

# Next-generation, mineral-oil-free adjuvant oils for animal vaccines



**Shell**  
**Ondina X**

**Shell Process Oils**





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## Are...

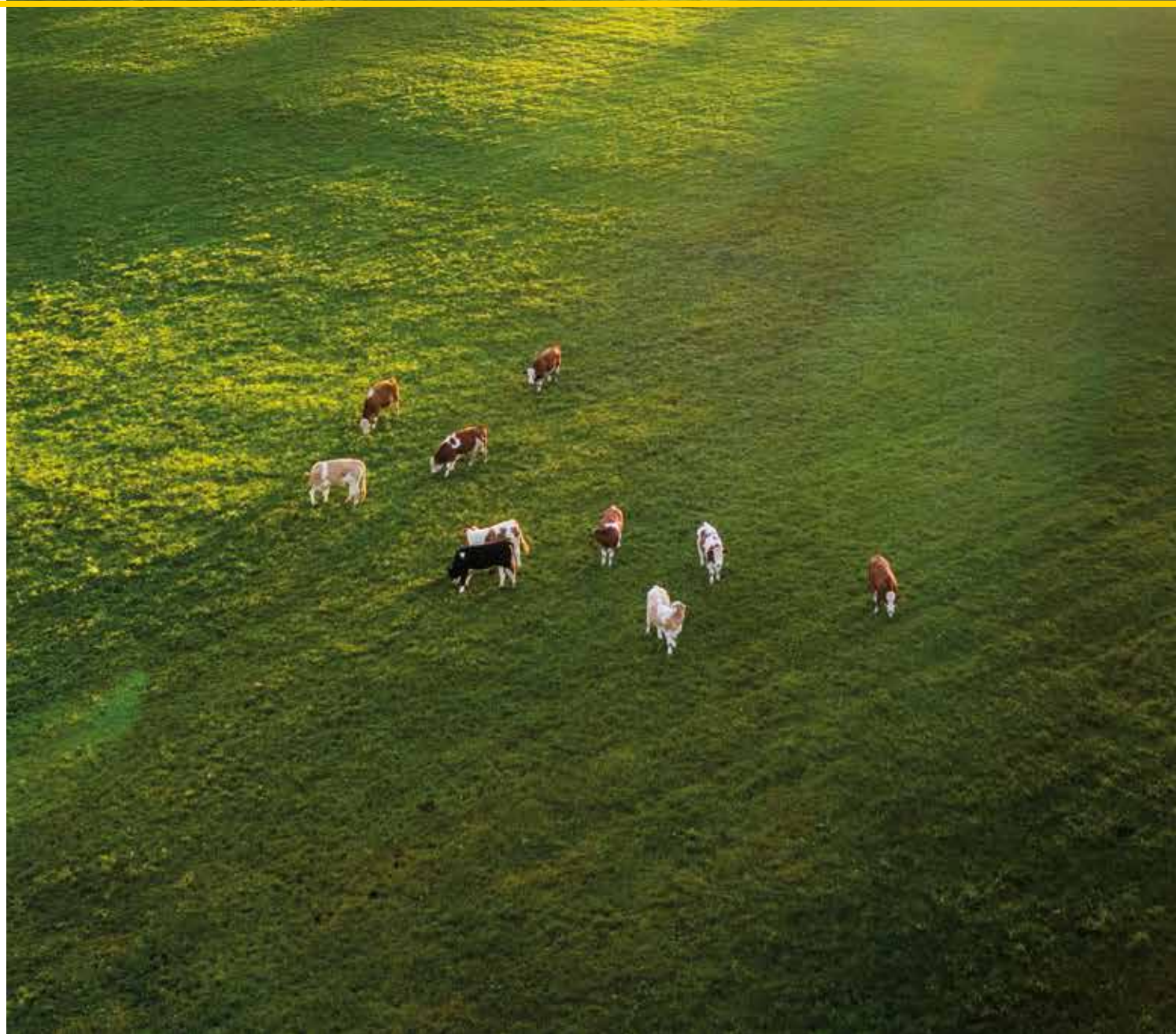
- ...your animal vaccines causing unwanted side effects?
- ...your animals experiencing unwanted tissue accumulations?
- ...you aiming to ensure consistent vaccine quality?
- ...you preparing for stricter vaccine purity regulations?
- ...you looking for a versatile adjuvant oil for research?
- ...you concerned about undesirable toxicological and ecotoxicological impacts?

