

Je stärker eine Plasmalipoprotein-Fraktion am Fettstoffwechsel und Fett-Transport beteiligt ist, desto höher ist ihre Turnover-Rate. Dies gilt für alle Komponenten einer Fraktion, auch für ihre spezifischen Protein-Anteile. So konnte gezeigt werden, daß die biologische Halbwertszeit des Apo B als ein Hauptbestandteil der VLDL- und LDL-Fraktion höher ist als die des Apo A. Ebenso gibt es Hinweise dafür, daß die des Apo C höher ist als die des Apo B. Alle Apo-Lipoproteine haben eine deutlich höhere Turnover-Rate als andere Plasmalipoproteine, ausgenommen das Fibrinogen. Es kommt der Protein-Synthese u. a. über die Lipoproteine eine entscheidende Rolle im Fettstoffwechsel und Fett-Transport zu. Dies zeigt sich in der Tatsache, daß Gaben von Pyromycin zu einer Akkumulation von Lipiden in der Leber und den Mukosazellen führt. Die Synthese von Plasmalipoproteinen in der Leber konnte in der perfundierten Leber, an Leberschnitten und Leberribosompräparaten mit markierten Aminosäuren nachgewiesen werden. Ebenso gibt es eindeutige Hinweise dafür, daß auch die Mukosa der Darmwand zur Synthese, zu mindestens eines Teils, der Apo-Lipoproteine befähigt ist. Ungeklärt und mit der Struktur der Plasmalipoproteine eng verbunden ist die Frage, wie es zu der Formation und dem Abbau dieser Makromoleküle kommt. Es ist weiter zu klären, ob die Protein- und Lipid-Synthese an der gleichen Stelle in der Zelle unter Umständen unabhängig voneinander oder eng verknüpft miteinander abläuft, ob es ausschließlich zu einer de novo Synthese von Plasmalipoproteinen kommt oder ob abgebaute Teile von Plasmalipoproteinen, z. B. Apo-Lipoproteine, erneut aufgebaut werden können. Es gibt Hinweise dafür, daß Apo-Lipoprotein-Phosphatidresiduen im Plasma zirkulieren.

Den Apo-Lipoproteinen kommt wahrscheinlich zusammen mit den Phospholipiden eine bedeutende Rolle bezüglich der Struktur der Plasmalipoproteine zu. So ist es gut denkbar, daß die verschiedenen Apo-Lipoproteine eine unterschiedliche Kapazität besitzen, Fettsäuren und Phospholipide kovalent zu binden. Solche Bindungen könnten einen hohen lipophilen Charakter besitzen und somit von entscheidender Bedeutung bei der endgültigen Protein-Lipid-Zusammensetzung des Lipoproteins sein. In ähnlicher Weise könnten die Protein-Kohlenhydrat-Bindungen und die Kohlenhydrat-Anteile selbst eine Rolle spielen. Die Aggregation dieser Gerüste mit dem Hauptanteil der Lipide beruht wahrscheinlich auf physikalischen Kräften. Enzymatisch gesteuerte Reaktionen im Plasma selbst und im Austausch mit Geweben können vermutlich einen teilweise Ab-, Um- und Aufbau von Plasmalipoproteinen bewirken, der sowohl für die Verschiebung der Apo-Lipoproteine von einer in eine andere Dichteklasse verantwortlich ist, wie für die Tatsache, daß Apo-Lipoproteine und ihre korrespondierenden Lipide eine unterschiedliche Turnover-Rate besitzen.

Man kann heute durchaus behaupten, daß die Apo-Lipoproteine die essentielle Komponente der Plasmalipoproteine darstellen. Es kommt ihnen somit auch eine zentrale Rolle im Fett-Transport zu. Die weitere Analyse der im Lipoprotein enthaltenen Proteinanteile und die eingehende Untersuchung der Bindungskräfte, vor allem zwischen Apo-Lipoproteinen und Phosphatiden, wird nicht nur helfen die Struktur und den Stoffwechsel der Lipoproteine aufzuklären, sondern darüber hinaus entscheidende Einblicke in den Transport der Fette ermöglichen.

