2007-08

Paper II – Practical

(Exploitation of Patents – Drafting, Specification & Patent Writing)

Time: 2 ½ hours. **Full marks: 60**

INSTRUCTIONS TO CANDIDATES

The questions to be interpreted as given and no clarification can be sought from the invigilator.

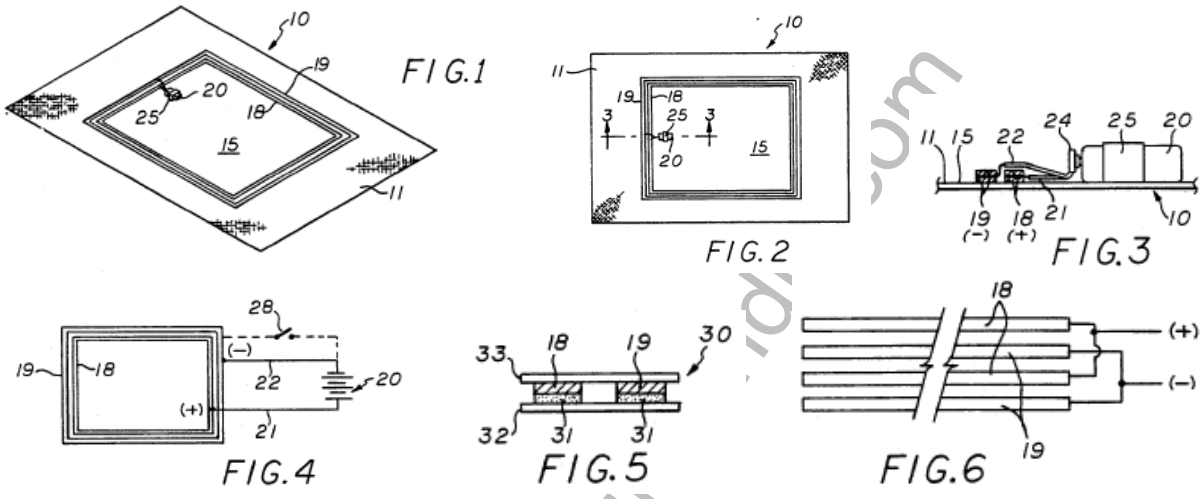
You are required to draft an US patent application with the following data and information. You are required to attempt either A or B (any one). Do not draw or attach figures

Question A)

This invention relates generally to electrical insect eradication devices, and more particularly to an electrified table cloth having insect repelling strips. Devices for the eradication of crawling insects through the use of electricity are known in the art. There are several patents which disclose various devices for the electrical eradication of insects. The present invention is distinguished over the prior art in general, and these patents in particular, by an electrified table cloth for preventing crawling insects from gaining access to the consumer's food or drink. The cloth is formed of electrically insulated material and has at least one pair of parallel electrically conductive strips secured to the edge or border of the cloth to completely encircle the cloth which are connected to a low voltage DC battery also secured to the cloth. The strips of electrical conductive material are spaced apart sufficiently to normally prevent completion of a circuit across the strips and for completion of a circuit across said strips through an insect's body as the insect attempts to traverse the strips when crawling across the edge of the cloth. The current passing through the insect's body is sufficient to produce a sensation which will discourage further travel across the edge of the cloth. A consumer who may contact the strips will usually not feel the current, and even if the consumer is wet, the current will produce only a slight tingling sensation. The electrical apparatus may also be provided in kit form to be installed on table cloths by the consumer.

DRAWINGS REFERENCES -
FIG. 1 is an isometric view of an electrified table cloth in accordance with the present invention.

FIG. 2 is a top plan view of an electrified table cloth in accordance with the present invention.
FIG. 3 is an enlarged detail of a portion of the electrified table cloth surface taken along Line 3--3 of FIG. 2 showing the electrical conductors installed thereon.
FIG. 4 is a schematic electrical diagram of the electrical circuitry of the electrified table cloth.
FIG. 5 is a greatly enlarged transverse cross section of the electrical strips in a peel and stick form.
FIG. 6 is a partial elevation of the electrical strips showing the electrical connection.



