



# SCI Day of Science and Careers

## Being a patent attorney

Darren Smyth

Partner, EIP

[dsmyth@eip.com](mailto:dsmyth@eip.com)



**What is a patent attorney?**



## **A patent attorney is**

- A lawyer
- Specialised in the legal protection of inventions
- Mostly obtaining protection
  - Drafting patent applications
  - Arguing with patent offices
- Also advising on rights, eg licensing, freedom to operate
- And enforcement of rights, eg litigation



## You get to work with

- Inventors and research teams
- Commercial and marketing teams
- Patent attorneys in other countries
- Patent examiners at UK and European Patent Offices
- Other lawyers (solicitors, barristers)



**What do you need?**



## Essential and desirable qualifications

- A science or engineering degree
- Further degree is optional, but not unusual
- Proficiency at written English
- Foreign languages an asset
- Attention to detail
- Good communication and analytical skills



## Qualification route

- Must be done under supervision of patent attorney (patent attorney firm or in-house department)
- First level exams – Patent Examination Board or University course (Queen Mary, Bournemouth, Brunel)
- Final UK exams
- Two sets of exams for qualification before European Patent Office – exam and “pre-exam”
- Expect to take 4 to 6 years
- Involves large amount of private study and for many their first experience of exam failure



**Not all patents are complicated**





**United States Patent**

[15] **3,699,222**

Isaacs et al.

[45] **Oct. 17, 1972**

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[54] **PRODUCTION OF VIRAL  
INTERFERING SUBSTANCES**

[58] **Field of Search.....424/85**

**What is claimed is:**

- 1. Interferon.**
- 2. Human interferon.**
- 3. Monkey interferon.**
- 4. Chick interferon.**



# United States Patent Office

2,699,054

Patented Jan. 11, 1955

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What is claimed is:

1. A compound chosen from the group consisting of tetracycline, the mineral acid salts of tetracycline, the alkali metal salts of tetracycline and the alkaline earth metal salts of tetracycline.
2. Tetracycline.
3. Mineral acid salts of tetracycline.
4. Alkali metal salts of tetracycline.
5. Alkaline earth metal salts of tetracycline.
6. Tetracycline hydrochloride.



# UNITED STATES PATENT OFFICE

2,230,654

**TETRAFLUOROETHYLENE POLYMERS**

I claim:

1. Polymerized tetrafluoroethylene.
2. The process of polymerizing tetrafluoroethylene which comprises subjecting it to super-atmospheric pressure.
3. The process of polymerizing tetrafluoroethylene which comprises subjecting it to super-atmospheric pressure in the presence of a catalyst.



# United States Patent Office

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3,156,523

Patented Nov. 10, 1964

What is claimed is:

1. Element 95.
2. The isotope of element 95 having the mass number 241.
3. The isotope of element 95 having the mass number 242.

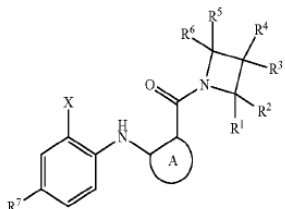


**But often they are...**



We claim:

1. A compound of formula I:



or a pharmaceutically acceptable salt or solvate, thereof, wherein A, X, R<sup>1</sup>, R<sup>2</sup>, R<sup>3</sup>, R<sup>4</sup>, R<sup>5</sup>, R<sup>6</sup>, and R<sup>7</sup> are as defined in Group A, Group B, Group C, or Group D:

Group A:

A is arylene optionally substituted with one, two, three or four groups selected from R<sup>10</sup>, R<sup>12</sup>, R<sup>14</sup>, R<sup>16</sup>, and R<sup>19</sup> where R<sup>10</sup>, R<sup>12</sup>, R<sup>14</sup> and R<sup>16</sup> are independently hydrogen, alkyl, alkenyl, alkynyl, halo, haloalkoxy, hydroxy, alkoxy, amino, alkylamino, dialkylamino, haloalkyl, —NHS(O)<sub>2</sub>R<sup>8</sup>, —CN, —C(O)R<sup>8</sup>, —C(O)OR<sup>8</sup>, —C(O)NR<sup>8</sup>R<sup>8</sup>, —NR<sup>8</sup>C(O)R<sup>8</sup>, and —NR<sup>8</sup>C(O)R<sup>8</sup> and where R<sup>19</sup> is hydrogen, alkyl, or alkenyl;

