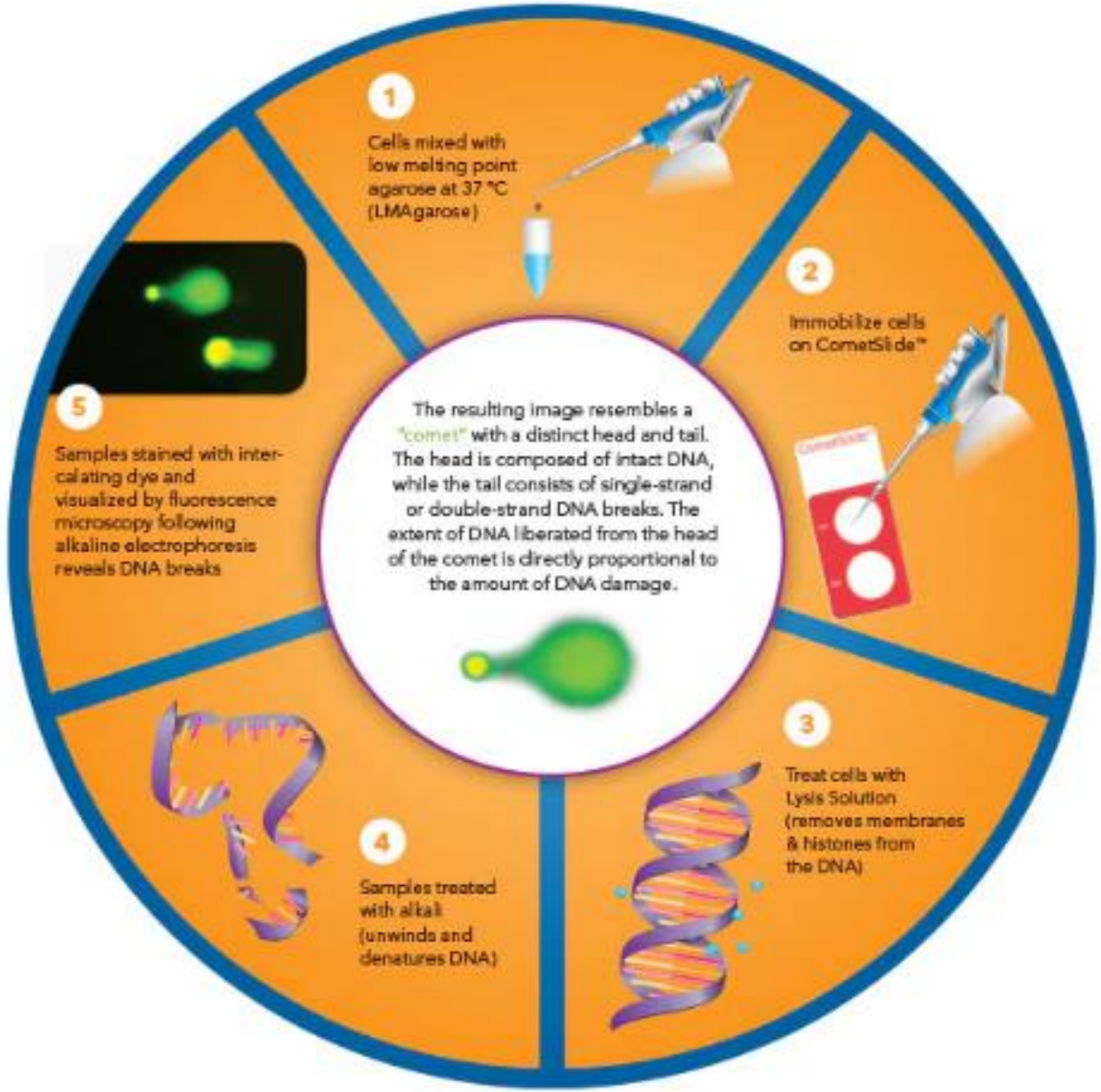
2. alkaline Comet Assay:

   is carried out at pH8 and a denaturing step is included so that both single and double-stranded breaks can be determined.

# Table 1

Variants of comet assay with their technical modifi cations and applications

| Type of single cell gel electrophoresis | Technical modifications | Applications |
|---|---|---|
| Alkaline comet assay[2] | Electrophoresis buffer with pH < 13 | Detection of both double and single-strand DNA breaks |
| Neutral comet assay[1] | Electrophoresis buffer with pH = 7 | Detection of single-strand DNA breaks |
| Comet assay using lesion-specific enzymes | Digesting nucleoids with Endonuclease III[4] or formamidopyrimidine DNA glycosylase (FPG)[5] | Detection of oxidized pyrimidines, purines and ultraviolet (UV) radiation induced dimmers |
| Bromodeoxyuridine labeling to detect replicating DNA[6] | Bromodeoxyuridine labeling during replication | To differentiate cells in S phase and non-S phase |
| Detecting intermediates in DNA repair[7] | Incubation with UV-irradiated cells | To detect effect of UV induced damaging treatment |
| Fluorescent *in situ* hybridization (FISH) comets[8] | Staining with FISH probes | To identify DNA of a particular chromosome in the comet tail |


1
Cells mixed with low melting point agarose at 37 °C (LMAgarose)
2
Immobilize cells on CometSlide™
3
Treat cells with Lysis Solution (removes membranes & histones from the DNA)
4
Samples treated with alkali (unwinds and denatures DNA)
5
Samples stained with intercalating dye and visualized by fluorescence microscopy following alkaline electrophoresis reveals DNA breaks
The resulting image resembles a "comet" with a distinct head and tail. The head is composed of intact DNA, while the tail consists of single-strand or double-strand DNA breaks. The extent of DNA liberated from the head of the comet is directly proportional to the amount of DNA damage.

# Applications

- These include genotoxicity testing,
- human biomonitoring
- molecular epidemiology,
- ecogenotoxicology,
- fundamental research in DNA damage and repair.