It is therefore an object of the present invention to provide an electrified table cloth which will effectively deter insects which attempt to crawl onto or across the cloth. It is another object of this invention to provide an electrified table cloth which will deter insects through the use of electricity, but is not harmful to consumers who may come into contact with the electrical conduits. Another object of this invention is to provide an electrified table cloth which utilizes electricity efficiently allowing the use of an inexpensive dry cell as the source of electrical power. Another object of this invention is to provide an electrified table cloth which includes spaced bands of electrodes surrounding the cloth and means for creating sufficient voltage across the electrodes only when an insect attempts to cross the electrodes by utilizing the insect's body as a conductor. Another object of this invention is to provide an electrified table cloth which operates continuously for long periods of time without care and maintenance. A further object of this invention is to provide an electrified table cloth which may be selectively activated to preserve the life of the battery. A still further object of this invention is to provide an electrified table cloth which is attractive in appearance, simple in design, inexpensive to manufacture, and rugged and durable in use.

The above noted objects and other objects of the invention are accomplished by an electrified table cloth for preventing crawling insects from gaining access to the consumer's food or drink. The cloth is formed of electrically insulated material and has at least one pair of parallel electrically conductive strips secured to the edges or border of the cloth to completely encircle the cloth which are connected to a low voltage DC battery also secured to the cloth. The strips

of electrical conductive material are spaced apart sufficiently to normally prevent completion of a circuit across the strips and for completion of a circuit across said strips through an insect's body as the insect attempts to traverse the strips when crawling across the edge of the cloth. The current passing through the insect's body is sufficient to produce a sensation which will discourage further travel across the edge of the cloth. A consumer who may come into contact with the strips will usually not feel the current, and even if the consumer is wet, the current will produce only a slight tingling sensation. The electrical apparatus may also be provided in kit form to be installed on table cloths by the consumer.
Referring to the drawings by numerals of reference, there is shown in FIGS. 1-3 an electrified table cloth 10 having a table cloth 11. The table cloth 10 represents a common table cloth shape used for supporting containers of food and/or drink.

The following description will utilize the electrified table cloth 10 of FIG. 1 for purposes of illustration. The electrified table cloth 10 is formed of suitable electrical insulating material, such as cloth or plastic. The cloth 11 has a surface 15 to support containers of food or drink.

A series of vertically spaced metallic strips 18 and 19 are secured to the surface of the table cloth 15 to encircle the cloth periphery near the outer edge. The strips 18 and 19 serve as electrical contacts. In the illustrated example, strip 18 represents the positive contact and strip 19 represents the negative contact. Electrical power is supplied to the strips by a low voltage DC battery 20. It has been found that a small 9 volt battery provides sufficient voltage for the intended purpose. Rechargeable batteries may also be used. For purposes of illustration, two strips are shown, but it should be understood that multiple strips may also be used, as shown in FIG. 6, wherein the alternating strips would be connected to one terminal of a battery and the interspaced strips connected to the other terminal of the battery.

The metallic strips 18 and 19 are formed of thin flexible electrical conductive material, such as aluminum foil or tin foil. The strips are connected to wires 21 and 22. The other ends of the wires are connected to a connector 24 which is releasably attached to the terminals of the battery 20.

A battery clip or elastic loop 25 may be secured on the surface of the cloth in a suitable location to releasably secure the battery 20 to the cloth. The wires 21 and 22 may also be secured to the surface of the table cloth 15 by suitable means, such as a strip of tape, to prevent them from becoming loosened or pulled from contact with the conductor strips 18 and 19.

The circuitry of the electrical system is shown in FIG. 4, and may include a switch 28 between the battery 20 and one of the conductors 18 or 19. The switch 28 allows the circuitry to be selectively activated when desired to preserve the life of the battery.

The metallic strips 18 and 19 are secured to the surface of the table cloth 15 by suitable means, such as adhesive, glue, or a suitable bonding agent. As shown in FIG. 5, the metallic strips may also be supplied in a peel and stick tape form 30 wherein the metallic strips 18 and 19 are provided with an adhesive backing 31. A strip of waxed paper 32 covers bottom of the tape to

protect the adhesive backing 31, and a top strip of paper 33 having a semi-tacky adhesive bottom surface covers the top surface of the metallic strips 18 and 19.