X is alkyl, halo, haloalkyl, or haloalkoxy;

R<sup>1</sup>, R<sup>2</sup>, R<sup>3</sup>, R<sup>4</sup>, R<sup>5</sup> and R<sup>6</sup> are independently hydrogen, halo, nitro, —NR<sup>8</sup>R<sup>8</sup>, —OR<sup>8</sup>, —NHS(O)<sub>2</sub>R<sup>8</sup>, —CN, —S(O)<sub>m</sub>R<sup>8</sup>, —S(O)<sub>2</sub>NR<sup>8</sup>R<sup>8</sup>, —C(O)R<sup>8</sup>, —C(O)OR<sup>8</sup>, —C(O)NR<sup>8</sup>R<sup>8</sup>, —NR<sup>8</sup>C(O)OR<sup>8</sup>, —NR<sup>8</sup>C(O)NR<sup>8</sup>R<sup>8</sup>, —NR<sup>8</sup>C(O)OR<sup>8</sup>, —NR<sup>8</sup>C(O)R<sup>8</sup>, —CH<sub>2</sub>N(R<sup>25</sup>)(NR<sup>25a</sup>R<sup>25b</sup>), —CH<sub>2</sub>NR<sup>25</sup>C(=NH)(NR<sup>25a</sup>R<sup>25b</sup>), —CH<sub>2</sub>NR<sup>25</sup>C(=NH)(N(R<sup>25a</sup>)(NO<sub>2</sub>)), —CH<sub>2</sub>NR<sup>25</sup>C(=NH)(N(R<sup>25a</sup>)(CN)), —CH<sub>2</sub>NR<sup>25</sup>C(=NH)(R<sup>25</sup>), —CH<sub>2</sub>NR<sup>25</sup>C(NR<sup>25a</sup>R<sup>25b</sup>)=CH(NO<sub>2</sub>), alkyl, alkenyl, alkynyl, cycloalkyl, heteroaryl, or heterocycloalkyl; where the alkyl, alkenyl, alkynyl, cycloalkyl, heteroaryl, and heterocycloalkyl are independently optionally substituted with one, two, three, four, five, six or seven groups independently selected from halo, alkyl, haloalkyl, nitro, optionally substituted cycloalkyl, optionally substituted heterocycloalkyl, optionally substituted aryl, optionally substituted arylalkyl, optionally substituted heteroaryl, —OR<sup>8</sup>, —NR<sup>8</sup>R<sup>8</sup>, —NR<sup>8</sup>S(O)<sub>2</sub>R<sup>8</sup>, —CN, —S(O)<sub>m</sub>R<sup>8</sup>, —C(O)R<sup>8</sup>, —C(O)OR<sup>8</sup>, —C(O)NR<sup>8</sup>R<sup>8</sup>, —NR<sup>8</sup>C(O)NR<sup>8</sup>R<sup>8</sup>, —NR<sup>8</sup>C(O)R<sup>8</sup>, —NR<sup>8</sup>C(O)OR<sup>8</sup> and —NR<sup>8</sup>C(O)R<sup>8</sup>; or one of R<sup>1</sup> and R<sup>2</sup> together with the carbon to which they are attached, R<sup>3</sup> and R<sup>4</sup> together with the carbon to which they are attached, and R<sup>5</sup> and R<sup>6</sup> together with the carbon to which they are attached form C(O) or C(=NOH);

m is 0, 1, or 2;

R<sup>7</sup> is hydrogen, halo or alkyl;

