

**Histophysiological thetics on the premium bioecological level for
the effecting of ultraviolet radiation of the sun in the appearance
of malignant melanoma in the outdoor domestic cats at the
Mesopotamia**

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Synopsis:

The present study bring to light that Mesopotamia region attended an fluctuation in UV-B radiation frequency to record a range value 200-280 nm, this change in turn play a corner role in the spread a radiation environmental pollution led to the injury of the outdoor cat's integument with malignant melanoma. physiologically 10 factors were been tested to being affected by this disorder including heart beats, breathing times, ADH value, melatonin value, Ca^{++} - K^+ - Na^+ levels, differential WBCs (neutrophil & basophil) values, and anemia occurrence, where they were showed a change in their values considered statistically within the significance levels. On the other hand, the histopathological sections explains a type of agglutinations for some abnormal naevus cells accompanied with a shrank of the injured cells with signs of rigidity for their nucleus.

Conclusion derived from the available data proved that high frequency of UV radiations at this region of Iraq causing mighty appearance of malignant melanoma at the outdoor cats.

Key words: Cat, UV-B, malignant melanoma, Mesopotamia, Histophysiology.

Zoology classification : QL671-699

Introduction:

Ultraviolet (UV) was considered one of sun's radiations that is physically causing the production of vitamin D in our skin, strengthen our skeleton and it can cure certain skin diseases⁽⁴⁾.

Violet color was being the shortest wavelengths of visible light (spectrum). But UV light has a shorter wavelength than that of violet light. The part of the electromagnetic spectrum that was UV light covers can be farther subdivided in several different overlapping into UV-A

(320-400 nm), UV-B (280-320 nm), UV-C (<280 nm), V-UV (10-200 nm), and E-UV (1-31 nm)⁽⁷⁾. When the UV light (especially UV-B) is combining the exposure to the sun rays and the global climate change it is clearly contribute in the rise of skin cancers on the earth, and it is being the most problematic source due to its physical role on those disorders like **malignant melanoma**⁽¹⁰⁾.

Malignant melanoma is a raised moles compromised a type of cancer arose from the melanocyte cells of the skin. Malignant melanoma develops when the melanocytes are no longer responding to the normal control mechanisms of cellular growth and they are capable of spreads to other organ(s) in the body (**metastasis**). Around 160000 new cases of melanoma were diagnosed worldwide each year, about 48000 melanoma cases related death occurred worldwide per annum⁽¹¹⁾. Epidemiological studies suggest that any exposure to the UV-B&A lights may be contributing in the developing of melanoma as a case of mutation. So, the

Procedure:

About 819 injured cats were been studied in the period of this search that is extends from 2008 until 2012.

Cats were expected to be hit by melanoma were centered on and clinically

possible significant elements in determining the risk include the intensity and duration of exposure to the sun, age, and the degree of pigmentation of the skin⁽¹⁾.

Cats were chosen as an animal's model at our study due to the easiest of catching or getting with a cheap costs, easy to treating, more available and suffered from many types of skin diseases specially natural occurring malignant melanoma. According to this, cats (*Felis catus*) were classified traditionally and scientifically as a chordate and referred to being a mammalian carnivore⁽²⁰⁾.

The aim of the present study is to disclosure the effects of environmental pollution of the sun irradiation that was had a negative assist on the animal's biology through the spreads of malignant melanoma at cats that were biologically have a direct attachment with human to being considered.

had undergone several tests including their pulse rates and breath times. In addition to this, jugular vein was used for collecting blood samples which has been checked for the evaluation of differential WBCs & RBCs by hemoanalyzer, ADH & melatonin by radioimmunoassay, calcium

by atomic spectroscopy, potassium and sodium by spectrophotometer, glucose by glucose oxidase double enzyme method, and total protein by protein electrophoresis. So, all of those mentioned procedures based on scientific practical manuals^(17,13).

Histologically, the injured sites of the skin were excised surgically then fixed by 4% formaldehyde and where they exposed to several laboratory routine rebounds according to Ohtit *etal* 2000⁽⁹⁾, whom applied and applicated the steps hydration, dehydration, embedding and staining with hematoxylin-eosin dye.

UV light frequency collected from the NASA's goddard space flight center during the period from 2005-2011, while their values were measured earthly by the

using of UV meter-docimeter by the assistance of the researcher of the commission forces at Iraq. Some physical and mathematical equations were applied to get the UV approximate values as a confirmative manner.