To apply the strips 18 and 19, the assembled tape form 30 is cut to the proper length. The waxed paper 32 is peeled off to expose the adhesive coating 31 and the metallic strips with the semi-tacky paper 33 still attached are applied to the outer edge of the cloth completely encircling it. The semi-tacky paper 33 keeps the parallel strips separated at the proper spacing during the application process. The ends of the metallic strips are overlapped on themselves, and the semi-tacky paper 33 is then removed to expose the outer surface of the metallic strips. As seen in FIG. 3, at one of the overlapped locations the unshielded ends of the wires 21 and 22 are placed on the top surface of the lower strip and are overlapped by the upper or overlapping strip to secure the wires therebetween and make a firm electrical connection. Glue, epoxy, or solder may also be used to further secure the wires to or between the conductive strips. The connector 24 is then connected to the battery terminals. If the circuitry contains a switch, it is turned on. The electrified cloth is then ready for operation. The electrical apparatus may also be provided in kit form to be installed on conventional cloths by the consumer.

As insects, such as roaches or ants, crawl onto the surface of the cloth, they will cross the conductor strips 18 and 19. When this occurs, the insect's body completes a circuit across the conductors. The current passing through the insect's body is sufficient to produce a sensation which will discourage further travel on the tablecloth. A consumer who may come into contact with the strips will usually not feel the current, and even if the consumer is wet, the current will produce only a slight tingling sensation.

While this invention has been described fully and completely with special emphasis upon a preferred embodiment, it should be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described herein.

Lapierre, U.S. Pat. No. 4,471,561 discloses a base sheet of electrical insulating material which will encircle a structure to be protected. Electrical contacts are embedded in the insulating base sheet except for limited exposed areas on the side of the sheet facing away from the structure. Power is supplied by a low voltage DC battery and converted to pulsating high voltage current at the electrodes by a transformer circuit. Shanahan et al, U.S. Pat. No. 4,165,577 discloses an electric baseboard trap for crawling insects. An elongated L-shaped base is mounted at the juncture of the wall and floor and has a well at the bottom. Electrical conductor strips are spaced apart on opposite sides of the well so that after an insect touches both conductors it will fall into the well. Makara, U.S. Pat. No. 3,077,050 discloses a combined ventilation and electrical screen. The screen is formed of perforated flexible insulating material and provided with transverse electrical conduits which are connected to a source of electrical power. Mahan U.S. Pat. No. 4,827,874 discloses an electrified pet dish for repelling insects.

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Question B)

An object cf the present invention is to provide two plant-derived high molecular weight substances which have potent anti-HIV activity. Another object of the present invention is to provide anti-HIV agents having as active components the above-mentioned high molecular weight substances. Still another object of the present invention is to provide a method for obtaining the high molecular weight anti-HIV substances from pine cones.

The anti-HIV agents in the present invention are characterized in that said agents which contain alkaline-water extracts of various pine cones such as Pinus parviflora Sieb. et Zucc., especially high molecular weight anti-HIV substances of this extract. The high molecular weight anti-HIV substances described above can be obtained by extraction of the pine cone with alkaline water.

Other objects and characteristics of the invention will become apparent from further disclosure of the invention to be made in the following detailed description of preferred embodiment, with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows dose-dependent inhibition by KS-7 of viral production in CEM cells chronically infected with HIV.

FIG. 2 shows time course of inhibition by KS-7 of viral replication in CEM cells chronically infected with HIV.

FIG. 3 shows effect of KS-6 added just after the HIV infection.

FIG. 4 shows effect of pretreatment wIth KS-6 or KS-7 on HIV replication.
Pine cones of various Pine trees such as Pinus parviflora Sieb. et Zucc., Pinus densiflora Sieb. et Zucc., and Pinus thunbergii Parl., can be used for the preparation of anti-HIV substances. It is preferable to use Pinus parviflora Sieb. et Zucc. due to an of active substances. Pine cones collected at summer season are enriched in floating fatty materials, which might disturb further purification. Therefore the pine cones should be collected in October when active substances accumulate in abundance.

The substances with a certain extent of activity can be extracted from pine cone by hot water extraction. However alkaline water extraction is more effective than hot water extraction to obtain larger amounts of the active substances the pine cone. Either alkaline extracts or further fractionated materials can be used as effective anti-HIV substances. The present inventors presumed that substances which are contained in this extract and used as active ingredients are high molecular weight substances. The most potent substances were named as KS-6 and KS-7.