Studies on Wool Wax III: Effect of Wool Wax and Certain Wool Wax Derivatives on the Rheological Behaviour of Vaseline

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Wool wax and certain wool wax derivatives are investigated as regards their effect on the rheological behaviour of a hydrocarbon ointment base (vaseline). The rheological parameters considered are: flow pattern, structural viscosity, yield value, plastic viscosity, coefficients B and M of thixotropic breakdown and structural recovery. Evidence is provided for marked changes of the rheological characteristics of the system in presence of any of the investigated materials. A discussion of the different effects is presented.

Studien über Wollwachs III: Einfluß des Wollwachses und einiger Wollwachs-Derivate auf das rheologische Verhalten von Vaseline

Die Verfasser untersuchten den Einfluß des Wollwachses und einiger Wollwachs-Derivate auf das rheologische Verhalten einer Salbengrundlage auf Kohlenwasserstoff-Basis (Vaseline). Zu den untersuchten Parametern gehörten das Fließverhalten, die Strukturviskosität, die Fließgrenze, die plastische Viskosität, die Koeffizienten B und M des thixotropen Zusammenbruchs und der Regeneration. Die Anwesenheit jeder der untersuchten Substanzen ändert die rheologischen Merkmale der Vaseline erheblich. Die verschiedenen Einflüsse werden diskutiert.

Etudes sur la cire de suint III: Influence de la cire de suint et de quelques dérivés de celle-ci sur le comportement rhéologique de la vaseline

Les auteurs ont étudié l'influence de la cire de suint et de quelques dérivés de celle-ci sur le comportement rhéologique d'une pommade à base de vaseline. Les paramètres étudiés englobaient les limites d'écoulement, la viscosité structurale, la viscosité plastique, les coefficients B et M de l'effondrement thixotrope et de la régénération. La présence de chacune des matières étudiées modifie considérablement les propriétés rhéologiques de la vaseline. Les diverses influences sont discutées.

Исследование шерстяных восков. Сообщение III: влияние шерстяного воска и некоторых его дериватов на реологическое поведение вазелина.

Авторы исследовали влияние шерстяного воска и некоторых его дериватов на реологическое поведение мази на основе углеводорода (вазелин). К исследованным параметрам принадлежали поведение при течении, структурная вязкость, предел текучести, пластическая вязкость, коэффициенты B и M тиксотропного разрушения и регенерации. Присутствие каждого исследованного вещества значительно изменяет реологические свойства вазелина. Обсуждаются различные влияния.

Wool wax, in conjunction with hydrocarbon and fatty ointment bases finds wide applications in pharmacy and cosmetics; however, its use is sometimes associated with certain problems. Its liability to oxidation, although being less pronounced compared to other fats, and its initiation of sensitivity reactions, although occurring in rare cases, are examples of these problems¹⁻³. To counteract these disadvantages and to induce certain other desirable properties, such as increasing its hydrophil-lipophil balance (HLB) for rendering it dispersible in water for certain uses, wool wax derivatives were introduced. The most important examples of these derivatives are hydrogenated wool wax, acetylated wool alcohols, and ethoxylated wool wax. In this communication, it was considered of interest to compare these derivatives with the natural wax as regards their effect on the rheological behaviour of a hydrocarbon ointment base (vaseline). However, the inclusion of the ethoxylated derivative was impossible due to the formation of a coarse dispersion system with vaseline. On the other hand, a direct comparative investigation of these materials as such was impossible because rheometric measurements under unique conditions of shear could not be performed.

Experimental

Material and Apparatus

- 1) English Merino wool wax: obtained from *Westbrook Lanolin Co.*, Bradford 4, England.
- 2) Hydrogenated wool wax (Lanocera[®], *Croda Ltd.*, Cowick Hall Snaith Goole, Yorkshire, England).
- 3) Acetylated wool alcohols (Acetulan[®], *American Cholesterol Products, Inc.*, Edison, New Jersey, U.S.A.).
- 4) Official grade of yellow soft paraffin.
- 5) Rotary viscometer "Rheotest", type R. V., *Veb. Prüfgerätee-Werk Medingen*, G. D. R.
- 6) Planimeter: type GK-800, *Metrim-pex*, Budapest, Hungary.

Procedures

1. Determination of the n-Paraffin Content of Yellow Vaseline

The vaseline used was first studied for its n-paraffin content, as this, according to *K. E. Schulte* and *M. A. Kassem*⁴, affects its rheological properties. Different methods for the determination of n-paraffin content depending on the formation of urea inclusion compounds with these paraffins were reported^{5, 6}. The method adopted here was that of *B. Schmitz*⁶ making use of the modifications recommended by *M. A. Kassem*⁷ to increase the accuracy of the process.