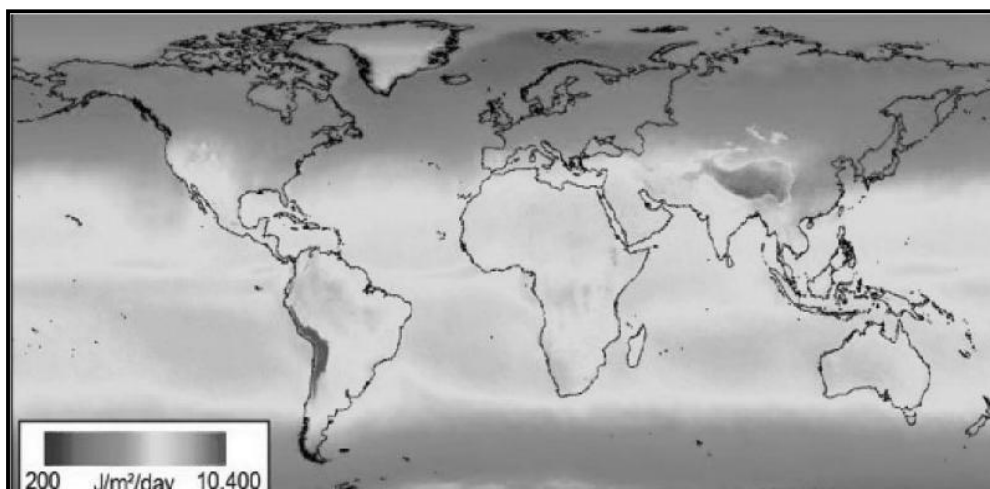
Statistical analysis, which we have to clarify the results of the search is T-students test according to Robert *etal* in 1984⁽¹⁵⁾.

It is worth mentioning that the glassware used in this search were manufactured locally, while other instruments were made at UV light technology limited at GB, Keran, Sedona, and GmbH Co. companies.

Results:

NASA's goddard space flight center provide us with a copy of the image

that they were captured at the period mentioned previously.



Picture-1: the average intensity of global UV-B light radiation

UV meter explains that UV-B wave was detected at the semi-same frequencies at different times of spring, summer, fall and winter seasons. So, the effective wave length frequency of UV-B was occurred at

spring and summer, which was reached to 280-340 nm to intervals equalized to 30 minutes sometimes. The table-1 explain the main UV types and percentages along of the year.

Table-1: the percentage of UV types in Mesopotamia from 2005-2010

UV Type	Frequency (nm)	Percentage of occurrence
UV-A	320-400	2%
UV-B	280-320	7%
UV-C	<280	6%
V-UV	10-200	36%
E-UV	1-31	49%

Physiologically, the clinical chemistry tests showed that most of blood's parameters was raised to an obvious extant to considered a significant difference e.g. potassium & calcium, while others was

been normal at the extreme values like the total protein & sodium, except the glucose sugar that was declined to reached its minimal value. Look down table number two.

Table-2: Cat's blood parameters values that affected by UV-B radiation

Blood parameter	Investigated value	Normal value
Potassium mEq/L	6	4.7
Calcium mg/100 ml	14	9.3
Protein g/dl	7.5	6.5
Sodium mEq/L	155	150
Glucose mg/100 ml	70	85

Additional endocrinal & hematological tests explained an elevation in the value of

both antidiuretic hormone & melatonin hormone. While the levels of both

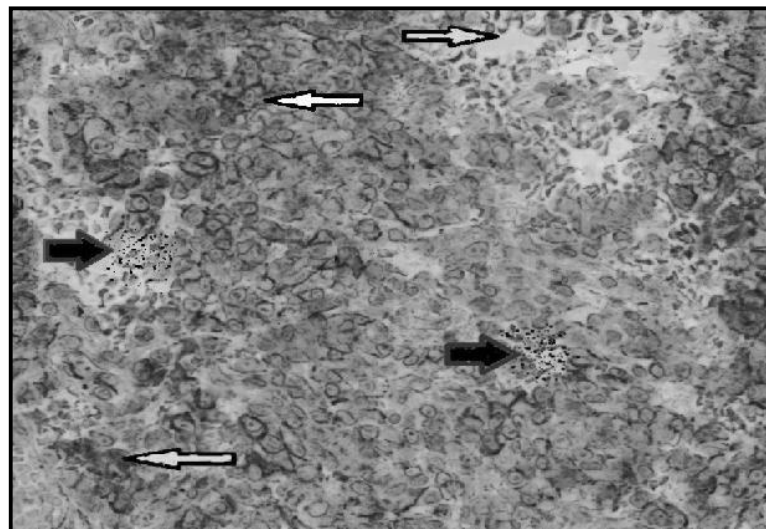
basophils and neutrophils showed an increase at a time anemia case had been presented here. Look table number 3.