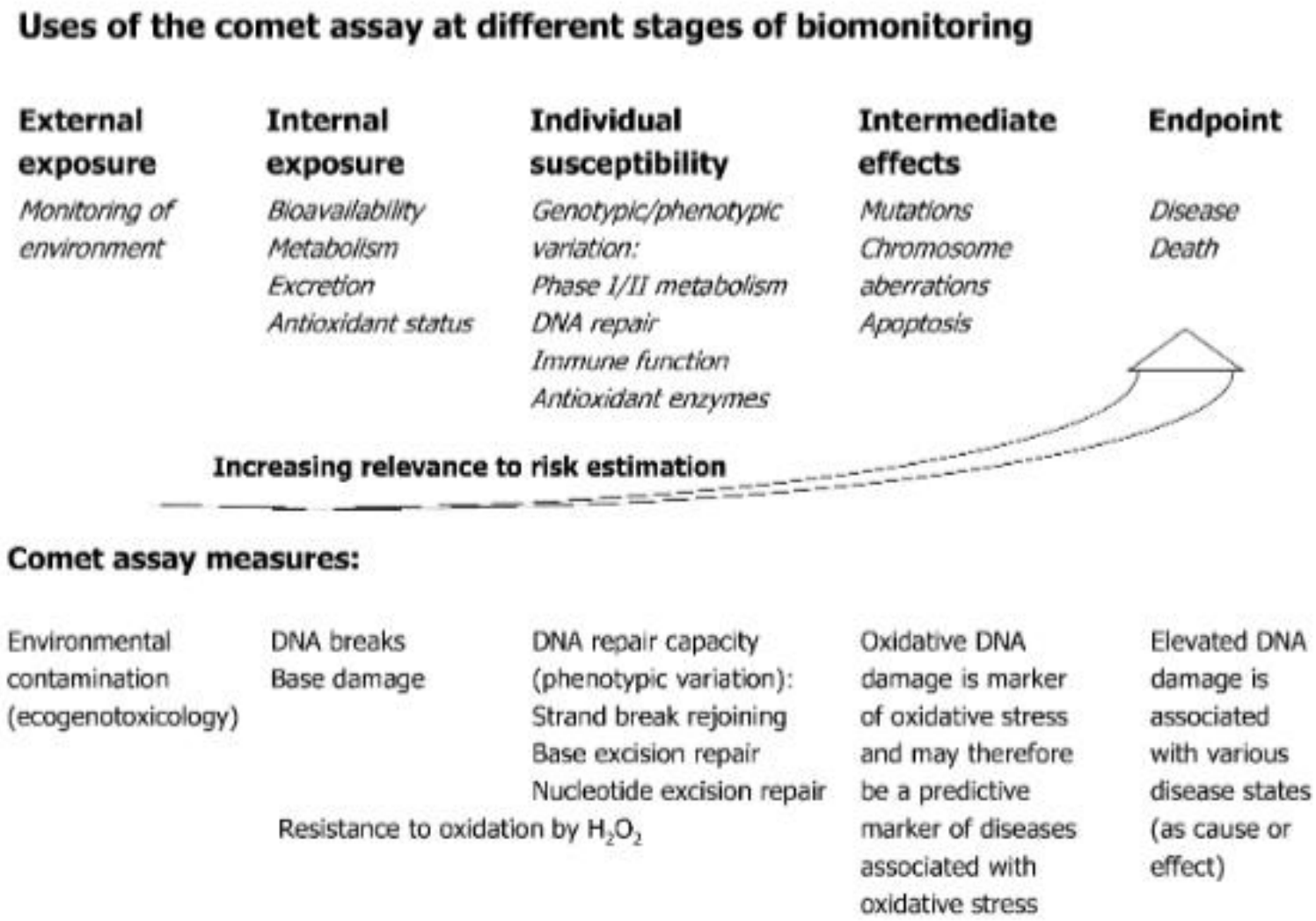
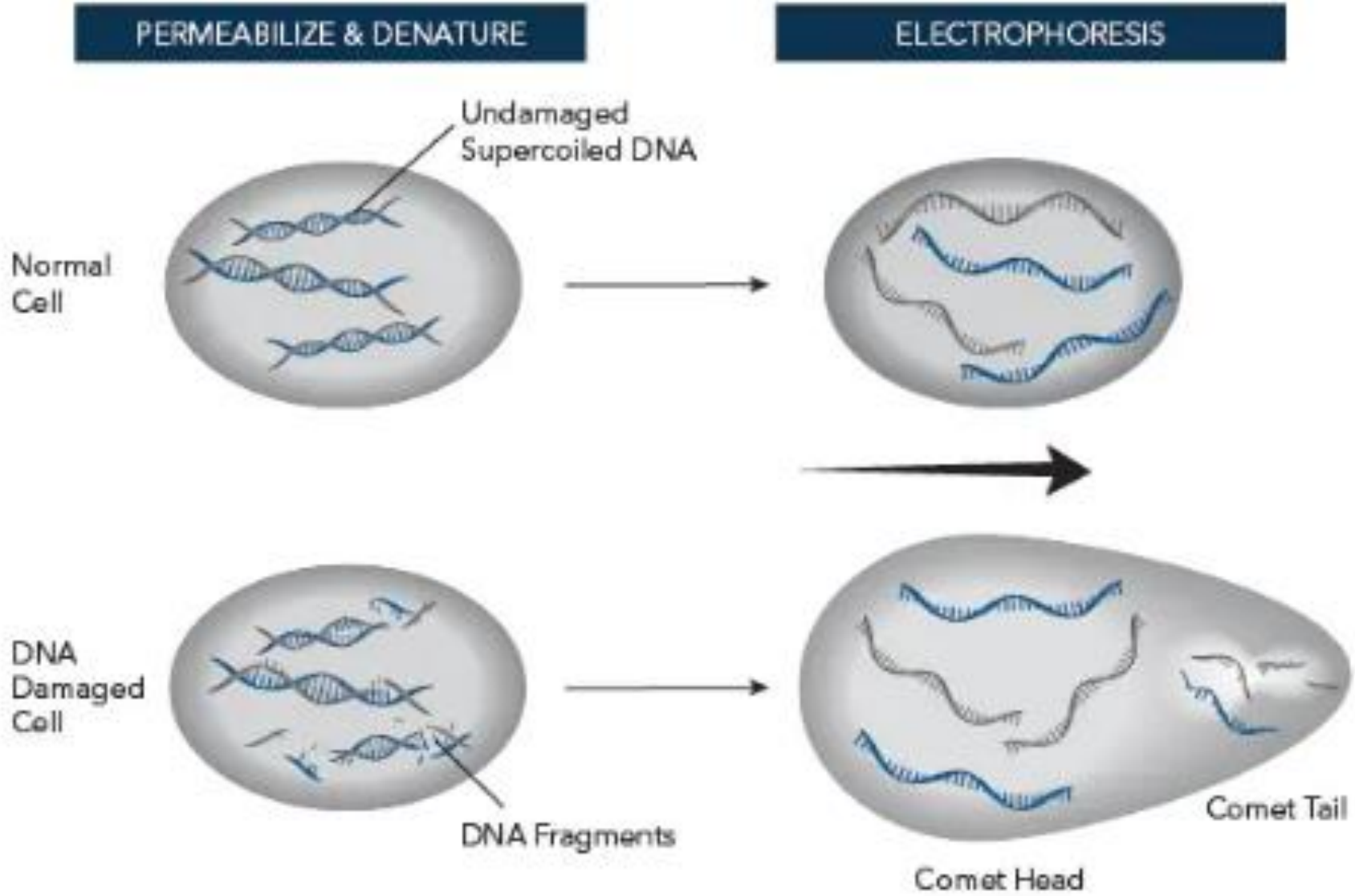