- ¹ *E. V. Truter*, *Wool Wax*, Chemistry and Technology, *Cleaver-Hume Press Ltd.*, London 1956.
- ² *R. G. Harry*, *The Principles and Practice of Modern Cosmetics*, volume II, "Cosmetic Materials", *Leonard Hill (Books) Limited*, London 1963, p. 251.
- ³ *M. B. Sulzberger* and *J. L. Morse*, *J. Amer. med. Assoc.* **96**, 2099 [1931].
- ⁴ *Pharmac. Acta Helvetiae* **38**, 358 [1963].
- ⁵ *W. Presting* and *R. Boenke*, *Pharmazie* **9**, 562 [1954].
- ⁶ *B. Schmitz*, *Dtsch. Apotheker-Ztg.* **98**, 357 [1958].
- ⁷ *M. A. Kassem*, Ph. D. Thesis, Münster University 1962.

2. Preparation of the Sample for Rheometry

The viscometer cup was filled with about 17 ml of the melted sample taking care to exclude any air bubbles. The temperature was raised to 70°C, and the sample was kept at that temperature for 15 min. After the first 10 min., the bob was rotated for one minute at a speed of 5 r. p. m. The temperature was then lowered and the sample was kept for one hour to acquire the desired temperature before beginning the measurements. The temperature was first raised to 70°C to ensure the complete melting of lanocera (m. p. 49°-50°C).

3. Rheological Determinations

The rheological parameters studied here included: flow curve, structural viscosity, yield value, plastic viscosity, coefficients B and M of thixotropic breakdown, and the effects of shearing and recovery times on the structural viscosity. These measurements were performed for all materials at 30°C according to procedures previously described in preceding communications^{8, 9}.

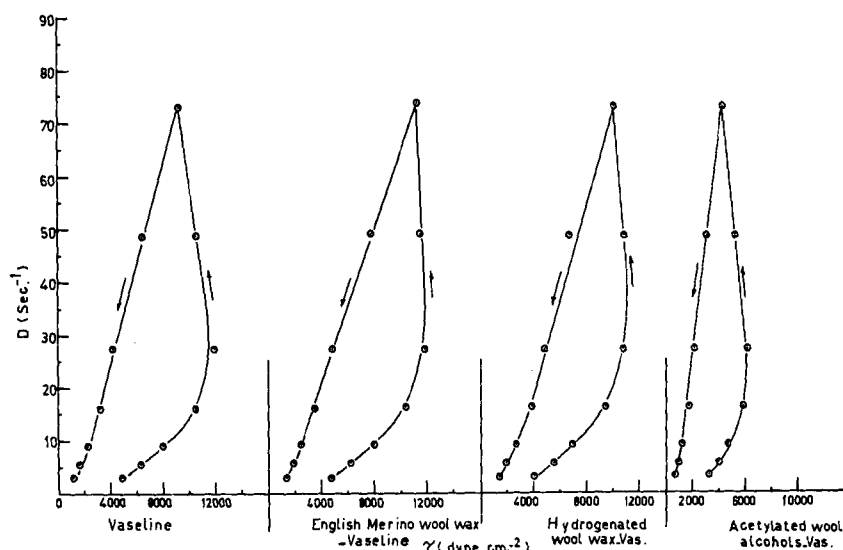


Fig. 1. Effect of wool wax and wool wax derivatives (10%) on the flow behaviour of vaseline at 30°C

Results and Discussion

1. Flow Curves

Fig. 1 shows that the flow pattern of all systems is quasiplastic with rheodestruction. It is observed that the part of the upwards curve determined at rates of shear higher than 20 sec.⁻¹ shows, in all cases, a steep flow. This phenomenon is more pronounced in the system containing only vaseline, which indicates its high mechanical lability.