Table-2: the cat's blood parameters values that were affected by UV-B radiation

Parameter	Investigated value	Normal value
ADH pmol/L	8	5
Melatonin pg/ml	22	17
Basophil $\times 10^3/cc$	3	Rare
Neutrophil $\times 10^3/cc$	15	10
RBCs $\times 10^6/cc$	3	7

Histologically, the sections of the selected injured skin showed abnormal spaces correlated with interference some parts of both the dermis and epidermis. Melanocytes in nests (nodular melanocarcinoma) seem abnormal with hyperchromic pleomorphic nuclei. Melanocyte inverted to being tumor cell

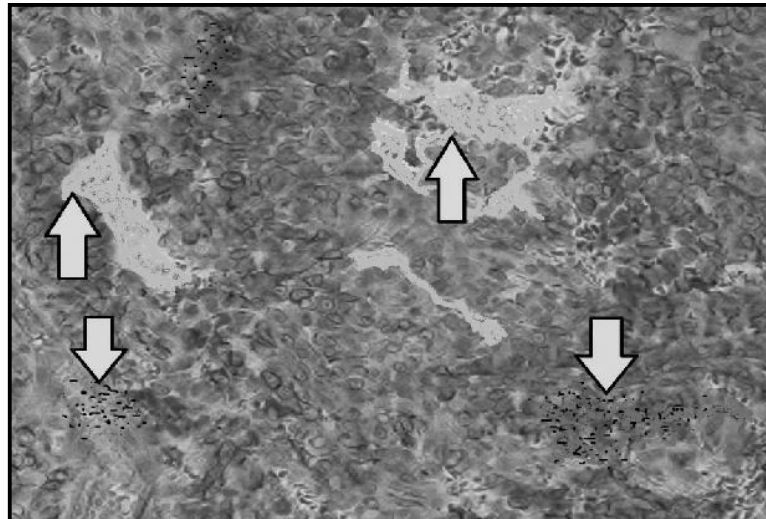
like a spindle shape and had large sized nuclei. Melanophages and epitheloid cells were presented deeper between other parts of the section where the last one had an abundant pink cytoplasm. See plate number one. Look down to the plate 1 and 2.



picture-1: malignant melanoma of a cat skin explains the massing of naevus cells and complexes of abnormal melanocytes (left side thick small arrow), variable membrane expression (right side thick big arrows), and abnormal spaces looked (right side thick small arrows). 150 x H-E stain.

By using two different stains as a new version in the scientific research, may be

shows the hidden structures or confirms the founded ones.



Picture-2: malignant melanoma of a cat skin explain the cell debris (downward arrow) and the abnormal spaces (upward arrows) 200 x Van Gieson stain.

The clinical investigations of the sick cats including auscultation events and respiratory rates resulted in a raised readings when comparing with the normal ones. So the registered number of heart beats reached 136 be. /minute (normal is 120 be. /minute), while the times of breaths calculated to appear about 31 br. /minute (normal is 26 br. /minute).

Discussion:

UV-B frequencies comprised the most dangerous ones for their ability to

Clinically, the main description of the injured sites is the asymmetrical skin lesion, which have had irregular borders and undistinguished different colors were been noticed. Mole's diameters were greater than 5 mm that were raised slightly above the skin surface.

penetrates the skin and caused complete destroying for its tissues. This action of UV-B radiation light can causing skin cancer by exciting DNA molecules in the

skin cells by forming covalent bonds between adjacent thymine bases in order to producing thymidine dimers accordingly. These dimers don't ordered in base pair type normally, which in turn can results in cancerous growth. This cancer connection is one reason for concern about ozone depletion and the ozone hole^(12, 16).

Acute UV irradiation of cat's skin causes a number of cellular and pathological changes including damaging DNA, cell cycle arrest, sunburn and hyperplasia. Apoptotic cells occurrence suggesting the UV induction of DNA breaking down⁽¹⁹⁾. We saw other types of changes represented with exudation of fluids outward the cells that's in turn causing shrinkage and protruding of the nuclei⁽³⁾.