**If yes, then try using Shell Ondina X adjuvant oils in your vaccine formulation.**

Shell Ondina X is a range of next-generation, synthetic, straight-cut, medicinal-grade oils with consistent quality that offer superior levels of safety. The range offers a good alternative to conventional adjuvant oils for formulating high-performance animal vaccines.

Produced from natural gas using Shell's proprietary Gas-To-Liquid (GTL) technology, Shell Ondina X adjuvant oils are mineral-oil-free with **unique paraffinic structures** that provide exceptional purity and offer the potential to improve animal vaccine efficacy <sup>[1, 2]</sup>.

With a range of viscosities, **narrow chain-length distribution** and associated average molecular weights, the Shell Ondina X range offers targeted choices for a variety of applications and animal species.



## Benefits

Shell Ondina X oils have numerous key benefits that make them smart alternative adjuvants to conventional mineral oils and other, non-mineral-based products such as squalane <sup>[3]</sup>.

### Safer for animals

Less injection pressure is required. These oils also show low systemic accumulation and rapid elimination <sup>[4]</sup>.

### Better versatility

Better for cold-climate applications, for example, high-latitude fisheries, where oils with better flowability are preferable, or when different permeability rates are required.

### Safer for humans and ecosystems

Shell Ondina X oils are metabolised as much as six times faster than conventional mineral oils in certain applications <sup>[4]</sup>. This lowers accumulation rates and reduces the risk of residual oil remaining in animal tissue and, thus, entering the human food chain <sup>[4]</sup>. It also reduces the risk of oil transferring into local ecosystems because of favourable biodegradation properties <sup>[5]</sup>.

### Scalable supply

The origin of Shell Ondina X oils is the Pearl GTL plant in Qatar, the largest facility in the world. We have GTL product storage hubs around the world in different regions including North America, the Middle East, Europe, Hong Kong, Singapore. This means that Shell can supply pharmaceutical-grade oils and support vaccine production even when demand is high.





## Features

With a well-defined chemical structure, Shell Ondina X adjuvant oils have an outstanding combination of chemical and physical properties such as exceptional purity, low viscosity, low accumulation rate and superior pour point performance, particularly in cold climates (Table 1).



### Superior safety

- Shell Ondina X oils are safer for:
- animals
  - humans
  - ecosystems.



### Exceptional purity

Shell Ondina X adjuvant oils are mineral-oil-free with unique paraffinic structures.



### Smart alternative

to conventional adjuvant oils for formulating high-performance animal vaccines.



### Outstanding properties

- Exceptional purity
- Well-defined chemical structure with narrow chain-length distribution.
- Low viscosity
- Lower accumulation rates

### Exceptional purity

- Shell Ondina X oils do not contain polycyclic aromatics or pristane, hopanes or steranes (biomarkers of mineral oil) [3].
- They are also virtually free of sulphur and nitrogen compounds. [7]

### Well-defined chemical structure

- Shell Ondina X oils have homogeneous, isoparaffinic chemical structures with narrow chain-length distributions. They do not contain the complex, plant-based hydrocarbon structures of conventional mineral oils (Figure 1) [7].

### Low viscosity

- At the same viscosity, Shell Ondina X oils have lower pour points, which gives them excellent performance at low temperatures.

### Lower accumulation rates

- Shell Ondina X oils are saturated, low-branched hydrocarbons that metabolise to organic fatty acids that the body can either reuse or degrade by  $\beta$ -oxidation [4, 6].
- These oils show low systemic accumulation and rapid elimination [4].

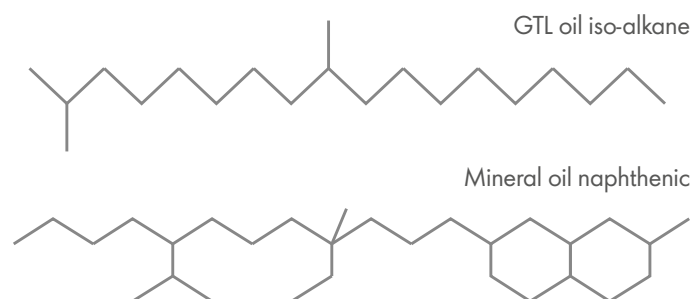


Figure 1: The chemical structure of Shell Ondina X GTL oil (iso-alkane) compared with a conventional mineral oil (naphthenic).