2. Structural Viscosity

The structural viscosity values as determined at low (3 sec.⁻¹) and high (72.9 sec.⁻¹) rates of shear are given in Table 1. The results show that the apparent viscosity of the slightly sheared samples is very much higher than that of the more sheared ones. This phenomenon is

- ⁸ *M. A. Kassem*, *A. A. Kassem* and *H. A. Salama*, *Fette · Seifen · Anstrichmittel*, under publication.
- ⁹ *M. A. Kassem*, *A. A. Kassem* and *H. A. Salama*, *Fette · Seifen · Anstrichmittel*, under publication.

much more pronounced in the systems of vaseline and vaseline-acetylated wool alcohols. It is interesting to note that, although wool wax and hydrogenated wool wax cause a lowering of the viscosity of vaseline at the low shearing level, yet they produce the reverse effect at the high shearing level. This would indicate that both of them increase the mechanical stability of the gel system. On the other hand, the acetylated wool alcohols lower the viscosity of the system at both levels and, furthermore, increase the mechanical lability of the gel to a certain extent.

Table 1
Structural Viscosity of Different Systems Measured at 3 and 72.9 sec.⁻¹

System	Structural Viscosity (Poise) at:	
	3 sec. ⁻¹	72.9 sec. ⁻¹
Wool Wax-Vaseline	1555.6	154.0
Hydrogenated Wool Wax-Vaseline	1325.7	139.4
Acetylated Wool Alcohols-Vaseline	1080.2	60.6
Vaseline	1620.3	127.3

3. Yield Value

Table 2 shows that, while hydrogenated wool wax increases the yield value of the system, wool wax and the acetylated wool alcohols decrease it. This behaviour is not concordant with their behaviour towards the apparent viscosity, a phenomenon which might be explained by differences in the mechanical susceptibility of these different gel systems to low shearing rates. Under the conditions used in yield value determination, this factor is insignificant, however, it has some significance under the conditions of apparent viscosity determination.

Table 2
Yield Values of Different Systems Measured at 30° C

System	Yield Value (dyne · cm ⁻²)
Wool Wax-Vaseline	4013.3
Hydrogenated Wool Wax-Vaseline	5091.5
Acetylated Wool Alcohols-Vaseline	3114.8
Vaseline	4193.0

4. Plastic Viscosity

As seen from Table 3, wool wax increases greatly the plasticity of the system while the hydrogenated derivative produces only a slight increase. The acetylated alcohols, on the other hand, decrease the plastic viscosity to a large extent. This sequence resembles the one observed in the apparent viscosity of more sheared systems.

Table 3
Plastic Viscosity of Different Systems

System	Plastic Viscosity (Poise)
Wool Wax-Vaseline	137.0
Hydrogenated Wool Wax-Vaseline	109.5
Acetylated Wool Alcohols-Vaseline	47.3
Vaseline	105.7

5. Breakdown and Regeneration of Structure

5.1. Hysteresis Loop Area as a Measure of Thixotropic Breakdown of Structure

Table 4 demonstrates that hydrogenated wool wax and acetylated wool alcohols decrease the area of the hysteresis loop* for the system, the decrease being more pronounced in presence of the latter. In presence of wool wax, the area is scarcely affected. This would indicate decreased breakdown of structure in samples containing hydrogenated wool wax or acetylated wool alcohols. In the latter case the decrease is much more pronounced, whereas in presence of wool wax the structural breakdown remains practically unchanged.

Table 4
Area of Hysteresis Loop for Different Systems at 30° C

System	Area of Hysteresis Loop (cm ²)
Wool Wax-Vaseline	65.0
Hydrogenated Wool Wax-Vaseline	54.7
Acetylated Wool Alcohols-Vaseline	35.8
Vaseline	66.9

5.2. Breakdown of Structure as a Function of Shearing Rate

5.2.1. Influence of Rate of Shear on the Structural Viscosity

Fig. 2 illustrates that the structural viscosity, in all cases, decreases in the lower shearing rate much more rapidly than in the higher range. This behaviour indicates that the gel structure is disturbed to a large extent already by small shearing forces, so that by further