Biochemically, the rapid insensible decreased serum glucose returned to the elevation of sweating rate and weakness which were correlated with cases of shakiness and nausea due to exposing to sun shock, this is leading to an increased heart pulse which in turn consume large amount of ATP to cover this condition. On the other hand, hunger due to dryness and careless was played an additional role in the depletion of sugar value in the body⁽⁶⁾.

Dehydration was considered the main factor which affects the elevation of

both protein and sodium levels. This situation can be interpreted as that dehydration making the body drain the protein stores as a metabolic substituted pathway to avoid the depletion of the water source from the body of the animal⁽⁷⁾. Sunburn in conjunction with hot hours of the summer (sometimes) played a major role in water loss through the cats skin which leads to the activation of urinary system physiology through prevention of losing water by retention sodium & potassium at higher rates in the blood, at a time that potassium amounts exceeded that's of sodium to offer a cofactor which blocks any probable changes may be occurred at this situation once and recoup declined sodium values other time⁽²⁾. In the same context of the increase, the malignancy tumor assist in 90% of the calcium ion elevation ratios due to the abnormal activity of some endocrinal glands during the crisis. While vitamin D excessive production play a minor role in those elevated due to it is metabolically stimulate several pathways of abnormal gland actions⁽²¹⁾.

Hematological increase of both basophiles and neutrophiles readings comes as a result of leukocytosis case occurred previously, so this elevation play an obvious role in the elevation of potassium ion values at the blood as a

result of the destroying some elements in the blood by those leukocytes. On the same turn, the increasing of basophiles ratios reflex the allergic action to combat the sun burning (UV irradiation), not to mention the tissue damaging eliciting both the hypersensitivity and inflammation reactions whom expressed about this elevation of both types of white blood cells⁽⁵⁾.

Accordingly, the physiological elevation of antidiuretics hormone readings accompanied with the effect of high readings of weather temperatures, in a way explained the biological role of this hormone which control the more lose of

water and fluids to kept the water equilibrium at its limits⁽¹⁴⁾. At the same time, melatonin elevation reflex its affection by the mutation happened due to the direct effect of UV-B irradiation, so this mutation controls the abnormal productions and secretions of those cells⁽¹⁸⁾.

Our explanation for this search study is that UV-b and other types of UV patterns irradiation observed to being leaded to the happened a scary conditions may be affects another creatures at the Mesopotamia other than cats by causing several dangerous malignant tumors one of them is the cutaneous melanoma.

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طروح فسلجية نسجية على المستوى البيئي-الحيوي المتقدم لتأثير الإشعاع فوق البنفسجي للشمس في تجلي الورم السحاميني في القطط غير المنزلية في الفرات الأوسط

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الخلاصة:

كشفت نتائج الدراسة الحالية بأن منطقة الفرات الأوسط شهدت تقلبات في ترددات الإشعاع فوق البنفسجي-ب الذي بلغت قيمته 200-280 نم، وذلك ما أدى الى إيجاد تلوث بيئي إشعاعي تسبب في إصابة القطط غير المؤواة في المنازل بالورم السحاميني. وعلى المستوى الفسيولوجي أدت هذه العلة الى حدوث تغير في مناسيب عشرة عوامل هي ضربات القلب، معدّل التنفس، هرمون مضاد الإبالة، السحامين، الكالسيوم، البوتاسيوم، الصوديوم، متفرقات كريات الدم البيض(العدلات والقعدات)، وفقر الدم، حيث كان مستوى هذا التغير ذو فروق معنوية من الناحية الإحصائية. من جانب آخر أظهرت المقاطع النسجية نوعاً من التلازن لبعض الخلايا الوحمة المصحوبة بانكماش الخلايا الملتهبة وتصلب نواتها.

ومن خلال البيانات المعطاة نستنتج أن التغيرات الواضحة في تردد الإشعاع فوق البنفسجي للشمس في منطقة الفرات الأوسط أدى الى حدوث مرض السرطان السحاميني بصورة واضحة في القطط غير المؤواة.

Zoology classification : QL671-699

كلمات مفتاحية: القطط، أشعة فوق بنفسجية-نوع باء، الورم السحاميني، الفرات الأوسط، فسيولوجيا الأنسجة.