R<sup>8</sup>, R<sup>8'</sup> and R<sup>8''</sup> are independently selected from hydrogen, hydroxy, optionally substituted alkoxy, alkyl, alkenyl, alkynyl, aryl, cycloalkyl, heteroaryl, and heterocycloalkyl; where the alkyl, alkenyl, alkynyl, aryl, cycloalkyl, heteroaryl, and heterocycloalkyl are independently optionally substituted with one, two, three,

four, or five groups independently selected from alkyl, halo, hydroxy, hydroxyalkyl, optionally substituted alkoxy, alkoxyalkyl, haloalkyl, carboxy, alkoxy carbonyl, alkenyloxycarbonyl, optionally substituted cycloalkyl, optionally substituted cycloalkyloxycarbonyl, optionally substituted aryl, optionally substituted aryloxy, optionally substituted aryloxy carbonyl, optionally substituted arylalkyl, optionally substituted arylalkyloxy, optionally substituted arylalkyloxycarbonyl, nitro, cyano, optionally substituted heterocycloalkyl, optionally substituted heteroaryl, —S(O)<sub>n</sub>R<sup>31</sup> (where n is 0, 1, or 2 and R<sup>31</sup> is optionally substituted alkyl, optionally substituted aryl, optionally substituted heterocycloalkyl, or optionally substituted heteroaryl), —NR<sup>34</sup>SO<sub>2</sub>R<sup>34a</sup> (where R<sup>34</sup> is hydrogen or alkyl and R<sup>34a</sup> is alkyl, alkenyl, cycloalkyl, aryl, heteroaryl, or heterocycloalkyl), —SO<sub>2</sub>NR<sup>35</sup>R<sup>35a</sup> (where R<sup>35</sup> is hydrogen or alkyl and R<sup>35a</sup> is alkyl, alkenyl, cycloalkyl, aryl, heteroaryl, or heterocycloalkyl), —NR<sup>32</sup>C(O)R<sup>32a</sup> (where R<sup>32</sup> is hydrogen or alkyl and R<sup>32a</sup> is alkyl, alkenyl, alkoxy, or cycloalkyl), —NR<sup>30</sup>R<sup>30'</sup> (where R<sup>30</sup> and R<sup>30'</sup> are independently hydrogen, alkyl, or hydroxyalkyl), and —C(O)NR<sup>33</sup>R<sup>33a</sup> (where R<sup>33</sup> is hydrogen or alkyl and R<sup>33a</sup> is alkyl, alkenyl, alkynyl, or cycloalkyl); and

R<sup>9</sup> is alkyl, alkenyl, alkynyl, aryl, cycloalkyl, heteroaryl, and heterocycloalkyl; where the alkyl, alkenyl, alkynyl, aryl, cycloalkyl, heteroaryl, and heterocycloalkyl are independently optionally substituted with one, two, three, four, or five groups selected from halo, hydroxy, alkyl, haloalkyl, haloalkoxy, amino, alkylamino, and dialkylamino;

Group B:

A is heteroarylene optionally substituted with one, two, three, or four groups selected from R<sup>10</sup>, R<sup>12</sup>, R<sup>14</sup>, R<sup>16</sup> and R<sup>19</sup> where R<sup>10</sup>, R<sup>12</sup>, R<sup>14</sup> and R<sup>16</sup> are independently hydrogen, alkyl, alkenyl, alkynyl, halo, haloalkoxy, hydroxy, alkoxy, cyano, amino, alkylamino, dialkylamino, haloalkyl, alkylsulfonylamino, alkylcarbonyl, alkylcarbonyl, alkoxy carbonyl, alkenyloxycarbonyl, aminocarbonyl, alkylaminocarbonyl, dialkylaminocarbonyl, or alkylcarbonylamino; where R<sup>19</sup> is hydrogen, alkyl, or alkenyl; and where each alkyl and alkenyl, either alone or as part of another group within R<sup>10</sup>, R<sup>12</sup>, R<sup>14</sup>, R<sup>16</sup>, and R<sup>19</sup>, is independently optionally substituted with halo, hydroxy, or alkoxy;