Alkaline water extracts used in this invention can be prepared by directly extracting a pine cone

with aqueous alkaline solution such as aqueous NaOH. It is preferable, however, to obtain alkaline water extracts from a pine cone in which oils and hot-water extractable materials have been removed by extensive alcohol and boiling water washing before alkaline water extraction.

Either organic bases or inorganic bases can be used as alkaline substances for extraction media. The pH in aqueous alkaline solution is preferable to be more than 8.0; most preferably pH being 9.0 to 13.0.

The extracted solution should be concentrated to desired concentration, if needed, neutralized with appropriate acid and then lyophilized to give appropriate concentrated solution or solid. These can be used as active components without further fractionation. Alternatively, the concentrate can be separated into precipitate and supernatant by some appropriate methods such as centrifugation. KS-6 can be obtained from precipitate by reextraction with alkaline water, and KS-7 from supernatant by ethanol precipitation.

PURIFICATION PROCEDURE OF KS-6 AND KS-7

500g of pine cones was washed succesively, twice with about 5 liters of methanol, and twice with 85% ethanol for 4 hours with reflux, and then extracted for 6 hours, 3 times with boiling water. The residue was extracted twice with 5 liters of 1% sodium hydroxide aqueous solution for 6 hours at room temperature. After removal of insoluble materials by filtration through gauze, the pH of the filtrate was adjusted to 5.0 with acetic acid. The precipitate was collected by centrifugation for 20 minutes at 10000 xg at 4.degree. C., dissolved in a small volume of 1% sodium hydroxide aqueous solution, centrifuged to remove insoluble materials and the supernatant was neutralized with acetic acid. The obtained substance is KS-6. The remaining supernatant was precipitated with one volume of ethanol to obtain KS-7. both KS-6 and KS-7 were dialyzed against distilled water and lyophilized. Yield of these substances KS-6 and KS-7 was about 0.5% and 1%, respectively.

ANALYTICAL PROCEDURES

Neutral sugar composition was analyzed by gas-liquid chromatography of trimethylsilyl derivatives of methyl glucosides obtained by methanalysis in methanolic HC1 for 16 hours at 65.degree. C. Neutral sugar content was also determined by the phenol-sulfuric acid method. Uronic acids were analyzed by gas-liquid chromatography of trimethylsilyl derivatives after their conversion to aldonolactone. Uronic acids content was determined by the carbazoIe method. Carbon, hydrogen, nitrogen and sulfur content was determined by element analyzer.

ENDOTOXIN ASSAY

The presence of endotoxin was determined by the Endospecy (Endotoxin Specific Test, Seikagaku Kogyo, Ltd., Japan) with Escherichia coli 0111:B4 endotoxin as a standard.

HIV INFECTION TO T CELL

The CEM cell used was a T cell line derived from human leukemia patient. The virus used was HIV N.Y. strain.

CEM cells were infected by addition with HIV-carrying culture medium. Infectivity of the virus released into the culture medium was assayed with reverse transcriptase (RT) activity and p24 antigen capture method.

KS-6 has a dark brownIsh color, with an absorption shoulder at 260-280 nm. It easily dissolves in water, and mixtures of water and alcohol, or acetone. It contains carbon (43.2wt %), hydrogen (4.0wt %), nitrogen (2.6wt %) and no sulfur. KS-6 contains also neutral sugars (11.0wt %) consisting of fucose (9.4mol %), mannnose (19.0mol %), galactose (44.7mol %) and glucose (26.9mol %), and a negligible amount of uronic acid (1.7wt %). The molecular weight determined by gel filtration under alkaline condition was 10 kD.

KS-7 also has brownish color, with an absorption shoulder at 260-280 nm. It easily dissolves in water, but tends to precipitate in physiological saline and the mixtures of water and alcohol, or acetone. It has carbon (33.55wt %), hydrogen (4.23wt %), and undetectable amount of nitrogen and sulfur. KS-7 contains also neutral sugars (39.5wt %) consisting of arabinose (16.5mol %), mannose (16.2mol %), galactose (39.3mol %) and glucose (26.0 mol %), and abundant uronic acid (58.2wt %). The contamination of endotoxin was around 0.0025%. The molecular weight determined by gel filtration under alkaline condition was 10-200 kD.