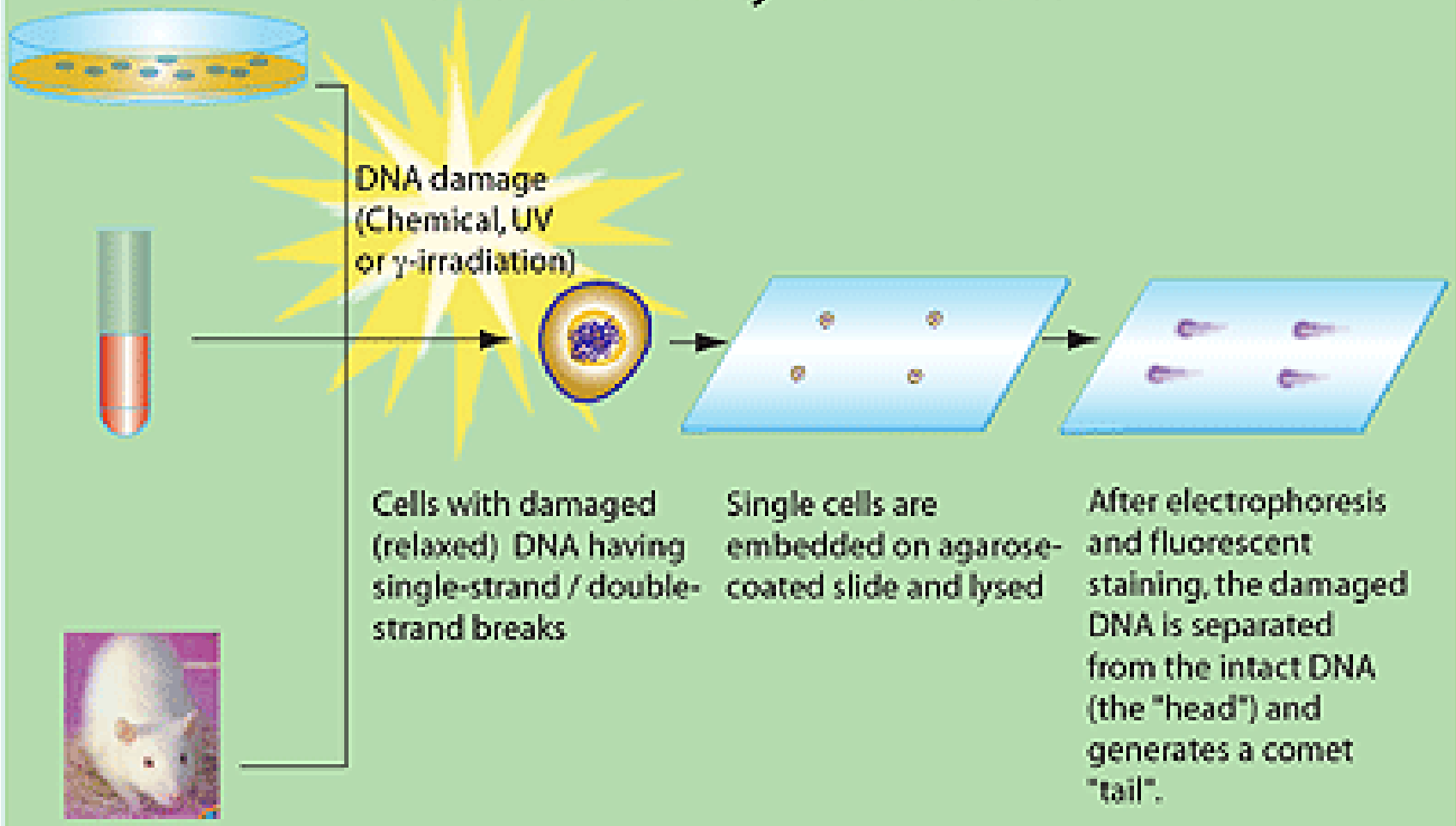

**Fig. 1.** The range of applications of the comet assay, measuring various experimental end points (below the arrow) and reflecting different levels of risk determination from exposure to disease (above the arrow).

# Advantages

- it is considered to be highly sensitive to DNA damage expressed as single strand breaks and alkali-labile sites,
- it uses data from individual cells,
- and few cells are required
- DNA damage can be measured in the absence of mitotic activity, and some reports on the use of the comet assay as a method to detect genotoxicity in organs without mitotic activity have recently been published


PERMEABILIZE & DENATURE
ELECTROPHORESIS
Undamaged
Supercoiled DNA
Normal
Cell
DNA
Damaged
Cell
DNA Fragments
Comet Tail
Comet Head

# Comet Assay Overview



# Stages

- Encapsulation
- Lysis
- Electrophoresis

# Encapsulation

- A sample of cells, either derived from an in vitro cell culture or from an in vivo test subject is dispersed into individual cells and suspended in molten low-melting-point agarose at 37 °C. This mono-suspension is cast on a microscope slide. A glass cover slip is held at an angle and the mono-suspension applied to the point of contact between the coverslip and the slide. As the coverslip is lowered onto the slide the molten agarose spreads to form a thin layer. The agarose is gelled at 4 °C and the coverslip removed.
- The agarose forms a matrix of carbohydrate fibers that encapsulate the cells, anchoring them in place. The agarose is considered to be osmotic-neutral, therefore solutions can penetrate the gel and affect the cells without cells shifting position.
- In an in vitro study the cells would be exposed to a test agent – typically UV light, ionising radiation, or a genotoxic chemical – to induce DNA damage in the encapsulated cells. For calibration, hydrogen peroxide is usually used to provide a standardized level of DNA damage.

# Lysis

- The slides are then immersed in a solution that cause the cells to lyse.
- The lysis solution often used in the comet assay consists of a highly concentrated aqueous salt (often, common table salt can be used) and a detergent (such as Triton X-100 or sarcosinate). The pH of the lysis solution can be adjusted (usually between neutral and alkaline pH) depending upon the type of damage the researcher is investigating.

- The aqueous salt disrupts proteins and their bonding patterns within the cell as well as disrupting the RNA content of the cell. The detergent dissolves the cellular membranes. Through the action of the lysis solution the cells are destroyed.
- All proteins, RNA, membranes and cytoplasmic and nucleoplasmic constituents are disrupted and diffuse into the agarose matrix. Only the DNA of the cell remains, and unravels to fill the cavity in the agarose that the whole cell formerly filled. This structure is called nucleoid (a general term for a structure in which DNA is concentrated).