X is alkyl, halo, haloalkyl, or haloalkoxy;

R<sup>1</sup>, R<sup>2</sup>, R<sup>3</sup>, R<sup>4</sup>, R<sup>5</sup> and R<sup>6</sup> are independently hydrogen, halo, nitro, —NR<sup>8</sup>R<sup>8</sup>, —OR<sup>8</sup>, —NHS(O)<sub>2</sub>R<sup>8</sup>, —CN, —S(O)<sub>m</sub>R<sup>8</sup>, —S(O)<sub>2</sub>NR<sup>8</sup>R<sup>8</sup>, —C(O)R<sup>8</sup>, —C(O)OR<sup>8</sup>, —C(O)NR<sup>8</sup>R<sup>8</sup>, —NR<sup>8</sup>C(O)OR<sup>8</sup>, —NR<sup>8</sup>C(O)NR<sup>8</sup>R<sup>8</sup>, —NR<sup>8</sup>C(O)OR<sup>8</sup>, —NR<sup>8</sup>C(O)R<sup>8</sup>, —CH<sub>2</sub>N(R<sup>25</sup>)(NR<sup>25a</sup>R<sup>25b</sup>), —CH<sub>2</sub>NR<sup>25</sup>C(=NH)(NR<sup>25a</sup>R<sup>25b</sup>), —CH<sub>2</sub>NR<sup>25</sup>C(=NH)(N(R<sup>25a</sup>)(NO<sub>2</sub>)), —CH<sub>2</sub>NR<sup>25</sup>C(=NH)(N(R<sup>25a</sup>)(CN)), —CH<sub>2</sub>NR<sup>25</sup>C(=NH)(R<sup>25</sup>), —CH<sub>2</sub>NR<sup>25</sup>C(NR<sup>25a</sup>R<sup>25b</sup>)=CH(NO<sub>2</sub>), alkyl, alkenyl, alkynyl, cycloalkyl, heteroaryl, or heterocycloalkyl, where the alkyl, alkenyl, alkynyl, cycloalkyl, heteroaryl, and heterocycloalkyl are independently optionally substituted with one, two, three, four, five, six or seven groups independently selected from halo, alkyl,



haloalkyl, nitro, optionally substituted cycloalkyl, optionally substituted heterocycloalkyl, optionally substituted aryl, optionally substituted arylalkyl, optionally substituted heteroaryl,  $-\text{OR}^8$ ,  $-\text{NR}^8\text{R}^8$ ,  $-\text{NR}^8\text{S}(\text{O})_2\text{R}^9$ ,  $-\text{CN}$ ,  $-\text{S}(\text{O})_m\text{R}^9$ ,  $-\text{C}(\text{O})\text{R}^8$ ,  $-\text{C}(\text{O})\text{OR}^8$ ,  $-\text{C}(\text{O})\text{NR}^8\text{R}^8$ ,  $-\text{NR}^8\text{C}(\text{O})\text{NR}^8\text{R}^8$ ,  $-\text{NR}^8\text{C}(\text{O})\text{OR}^8$  and  $-\text{NR}^8\text{C}(\text{O})\text{R}^8$ ; or one of  $\text{R}^1$  and  $\text{R}^2$  together with the carbon to which they are attached,  $\text{R}^3$  and  $\text{R}^4$  together with the carbon to which they are attached, and  $\text{R}^5$  and  $\text{R}^6$  together with the carbon to which they are attached form  $\text{C}(\text{O})$  or  $\text{C}(=\text{NOH})$ ;

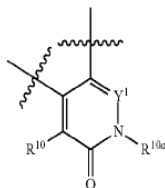
m is 1 or 2;

