Data Article

Data on substantial gravity of carbon dioxide due to pressured metered-dose inhaler steroid treatments for the 2006 year in Japan

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A R T I C L E   I N F O

Article history:
Received 11 March 2018
Accepted 23 August 2018
Available online 12 September 2018

Keywords:
HFA
HFC
ICS
pMDI
CO2
Greenhouse gas
Global warming
Montreal protocol
Kyoto Protocol

A B S T R A C T

People all over the world should work in each individual against global warming due to greenhouse gas that is made up of a majority of carbon dioxide. On the other hand chloro-fluoro-carbon (CFC) was used with pressured metered-dose inhaler steroid therapy, but CFC became banning the use because of ozone depleting substance. Hydrofluorocarbon (HFA134a, tetra-fluoro-methane) is used as alternative CFC until now. Less-famously hydro-fluo-carbon (HFA134a) have 1300-fold (mole ratio) energy of heat-trapping relative to carbon dioxide.

On an extremely localized story, we derived substantial gravity of carbon dioxide from sales total of pressured metered-dose inhaler (pMDI) steroid drugs for the year in Japan. The amount of total sales of inhaled corticosteroid drugs on annual 2006 year was 320 hundred-millions yen. 88 hundred-millions yen (27.4% for total ICS sales) was accounted for pressured metered-dose inhaler steroid. Now in Japan there are three kinds of pressured metered-dose inhaler steroid drugs which all use tetra-fluoro-methane (HFA134a). In fact total gravity of tetra-fluoro-methane (HFA134a) from pressured metered-dose inhaler steroid for annual 2006 year was 19.7 t and substantial gravity of carbon dioxide was 10.8 thousand ton. As total gravity of carbon dioxide production throughout the year in Japan was 13 hundred-million ton. Therefore substantial gravity of carbon dioxide by steroids pressured metered-dose inhaler was very small (0.001%)
compared to total carbon dioxide production in Japan. Until today carbon-dioxide reducing make very slow progress, for that reason medical service worker unexceptionally should exert an effort for carbon-dioxide reduction if only slightly through the daily clinical examination.

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### Specification table

| Subject area       | Chemistry |
|--------------------|-----------|
| More specific subject area | Global warming |
| Type of data       | Figures and table |
| How data was acquired | Interest in global warming, Drugs sales in Japan 2006, CHRONOLOGICAL SCIENTIFIC TABLES 2006 Japanese version |
| Data format        | Images |
| Experimental factors | N/A |
| Experimental features | N/A |
| Data source location | Japan |
| Data accessibility | The images are available with this article |

### Value of the data

- Unique and important data from new stand point.
- pMDI products substantial amount of CO2.
- The reason to select dry powder or solution of three ICS inhalation methods.
- Enlightenment of global warming.

### 1. Data

There are three kinds of method (electric nebulizer, dry powder and pMDI) for inhaled corticosteroid therapy. All of pMDIs need alternative CFC such as HFC (HFA) 134a that is not Ozone depleting substance but greenhouse gas. More over HFA134a has 1300 folds (mole ratio) efficacy of greenhouse gas compared with CO2. We examined carbon dioxide emissions due to extremely located pMDI from drug sales 2006 in japan. Total sales of ICS in 2006 japan was 3200 hundred million yen. Sales of pMDI consisted in 27.4% (BDP-pMDI; 19% and FP-pMDI; 8.4%). Substantial gravity of carbon dioxide due to only steroid pMDI was 10835 ton/year in Japan. Total gravity of carbon dioxide production throughout the year in Japan was 13 hundred-million ton. Therefore substantial gravity of carbon dioxide by steroids pMDI was very small (0.001%) compared to total carbon dioxide production in Japan. Until today carbon-dioxide reducing make very slow progress, for that reason medical service worker unexceptionally should exert an effort for carbon-dioxide reduction if only slightly through the daily clinical examination. New technique for pMDI is necessary for HFA (CO2) reduction.
2. Experimental design, materials and methods

2.1. Mechanism of global warning

Homeostasis of the Earth (Fig. 1.).