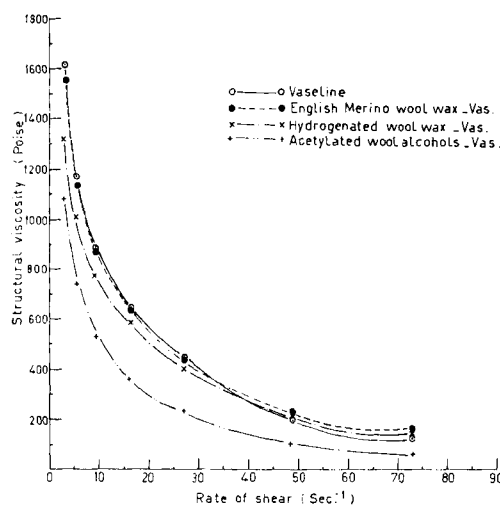


Fig. 2. Effect of wool wax and wool wax derivatives (10%) on the structural viscosity of vaseline (at 30° C) as a function of rate of shear

increase of the shearing rate no appreciable disturbance of structure could be induced. The figure shows also that the presence of wool wax or any of the derivatives used lowers the susceptibility of the gel system towards increased rates of shear.

* The area was measured from flow curves drawn so that each cm on the shear stress axis represents 1000 dyne · cm⁻², while each cm on the shear rate axis represents 5 sec.⁻¹.

5.2.2. Coefficient M of Thixotropic Breakdown of Structure

Table 5 shows that both wool wax and the derivatives studied lower the coefficient M value of the system to a great extent. This would indicate that the mechanical lability of the system towards increasing rates of shear is lowered greatly by these substances. The com-

parison of wool wax and wool wax derivatives in this respect indicates that acetylated wool alcohols and hydrogenated wool wax increase the mechanical stability of the system to a much greater extent than done by the wax itself. In the same respect, the effect of acetylated wool alcohols is somewhat greater than that of hydrogenated wool wax.

Table 5
Values of Coefficients M and B for Different Systems at 30° C

System	Coefficient M (Poise)	Coefficient B (Poise)
Wool Wax-Vaseline	517.9	94.4
Hydrogenated Wool Wax-Vaseline	279.1	76.6
Acetylated Wool Alcohols-Vaseline	250.0	58.4
Vaseline	720.7	41.1

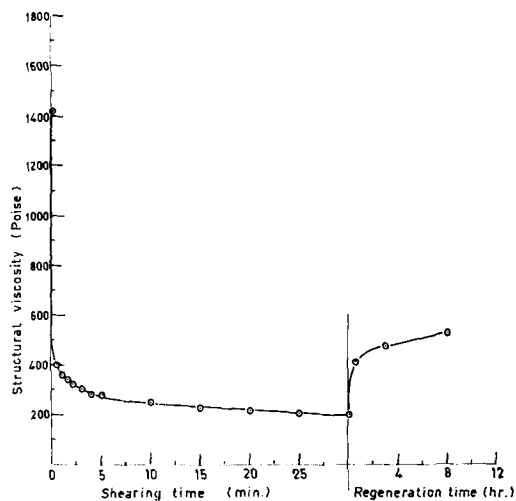


Fig. 3. Effect of shearing and regeneration times on the structural viscosity of vaseline at 30° C

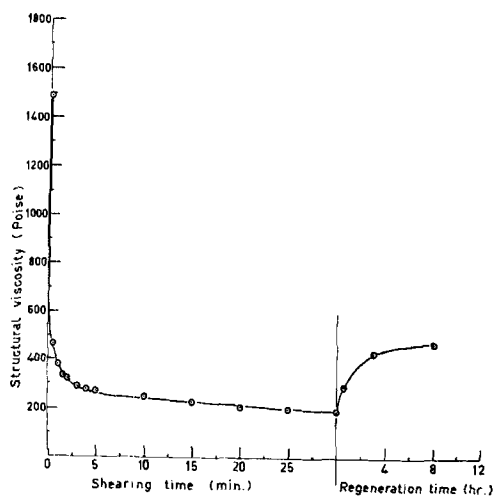


Fig. 4. Effect of wool wax (10%) on the structural viscosity of vaseline (at 30° C) as a function of shearing and regeneration times

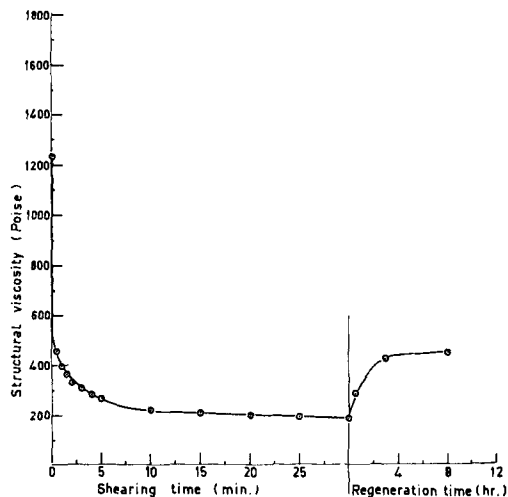


Fig. 5. Effect of hydrogenated wool wax (10%) on the structural viscosity of vaseline (at 30° C) as a function of shearing and regeneration times