- Under alkaline (pH >13) conditions, the assay can detect single and double-stranded breaks, incomplete repair sites, alkali-labile sites, and also possibly both DNA–protein and DNA–DNA cross-links, in virtually any eukaryotic cell population that can be obtained as a single cell suspension
- Base adducts and alkylated bases induced in cells develop into SSBs and/or alkali-labile sites that can be detected by the comet assay through repairing events.
- The importance is that this assay can detect SSBs as initial lesions and repair intermediates but not initial DNA lesions such as base adducts directly. Therefore, to interpret the outcomes of this assay adequately, it is important to understand how the repair system affects its detecting power and what it can detect.
- Initial DNA lesions are defined as DNA lesions, such as SSBs, alkylated bases, base adducts, and pyramiding dimmers that are produced directly by the reaction between mutagens and DNA.
- SSBs that generated during the repairing process of initial lesions, such as alkylated bases, base adducts, and pyramiding dimmers, are considered to be secondary lesions.

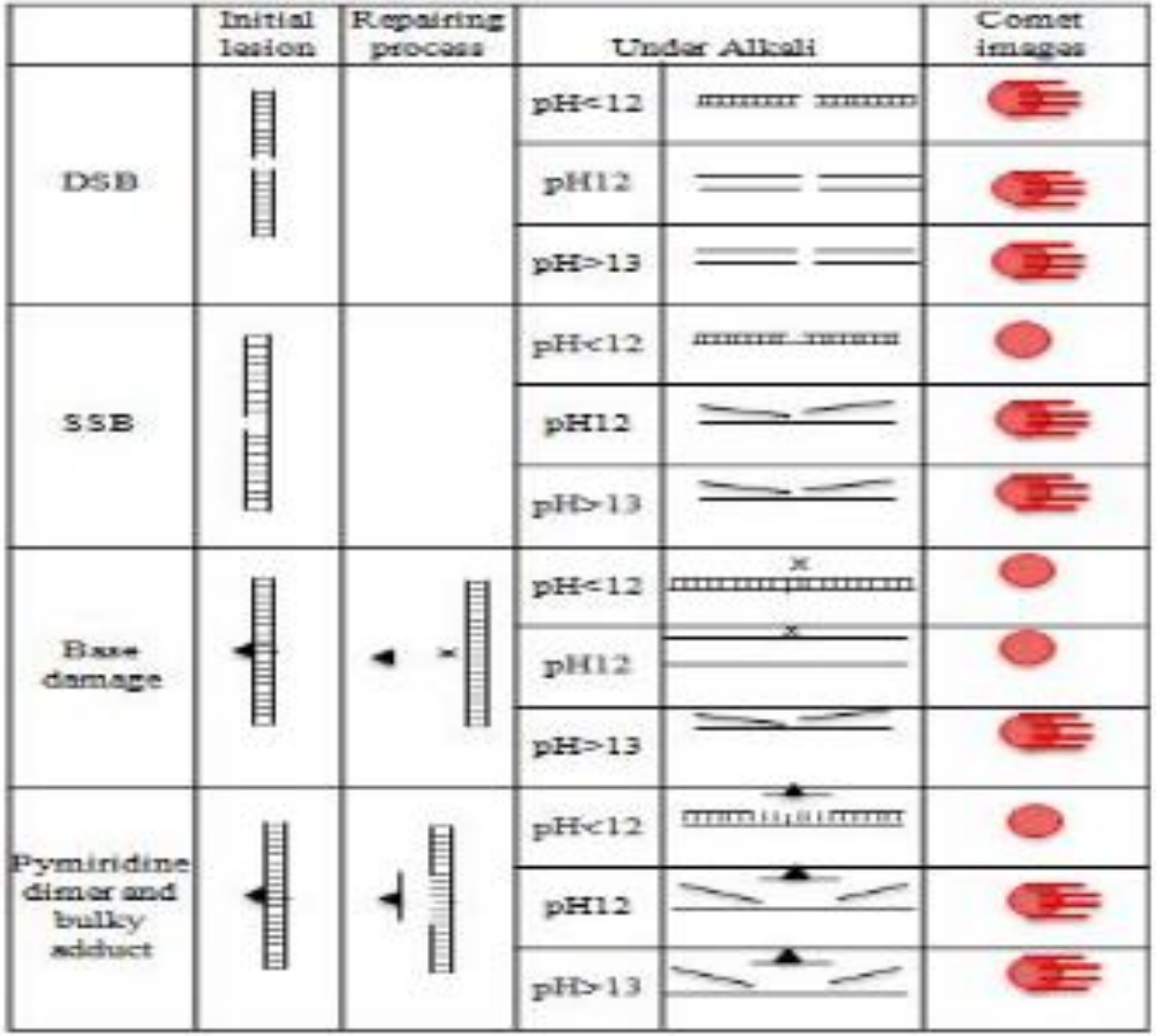
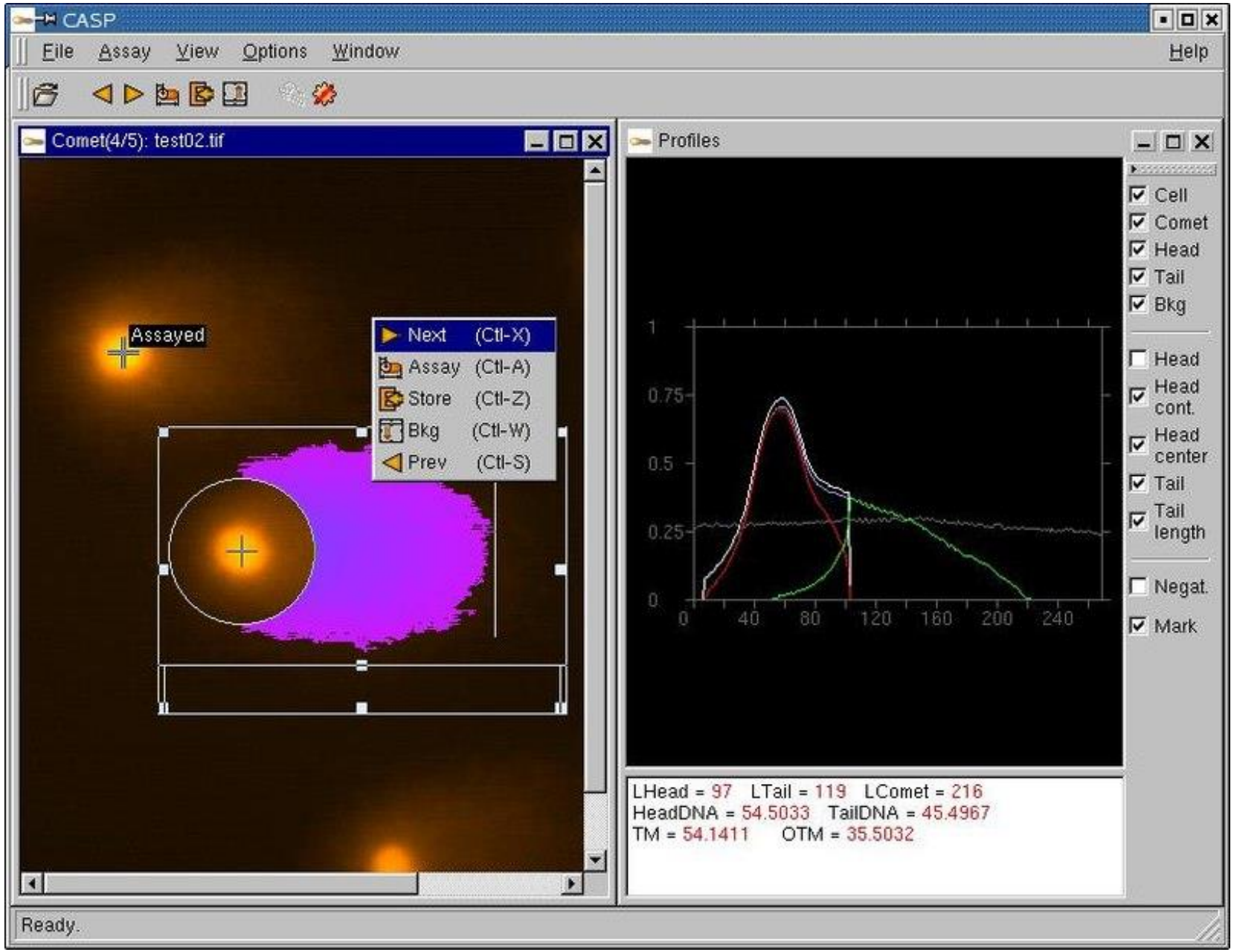