ANTI-HIV ACTIVITY OF KS-6AND KS-7

1. Effect of KS-7 on chronic HIV infection -- A clone of the CEM T cell line was cultured for long period with HIV at low virus infection ratio. The chronically infected cells were incubated for 1 week with various concentration of KS-7 (0-350 .mu.g/ml). At various time points thereafter HIV production in culture supernatants was measured by RT method. As shown in FIG. 1, HIV replication was reduced by 66% by addition of KS-7 at concentration of as low as 7 .mu.g/ml. KS-7, at concentration of more than 70 .mu.g/ml, inhihIt HIV replication by more than 85%. Viability of CEM cells was not affected by treatment with 70 .mu.g/ml of KS-7. A similar degree of inhibition of HIV replication was observed in cells treated with 200 .mu.g/ml suramine, a potent inhibitor of retrovial RT. However, this concentration of suramine reduced the viability of CEM cells to 78%. The

time course of the inhibition of HIV replication by KS-7 was next investigated. The chronically infected CEM cells were treated with 50 pg/ml or 100 .mu.g/ml KS-7 for 5, 7, 10, or 17 days and the viral RT activity recovered from the culture supernatant was determined as shown in FIG. 2. RT activity found in supernatants of the treated cells was at any time points inhibited by about 90%. This indicates that KS-7 inhibit viral production. It should be noted that the cells were diluted 1:5 and supplemented with fresh medium containing KS-7 at the time indicated by arrows, and the RT activity (ordinate) was plotted in log scale in FIG. 2.

2. Effect of KS-6 on acute HIV infection -- Next, the ability of KS-6 to inhibit virus replication in acute infection with HIV was investigated. The CEM cells were infected with HIV at high virus concentration. After viral adsorption, the cells were washed 3 times with medium and maintained at 5.times.10.sup.5 cells/ml in medium supplemented with various concentrations of KS-6 (ranged from 0-30.mu.g/ml). After incubation for 3 to 7 days, concentration of HIV p24 antigen in the culture supernatants was determined by a commercially available p24 antigen capture assay (Abbot's Lab.). As shown in FIG. 3, the antiviral activity was induced by KS-6 at more than 0.3 .mu.g/ml. Higher concentration of KS-6 ("3 pg/ml" or "30 .mu.g/ml") inhibited HIV replication by 50% and 88%, respectively. The viability of CEM cells was not significantly affected at any of these concentrations.
3. Effect of CEM cell pretreatment by KS- 6 or KS-7 -- It was Investigated whether pretreatment of CEM cells with KS-6 or KS-7 could enhance the inhibition of HIV replication. CEM cells were Pretreated for 1 or 7 days with various concentrations of KS-6 (0.3-30 .mu.g/ml) or KS-7 (3-100 .mu.g/ml). After washing, the cells were infected with HIV virus at high virus concentration, and maintained in medium containing the same concentrations of KS-6 or KS-7 used in pretreatment. After 5 days incubation, the concentratIon of p24 in culture supernatant was determined by p24 antigen capture method. As seen in FIG. 4, a reduction of viral titer was observed in CEM cell cultures pretreated with 0.3 .mu.g/ml of KS-6. An 80-95% reduction of HIV replication was attained by KS-6 at the concentrations of 3 and 30 .mu.g/ml, respectively. 1n contrast, antiviral activity of KS-7 was slightly weaker than that of KS-6. The anti-HIV activity of KS-7 was detected at more than 10 .mu.g/ml, and 95% inhibition of HIV replication was achieved by KS-7 at 30-100 .mu.g/ml.

The present data demonstrate that antitumor substances KS-6 and KS-7, prepared from alkaline water extracts of pine cone effectively inhibit HIV replication, and the antivial activity of these agents is augumented by pretreatment of the target cells with these agents before HIV infection. A distinguishing feature of human immunodeficiency virus (HIV) is its selective cytotoxicity for helper T lymphocytes. Infection in vivo is manifested by severe and diverse

abberations of immune system and causes death. As descrived above, KS-6 and KS-7 of the present invention have potent anti-HIV activity, as well as their immunopotentiating activity manifested by activation of human peripheral blood monocytes and polymorphonuclear cells. Therefore, it is highly probable that these agents might improve the condition of AIDS patients and its effect might be augumented by combinational treatment with other chemotherapeutic agents (e.g. azido-thymidine, dideoxycytidine, suramine).