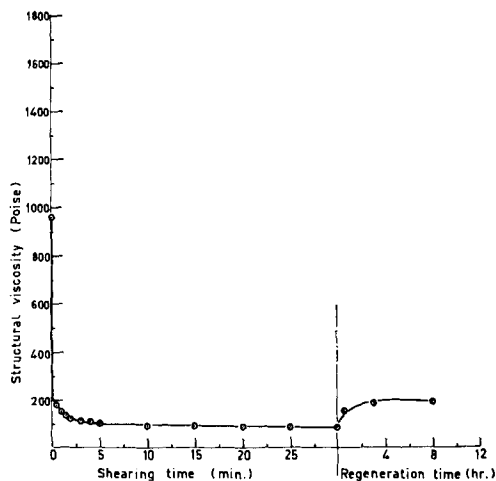


Fig. 6. Effect of acetylated wool alcohols (10%) on the structural viscosity of vaseline (at 30° C) as a function of shearing and regeneration times

5.3. Breakdown of Structure as a Function of Time of Shear

5.3.1. Dependency of the Structural Viscosity on Shearing Time at Constant Rate of Shear

The relationship between apparent viscosity and time of shear was determined for the different samples at a rate of shear of 16.2 sec⁻¹. Figures 3, 4, 5 and 6 illustrate the influence of shearing and recovery times on the apparent viscosity. A common character of these curves is the very rapid fall of apparent viscosity initially after the first few seconds of shear. This fall is then slowed down until the viscosity approaches an equilibrium value.

Table 6 shows that, whereas wool wax increases the initial viscosity of the system, the investigated derivatives lower it. The lowering is greatest in the case of acetylated wool alcohols. The equilibrium viscosity, on the other hand, decreases in presence of any of these substances in the sequence of wool wax < hydrogenated wax < acetylated wool alcohols. It is interesting to note that although the hydrogenated wax is much more viscous than the non-modified wool wax, yet the thickening effect of the former is much lower.

Comparing the effects of wool wax and wool wax derivatives on the percentage breakdown of structure of the system, it is found that, while the hydrogenated derivative produces a slight decrease, wool wax and acetylated wool alcohols exert an increase; the effect of the latter is more pronounced.

Table 6

Values of Initial Viscosity, Equilibrium Viscosity and Percentage Breakdown of Structure for Different Systems

System	Initial viscosity (Poise)	Equilibrium viscosity (Poise)	% Breakdown of structure
Wool Wax-Vaseline	1491.2	194.1	87.0
Hydrogenated Wool Wax-Vaseline	1236.6	188.6	84.8
Acetylated Wool Alcohols-Vaseline	963.8	88.7	90.8
Vaseline	1418.4	197.8	86.1

5.3.2. Time Coefficient B of Thixotropic Breakdown of Structure

Table 5 shows that wool wax or any of the derivatives used increases the B-value of the system in the order of wool wax > hydrogenated wool wax > acetylated wool alcohols. This behaviour is the reverse to their effects on coefficient M, where a decrease was observed.

Comparison of the B-values with the corresponding M ones shows that the former are very much lower, indicating thus the higher lability of the structure towards rate of shear than to shearing time.

5.4. Regeneration of Structure as a Function of Recovery Time

The effect of recovery time on the structural viscosity for the studied systems is illustrated in figures 3, 4, 5 and 6. The figures indicate that both wool wax and wool wax derivatives delay the regeneration of vaseline. Relating the values of the structural viscosity at the end of recovery time to those of the equilibrium viscosity for the different systems, it is found that the acetylated alcohols delay the regeneration of vaseline to the greatest extent. Wool wax and the hydrogenated derivative, on the other hand, produce similar but less pronounced effects.