**Figure 2** Mechanisms of comet-tail formation upon different kinds of initial lesion. ▲, base lesion; x, AP-site.

# Electrophoresis

- After lysis of the cells (typically 1 to 2 hours at 4 °C) the slides are washed in distilled water to remove all salts and immersed in a second solution – an electrophoresis solution. Again this solution can have its pH adjusted depending upon the type of damage that is being investigated.
- The slides are left for ~20 minutes in the electrophoresis solution prior to an electric field being applied. In alkaline conditions the DNA double helix is denatured and the nucleoid becomes single stranded.
- An electric field is applied (typically 1 V/cm) for ~20 minutes.

- The slides are then neutralized to pH 7, stained with a DNA-specific fluorescent stain and analyzed using a microscope with an attached CCD (charge-coupled device – essentially a digital camera) that is connected to a computer with image analysis software.

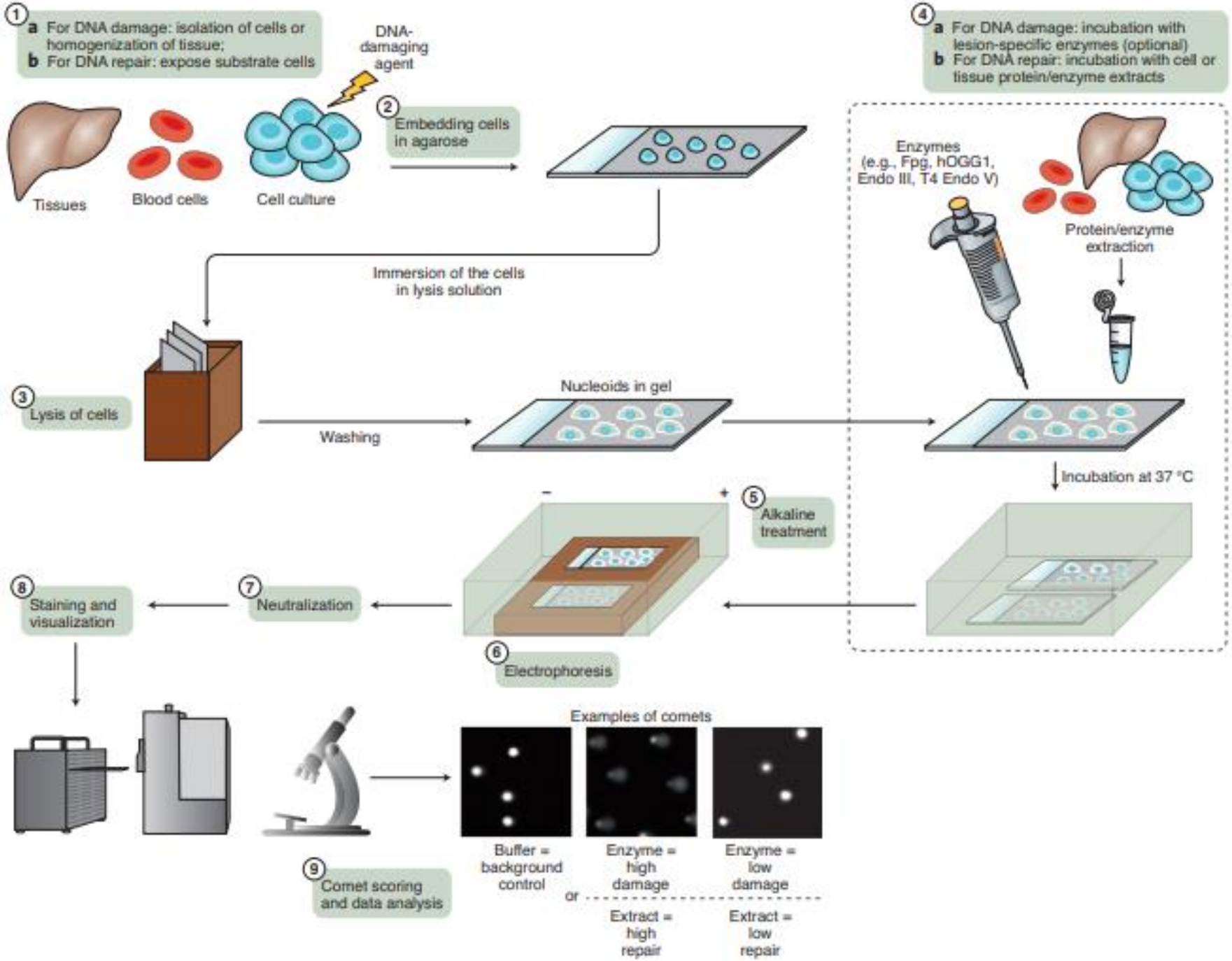

CASP
File
Assay
View
Options
Window
Help
Comet(4/5): test02.tif
Assayed
Next (Ctl-X)
Assay (Ctl-A)
Store (Ctl-Z)
Bkg (Ctl-W)
Prev (Ctl-S)
Profiles
Cell
Comet
Head
Tail
Bkg
Head
Head cont.
Head center
Tail
Tail length
Negat.
Mark
1
0.75
0.5
0.25
0
0
40
80
120
160
200
240
LHead = 97 LTail = 119 LComet = 216
HeadDNA = 54.5033 TailDNA = 45.4967
TM = 54.1411 OTM = 35.5032
Ready.