Fig. 1 shows Homeostasis of the Earth. As amount of 100 light energy light reach to the earth, in result amount 100 of heat energy converted from light energy release to the outside of the earth. But heat energy converted from light energy on the face earth reflex by atmosphere. Repeat heat energy release and reflex give us global warming (Homeostasis) for not only human being but also all live being. But in atmosphere CO2, methane gas, HCF become to increase, reflex of heat energy increase, finally temperature on face earth increase (global warming).

Red the arrows indicate light energy and the blue arrows indicate thermal energy (Fig. 1.). Light energy is exchanged to thermal energy on the face of the earth. A mainly part of light energy is reflect by atmosphere that is reflect by face of the earth. This repeat process keep thermal of the face of the earth called homeostasis. In atmosphere greenhouse gas such as CO2, HFC (Hydro-fluoro-carbon) and etc. are increased, temperature of the face on the earth is up those bring global warming and abnormal weather.

2.2. Montreal and Kyoto protocol, Greenhouse gas (Table 1)

On 1988 Montreal protocol decided to be inhibited Ozone depleting substance product such as CFC (Chloro-fluoro-carbon) (Fig. 2.). On 1997 Kyoto protocol decided to be inhibited Greenhouse gas such as HFA134a (Hydro-fluoro-alkane) or HFC (Hydro-fluoro-carbon) 134a until 2030 (Fig. 2.). HFC134a and HFA134a are same substances of 1, 1, 1, 2-tetrafluoroethane. There are various kinds of greenhouse gas HFA134a belongs to greenhouse gas (Table 1). The amount of HFA134a using pMDI is very few dose but cannot be ignored dose.
2.3. 2006 Current ICS drugs (Table 2)

By big classification there are three kinds of ICS. Only pMDI needs HFA134a. In 2006 pMDI there are 7 kinds of pMDI (Table 2), BDP (50, 100 μg/puff) (Dainippon Sumitomo Pharma Co., Ltd), FP (50, 100 μg/puff) (GlaxoSmithKline K.K) and Ciclesonide (50, 100, 200 μg/puff) (TEIJIN PHARMA LIMITED).

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**Table 1**

Greenhouse gas (GHG).

| Substance               | Use                          | Ozone depleting index | Global warming index |
|-------------------------|------------------------------|-----------------------|----------------------|
| Ozone depleting substance |                             |                       |                      |
| CFC                     | Refrigerator, air con,       | 0.6–1.0               | 4600–14,000          |
|                         | Insulation                   | (CFC12: 1.0)          | (CFC12: 10,600)     |
| HCFC                    | Refrigerator, air con,       | 0.001–0.52            | 120–2400             |
|                         | Insulation                   | (HCFC22: 0.055)       | (HFCFC22: 1700)     |
| Halon                   | Extinguishing                | 3.0–10.0              |                      |
| Alternatives for chlorofluorocarbon |                     |                       |                      |
| HFC                     | Refrigerator, Air con,       | 0                     | 140–11,700           |
|                         | pMDI                         |                       | (HFC134a: 1300)     |
| PFC                     | Cleaning agent,              | 0                     | 6500–9200            |
|                         | Semiconductor                |                       | 6500                 |
| SF6                     | Electric insulating,         | 0                     | 23,900               |
|                         | Semiconductor                |                       |                      |

CFC: Chlorofluorocarbon, HCFC: Hydrochlorofluorocarbon, HFC: Hydrofluorocarbon, PFC: Perfluorocarbon, SF6: Sulfur hexafluoride.