$\text{R}^7$  is hydrogen, halo or alkyl; and

$\text{R}^8$ ,  $\text{R}^9$  and  $\text{R}^{8'}$  are independently selected from hydrogen, hydroxy, optionally substituted alkoxy, alkyl, haloalkyl, alkenyl, alkynyl, aryl, cycloalkyl, heteroaryl, and heterocycloalkyl, where the alkyl, alkenyl, alkynyl, aryl, cycloalkyl, heteroaryl, and heterocycloalkyl are independently optionally substituted with one, two three, four, or five groups independently selected from alkyl, halo, hydroxy, hydroxyalkyl, optionally substituted alkoxy, alkoxyalkyl, haloalkyl, carboxy, carboxy ester, nitro, cyano,  $-\text{S}(\text{O})_n\text{R}^{31}$  (where n is 0, 1, or 2 and  $\text{R}^{31}$  is optionally substituted alkyl, optionally substituted aryl, optionally substituted cycloalkyl, optionally substituted heterocycloalkyl, or optionally substituted heteroaryl),  $-\text{NR}^{36}\text{S}(\text{O})_2\text{R}^{36a}$  (where  $\text{R}^{36}$  is hydrogen, alkyl, or alkenyl and  $\text{R}^{36a}$  is alkyl, alkenyl, optionally substituted aryl, optionally substituted cycloalkyl, optionally substituted heterocycloalkyl, or optionally substituted heteroaryl),  $-\text{S}(\text{O})_2\text{NR}^{37}\text{R}^{37a}$  (where  $\text{R}^{37}$  is hydrogen, alkyl, or alkenyl and  $\text{R}^{37a}$  is alkyl, alkenyl, optionally substituted aryl, optionally substituted cycloalkyl, optionally substituted heterocycloalkyl, or optionally substituted heteroaryl), optionally substituted cycloalkyl, optionally substituted heterocycloalkyl, optionally substituted arylalkyl, optionally substituted aryloxy, optionally substituted arylalkoxy, optionally substituted heteroaryl,  $-\text{NHC}(\text{O})\text{R}^{32}$  (where  $\text{R}^{32}$  is alkyl, alkenyl, alkoxy, or cycloalkyl) and  $-\text{NR}^{30}\text{R}^{30'}$  (where  $\text{R}^{30}$  and  $\text{R}^{30'}$  are independently hydrogen, alkyl, or hydroxyalkyl), and  $-\text{C}(\text{O})\text{NHR}^{33}$  (where  $\text{R}^{33}$  is alkyl, alkenyl, alkynyl, or cycloalkyl);

Group C:

A is



where  $\text{R}^{10}$  is hydrogen, alkyl, alkenyl, alkynyl, halo, haloalkoxy, hydroxy, alkoxy, amino, alkylamino, dialkylamino, haloalkyl,  $-\text{NHS}(\text{O})_2\text{R}^8$ ,  $-\text{CN}$ ,  $-\text{C}(\text{O})\text{R}^8$ ,  $-\text{C}(\text{O})\text{OR}^8$ ,  $-\text{C}(\text{O})\text{NR}^8\text{R}^8$  and  $\text{NR}^8\text{C}(\text{O})\text{R}^8$ ;

$\text{R}^{10a}$  is hydrogen, alkyl, or alkenyl;

$\text{Y}^1$  is  $-\text{CH}-$  or  $-\text{N}-$ ;

X is alkyl, halo, haloalkyl, or haloalkoxy;