| Product                          | White oil                                    | Hydrocracked oil                      | Shell Ondina X 409                                     | Shell Ondina X 411                                    | Shell Ondina X 415                                     | Squalane                               | Squalene                                            |
|----------------------------------|----------------------------------------------|---------------------------------------|--------------------------------------------------------|-------------------------------------------------------|--------------------------------------------------------|----------------------------------------|-----------------------------------------------------|
| <b>Chemical class</b>            | Saturated hydrocarbon                        | Saturated hydrocarbon                 | Saturated hydrocarbon                                  | Saturated hydrocarbon                                 | Saturated hydrocarbon                                  | Saturated hydrocarbon                  | Unsaturated hydrocarbon                             |
| <b>Origin</b>                    | Mineral oil                                  | Mineral oil                           | Synthetic                                              | Synthetic                                             | Synthetic                                              | Shark liver                            | Shark liver                                         |
| <b>Boiling range (°C)</b>        | 280-400                                      | 280-320                               | 270-295                                                | 305-355                                               | 320-380                                                | 285                                    | 285                                                 |
| <b>Kinematic viscosity (cSt)</b> | 7.2 at 40°C                                  | 4.1 at 40°C                           | 3.5 at 40°C                                            | 6.0 at 40°C                                           | 9.3 at 40°C                                            | 34 at 20°C                             | 14 at 25°C                                          |
| <b>Pour point (°C)</b>           | -6                                           | -18                                   | -18                                                    | -15                                                   | -39                                                    | -38                                    | -75                                                 |
| <b>Density (kg/m³)</b>           | 840 at 15°C                                  | 813 at 15°C                           | 785 at 15°C                                            | 800 at 15°C                                           | 806 at 15°C                                            | 805 at 20°C                            | 858 at 20°C                                         |
| <b>Oxidation stability</b>       | ++                                           | ++                                    | ++                                                     | ++                                                    | ++                                                     | ++                                     | 0                                                   |
| <b>Isomer types</b>              | Iso-, n- and alkylated cycloparaffins (>50%) | Iso-, n- and alkylated cycloparaffins | Linear and low-branched hydrocarbons; n-paraffins <15% | Linear and low-branched hydrocarbons; n-paraffins <1% | Linear and low-branched hydrocarbons; n-paraffins <10% | Highly branched, saturated hydrocarbon | Highly branched, unsaturated hydrocarbon-iso-olefin |
| <b>Carbon number range</b>       | C <sub>15</sub> -C <sub>30</sub>             | C <sub>15</sub> -C <sub>19</sub>      | C <sub>15</sub> -C <sub>19</sub>                       | C <sub>18</sub> -C <sub>24</sub>                      | C <sub>17</sub> -C <sub>31</sub>                       | C <sub>30</sub>                        | C <sub>30</sub>                                     |

Table 1: Comparison of the chemical and physical properties of Shell Ondina X oils with those of conventional adjuvant oils.



## Shell Ondina X portfolio range

Shell Ondina X adjuvant oils have been specifically designed and tested to meet the stringent medicinal white oil purity requirements of the major international pharmacopoeias, including the European Pharmacopoeia, the United States Pharmacopoeia, the Chinese Pharmacopoeia and the Indian Pharmacopoeia.

The world's first monograph on our synthetic paraffinic products (Shell Ondina X 409, 411, 415 and 420) is contained in the German Pharmacopoeia (Deutsches Arzneimittelbuch) DAB 2022, to date the only pharmacopoeia that specifies levels of mineral oil aromatic hydrocarbons (MOAH) and other components such as polycyclic aromatic hydrocarbons (PAH).

## Why Shell?

- The Pearl GTL facility, the largest in the world, can meet any demand.
- Shell has decades of technological experience in developing GTL products for a wide variety of applications including in life science.
- Shell Ondina X products are produced from Shell's proprietary GTL technology that offers a one of its kind purity level. (Figure 2)

### (a) From natural gas to liquid energy

How Shell creates products from natural gas that would otherwise be produced from oil.



### (b) Global reach

Shell Ondina X oils are supplied to major markets around the world. If you are interested in unlocking valuable performance advantages, talk to us about the benefits that the Shell Ondina X range could have for your business.



Figure 2: (a) How Shell produces Shell Ondina X oils at its Pearl GTL facility, Qatar. (b) Shell Ondina X oils are supplied to major markets around the world.

## Speak with our experts

We recognise the crucial role that adjuvants play in your products, so we offer expert consultation and technical advice to support your business needs. We also understand that the quality of these vital oils is paramount and that using an adjuvant with highly consistent quality can have a major bearing on the success of your business.

**For further information, please contact our experts:**

[www.shell.com/business-customers/lubricants-for-business/process-oils/contact-our-process-oils-experts.html](http://www.shell.com/business-customers/lubricants-for-business/process-oils/contact-our-process-oils-experts.html).

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