Comparing the values of quotient R^{10} , which represents the amount of regenerated structure in percent to that

broken down, after a recovery time of 8 hrs. (fig. 7) for the different systems, it is seen that this value decreases in presence of any of the studied materials. However, this decrease is slight in the case of wool wax and the hydrogenated derivative, and is more pronounced for the acetylated alcohols.

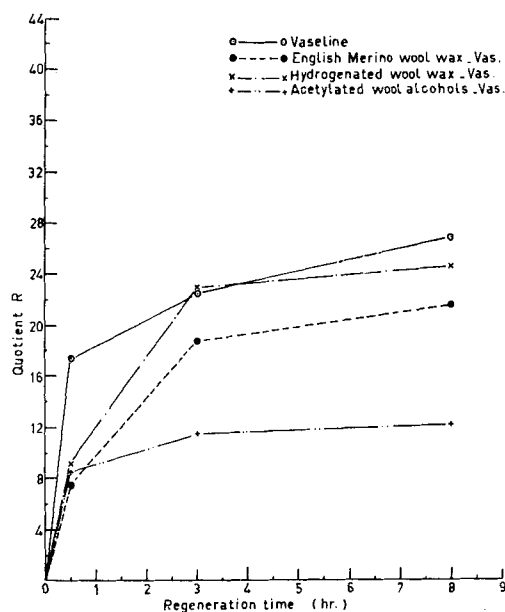


Fig. 7. Effect of wool wax and wool wax derivatives (10%) on the quotient R of vaseline as a function of regeneration time

Conclusion

Wool wax and wool wax derivatives are found to affect greatly the rheological behaviour of vaseline. Considering the parameters of consistency, thixotropic breakdown and regeneration of the gel-structure, the following might be concluded:

1. Phenomenon of Consistency

a) At high shearing level, both wool wax and the hydrogenated derivative increase the consistency of the system as shown from the structural and plastic viscosities; the former produces a greater increase. On the other hand, the acetylated alcohols lower the consistency.

b) At low shearing level, both wool wax and the derivatives lower the consistency of the system. Acetylated wool alcohols produce the greatest effect while the wax itself the least. Hydrogenated wool wax, in spite of its waxy nature, higher melting point (49°—50° C) and viscosity as compared to the natural wax, exerts a much less marked thickening effect. This could be explained by an increase of the crystallite size of solid elements of the gel-structure which is more pronounced in presence of hydrogenated wool wax. A further explanation would be given by the different susceptibilities towards mechanical influences.

c) Both wool wax and the acetylated alcohols lower the yield value of the system, the lowering being more pronounced in presence of the latter. On the other

¹⁰ K. E. Schulte and M. A. Kassem, *Pharmac. Acta Helvetiae* **38**, 34 [1963].

hand, hydrogenated wool wax produces a marked increase in that value. Here, again, the behaviour of the hydrogenated derivative can be explained according to the above mentioned suppositions.

2. Phenomenon of Breakdown of the Gel-Structure

The investigation of this phenomenon through the hysteresis loop-area, dependency of structural viscosity on shearing rate, coefficient M, dependency of structural viscosity on time of shear and coefficient B reveals that:

a) The thixotropic breakdown of structure for all systems is much more dependent on the rate of shear than on the time of shear as the comparison of M- and B-values would indicate.

b) Both wool wax and the derivatives lower the thixotropic breakdown induced by increasing rate of shear. The acetylated alcohols produce the greatest effect, while the wax produces the least. The effect of hydrogenated wool wax approaches nearly that of the acetylated alcohols.

c) Wool wax as well as the derivatives, in the order of wool wax > hydrogenated wool wax > acetylated wool alcohols, increase the thixotropic breakdown induced by increasing time of shear.

3. Phenomenon of Regeneration of the Gel-Structure in the Stationary State

a) The presence of any of the materials used delays the thixotropic regeneration of the system. Acetylated wool alcohols induce the most pronounced decrease, while wool wax and the hydrogenated derivative produce similar but less pronounced effects.

b) Wool wax and the derivatives, in the order of acetylated wool alcohols > wool wax > hydrogenated wool wax, lower the amount of regenerated structure in percent to that broken down (quotient R).

Acknowledgement

The authors would like to express their gratitude to *Croda Ltd.* (Yorkshire, England) and *American Cholesterol Products, Inc.* (New Jersey, U.S.A) for the kind supply of wax derivatives.