$\text{R}^1$ ,  $\text{R}^2$ ,  $\text{R}^3$ ,  $\text{R}^4$ ,  $\text{R}^5$  and  $\text{R}^6$  are independently hydrogen, halo, nitro,  $-\text{NR}^8\text{R}^8$ ,  $-\text{OR}^8$ ,  $-\text{NHS}(\text{O})_2\text{R}^8$ ,  $-\text{CN}$ ,  $-\text{S}(\text{O})_m\text{R}^8$ ,  $-\text{S}(\text{O})_2\text{NR}^8\text{R}^8$ ,  $-\text{C}(\text{O})\text{R}^8$ ,  $-\text{C}(\text{O})\text{OR}^8$ ,  $-\text{C}(\text{O})\text{NR}^8\text{R}^8$ ,  $-\text{NR}^8\text{C}(\text{O})\text{OR}^8$ ,  $-\text{NR}^8\text{C}(\text{O})\text{NR}^8\text{R}^8$ ,  $-\text{NR}^8\text{C}(\text{O})\text{R}^8$ ,  $-\text{NR}^8\text{C}(\text{O})\text{R}^8$ ,  $-\text{CH}_2\text{N}(\text{R}^{25})\text{NR}^{25a}\text{R}^{25b}$ ,  $-\text{CH}_2\text{NR}^{25}\text{C}(=\text{NH})(\text{NR}^{25a}\text{R}^{25b})$ ,  $-\text{CH}_2\text{NR}^{25}\text{C}(=\text{NH})(\text{N}(\text{R}^{25a})(\text{NO}_2))$ ,  $-\text{CH}_2\text{NR}^{25}\text{C}(=\text{NH})(\text{N}(\text{R}^{25a})(\text{CN}))$ ,  $-\text{CH}_2\text{NR}^{25}\text{C}(=\text{NH})(\text{R}^{25})$ ,  $-\text{CH}_2\text{NR}^{25}\text{C}(\text{NR}^{25a}\text{R}^{25b})=\text{CH}(\text{NO}_2)$ , alkyl, alkenyl, alkynyl, cycloalkyl, heteroaryl, or heterocycloalkyl, where the alkyl, alkenyl, alkynyl, cycloalkyl, heteroaryl, and heterocycloalkyl are independently optionally substituted with one, two, three, four, five, six or seven groups independently selected from halo, alkyl, haloalkyl, nitro, optionally substituted cycloalkyl, optionally substituted heterocycloalkyl, optionally substituted aryl, optionally substituted arylalkyl, optionally substituted heteroaryl,  $-\text{OR}^8$ ,  $-\text{NR}^8\text{R}^8$ ,  $-\text{NR}^8\text{S}(\text{O})_2\text{R}^9$ ,  $-\text{CN}$ ,  $-\text{S}(\text{O})_m\text{R}^9$ ,  $-\text{C}(\text{O})\text{R}^8$ ,  $-\text{C}(\text{O})\text{OR}^8$ ,  $-\text{C}(\text{O})\text{NR}^8\text{R}^8$ ,  $-\text{NR}^8\text{C}(\text{O})\text{NR}^8\text{R}^8$ ,  $-\text{NR}^8\text{C}(\text{O})\text{OR}^8$  and  $-\text{NR}^8\text{C}(\text{O})\text{R}^8$ ; or one of  $\text{R}^1$  and  $\text{R}^2$  together with the carbon to which they are attached,  $\text{R}^3$  and  $\text{R}^4$  together with the carbon to which they are attached, and  $\text{R}^5$  and  $\text{R}^6$  together with the carbon to which they are attached form  $\text{C}(\text{O})$  or  $\text{C}(=\text{NOH})$ ;

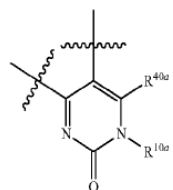
m is 1 or 2;