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2.4. Contents of pMDI (Table 3)

Each can of pMDI includes HFA134a, BDP (50, 100 μg/puff): 7.8 g/can, FP (50 μg/puff): 10.6 g/can, FP (100 μg/puff): 7.0 g/can, Ciclesonide (50, 100 μg/puff): 5.9 g/can, Ciclesonide (200 μg/puff): 3.0 g respectively.

| pMDI (Contents) | BDP (50, 100 μg/puff) Dainippon Sumitomo Pharma Co., Ltd | FP (50, 100 μg/puff) GlaxoSmithKline K.K. |
|-----------------|----------------------------------------------------------|------------------------------------------|
| Content WT      | HFA WT                                                   | Price/can (yen/can)                      |
| HFA WT/puff(mg) | Price/HFA1g (yen/g)                                     | HFA(mg)/MDI 200 μg                      |
| 50 μg/puff      | 8.7 g                                                    | 78                                       | 3023 | 388 | 312 |
| 100 μg/puff     | 8.7 g                                                    | 100                                      | 78   | 4024 | 516 | 156 |
| FP (HFA,FP)     | 10.6 g                                                   | 120                                      | 88   | 2367 | 223 | 353 |
| 50 μg/puff      | 7.0 g                                                    | 60                                       | 117  | 2378 | 340 | 233 |
| 100 μg/puff     | 6.6 g                                                    | 112                                      | 53   | 1814 | 307 | 210 |
| Ciclesonide (HFA, Ethanol, Ciclesonide) | 6.6 g | 5.9 g | 112 | 53 | 2380 | 403 | 105 |
| 50 μg/puff      | 3.3 g                                                    | 56                                       | 54   | 2380 | 403 | 54  |

2.5. Sale share of ICS (Fig. 3)

Total sales of 2006 ICS was 320 hundred million yen (Fig. 3). In it pMDI occupied 27.4% (BDP-pMDI: 19% and FP-pMDI: 8.4%) (Fig. 3). When we calculate the number of can, we selected high price of can on occasion (Table 3). Because from ICS sale data, on BDP-pMDI we could not distinguish 50 μg-can or 100 μg-can (Table 3).
2.6. **Substantial gravity of carbon dioxide**

Substantial gravity of carbon dioxide was calculated by below formula.

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\text{Substantial gravity of carbon dioxide} = \text{sum total (HFA gravity/can} \times \text{sale number of can} \times \text{CO2 molar weight/ HFA134a molar weight} \times 1300).
\]

2.7. **Substantial gravity of carbon dioxide (Table 4)**

Substantial gravity of carbon dioxide from BDP, FP and Ciclesonide were 6490, 4345 and 0 t respectively. Because Ciclesonide started to sale on 2006, there is no data of ciclesonide sale. Substantial gravity of carbon dioxide due to steroid pMDI was 10835 ton/2006 year in Japan (Table 4). Total gravity of carbon dioxide production throughout the year in Japan was 13 hundred-million ton. Therefore substantial gravity of carbon dioxide by steroids pMDI was very small (0.001%) compared to total carbon dioxide production in Japan. The amount is bigger than we expected. It is not until existence of warming gas by steroids pMDI for asthmatic treatment.

Until today carbon-dioxide reducing make very slow progress, for that reason medical service worker unexceptionally should exert an effort for carbon-dioxide reduction if only slightly through the daily clinical examination.

**Table 4**

|          | Amount of sales hundred million (yen) | Price of can (yen) | Quantity of can thousand | HFA weight (ton) | Carbon dioxide weight (ton) |
|----------|---------------------------------------|--------------------|--------------------------|-----------------|-----------------------------|
| BDP      | 60.8                                  | 4024               | 1510                     | 11.8            | 6490                        |
| FP       | 26.9                                  | 2378               | 1131                     | 7.9             | 4345                        |
| Total    | 87.7                                  | 2641               | 19.7                     | 10835           |

Total carbon dioxide weight due to HFA of pMDI for one year accounts approximately the weight of ten thousand compact auto car.
Acknowledgments

We hope all lives to be peace without global warming and war. War also must produce a lot of substantial CO2.

Transparency document. Supplementary material

Transparency document associated with this article can be found in the online version at http://dx.doi.org/10.1016/j.dib.2018.08.070.