Untersuchung von in Haushalten benutzten Fritürefetten

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Drei Fettmischungen mit steigendem Gehalt an mehrfach ungesättigten Fettsäuren wurden in je 140 Haushalten während 8 Wochen zum Fritieren verwendet. Von den gebrauchten Bratfetten wurden freie Fettsäuren (ffa), Rauchpunkt, Schaumzahl, Jodfarbzahl und petrolätherunlösliche oxydierte Fettsäuren, von einer Versuchsreihe zusätzlich apolare dimere Fettsäuren und Viskosität bestimmt. Aus der Häufigkeitsverteilung der Analysendaten wird der Schluß gezogen, daß die Beanspruchung der Fette im Haushalt im allgemeinen sehr gering war. Eine eindeutige Beziehung zwischen Analysendaten und Gehalt an mehrfach ungesättigten Fettsäuren ließ sich nicht ableiten.

Investigation of Frying Fats Used in Households

Each of three fat mixtures with increasing content of polyunsaturated fatty acids were employed for frying in 140 households. The used fats were tested for free fatty acids (ffa), smoke point, foam value, iodine colour value, oxidized fatty acids insoluble in petroleum ether. Additionally, the unpolar dimeric fatty acids and the viscosity were determined in one series of experiments. It was concluded by statistical analysis that the fats in the household were subjected to very little stress. No direct relationship could be derived between the analytical data and the content of polyunsaturated fatty acids.

In drei Versuchsreihen wurden vom Institut für Verbrauchs- und Einkaufsforschung (IVE) Fettmischungen ähnlicher Konsistenz an je ca. 140 Haushaltungen in mehreren Städten der Bundesrepublik zum Frittieren ausgegeben. In der 1. Versuchsreihe (I) wurde eine Fettmischung mit 21% Erdnußöl als Ölanteil verwendet. In der 2. Versuchsreihe (II) wurde das Erdnußöl durch Sojaöl ersetzt, und in der 3. Versuchsreihe (III) wurde der Sojaölanteil auf 70% erhöht. Der Gehalt an mehrfach ungesättigten Fettsäuren nahm also in der Reihenfolge I, II, III zu. Nach achtwöchigem Verbleib im Haushalt

Etude des huiles à frire utilisées dans des ménages

Trois mélanges d'huiles à teneur croissante en acides gras polyinsaturés ont été employés dans 140 ménages pendant 8 semaines pour la friture. Dans les huiles à frire usées, on a déterminé les acides gras libres, le point de fumée, l'indice de mousse, l'indice de couleur à l'iode, les acides gras oxydés insolubles dans l'éther de pétrole, les acides gras dimères apolaires et la viscosité. Les données analytiques permettent de conclure que la charge des huiles est d'une manière générale très légère. Les données analytiques ne sont guère fonction de la teneur en acides gras polyinsaturés.

Ниследование бытовых жировых масел для жарения.

Три смеси жиров с возрастающим содержанием многократно ненасыщенных жирных кислот в течение 8 недель применялись в 140 домашних хозяйствах для жарения. Для примененных жиров определены свободные жирные кислоты, точка дымообразования, число вспенивания, число йодного окрашивания и нерастворимые в керосине окисленные жирные кислоты, в одной серии опытов кроме того аполарные димерные жирные кислоты и вязкость. Из распределения встречаемости аналитических данных авторы заключают, что использование жиров в домашнем хозяйстве в общем было незначительным. Однозначную связь между аналитическими данными и содержанием многократно ненасыщенных жирных кислот установить не удалось.

wurden die gebrauchten Fette von uns untersucht, um festzustellen, wie stark derartige Fette im Haushalt belastet werden.

Hierzu wurden die Bestimmungen der freien Fettsäuren¹, des Rauchpunktes², der Schaumzahl³, der Jodfarbzahl⁴ und der petrolätherunlöslichen oxydierten Fettsäu-

¹ DGF-Einheitsmethoden C-V 2 (57) und C-V 5 (57).

² DGF-Einheitsmethoden C-IV 11 (Entwurf) unveröffentlicht.

³ H. E. Rost, Fette · Seifen · Anstrichmittel 66, 123 [1964].

⁴ DGF-Einheitsmethoden C-IV 4 a (Entwurf) unveröffentlicht.