$\text{R}^7$  is hydrogen, halo or alkyl; and

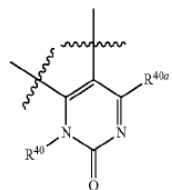
$\text{R}^8$ ,  $\text{R}^9$  and  $\text{R}^{8'}$  are independently selected from hydrogen, hydroxy, optionally substituted alkoxy, alkyl, haloalkyl, alkenyl, alkynyl, aryl, cycloalkyl, heteroaryl, and heterocycloalkyl, where the alkyl, alkenyl, alkynyl, aryl, cycloalkyl, heteroaryl, and heterocycloalkyl are independently optionally substituted with one, two three, four, or five groups independently selected from alkyl, halo, hydroxy, hydroxyalkyl, optionally substituted alkoxy, alkoxyalkyl, haloalkyl, carboxy, carboxy ester, nitro, cyano,  $-\text{S}(\text{O})_n\text{R}^{31}$  (where n is 0, 1, or 2 and  $\text{R}^{31}$  is optionally substituted alkyl, optionally substituted aryl, optionally substituted cycloalkyl, optionally substituted heterocycloalkyl, or optionally substituted heteroaryl),  $-\text{NR}^{36}\text{S}(\text{O})_2\text{R}^{36a}$  (where  $\text{R}^{36}$  is hydrogen, alkyl, or alkenyl and  $\text{R}^{36a}$  is alkyl, alkenyl, optionally substituted aryl, optionally substituted cycloalkyl, optionally substituted heterocycloalkyl, or optionally substituted heteroaryl),  $-\text{S}(\text{O})_2\text{NR}^{37}\text{R}^{37a}$  (where  $\text{R}^{37}$  is hydrogen, alkyl, or alkenyl and  $\text{R}^{37a}$  is alkyl, alkenyl, optionally substituted aryl, optionally substituted cycloalkyl, optionally substituted heterocycloalkyl, or optionally substituted heteroaryl), optionally substituted cycloalkyl, optionally substituted heterocycloalkyl, optionally substituted arylalkyl, optionally substituted aryloxy, optionally substituted arylalkoxy, optionally substituted heteroaryl,  $-\text{NHC}(\text{O})\text{R}^{32}$  (where  $\text{R}^{32}$  is alkyl, alkenyl, alkoxy, or cycloalkyl) and  $-\text{NR}^{30}\text{R}^{30'}$  (where  $\text{R}^{30}$  and  $\text{R}^{30'}$  are independently hydrogen, alkyl, or hydroxyalkyl), and  $-\text{C}(\text{O})\text{NHR}^{33}$  (where  $\text{R}^{33}$  is alkyl, alkenyl, alkynyl, or cycloalkyl); or



Group D:  
A is



or



(b)

(c)

$R^{40}$  and  $R^{40a}$  are independently hydrogen or alkyl;

X is alkyl, halo, haloalkyl, or haloalkoxy;

$R^1$ ,  $R^2$ ,  $R^3$ ,  $R^4$ ,  $R^5$  and  $R^6$  are independently hydrogen, halo, nitro,  $-\text{NR}^8\text{R}^8$ ,  $-\text{OR}^8$ ,  $-\text{NHS}(\text{O})_2\text{R}^8$ ,  $-\text{CN}$ ,  $-\text{S}(\text{O})_m\text{R}^8$ ,  $-\text{S}(\text{O})_2\text{NR}^8\text{R}^8$ ,  $-\text{C}(\text{O})\text{R}^8$ ,  $-\text{C}(\text{O})\text{OR}^8$ ,  $-\text{C}(\text{O})\text{NR}^8\text{R}^8$ ,  $-\text{NR}^8\text{C}(\text{O})\text{OR}^8$ ,  $-\text{NR}^8\text{C}(\text{O})\text{NR}^8\text{R}^8$ ,  $-\text{NR}^8\text{C}(\text{O})\text{OR}^8$ ,  $-\text{NR}^8\text{C}(\text{O})\text{R}^8$ ,  $-\text{CH}_2\text{N}(\text{R}^{25})$  ( $\text{NR}^{25a}\text{R}^{25b}$ ),  $-\text{CH}_2\text{NR}^{25}\text{C}(\text{=NH})(\text{NR}^{25a}\text{R}^{25b})$ ,  $-\text{CH}_2\text{NR}^{25}\text{C}(\text{=NH})(\text{N}(\text{R}^{25a})(\text{NO}_2))$ ,  $-\text{CH}_2\text{NR}^{25}\text{C}(\text{=NH})(\text{N}(\text{R}^{25a})(\text{CN}))$ ,  $-\text{CH}_2\text{NR}^{25}\text{C}(\text{=NH})(\text{R}^{25})$ ,  $-\text{CH}_2\text{NR}^{25}\text{C}(\text{NR}^{25a}\text{R}^{25b})=\text{CH}(\text{NO}_2)$ , alkyl, alkenyl, alkynyl, cycloalkyl, heteroaryl, or heterocycloalkyl, where the alkyl, alkenyl, alkynyl, cycloalkyl, heteroaryl, and heterocycloalkyl are independently optionally substituted with one, two, three, four, five, six or seven groups independently selected from halo, alkyl, haloalkyl, nitro, optionally substituted cycloalkyl, optionally substituted heterocycloalkyl, optionally substituted aryl, optionally substituted arylalkyl, optionally substituted heteroaryl,  $-\text{OR}^8$ ,  $-\text{NR}^8\text{R}^8$ ,  $-\text{NR}^8\text{S}(\text{O})_2\text{R}^9$ ,  $-\text{CN}$ ,  $-\text{S}(\text{O})_m\text{R}^9$ ,  $-\text{C}(\text{O})\text{R}^8$ ,  $-\text{C}(\text{O})\text{OR}^8$ ,  $-\text{C}(\text{O})\text{NR}^8\text{R}^8$ ,  $-\text{NR}^8\text{C}(\text{O})\text{NR}^8\text{R}^8$ ,  $-\text{NR}^8\text{C}(\text{O})\text{OR}^8$  and  $-\text{NR}^8\text{C}(\text{O})\text{R}^8$ ; or one of  $R^1$  and  $R^2$  together with the carbon to which they are attached,  $R^3$  and  $R^4$  together with the carbon to which they are attached, and  $R^5$  and  $R^6$  together with the carbon to which they are attached form  $\text{C}(\text{O})$  or  $\text{C}(\text{=NOH})$ ;