The present invention relates to plant-derived high molecular weight substances which have potent anti-HIV activity. The human immunodeficiency virus (HIV) is the causative agent associated with AIDS (acquired immune deficiency syndrome), ARC (AIDS-related complex) and related diseases. A distinguishing feature of HIV is its selective cytotoxicity for helper T lymphocytes. Severe and diverse aberrations of the immune system significantly reduce the host defense against various opportunistic infections, resulting finally in a host death.

Nowadays, many anti-HIV agents including Krestin and Lentinan have been isolated from plants and chemically synthesized. However, the effect of most of these agents are generally weak and they have severe side effects.

In order to explore new type of anti-HIV substance, the present inventors have compared the anti-HIV activity of various plant components. The present inventors have found potent anti-HIV activity in the antitumor substances obtained from aqueous alkaline extract of pine cone. The substances with the most potent anti-HIV activity was named as KS-6 and KS-7.

(**Figure 1/1)**

FIG. 1

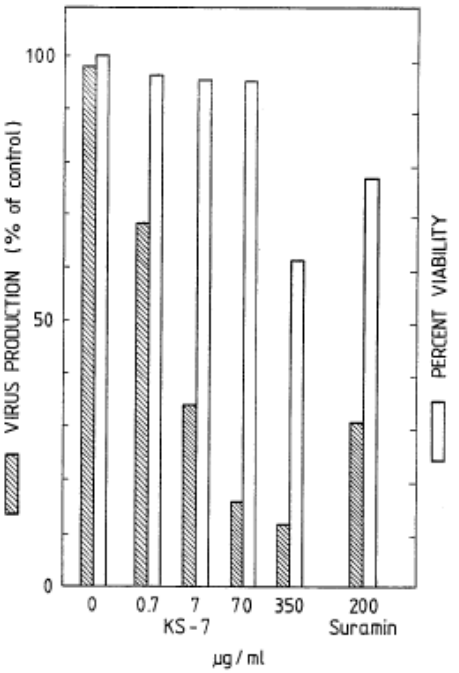

FIG. 2

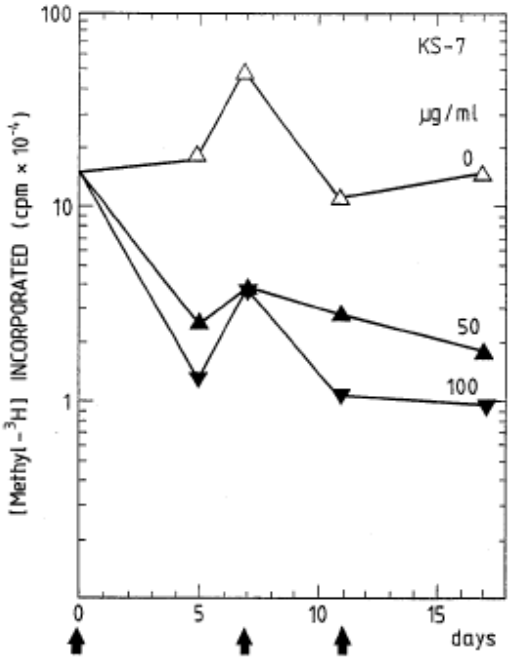

FIG. 3

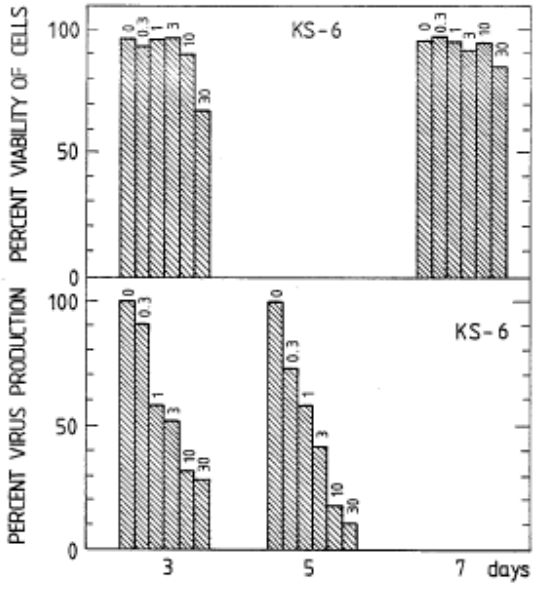

FIG. 4