# Reference standard

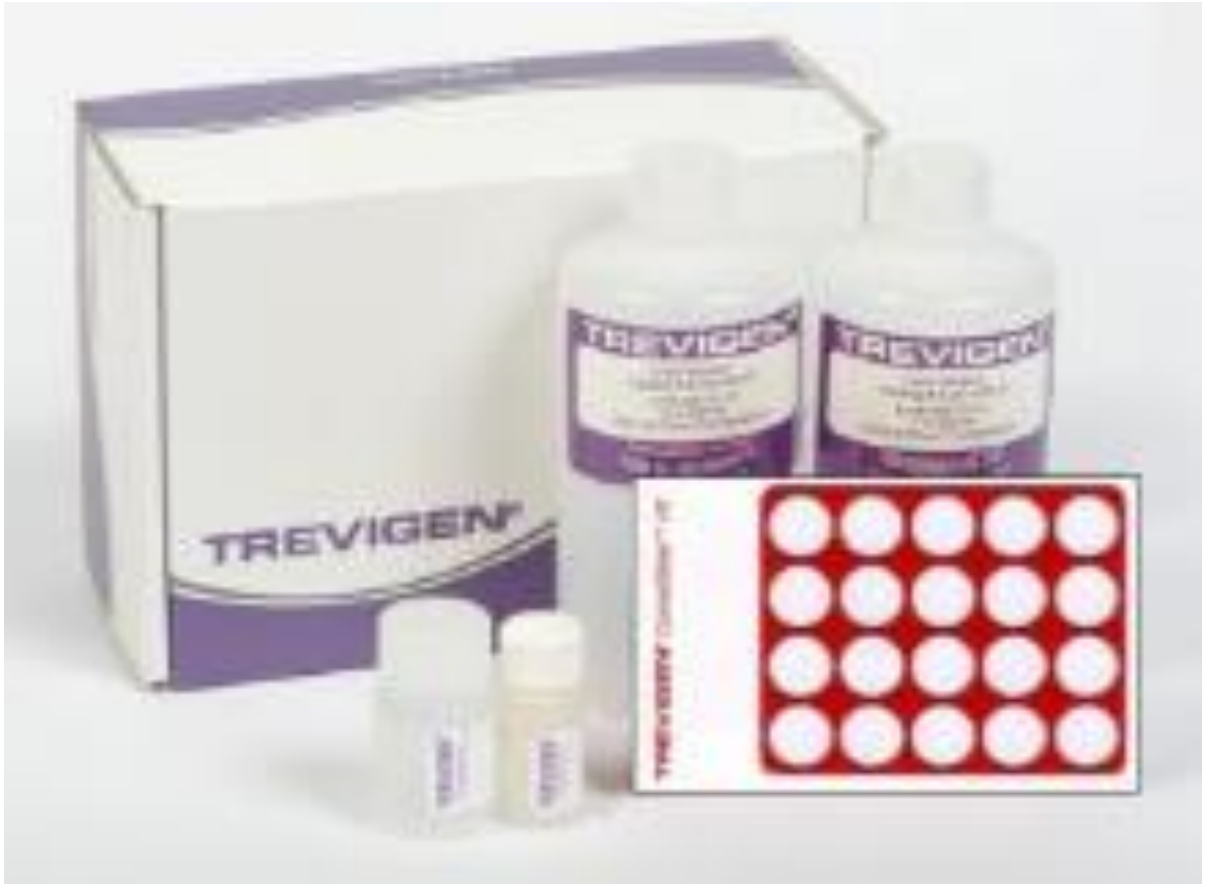
- Reference standard cells are normally set in gels in parallel to sample gels.
- Internal standards—i.e., standard cells in the same gel as sample cells—would be ideal; but it is of course essential to be able to distinguish the two types of cell. Fish cells that are either larger or smaller in genome size compared to human cells have successfully been adopted for this purpose.
- These reference cells can be used in combination with a standard or calibration curve (established with cells given different doses of ionizing radiation), enabling a more precise quantification of DNA lesions expressed as a DNA break frequency rather than % tail DNA.

# what can we hope for in the next 30 years?

- Acceptance of the in vitro comet assay for genotoxicity testing, inexpensive automated comet scoring to save researchers from interminable microscope viewing, protocol standardization (perhaps) and reliable internal reference standards, more human biomonitoring studies of DNA repair (accepting that phenotypic assays have an important place alongside genomics and transcriptomics), environmental monitoring using a variety of animal and plant species; and many more unpredictable developments and applications.


1
a For DNA damage: isolation of cells or homogenization of tissue;
b For DNA repair: expose substrate cells
DNA-damaging agent
Tissues
Blood cells
Cell culture
2
Embedding cells in agarose
4
a For DNA damage: incubation with lesion-specific enzymes (optional)
b For DNA repair: incubation with cell or tissue protein/enzyme extracts
Enzymes (e.g., Fpg, hOGG1, Endo III, T4 Endo V)
Protein/enzyme extraction
Immersion of the cells in lysis solution
3
Lysis of cells
Nucleoids in gel
Washing
Incubation at 37 °C
5
Alkaline treatment
8
Staining and visualization
7
Neutralization
6
Electrophoresis
Examples of comets
Buffer = background control
Enzyme = high damage
Enzyme = low damage
or
Extract = high repair
Extract = low repair
9
Comet scoring and data analysis

CometAssay® Lysis Solution
CometAssay® LMAgarose
200 mM EDTA, pH 10
CometSlides™ (20 Well, 2 Slides)



# Recommendations

- Human blood cells are particularly useful for biomonitoring purposes as they are easily acquired.
- Most studies use fresh whole-blood cells or isolated leukocytes or lymphocytes. They cannot be regarded as typical somatic cells but because they circulate in the body, their cellular, nuclear and metabolic state(including DNA) reflects overall body exposure.
- the influence of cryopreservation on endogenous and induced DNA strand breakage, oxidized purines, oxidized pyrimidines and mis-incorporated uracil, antioxidant capacity and DNA repair capability in human peripheral blood lymphocytes.
- Freezing did not increase endogenous levels of DNA damage in freshly isolated human lymphocytes.
- freezing lymphocytes slowly in cell culture medium(minimal essential medium (MEM) or Roswell Park Memorial Institute (RPMI) medium) with 10% foetal bovine serum and10% dimethylsulphoxide (DMSO, a common cryoprotectant)and keeping them at -80°C
- protocol for the evaluation of DNA damage in frozen whole blood. The total blood sample was mixed with an equal volume of medium containing 20%DMSO, and then stored at -80°C. There were no differences in DNA strand breaks between fresh and frozen blood. Though differences in the level of DNA damage between fresh and frozen samples of blood cells may be observed, they are generally slight and consistent, and the use of frozen white blood cells (or whole blood) has logistic advantages when numerous samples are collected in a short time, as in many biomonitoring studies.