m is 1 or 2;

$R^7$  is hydrogen, halo or alkyl; and

$R^8$ ,  $R^{8'}$  and  $R_8$  are independently selected from hydrogen, hydroxy, optionally substituted alkoxy, alkyl, haloalkyl, alkenyl, alkynyl, aryl, cycloalkyl, heteroaryl, and heterocycloalkyl, where the alkyl, alkenyl, alkynyl, aryl, cycloalkyl, heteroaryl, and heterocycloalkyl are independently optionally substituted with one, two three, four, or five groups independently selected from alkyl, halo, hydroxy, hydroxyalkyl, optionally substituted alkoxy, alkoxyalkyl, haloalkyl, carboxy, carboxy ester, nitro, cyano,  $-\text{S}(\text{O})_n\text{R}^{31}$  (where n is 0, 1, or 2 and  $R^{31}$  is optionally substituted alkyl, optionally substituted

aryl, optionally substituted cycloalkyl, optionally substituted heterocycloalkyl, or optionally substituted heteroaryl),  $-\text{NR}^{36}\text{S}(\text{O})_2\text{R}^{36a}$  (where  $R^{36}$  is hydrogen, alkyl, or alkenyl and  $R^{36a}$  is alkyl, alkenyl, optionally substituted aryl, optionally substituted cycloalkyl, optionally substituted heterocycloalkyl, or optionally substituted heteroaryl),  $-\text{S}(\text{O})_2\text{NR}^{37}\text{R}^{37a}$  (where  $R^{37}$  is hydrogen, alkyl, or alkenyl and  $R^{37a}$  is alkyl, alkenyl, optionally substituted aryl, optionally substituted cycloalkyl, optionally substituted heterocycloalkyl, or optionally substituted heteroaryl), optionally substituted cycloalkyl, optionally substituted heterocycloalkyl, or optionally substituted heteroaryl), optionally substituted arylalkyl, optionally substituted aryloxy, optionally substituted arylalkyloxy, optionally substituted heteroaryl,  $-\text{NHC}(\text{O})\text{R}^{32}$  (where  $R^{32}$  is alkyl, alkenyl, alkoxy, or cycloalkyl) and  $-\text{NR}^{30}\text{R}^{30'}$  (where  $R^{30}$  and  $R^{30'}$  are independently hydrogen, alkyl, or hydroxyalkyl), and  $-\text{C}(\text{O})\text{NHR}^{33}$  (where  $R^{33}$  is alkyl, alkenyl, alkynyl, or cycloalkyl).





**Please ask questions**