# Take message for future

- There follows a checklist to help in **planning a biomonitoring study with the comet assay** (e.g. monitoring populations for effects of exposure to a genotoxic agent or effects of differences in diet or lifestyle or age; also intervention studies, e.g. with dietary constituents). We assume that the samples consist of lymphocytes (the usual biomonitoring material for the comet assay).

1. Make sure you have sufficient subjects in the study to obtain statistically meaningful results; carry out a 'power calculation'.
2. Include a control group of subjects, i.e. unexposed or untreated or taking a placebo (according to the type of study).
3. Always obtain ethical approval.
4. Sampling of subjects should be performed in the same way throughout the study.
5. Be aware of the possibility of 'seasonal effects'; collect samples from controls and exposed/treated at the same time, rather than in consecutive phases.

- Include a negative control (e.g. untreated lymphocytes) in each comet assay experiment. Preferably, these cells should be frozen aliquots from a single collection of lymphocytes.
- Include a positive control (e.g. lymphocytes treated with H2O2) in each comet assay experiment. Preferably, these cells should be from a single collection of lymphocytes, treated with the damaging agent and then frozen.
- Ensure that comet scoring is done ‘blind’.
- When analyzing results in terms of the overall effect of exposure or treatment, it is the overall comet score for each subject/sample that counts—not the values for all the comets scored (which would give a misleading view of variation).

# Published articles
# Concerning comet application at ICCMGR

Iraqi Journal of Cancer and Medical Genetics

# Determination of DNA damage induced after bitter orange *(Citrus aurantium)* essential oil administrated *in vivo*

Zaynab Saad, Nadia Barakat, Amer T. Tawfeeq, Nahi Y. Yaseen, Teeba Hekmat Jaffer, Saba Kamel, Rasha AbdAmer and Amna Abdullateef

Iraqi Center for Cancer and Medical Genetics research/ Al Mustansiriya University

## Abstract:

This research was carried out in order to investigate whether the purified bitter orange (*Citrus aurantium*) volatile oil purified from peels has a potentiality to induced DNA damage if administrated orally in vivo. White adult male rats (180-250g) were divided into five groups each group with five individuals. The first three groups administrated three different concentration of the purified citrus essential oil 100, 200 and 300µl/ kg Body weight (Bwt). The fourth group administrated olive oil and served as positive control group. The fifth was administrated water as negative control group. Dosing for all groups were two times weekly for one month period. To detected DNA damage, alkaline single cell gel electrophoresis (SCGE) for the blood samples was carried out for all groups. Parameters of nuclear olive moment, comet tail length, and DNA on comet tail were calculated. Results showed that there were no significant differences between treated and control untreated groups as well as olive oil administrated group. These results indicate that citrus volatile oil has no genotoxic effect and it was safe and tolerable in the highest dose used for the specified period of time conducted.

***Key words:*** *citrus oil, rat, comet assay, olive oil, tail moment*

Iraqi Journal of Cancer and Medical Genetics

# Genotoxicity of Silver Nanoparticles synthesized by Laser Ablation Method *in Vivo*

Amer T. Tawfeeq, Husam Al-Deen M. Kadhim, Nahi Y. Yaseen, Saba K. Kalil, Aseel F. Ghedan, Rasha A.Hussein, Amina Yusif Abdul-Lateaf

Iraqi Center for Cancer Research and Medical Genetics / University of Al-Mustansiriyah

## Abstract:

This research was conducted to evaluate three main methods usually used to assess cellular DNA damage in genotoxicity assays. These methods were single cell gel electrophoresis (comet assay), micronucleus formation, and DNA fragmentation assay. Nanoparticles genotoxicity is a subject of compelling immediate action as a result of wide application of nanotechnology in many sectors which in contact with humane health. The mentioned methods were used to assess the genotoxicity of silver nanoparticles in vivo. Silver nanoparticles were synthesized by laser ablation of pure silver plate submerged in double distilled water. The synthesized nanosilver was characterized with UV-Visible spectroscopy and atomic force microscope. After its characterization, silver nanoparticles were injected subcutaneously in to BALB/c mice at 200 µg/ kg BW for two different periods of time, one week and two weeks in daily manner. After the end of injection the animals were sacrificed and their bone marrow cells, lymphocytes, and spleen cells were collected. DNA damage in these cells was assessed using the three mentioned methods. Results indicated that the three types of DNA damage assessment methods were capable to detect the genotoxicity of silver nanoparticles in the treated animals. Spleen cells were the less DNA damaged cells as indicated with the three assays in the first week of injection. Lymphocytes and bone marrow cells was effected in more aggressive manner.

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2018, VOL. 46, NO. 6, 1215–1229
https://doi.org/10.1080/21691401.2017.1366335



# Biosynthesis, characterization of magnetic iron oxide nanoparticles and evaluations of the cytotoxicity and DNA damage of human breast carcinoma cell lines

Ghassan M. Sulaiman[a], Amer T. Tawfeeq[b] and Amal S. Naji[a]

[a]Biotechnology Division, Applied Science Department, University of Technology, Baghdad, Iraq; [b]Molecular Biology Department, Iraqi Center for Cancer and Medical Genetics Research, University of Al-Mustansiriyah, Baghdad, Iraq

**ABSTRACT**

Magnetic iron oxide nanoparticles (MNPs) were synthesized using *Albizia adianthifolia* leaf extract as reducing and protecting agent. Colour changing, UV–Vis spectrum, X-ray diffraction (XRD), Fourier transform infrared (FT-IR) spectroscopy and scanning electron microscopy (SEM) confirmed the biosynthesis and characterization of MNPs. The XRD pattern revealed that MNPs are crystalline in nature. FT-IR spectral analysis showed that MNPs was capped with plant constituents. From SEM analysis, the MNPs were generally found to be spherical in shape and the size was ranged 32–100 nm. Free radical scavenging potentials of the MNPs against DPPH were confirmed based on its stable anti-oxidant effects. The synthesized MNPs were used to capture *Staphylococcus aureus* under the magnetic field effect. Further, it was observed that the MNPs are able to exert cytotoxic effect towards human breast (AMJ-13) and (MCF-7) cancer cells. The anti-proliferative effect of this treatment is due to cell death and inducing apoptosis. Mitochondrial membrane potential, acridine orange-propidium iodide staining assays as well as single cell and DNA gel electrophoresis analyses indicated that MNPs induce cell death only by apoptosis. The findings of present study suggest that the MNPs might be used for medicinal applications particularly for cancer therapeutics.

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**KEYWORDS**
*Albizia adianthifolia*; biosynthesis; MNPs; AMJ-13 cells; MCF-7 cells

Iraqi Journal of Cancer and Medical Genetics

# Relationship between blood lead levels and cytogenotoxic effects in human exposed to diesel exhaust

Naida Tareq Barakat[1], Nahi Yousif Yaseen[1], Muhammed Nafe'a Ali[2]

1 Iraqi center for cancer and medical genetics research /Al-Mustansiriyah University
2 Department of Biology/ College of Science/ University of Baghdad

## Abstract:

Diesel exhaust (DE) is a mixture of hundreds organic and inorganic compounds, several of them are cytogenotoxic. This way, the aim of this study was to indicate the relationship between blood lead level and the exposure to cytogenotoxic constituents of DE. Blood samples were collected from 80 nonsmoker healthy men. Sixty of them were exposed directly to DE and the others were negative control. Exposure metrics included blood lead levels (Blls) while cytogenotoxic effects of DE were investigated by using micronucleus assay (MN), sister chromatid exchange assay (SCE) and comet assay. The results showed that the means of Blls in exposed workers to DE (47.40 – 49.50) µg/dl significantly higher ($P < 0.01$) than mean of Blls in control gruop (15.75) µg/dl. When Blls range from 60 to 80 µg/dl , the cytogenotoxic effects were significantly higher ($P < 0.01$) than others Blls groups. So that BLL it can be indictor to exposure to DE which have cytogenotoxic effects on human.

***keywords:*** *diesel exhaust, lead, blood lead levels, sister chromatid exchange, micronucleus assay, comet assay.*

Iraqi Journal of Cancer and Medical Genetics

# Confirming intrinsic pathway apoptosis event in cervical carcinoma cells (HeLa) treated with hybrid nanoliposomes

Noor A. Awad[1], Nahi Y. Yassen[2], Amer T. Tawfeeq[2], Kismat M. Turki[1]

1 Clinical biochemistry division\ College of Medicine \ Baghdad University.
2 Molecular Biology Dept.\ Iraqi Center for Cancer and medical Genetics Research\ Al-Mustansiriya University.

## Abstract:

Cancer targeted nanotherapy represent an exciting field in the search for new cancer specific therapies to avoid conventional chemotherapy side effects. Because cancer cells usually have malfunctioning apoptotic machinery which favors survival pathways and drug resistance. Cancer cell apoptosis is the favorable event to be induced in any new anticancer agent development. Nanotherapy goals are to elevate therapeutic efficiency, selectivity, and overcome drug resistance as major obstacle in cancer treatment. Hybrid nanoliposomes (nHLs) may fulfill all these features in cancer therapeutics. We have previously demonstrated the ability of in house synthesized nHLs to inhibit HeLa cell line proliferation and study preliminary the induction of apoptosis as a consequences of that inhibition. In order to confirm the event of apoptosis in HeLa cell line incubated with the synthesized nHLs we exposed HeLa cells to inhibition concentration 50 (IC50) of previously synthesized hybrid nanoliposomes. Mechanism of apoptosis induction was determined using mitochondrial membrane potential disruption, caspase-3 activity and single cell gel electrophoresis as well as DNA fragmentation assay. All apoptosis detection procedures used gave a clear defined significant indication that nHLs was capable of induce apoptosis in HeLa cells through intrinsic pathway. This result needs further investigation to confirm nHLs as potential nanotherapy.

***Key words:*** *apoptosis, nanoliposome, liposome, nanobiotechnology, HeLa cells.*

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**Journal Homepage: http://tjps.tu.edu.iq/index.php/j**

# genotoxicity produced in the epithelial cells of the oral cavity and Comet assay in urinary tract of workers in aluminum factories

**Sarab Dalaf Khalaf , Wajdi Sabeeh Sadeq**

*Department of Biology , College of Sciences Tikrit University , Tikrit , Iraq*

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**Corresponding Author:**

**Name:** Sarab Dalaf Khalaf

**E-mail:** gig9824@gmail.com

**Tel:**

## ABSTRACT

Whilst being environmentally abundant, aluminum is not essential for life. On the contrary, aluminum is a widely recognized neurotoxin that inhibits more than 200 biologically important functions and causes various adverse effects in plants, animals, and humans. The acute toxicity of aluminum is low. No acute effects due to dietary exposure to aluminum have been observed in the general population. A compendium is provided of aluminum compounds used in industrial settings, and as pharmaceuticals, food additives, cosmetics and as other household products. In our current study, the genotoxicity of aluminum was evaluated in epithelial cells by Micronucleus assay in buccal cells and Comet assay in urinary tract cells, 50 samples were taken from the workers in the aluminum factory and 50 samples as control. The results showed significant increased in the average of the affected cells (8.86 ± 1.36) and the average total cell total (51.66 ± 18.19) in urinary tract while the average of damage cells (72.02 ± 8.99) and It is noted that the mean micronuclei (1.61±29.80) and the average abnormality in all cells (3.06 ±92.54) while the Mni(51.28 ±10.61). These results suggest that the estimation of cellular genetic damage in epithelial cells by Micronucleus assay and Comet assay estimation is important to know the toxic effects of aluminum.

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TJPS

IASJ

المجلات الاكاديمية العراقية

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*ISSN: 1813 – 1662 (Print) --- E-ISSN: 2415 – 1726 (Online)*

**Journal Homepage: http://tjps.tu.edu.iq/index.php/j**

# The ability of Mycophenolate Mofetil to induce chromosome aberration and DNA damage in *Mus Musculus* Mice

**RUIDA WATHEQ NEAMA , WAJDI SABEEH SADEQ**

*Biology Department , College of Sciences , Tikrit University , Tikrit , Iraq*

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**Corresponding Author:**

**Name:** RUIDA WATHEQ NEAMA

**E-mail:**

**Tel:**

## ABSTRACT

Mycophenolate mofetil (MMF, cellcept) is widely used in maintenance immunosuppressive therapy for prevention refractory rejection in sold organ transplant recipients. MMF is orally used, and rapidly metabolized to its active constituent Mycophenolic acid. MPA is an inhibitor of Inosine Monophosphate Dehydrogenase II (IMPDH II) in lymphocyte causing in reduction in intracellular guanine nucleotide pools and leads to inhibition of lymphocyte proliferation. MMF is considered to be an effective and safe immunosuppressive agent compared with other medicins. MMF lacks the nephrotoxicity. But it has important side effects, gastrointestinal and heamatological adverse effects are the most common. The results of this study show the high significant in total chromosome aberrations in treatment groups compared with control. Also there is high significant differences in total damage DNA in treatment groups than control. In conclusion, MMF may has a high genotoxicity by induced chromosome aberration and DNA damage.